

BULLETIN  ARIZONA STATE UNIVERSITY

MATHEMATICS DEPARTMENT
ARIZONA STATE UNIVERSITY
TEMPE, ARIZONA



ARIZONA STATE UNIVERSITY
GENERAL CATALOG • 1969-70 • 1970-71



General Catalog • 1969-70/1970-71

MATHEMATICS DEPARTMENT
ARIZONA STATE UNIVERSITY
TEMPE, ARIZONA

Arizona State University

*Requests for detailed information
should be addressed as follows:*

REGISTRAR AND DIRECTOR
OF ADMISSIONS
ARIZONA STATE UNIVERSITY
TEMPE, ARIZONA 85281

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TEMPE, ARIZONA

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*Arizona State University reserves the right
to change without notice any of the materials —
information, requirements, regulations —
published in this Bulletin.*

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Steps for Undergraduate Admission

1. *Application for Admission.* Write to the office of the Registrar and Director of Admissions for an Application for Admission form. With the application form will come brief instructions, a Health Examination Report form, and a housing information request. If you will need University housing, make your arrangements early. (See page 97.)

2. *Official Transcripts.* Official copies of high school and college records must be sent to the Admissions Office. High school records may be submitted as early as the close of the seventh semester. (See page 67.)

3. *Aptitude Test.* (For all new freshmen.) Arrangements for taking the American College Test (ACT), are made through the high school. It should be taken during the senior year, and test scores should be sent to the Admissions Office. (See page 67.)

4. *Admission.* When all of the necessary documents are received in the Admissions Office, notification of the action taken on the application will be mailed to the student. For details on entrance requirements, see pages 67-73.

5. *Health Examination.* The Health Examination Report form is to be completed by a physician and sent to the Student Health Service. (See page 99.)

Arizona State University

Colleges, Schools, Divisions, and Departments of Instruction

COLLEGE OF LIBERAL ARTS

Departments: Aerospace Studies, Anthropology, Botany, Chemistry, English, Foreign Languages, Geography, Geology, Health, Physical Education and Recreation, History, Home Economics, Mass Communications, Mathematics, Military Science, Philosophy, Physics, Political Science, Psychology, Sociology, Zoology.

COLLEGE OF ARCHITECTURE

COLLEGE OF BUSINESS ADMINISTRATION

Departments: Accounting, Economics, General Business Administration, Management, Marketing, Office Administration and Business Education, Quantitative Systems.

COLLEGE OF EDUCATION

Departments: Elementary Education, Secondary Education, Educational Administration and Supervision, Educational Foundations, Counseling and Educational Psychology, Special Education, Library Science.

COLLEGE OF ENGINEERING SCIENCES

School of Engineering. Faculties: Chemical Engineering, Civil Engineering, Electrical Engineering, Engineering Mechanics, Engineering Science, Industrial Engineering, Mechanical Engineering.

Division of Technology. Aeronautical Technology, Electronic Technology, Graphic Arts Technology, Industrial Technology, Technical Education Technology.

Division of Agriculture. Agricultural Economics, Animal Agriculture, Plant Agriculture.

Division of Construction.

COLLEGE OF FINE ARTS

Departments: Art, Music, Speech and Drama, Center for Humanities.

COLLEGE OF LAW

COLLEGE OF NURSING

GRADUATE COLLEGE

GRADUATE SCHOOL OF SOCIAL SERVICE ADMINISTRATION

UNIVERSITY EXTENSION AND SUMMER SESSIONS

University Calendar

1969-1970-1971

Fall Semester	1969-70	1970-71
First Faculty Meeting	Sept. 6, Sa.	Sept. 5, Sa.
Residence Halls Open	Sept. 7, Su.	Sept. 6, Su.
First Freshman Assembly	Sept. 8, M.	Sept. 8, Tu.
Orientation and Advisement for New Students	Sept. 8-11 M.-Th.	Sept. 8-10 Tu.-Th.
All Students Complete Registration and Pay Fees	Sept. 12-13, F., Sa. to Noon	Sept. 11-12, F., Sa. to Noon
Instruction Begins	Sept. 15, M.	Sept. 14, M.
Last Day of Registration for Credit	Sept. 20, Sa. to Noon	Sept. 19, Sa. to Noon
Last Day Courses May Be Dropped Without Penalty	Oct. 24, Fr.	Oct. 23, Fr.
Mid-Semester Scholarship Reports Due	Nov. 7, Fr.	Nov. 6, Fr.
Veterans Day, No Classes	Nov. 11, Tu.	Nov. 11, W.
Candidates for Bachelors Degree Must File Application for Graduation by	Nov. 15, Sa. to Noon	Nov. 16, M.
Thanksgiving Recess, Classes Excused	Nov. 27, Th. through Nov. 30, Su.	Nov. 26. Th. through Nov. 29, Su.
Christmas Vacation, Classes Excused	Dec. 20, Sa. through Jan. 4, Su.	Dec. 19, Sa. through Jan. 3, Su.
Instruction Ends	Jan. 17, Sa.	Jan. 16, Sa.
Final Examinations	Jan. 19-24, M., Tu., W., Th., Fr., Sa.	Jan. 18-23, M., Tu., W., Th., Fr., Sa.

For the calendar of the College of Law, see the Bulletin of that College.

Spring Semester	1969-70	1970-71
Residence Halls Open to New Students.....	Feb. 1, Su.	Jan. 31, Su.
Advisement, New and Continuing Students	Feb. 2, M.	Feb. 1, M.
All Students Complete Registration and Pay Fees	Feb. 3-4, Tu., W. to Noon	Feb. 2-3, Tu., W. to Noon
Instruction Begins	Feb. 5, Th.	Feb. 4, Th.
Last Day of Registration for Credit	Feb. 11, W.	Feb. 10, W.
Washington's Birthday, No Classes	Feb. 23, M.	Feb. 15, M.
Charter Day Convocation	Mar. 12, Th.	Mar 12, F.
Last Day Courses May Be Dropped Without Penalty	Mar. 18, W.	Mar. 17, W.
Mid-Semester Scholarship Reports Due....	Apr. 1, W.	Mar. 31, W.
Easter Vacation, Classes Excused	Mar. 26-31, Th., Fr., Sa., Su., M., Tu.	Apr. 8-13, Th., Fr., Sa., Su., M., Tu.
Instruction Ends	May 27, W.	May 26, W.
Final Examinations	May 28, 29, Th., Fr., June 1, 2, 3, 4, M., Tu., W., Th.	May 27, 28, 29, Th., Fr., Sa., Noon, June 1, 2, 3, Tu., W., Th.
Memorial Day, No Classes	May 30, Sa.	May 31, M.
Baccalaureate Service	May 31, Su., 7:00 p.m.	May 30, Su., 7:00 p.m.
Commencement Exercises	June 2, Tu. 8:00 p.m.	June 1, Tu., 8:00 p.m.
Residence Halls Close	June 6, Sa., Noon	June 5, Sa., Noon
SUMMER SESSIONS		
First Summer Session Registration	June 13, Sa.	June 12, Sa.
Instruction Begins	June 15, M.	June 14, M.
First Summer Session Ends	July 18, Sa.	July 17, Sa.
Second Summer Session Registration	July 18, Sa.	July 17, Sa.
Instruction Begins	July 20, M.	July 19, M.
Second Summer Session Ends	Aug. 22, Sa.	Aug. 21, Sa.

1969

JULY							AUGUST							SEPTEMBER						
SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT
		1	2	3	4	5	3	4	5	6	7	8	9	7	8	9	10	11	12	13
6	7	8	9	10	11	12	10	11	12	13	14	15	16	14	15	16	17	18	19	20
13	14	15	16	17	18	19	17	18	19	20	21	22	23	21	22	23	24	25	26	27
20	21	22	23	24	25	26	24	25	26	27	28	29	30	28	29	30				
27	28	29	30	31			31													

OCTOBER							NOVEMBER							DECEMBER						
SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4	2	3	4	5	6	7	8	7	8	9	10	11	12	13
5	6	7	8	9	10	11	9	10	11	12	13	14	15	14	15	16	17	18	19	20
12	13	14	15	16	17	18	16	17	18	19	20	21	22	21	22	23	24	25	26	27
19	20	21	22	23	24	25	23	24	25	26	27	28	29	28	29	30	31			
26	27	28	29	30	31		30													

1970

JANUARY							FEBRUARY							MARCH						
SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT
				1	2	3	1	2	3	4	5	6	7	1	2	3	4	5	6	7
4	5	6	7	8	9	10	8	9	10	11	12	13	14	8	9	10	11	12	13	14
11	12	13	14	15	16	17	15	16	17	18	19	20	21	15	16	17	18	19	20	21
18	19	20	21	22	23	24	22	23	24	25	26	27	28	22	23	24	25	26	27	28
25	26	27	28	29	30	31								29	30	31				

APRIL							MAY							JUNE						
SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4	3	4	5	6	7	8	9	7	8	9	10	11	12	13
5	6	7	8	9	10	11	10	11	12	13	14	15	16	14	15	16	17	18	19	20
12	13	14	15	16	17	18	17	18	19	20	21	22	23	21	22	23	24	25	26	27
19	20	21	22	23	24	25	24	25	26	27	28	29	30	28	29	30				
26	27	28	29	30			31													

JULY							AUGUST							SEPTEMBER						
SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4	2	3	4	5	6	7	8	6	7	8	9	10	11	12
5	6	7	8	9	10	11	9	10	11	12	13	14	15	13	14	15	16	17	18	19
12	13	14	15	16	17	18	16	17	18	19	20	21	22	20	21	22	23	24	25	26
19	20	21	22	23	24	25	23	24	25	26	27	28	29	27	28	29	30			
26	27	28	29	30	31		30	31												

OCTOBER							NOVEMBER							DECEMBER						
SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4	1	2	3	4	5	6	7	6	7	8	9	10	11	12
4	5	6	7	8	9	10	8	9	10	11	12	13	14	13	14	15	16	17	18	19
11	12	13	14	15	16	17	15	16	17	18	19	20	21	20	21	22	23	24	25	26
18	19	20	21	22	23	24	22	23	24	25	26	27	28	27	28	29	30	31		
25	26	27	28	29	30	31	29	30												

1971

JANUARY							FEBRUARY							MARCH						
SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT
					1	2	1	2	3	4	5	6	7	8	9	10	11	12	13	
3	4	5	6	7	8	9	7	8	9	10	11	12	13	14	15	16	17	18	19	20
10	11	12	13	14	15	16	14	15	16	17	18	19	20	21	22	23	24	25	26	27
17	18	19	20	21	22	23	21	22	23	24	25	26	27	28	29	30	31			
24	25	26	27	28	29	30	28													
31																				

APRIL							MAY							JUNE						
SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT
				1	2	3	2	3	4	5	6	7	8	6	7	8	9	10	11	12
4	5	6	7	8	9	10	9	10	11	12	13	14	15	13	14	15	16	17	18	19
11	12	13	14	15	16	17	16	17	18	19	20	21	22	20	21	22	23	24	25	26
18	19	20	21	22	23	24	23	24	25	26	27	28	29	27	28	29	30			
25	26	27	28	29	30		30	31												

ARIZONA BOARD OF REGENTS

EX OFFICIO

Jack Williams *Governor of Arizona*
 Sarah Folsom, B.S., M.S., L.H.D. *State Superintendent
 of Public Instruction*

APPOINTED

	Term Expires
W. P. Goss, B.S. in Min. E.	<i>January, 1971</i>
Arthur B. Schellenberg, B.S. in Ch. E.	<i>January, 1971</i>
Elwood W. Bradford, B.S.	<i>January, 1973</i>
Norman G. Sharber	<i>January, 1973</i>
Norma Barr Rockfellow	<i>January, 1975</i>
Paul L. Singer, B.S., M.D., F.A.C.S.	<i>January, 1975</i>
Gordon D. Paris	<i>January, 1977</i>
Dean Burch, LL.B.	<i>January, 1977</i>
Thomas L. Hall, B.A., LL.B.	<i>Adviser to the Board</i>
Myron R. Holbert, A.B., M.A.	<i>Budget Officer for Board</i>

ARIZONA STATE UNIVERSITY

G. Homer Durham, Ph.D. *President of the University*
 Karl H. Dannenfeldt, Ph.D. *Academic Vice President*
 George F. Hamm, Ph.D. *Vice President, Student Affairs;
 Dean of Students*
 William J. Burke, Ph.D. *Vice President, Graduate Studies;
 Dean, Graduate College*
 Joseph C. Schabacker, Ph.D. *Vice President, University Extension;
 Dean, Summer Sessions*
 Gilbert L. Cady, B.A. in Ed. *Vice President, Business Affairs*

Faculty, University Offices and Services

General Administration

- G. HOMER DURHAM (1960)***President of the University;
Professor of Political Science
A.B., University of Utah; Ph.D., University of California, Los Angeles
- KARL H. DANNENFELDT (1956)**Academic Vice President;
Professor of History
A.B., Valparaiso University; M.A., Indiana University; Ph.D., University of Chicago
- GEORGE F. HAMM (1962)**Vice President, Student Affairs;
Dean of Students; Associate Professor of Education
B.S., South Dakota State College; M.A., Ph.D., University of Wyoming
- WILLIAM J. BURKE (1962)**Vice President, Graduate Studies;
Dean, Graduate College; Professor of Chemistry
A.B., Ohio University; Ph.D., Ohio State University
- JOSEPH C. SCHABACKER (1963)**Vice President, University Extension;
Dean, Summer Sessions; Professor of Management
B.S., Temple University; M.B.A., Ph.D., University of California, Los Angeles
- GILBERT L. CADY (1934)**Vice President, Business Affairs
B.A., in Ed., Arizona State University
- GEORGE A. PEEK, JR. (1964)**Dean, College of Liberal Arts;
Professor of Political Science
B.A., M.A., Ph.D., University of Virginia
- JAMES W. ELMORE (1949)**Dean, College of Architecture;
Professor of Architecture
A.B., University of Nebraska; M.S. in Arch., Columbia University
- GLENN D. OVERMAN (1956)**Dean, College of Business Administration;
Professor of Business Administration
B.S., Central State College; M.S., Oklahoma State University; D.B.A., Indiana University
- HARRY K. NEWBURN (1963)**Dean, College of Education;
Professor of Education
B.Ed., Western Illinois State University; M.A., Ph.D., State University of Iowa
- LEE P. THOMPSON (1955)**Dean, College of Engineering Sciences;
Director, School of Engineering; Professor of Engineering
B.A., Indiana University; M.S., Ph.D., Agricultural and Mechanical College of Texas
- HENRY A. BRUINSMA (1964)**Dean, College of Fine Arts;
Professor of Music
B.M., M.M., Ph.D., University of Michigan

*Year of first appointment to the faculty.

- WILLARD H. PEDRICK (1966)**Dean, College of Law;
 Professor of Law
 B.A., Parsons College; J.D., Northwestern University
- HORACE W. LUNDBERG (1962)**Dean, Graduate School of Social Service
 Administration; Professor of Social Work
 B.S., Utah State University; M.S., University of Utah; M.S.W., University of California,
 Berkeley; Ph.D., University of Minnesota
- LORETTA A. HANNER (1957)**Dean, College of Nursing;
 Professor of Nursing
 R.N., Michael Reese Hospital School of Nursing;
 P.H.N., B.S., University of Minnesota; M.S., Cornell University
- RICHARD G. LANDINI (1959)**Dean, Litchfield College;
 Professor of English
 A.B., M.A., University of Miami; Ph.D., University of Florida
- ALAN D. COVEY (1962)**University Librarian;
 Professor of Library Science
 A.B., Certificate in L.S., University of California, Berkeley; Ed.D., Stanford University
- ALFRED THOMAS, JR. (1939)**Registrar and Director of Admissions
 B.A. in Ed., M.A. in Ed., Arizona State University
- T. TILMAN CRANCE (1941)** ..Director of Budgets and Institutional Studies
 B.A. in Ed., M.A. in Ed., Arizona State University; C.P.A., Arizona
- CECELIA SCOULAR (1955)**Director, Memorial Union
 B.A., Lawrence College; M.A., Teachers College, Columbia University
- ROBERT F. MENKE (1947)**Director of Placement Service;
 Professor of Education
 B.S., Oshkosh State College; M.A. in Ed., Ph.D., Northwestern University
- MARY L. BUNTE (1933)**Administrative Secretary, President's Office
 A.B. in Ed., Northern Arizona University; M.A. in Ed., Arizona State University
- JAMES W. CREASMAN (1947)** Director, University Relations
 B.A. in Ed., Arizona State University
- DONALD V. DOTTS (1958)**Executive Director, Alumni Association
 B.A., Arizona State University
- JOSEPH E. SPRING (1954)**Director, Information Services
 B.A., Illinois Wesleyan University; M.A., Ph.D., University of Denver
- DEAN E. SMITH (1950-52; 1959)**Director of Publications
 and University Editor
 B.S., Arizona State University
- EDWARD M. HICKCOX (1958)** Assistant Vice President for
 Business Affairs; Director of Auxiliary Services
 B.S., New Mexico Agricultural and Mechanical Arts College;
 B.A. in Ed., Arizona State University; M.A. in Ed., Arizona State University
- KATHRYN K. GAMMAGE (1960)**Assistant to the Vice President
 for Business Affairs
 (Gifts and Endowments)
 B.A., Heidelberg College; M.S. in Ed., Syracuse University
- CLYDE B. SMITH (1952)**Director of Intercollegiate Athletics;
 Professor of Health, Physical Education and Recreation
 A.B., Geneva College; M.S. in Ed., Indiana University

Resident Faculty

- ABBOTT, JOHN C. (1956)** Associate Professor of Education
B.S., M.S., Ed.D., Indiana University
- ABDOW, MIRIAM J. (1965)** Instructor in French
M.A., University of Paris (France)
- ABRAHAM, WILLARD (1953)** Professor of Education;
Chairman, Department of Special Education
B.S., Illinois Institute of Technology; M.Ed., Chicago Teachers College;
Ph.D., Northwestern University
- ACEVEDO, ROBERTO M. (1964)** Assistant Professor of Spanish
A.B., University of California, Berkeley; M.A., University of Arizona
- ADAMS, VAUGHN P., JR. (1968)** Assistant Professor of Design
Technology
B.S., M.S., Arizona State University
- ADAMS, WALLACE E. (1958)** Professor of History
B.S., M.A., University of Oregon; Ph.D., Stanford University
- AHMADZADEH, AKBAR (1966)** Associate Professor of Physics
B.A., Ph.D., University of California, Berkeley
- ALARCON, JUSTO S. (1968)** Instructor in Spanish
B.A. and M.A. (Theol.), Serafica (Spain); M.A. (Social Sc.), Laval University (Canada);
M.A. (Spanish), Arizona State University
- ALDRICH, FRANK T. (1969)** Assistant Professor of Geography
B.A., University of Texas; M.S., Oregon State University
- ALISKY, MARVIN (1957)** Professor of Political Science;
Director of Center for Latin American Studies
B.A., M.J., University of Texas; Ph.D., University of Texas
- ALLEN, THEODORE, JR. (1959)** Professor of Engineering
B.S.M.E., M.S.M.E., Agricultural & Mechanical College of Texas
- ALPHER, BARRY J. (1968)** Assistant Professor of Anthropology
B.A., University of Chicago
- ANDERSON, BRUCE A. (1966)** Assistant Professor of Mathematics
B.A., M.S., Ph.D., University of Iowa
- ANDERSON, ETHEL (1966)** Assistant Professor of Education;
Counselor, University Counseling Service
B.S., Utah State University; M.Ed., Ed.D., University of Wyoming
- ANDERSON, MELVIN S. (1967)** Associate Professor of
Business Administration
B.S., M.S., Oklahoma State University; Ed.D., University of Arkansas
- APILADO, VINCENT P. (1969)** Assistant Professor of Business
Administration
B.S., University of Portland; M.B.A., University of Oregon;
Ph.D., University of Michigan
- ARCHER, JEROME W. (1963)** Professor of English;
Chairman, Department of English
B.A., M.A., Marquette University; Ph.D., Northwestern University
- ARMSTRONG, ROBERT L. (1967)** Assistant Professor of Education
B.A., State Teachers College of Iowa; M.S., State University of Iowa;
Ed.D., University of Arizona
- ARNER, DOUGLAS G. (1959)** Professor of Philosophy;
Chairman, Department of Philosophy
B.S., Creighton University; M.A., Ph.D., University of Michigan
- ARNQUIST, CLIFFORD W. (1966)** Assistant Professor of Mathematics
A.B., University of California, Riverside; M.A., University of California, Berkeley;
Ph.D., University of California, Riverside
- ARONSON, JEROME M. (1966)** Associate Professor of Botany
B.A., Ph.D., University of California, Berkeley
- ASHE, ROBERT W. (1955)** Professor of Education
A.B., M.A., in Ed., Arizona State University; Ed.D., University of Southern California

- ATSUMI, TAKAYORI (1968) Instructor in Music
B.M.A., Kunitachi Music College (Japan); M.M., New England Conservatory of Music
- AUTENRIETH, BERTHA (1946) Associate Professor of Music
B.M., New England Conservatory; M.M., University of Michigan
- AUTORE, DONALD D. (1959) Assistant Professor of Engineering
B.S.E., University of Michigan; M.S.E., Arizona State University
- AVERY, JAMES P. (1960) Professor of Engineering
B.S.E., M.S.E., University of Michigan; Ph.D., Purdue University
- AX, LELAND S. (1959) Associate Professor of Engineering
B.S.E.E., B.S.R.E., Tri State College; M.S., Kansas State College
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- MOAN, OBERT B. (1963) Professor of Engineering
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- TINGEY, SHERMAN N. (1966)** Associate Professor of Management
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- TOOTLE, JOHN C. (1967)** Associate Professor of
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- TURNBOW, JAMES W. (1959)** Professor of Engineering
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- TURNER, CHRISTY G., II (1966)** Associate Professor of Anthropology
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- UHL, RAYMOND (1959)** Professor of Political Science
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- VERMEULEN, PETER J. (1968)** Associate Professor of Engineering
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- VICHULES, LEO D. (1961)** Assistant Professor of Political Science
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- VIRGILLO, CARMELO (1965)** Associate Professor of
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- VON BRETZEL, PHILIP K. (1967) Assistant Professor of Philosophy
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- VON DER HEYDT, ALFRED (1950) Professor of German
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- WALKER, STEPHEN G. (1969) Assistant Professor of Political Science
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- WALLACE, CHARLES E. (1958) Professor of Engineering;
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- WARREN, DOLORES (1968) Instructor in Nursing
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- WARREN, MORRISON F. (1968) Associate Professor of Education;
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- WELCH, H. WILLIAM (1967) Professor of Engineering;
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- WELLONS, KENNARD W. (1966) Assistant Professor of Social Work
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- WEXLER, CHARLES (1930) Professor of Mathematics
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- WHIFFEN, MARCUS (1960) Professor of Architecture
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- WHITAM, FREDERICK L. (1966) Associate Professor of Sociology
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 B.A., Bethany-Peniel College; M.A., University of Oklahoma
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- WILLSON, LORETTA L. (1947)** Assistant Professor of Speech and Drama
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- WILSON, GLORIA N. (1961)** Assistant Professor of
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 B.Ed., University of Saskatchewan; M.A., Arizona State University
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 B.S., M.S., Ph.D., Marquette University
- WILT, GLENN A., JR. (1963)** Associate Professor of
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 B.S., M.S., University of Utah; Ph.D., University of California, Berkeley
- WOOTTEN, WILLIAM W. (1959)** Assistant Professor of History
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- WORK, RICHARD N. (1965)** Professor of Physics;
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- ZACHER, ROBERT V. (1947) Professor of Advertising
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Visiting Professors and Lecturers

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- CULLUM, LESLIE E. Lecturer in Zoology;
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- DE BOLSKE, JACK Lecturer in Political Science
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B.A., Los Angeles Art Center
- EDLIN, FRANK E. Lecturer in Engineering
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- EIDELBERG, EDUARDO Lecturer in Psychology
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- PYLE, WILLIAM W. Lecturer in Accounting
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- REED, WILLIAM H. Lecturer in Industrial Technology
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- ROPER, DEVON J. Lecturer in Industrial Technology
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- COVEY, ALAN D. (1962) University Librarian;
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- BEECHER, MARY E. (1958) Catalog Librarian
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- JOHNSON, KARL B. (1968)** Arizona Librarian
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- KESSLER, HOLLY G. (1966)** Catalog Librarian
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- KNEPP, KENNETH B. (1968)** Head, Bibliography Service
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- MCGRATH, AFTON L. (1966)** Head, Social Science
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B.A., Arizona State University; M.L.S., University of California, Berkeley
- MUIR, GERTRUDE F. (1960-62; 1963)** Reference Librarian
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- WU, AI-HWA (1964) Catalog Librarian
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Law Library

- MURRAY, WILLIAM R. (1968) Assistant Law Librarian,
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LL.B., Memphis State University; M.Law.Lib., University of Washington
- TSAO, JAMES J. (1967) Catalog Librarian, College of Law
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Student Health Service

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- JONES, RICHARD L. (1968) University Physician
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- PALMER, PAUL E., F.A.C.O.S. (1969) Medical Consultant, P/T
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Associate Director of Admissions	Joseph A. Norton
Associate Registrar	Galen H. Cassidy
Assistant Director of Admissions	Ann J. Kolberg
Assistant Registrar	Madelyn Wright
Director, Bureau of Publications and University Editor	Dean E. Smith

Colleges, Schools, and Divisions

College of Liberal Arts	George A. Peek, Jr., Dean
College of Architecture	James W. Elmore, Dean
College of Business Administration	Glenn D. Overman, Dean
College of Education	Harry K. Newburn, Dean
College of Engineering Sciences	Lee P. Thompson, Dean
School of Engineering	Lee P. Thompson, Director
Division of Agriculture	Daniel O. Robinson, Director
Division of Technology	Walter E. Burdette, Director
Division of Construction	Edward F. Shaifer, Jr., Director
College of Fine Arts	Henry A. Bruinsma, Dean
College of Law	Willard H. Pedrick, Dean
College of Nursing	Loretta A. Hanner, Dean
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Departments of Instruction

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Secondary Education (see Education, Secondary)	
Social Service Administration	Horace W. Lundberg, Dean
Sociology	Thomas Ford Hout, Chairman
Special Education (see Education, Special)	
Speech and Drama	Gale L. Richards, Chairman
Technology	Walter E. Burdette, Director
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University Library

University Librarian	Alan D. Covey
Assistant Librarian	Thomas Harris
Assistant Librarian	Donald Johnson
Curator, Arizona Historical Foundation	Bert M. Fireman

Graduate Studies

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Student Affairs

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Assistant Dean—Fraternalities and Student Organizations	Robert W. Chamberlain
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Counselor	Robert W. Slettedahl
Director of Student Health Service	Elaine McFarland
Medical Director	Arthur F. Dorner, M.D.
Medical Consultant	John E. Schramel, M.D.
Consulting Roentgenologist	George A. Gentner, M.D.

Physicians	Edward Roth, M.D., Woodrow W. Scott, M.D., Ernest S. Watson, M.D., Joseph T. Poggi, M.D., Richard L. Jones, M.D., William S. Baum, M.D., Paul E. Palmer, M.D.
Director of Residence Halls	Jo Freida Dorris
Sahuaro Halls	Santo Albano
Manzanita Hall	Mary Hunt
Middle Campus Halls	
Best-Hayden-Irish	Richard Rankin
Wilson-Gammage	Irene Hanney
McClintock Halls	
Palo Verde Main	Margaret McCandless
Palo Verde East	Mary Watson
Palo Verde West	William Retts

Research and Service Agencies

Audiovisual Service	Joel A. Benedict, Director
Broadcasting, Bureau of	Robert H. Ellis, Director
Business and Economic Research, Bureau of	William Huizingh, Director
Center for American Studies	
Center for Asian Studies	Guilford A. Dudley, Director
Center for Executive Development	Director
Center for Family Life Studies	Owen W. Morgan, Director
Center for Higher Education	Minard W. Stout, Director
Center for Indian Education	Harry W. Sundwall, Director
Center for Latin-American Studies	Marvin Alisky, Director
Center for Meteorite Studies	Carleton B. Moore, Director
	George A. Boyd, Associate Director
Center for Urban Studies	Samuel E. Vickers, Acting Director
Data Processing Service (Moeur Building)	Reed W. Young, Manager
Educational Research and Services, Bureau of	R. Merwin Deever, Director
Engineering Research Center	Lee P. Thompson, Director
Financial Aids Office	Richard T. Wootton, Director
Gammage Center for the Performing Arts	David B. Scoular, Managing Director, Warren K. Sumners, Assistant Director
Public Administration, Institute of	William R. Gable, Director
Police Science, Institute of	
News Bureau and Information Services	Joseph E. Spring, Director
I. D. Payne Learning Laboratory	Morrison F. Warren, Director
Placement Service	Robert F. Menke, Director
Poisonous Animals Research Laboratory	Herbert L. Stahnke, Director
Publications, Bureau of	Dean E. Smith, Director
Residence Halls	Jo Freida Dorris, Director
Student Health Service	Elaine McFarland, Director
University Computer Center	Lee P. Thompson, Director
University Counseling Service	Stephen J. Kimler, Director
University Testing Service	Gerald C. Helmstadter, Director

Memorial Union

Director of Memorial Union	Cecelia Scoular
Assistant Director	Trudy Thomas

Business Affairs and Physical Plant

Vice President for Business Affairs	Gilbert L. Cady
Assistant Vice President, Business Affairs and Director of Auxiliary Services	Edward M. Hickcox
Bookstore Manager	Tony Bustamente
Director of Housing	Gayle Shuman
Purchasing Agent	George Morrell
Director of Development (Gifts and Endowments)	Kathryn K. Gammage
Comptroller	Raymond W. Cope
Associate Comptroller	Robert S. Burnes
Assistant Comptroller	Jack R. Armstrong
Assistant Comptroller	Richard D. Scow
Business Office Manager	Henry Spomer, Jr.
Manager, Data Processing Service	Reed W. Young
Director of Personnel and Payroll	G. Albin Matson, Jr.
Director of Physical Planning and Construction	John R. Ellingson, Sr.
Administrative Assistant, Physical Planning	Marc W. LeMieux
Director of Physical Plant	George J. Zelenski
Assistant to Director, Physical Plant	Arthur R. Garrett
Supervisor of Motor Pool	Andrew P. Mills
Managing Director, Gammage Center for the Performing Arts	David B. Scoular
Assistant Director	Warren K. Summers
Director of Campus Security	John B. Duffy

University Relations

Director	James W. Creasman
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Alumni Affairs

Executive Director	Donald V. Dotts
Assistant Executive Director	W. David Barnes
Editor	James W. Whitelaw

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Officers and Directors**

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Second Vice President	John B. Mills	
Secretary	Allen L. Rosenberg	
Associate Secretary	Kathryn K. Gammage	
Treasurer	Orval Knox	
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Walter E. Craig	Daniel Noble	Lyle Trimble
Sherman Hazeltine	James E. Patrick	J. C. Wetzler
W. W. Knorpp	Earl Recker	

Advisory Council to the President

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Secretary	Kathryn K. Gammage	
D. Harry Bonsall, Jr.	Hayden C. Hayden	Dwight Patterson
Everett Brown	Marshall Humphrey	Elias Paul
George W. Busey	Lucian B. Jolly	Earl C. Recker
A. B. Clements	Orval A. Knox	Allen L. Rosenberg
E. Ray Cowden	John Lassen	Harold D. Roth
William C. Davis	O. M. Lassen	John R. Sandige
Junius E. Driggs	Rod J. McMullin	William R. Shover
John Dutton	Lawrence Mehren	R. Gene Sparks
David Eastlake	Robert W. Moore	Lyle E. Trimble
Delos Ellsworth	Marvin Morrison	Keith Turley
Peter C. Gaffney	George Nader	Duane E. Webb
E. Paul Ganz	Marvin N. Palmer	J. C. Wetzler
	J. Snead Parker	

Sun Angel Foundation Executive Board

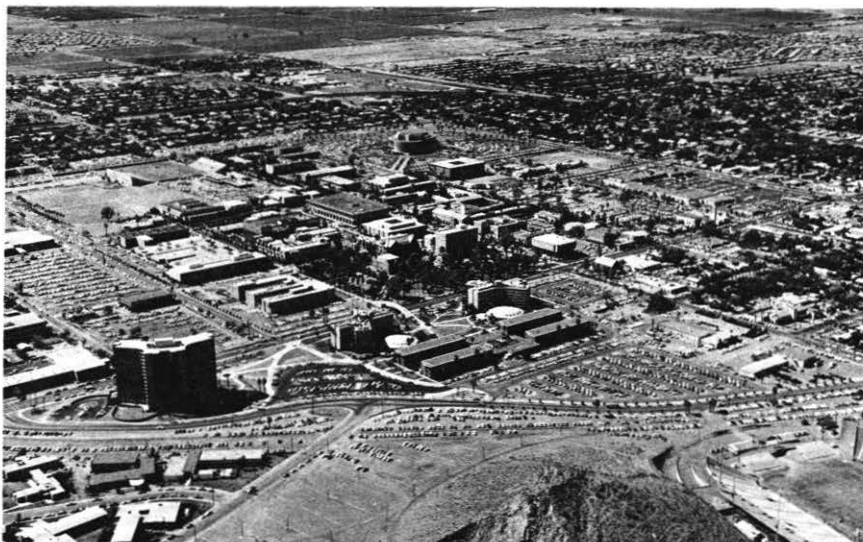
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Vice President	W. W. Caywood
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Treasurer	James A. Smith
Secretary	John J. Curry
At Large	James H. Coles
At Large	Malcolm Straus
Executive Secretary	Miles W. Casteel

General Information ▷

Academic Requirements ▷

Curriculums ▷

Organization, History, General Information



Aerial view of Arizona State University

OBJECTIVES

Arizona State University aims to educate for leadership and responsible citizenship. Increased competence, improved moral and ethical standards, expanded cultural horizons, and enhanced ability to seek answers to fundamental questions of human concern are the objectives of the University.

ORGANIZATION

Established in 1885 as the Arizona Territorial Normal School, Arizona State University is one of three major institutions governed by the Arizona Board of Regents, a body corporate and politic with perpetual succession under the Constitution and laws of Arizona. The Board consists of eight citizens appointed by the Governor of the State for terms of eight years, with the elected Governor and State Superintendent of Public Instruction as members *ex officio*. The Regents govern the University of Arizona (Tucson), Northern Arizona University (Flagstaff), and Arizona State University.

The Regents select and appoint the President of the University, who is the chief executive officer and the regular means of communication between the Board of Regents and the institution. The President is aided in the administrative work of the institution by Vice Presidents, Deans, Faculties, Directors, Departmental Chairmen and other officers.

The faculties and students of the University play an important role in educational policy, with a Faculty Senate, joint University councils, and the organs of the Associated Students serving the needs of a large institution. A comprehensive system of joint faculty, student, alumni and staff committees provides a constant exchange of ideas and collaboration on the part of all members of the University.

Arizona State University is organized into the Colleges of Liberal Arts, Architecture, Business Administration, Education, Engineering Sciences, Fine Arts, Law and Nursing; the Divisions of Agriculture, Technology and Construction; a Graduate School of Social Service Administration; Summer Sessions and University Extension; a Graduate College, and 52 departments of instruction. These academic agencies develop and effectuate the major teaching, research and service programs of the University, aided by the University libraries, museums, centers, and all other services.

HISTORY OF ARIZONA STATE UNIVERSITY

On February 26, 1885, House Bill 164, An Act to Establish a Normal School in the Territory of Arizona, was introduced in the Thirteenth Legislative Assembly of Arizona Territory by John Samuel Armstrong. The bill, strongly supported by Charles Trumbull Hayden of Tempe, passed the House on March 6, the Council on March 11, and was signed by Governor F. A. Tritle on March 12, 1885. Thus came into existence the institution today known as Arizona State University.

Instruction was instituted on February 8, 1886, when 33 students met in a single room under the supervision of Hiram Bradford Farmer.

The institution began with the broad obligation to provide "instruction of persons . . . in the art of teaching and in all the various branches that pertain to a good common school education; also, to give instruction in the mechanical arts and in husbandry and agricultural chemistry, the fundamental law of the United States, and in what regards the rights and duties of citizens."

With the growth of the state, especially the surrounding Phoenix metropolitan area, the school has carried forward this charter, accompanied by successive changes in its scope, name and government. On March 9, 1945, the three state institutions of higher learning came under the authority of one Board of Regents. By vote of the people, on November 4, 1958, the name Arizona State University replaced the previous name, Arizona State College.

ACCREDITATION AND AFFILIATION

Arizona State University is accredited by the North Central Association of Colleges and Secondary Schools. Professional programs in the various colleges, schools, divisions and departments are accredited by the corresponding national bodies. Arizona State University is a member of the National Association of State Universities and Land-Grant Colleges, the International Association of Universities, and is affiliated with the American Council on Education and other international, national and regional associations.

UNIVERSITY CAMPUS

ENVIRONMENT

LOCATION. Arizona State University is near the heart of metropolitan Phoenix in the city of Tempe. Within a few minutes' drive of the campus are the municipalities comprising the fast-growing Phoenix area—Scottsdale, Mesa, Chandler, Gilbert, Glendale, Litchfield Park, Peoria and other communities.

HISTORICAL AND SCENIC FEATURES. Nearby are such landmarks as Apache Trail, the man-made lakes of the Salt River Project, Roosevelt and Coolidge Dams, Hieroglyphic Canyon, and the Casa Grande National Monument. Somewhat more distant are the internationally famous Grand Canyon of the Colorado, Glen Canyon Dam, scenic Oak Creek Canyon, communities of the American Indian peoples, the Arizona-Sonoran deserts and other famed beauty spots.

GROUNDS

CAMPUS. Most of the major buildings on the 320-acre main campus have been erected during the past ten years. Broad lawns and subtropical trees provide year-round greenery.

UNIVERSITY FARM. The 320-acre farm is located six miles southeast of the campus. It is used for experimental and practical work in various phases of agricultural science.

UNIVERSITY LIBRARIES AND COLLECTIONS

CHARLES TRUMBULL HAYDEN LIBRARY (1966). The University's main library is built to house 1,300,000 volumes in 205,000 square feet of enclosed space. The five-story structure has seating for 3,000 persons, including 1,176 study carrels and 69 faculty studies. More than 1,000,000 items are included in the present library collections. Among special collections are the Arizona Collection, Curriculum Laboratory, the Papers of Carl Hayden, Barry Goldwater, and John J. Rhodes, and the library facility of the Solar Energy Society.

ARCHITECTURE LIBRARY. Contains more than 9,000 books on architecture and construction plus 160 periodicals and 10,000 slides in these fields.

AUDIOVISUAL FILM LIBRARY. Located in Matthews Hall, the library contains 6,300 films owned by the University, Arizona schools and other agencies.

ARIZONA HISTORICAL FOUNDATION LIBRARY. Under a cooperative agreement with ASU, the Arizona Historical Foundation's library of several thousand volumes is housed in the Charles Trumbull Hayden Library.

LAW LIBRARY. A growing collection of some 80,000 volumes is located in the John S. Armstrong Law Building. The facility is designed to house 200,000 volumes.

MUSIC RESEARCH FACILITY. A major collection of music scores, books and periodicals is housed in the Department of Music section of Gammage Auditorium.

UNIVERSITY BUILDINGS

ADMINISTRATION BUILDING (1951). University administration and business offices, and the Graduate College.

AERONAUTICAL TECHNOLOGY BUILDING (1966). Newest addition to the Division of Technology complex.

AGRICULTURE BUILDING (1948). Division of Agriculture, Department of Geology.

ALUMNI HOUSE (1907). Alumni Association.

JOHN S. ARMSTRONG LAW BUILDING (1967). College of Law.

ART AND ARCHITECTURE BUILDINGS (1969)

ARTS BUILDING (1914).

BUSINESS ADMINISTRATION BUILDINGS (1951 and 1968). College of Business Administration is in the new building. Older structure houses: Offices of the Vice President, University Extension and Summer Sessions; Placement Service; Departments of Geography and Mass Communications.

CENTRAL PLANT (1960). Central heating and cooling.

HIRAM BRADFORD FARMER EDUCATION BUILDING (1961). College of Education.

ENGINEERING CENTER (Wings A through F, 1957; Wing G, 1964). College of Engineering Sciences; School of Engineering; University Computer Center; Engineering Research Center; Division of Construction; KAET television studios.

FOREST HYDROLOGY BUILDING (1964). Rocky Mountain Forest and Range Experiment Station of the U. S. Forest Service.

GRADY GAMMAGE MEMORIAL AUDITORIUM (1964). (See below.)

HOME ECONOMICS BUILDING (1951, 1968).

HOME MANAGEMENT HOUSE AND NURSERY SCHOOL (1939).

INDUSTRIAL DESIGN AND TECHNOLOGY BUILDING (1964). Division of Technology.

KRAUSE HALL (1905). Personnel and Payroll.

LANGUAGE AND LITERATURE BUILDING (1965). Departments of English, Speech and Drama, and Foreign Languages.

LIFE SCIENCES CENTER (1959, 1963). Departments of Botany, and Zoology, Poisonous Animals Research Laboratory.

LYCEUM THEATRE (1939). University Players.

MATHEMATICS BUILDING (1968).

MATTHEWS CENTER (1930). University Art Collections; College of Fine Arts; Student Personnel Services.

MATTHEWS HALL (1918). Audiovisual Center; Bureau of Publications.

MEMORIAL UNION (1956). University cultural, social and recreational center. Addition under construction, 1969-70.

MOEUR ADMINISTRATION BUILDING (1938). Registrar and Director of Admissions; Housing Office; Data Processing Service.

COLLEGE OF NURSING BUILDING (1966). College of Nursing; Graduate School of Social Service Administration.

OLD MAIN (1894). Classrooms.

IRA D. PAYNE HALL (1969). College of Education.

PHYSICAL EDUCATION BUILDING (1952). Sun Devil Gymnasium; Health, Physical Education and Recreation Department.

PHYSICAL PLANT (1966). Planning and Construction; Department of Security.

PHYSICAL SCIENCES CENTER (1959, 1965). Departments of Chemistry, Physics and Philosophy; Center for Meteorite Studies.

QUADRANGLE (1913, 1914, 1936). Various student services.

ROTC BUILDING (1909). Departments of Aerospace Studies and Military Science.

SOCIAL SCIENCES BUILDING (1960). College of Liberal Arts; Anthropological Museum; Psychological Clinic; Institute of Public Administration; Departments of Anthropology, History, Political Science, Psychology, Sociology.

JOE SELLEH FIELD (1967). Track and field events.

SUN DEVIL FIELD (1960). Baseball Field.

SUN DEVIL STADIUM (1958). Football stadium.

SWIMMING POOL (1957).

WOMEN'S PHYSICAL EDUCATION BUILDING (1966).

RESIDENCE HALLS

Housing for Women

DIXIE GAMMAGE (1941).

JAMES H. McCLINTOCK

“A” (1951), “B” (1956)

GEORGE W. WILSON (1956)

PALO VERDE (1958)

PALO VERDE EAST (1963)

MANZANITA (1967)

SAHUARO (1958)

Housing for Men

FREDERICK M. IRISH (1940)

M. O. BEST (1956, 1967)

CHARLES TRUMBULL HAYDEN (1951)

PALO VERDE WEST (1964)

SAHUARO (1958)

ADELPHI HOUSING (1954)

Five units for small-group housing.

FRATERNITY HOUSING (1962)

Ten units for small-group housing.

EDUCATIONAL RESOURCES AND SERVICES

GRADY GAMMAGE MEMORIAL AUDITORIUM, Center for the Performing Arts at Arizona State University, was designed by Frank Lloyd Wright and named for the late President Gammage. This versatile auditorium seats 3,000 and has won wide acclaim for its design and acoustics. In addition to the great hall and related facilities (including the Aeolian-Skinner

organ contributed by Hugh W. and Barbara V. Long, largest pipe organ in the state), the building houses the Department of Music offices and Music Research Facility.

UNIVERSITY ART COLLECTIONS. On display in Matthews Center, the collections include paintings in oil, water color and tempera, numerous works of sculpture and ceramics, and an extensive print collection. The Collection of American Art, founded by the late Oliver B. James, is permanently on display. Selections from the collections of Mr. and Mrs. Read Mullan, Mr. and Mrs. Orme Lewis, Lewis and Lenore Ruskin, Mrs. Henry Luce, and Edward Jacobson are shown periodically.

I. D. PAYNE LABORATORY. Situated in the College of Education, the I. D. Payne Laboratory is engaged in educational experimentation and learning research, with especial concern for aiding the educational progress of disadvantaged children and enhancing their educational progress.

UNIVERSITY COMPUTER CENTER. Located in the Engineering Center, this facility serves research, teaching and experimental needs.

DATA PROCESSING SERVICE. Located in the Moeur Administration Building, this is a campus bureau designed to serve institutional and educational needs of the University.

BUREAU OF BROADCASTING. Television Facilities: The Bureau operates Arizona State University's educational television station (KAET, Channel 8). These facilities are used for training students in television skills in addition to telecasting educational programs to the general public.

Radio Facilities: The Bureau operates a professionally equipped broadcasting unit, KASN, located in the Engineering Center, to serve the teaching program in radio skills.

AUDIOVISUAL CENTER. The Center includes the Educational Graphic Arts, Service, the Photographic Service, and the Film Library, located in Matthews Hall. Its 6,300 films, cooperatively owned by 108 member schools, by ASU and by governmental agencies and industries which deposit films in the library, is the largest collection in Arizona.

INSTITUTE OF PUBLIC ADMINISTRATION. With its Survey Research Center and Center for Urban Studies, the Institute combines educational activities, research studies, conferences and special programs in the broad fields of public and urban concerns.

Admission, Academic Standards and Graduation

General Requirements

Age. All applicants for admission to Arizona State University must be at least 16 years of age.

Character. All new students are required to furnish satisfactory evidence of good character as evidenced by a certificate of graduation or of honorable dismissal from the school last attended.

Health. Prior to registration, every new student or former student who has not been in attendance at Arizona State University for a year or more must furnish the Student Health Service with a record of physical examination. For details see page 99 under heading "Health Service."

Aptitude Test. All new freshman students are required to take a general academic aptitude test prior to admission or registration. Arizona high school applicants may meet this requirement by taking the American College Test in their senior year under the program approved by the Arizona Secondary School Principals' Association and the Arizona High School Superintendents' Association, and by requesting that a report of the scores be sent to the Admissions Office of Arizona State University. Entering students may be required to take other tests for placement purposes authorized by Arizona State University.

Arizona State University reserves the right to deny admission or cancel registration of an individual whose attendance at Arizona State University, in the opinion of the appropriate administrative officer and the President, would not be mutually beneficial to himself and to the institution.

Admission To Arizona State University

The first phase of admission is admission to the institution. The second phase is admission to freshman standing in a curriculum of a particular college, school, division, or department within the institution.

Application for Admission. Inquiry regarding application for admission should be directed to the Registrar and Director of Admissions. To make formal application for admission, a student should submit a completed application blank to the Admissions Office, and should have his high school registrar or principal forward to the Admissions Office a transcript of his high school record. A preliminary application for admission may be filed any time during the second semester of the senior year, provided that a supplementary transcript be submitted following high school graduation.

GRADUATES FROM AN APPROVED SECONDARY SCHOOL

All applicants for admission to the institution must have graduated with satisfactory scholarship from an accredited secondary school and must

have completed a four-year secondary-school course or the equivalent with a minimum of 16 units in acceptable subjects. The definition of a unit is that used by the North Central Association of Colleges and Universities.

SCHOLARSHIP REQUIREMENTS

Regular Admission. Students must offer an acceptable program of secondary school subjects and must have ranked in the upper three-quarters of their graduating class.

Provisional Admission. Students offering an acceptable program of subjects but ranking in the lower one-fourth of their high school graduating class may apply for provisional admission. Such applicants may be granted provisional admission only after pre-admission counseling and testing in which they give evidence of ability to carry college work successfully.

Non-resident Admission. Applicants for admission from accredited secondary schools will be considered for admission if the transcript shows that the applicant has been graduated and has completed an acceptable program of secondary school subjects (as recommended below) and has ranked at least in the upper two-thirds, preferably the upper one-half, of his graduating class. Satisfactory American College Test scores are an acceptable substitute for rank in the graduating class.

Advanced Placement. Students who have taken a College Entrance Examination Board Advanced Placement Course in the secondary school, and who have taken the College Entrance Examination Board Advanced Placement Examination and received scores of 5 or 4, will receive University credit as well as advanced placement. Those students who receive a score of 3 may receive University credit and/or advanced placement after a review by the department concerned.

CLASSIFICATION OF ACCEPTABLE SECONDARY SCHOOL SUBJECTS

- GROUP I. English: only courses with major emphasis upon grammar, composition and literary analysis.
- GROUP II. Foreign language: a classical or modern foreign language. Less than one unit is not accepted. Two units or more are strongly recommended.
- GROUP III. Mathematics: one unit of algebra and one unit of mathematics other than arithmetic, business mathematics or general mathematics.
- GROUP IV. Social studies: history, civics, economics, sociology, geography, and government (including United States and Arizona Constitution).
- GROUP V. Laboratory science: only courses in biology, chemistry, and physics, in which at least one regular laboratory period is scheduled each week.
- GROUP VI. Fine arts: historical, theoretical, and performance courses in art, music, speech and drama, humanities.
- GROUP VII. Agriculture, bookkeeping, general science, home economics, arithmetic, business arithmetic, general mathematics, journalism, industrial arts, secretarial training, and other subjects

commonly offered for credit by secondary schools, except physical education and military science.

RECOMMENDED SECONDARY SCHOOL SUBJECT UNITS

English	4	(from Group I)
or English 3 and one		
Foreign Language 2	5	(from Groups I and II)
Mathematics	2	(from Group III)
American History and		
Social Studies	2	(from Group IV)
Laboratory Science	2	(from Group V)
Electives	6	(from Groups I through VII)
depending upon		
English option	5	
	16	16

ADDITIONAL SUBJECT UNITS RECOMMENDED

The recommended pattern of subjects is that which, on the basis of experience, can reasonably be expected to provide satisfactory preparation for college when these subjects have been completed with better than average grades. *Academically talented students are strongly urged to take additional courses from Groups I through V beyond those recommended above.*

ADMISSION TO FRESHMAN STANDING

The recommended program of secondary school subject units meets the requirements for admission to freshman standing in the Colleges of Liberal Arts, Education, Business Administration, Engineering Sciences, and Fine Arts, except in the School of Engineering, College of Architecture, and College of Nursing, as noted below.

In the School of Engineering, 3½ units are required in mathematics. Included must be advanced algebra, geometry, and trigonometry. Calculus is recommended. The laboratory sciences chosen must include at least one unit in physics and one unit in chemistry. One unit of biology is strongly recommended.

In the College of Architecture, mathematics must include algebra, advanced algebra and geometry for a total of 2½ units; laboratory sciences must include one unit of physics and one unit of chemistry; additional units recommended include geometry, trigonometry, art and drawing.

In the College of Nursing, mathematics must include algebra, advanced algebra and an additional unit of mathematics for a total of 2½ units; laboratory sciences must include one unit of biology and one unit of chemistry or their equivalent; an additional unit of physics is recommended.

PROVISIONS FOR ADMISSION FOR SECONDARY SCHOOL GRADUATES WHO HAVE NOT COMPLETED THE RECOMMENDED SUBJECT UNITS

Applicants who lack no more than two units of the recommended program may be admitted with deficiencies. Credit for college courses applied to deficiencies is not applicable to degree requirements.

APPROVED ARIZONA HIGH SCHOOLS

The high schools of the state are classified in four divisions—North Central Association high schools, Class A high schools, Class B high schools, and approved private schools. Graduates of these schools are accepted without examination under the foregoing provisions governing admission.

ADMISSION WITH ADVANCED STANDING

Application for Admission. Inquiry regarding application for admission must be directed to the Registrar and Director of Admissions. To make formal application for admission, a student should submit a completed application blank to the Admissions Office.

Transcripts. Before any student may register for work in the regular sessions of Arizona State University and be admitted to advanced standing and classification, his transcripts of high school and previous college work must be on file in the Office of the Registrar and Director of Admissions.

Students should request the high school principal and each college registrar to mail their transcripts directly to the Registrar and Director of Admissions. Transcripts should be on file in the Office of the Registrar and Director of Admissions at least 30 days in advance of the registration date. Transfer students whose transcripts are not received by this date may experience difficulty in planning course programs with curriculum advisers. Transcripts are not required at the time of registration of those taking work in the summer session, in extension, or by correspondence.

All transcripts or credentials submitted from other institutions become the property of Arizona State University. Neither the original nor copies will be released from the files. When duplicates are required, students should obtain new transcripts from the issuing institution. At the discretion of the administration of Arizona State University, admissions credentials and transcripts will be destroyed.

Transfer of Credit. Credentials presented for admission may be rejected in whole or in part and examinations required in any or all of the subjects offered. Applicants who have failed to maintain a satisfactory scholarship record acceptable to the University will not be admitted. However, students who have been disqualified in another institution because of scholarship, conduct, or other reasons, where there may have been extenuating circumstances, may be admitted after review and approval by the University Admissions and Standards Committee.

Students from approved institutions of higher education ordinarily will be given credit, hour for hour, for work done in these institutions insofar as it applies to the requirements of the curriculum pursued at Arizona State University. Arizona State University does not accept credit on transfer for courses in which lowest passing grades (D) were received. Grades and scholastic honor points earned at other colleges and universities, while part of the student's permanent record, are not included in the calculation of the student's cumulative index at Arizona State University.

Students who have registered in other colleges and universities may

not disregard their records in such institutions in order to make application for admission solely on the basis of their high school records.

Failure to report previous college attendance at the time of registration is sufficient cause for cancellation of the student's enrollment, of any credits earned, or both.

Credits from Junior Colleges. Credits transferred from an accredited junior college may be accepted up to a maximum of 63 semester hours. Additional credit may be accepted only upon authorization of the standards committee of the college in which the student is enrolled at Arizona State University.

Junior college students planning to transfer to Arizona State University at the end of their first or second year should plan their junior college courses to meet the requirements of the curriculum selected. Loss of time often results from failure to do this. Junior college transfer students will be permitted to follow the degree requirements specified in the Arizona State University catalog in effect at the time they began their junior college work providing their college attendance has been continuous and normal progress has been made. Ordinarily, courses transferred from junior colleges will not be accepted as upper division credit at Arizona State University.

Credits for Courses in Religion. Courses offered by the Tempe Religious Conference and other religion courses approved for transfer may be accepted for general elective credits at Arizona State University within the limits of the student's degree program. If such courses in religion are accepted in the area of General Studies in the student's degree program, they can count only as General Studies electives.

Credit for Military Service. For active service terminated under honorable conditions in the Army, Navy, Marine Corps, Air Force, or Coast Guard for a period of at least six months and less than a year, the University allows two units of military science; for one year or more of active service, four units of military science; and for a commission earned in the service, 12 upper-division units of military science.

Veterans must submit their records of service in the Armed Forces (photostatic copy of discharge and/or separation notice) to the Admissions Office as a part of their admissions credentials. Advanced standing credit will be granted on the basis of these records only if application is made prior to completion of an undergraduate degree program at Arizona State University.

VETERANS' DEPENDENTS

Students who are eligible for benefits as children of deceased veterans must file in the Veterans Accounts Office in the Business Office their certificates of eligibility at the time of registration. The certificate of eligibility is required before the University can arrange with the Veterans Administration to have benefits made available to individual students. At the time certificates are filed, students will receive instructions regarding application, payroll clearance and other important information connected with the program.

ADMISSION OF UNCLASSIFIED STUDENTS—UNDERGRADUATE

Persons 21 years of age or over who wish to enroll for six semester hours or less per semester of undergraduate course work may register as unclassified students. Unclassified students are not required to file transcripts or a residence classification form. These students must, however, file an unclassified student application for admission form. Unclassified students are not candidates for any degree. Students disqualified or otherwise not eligible for regular admission may not attend as unclassified students.

An unclassified student who wishes to work toward meeting requirements for a bachelor's degree must file an application for admission to a degree program with the Office of the Registrar and Director of Admissions and meet all admissions requirements in effect at the time he seeks admission as a degree-pursuing student. A maximum of 15 hours work completed as an unclassified student may be counted toward fulfilling degree requirements, provided the courses meet specific requirements within a degree program.

After a student has been once registered as a regular degree-pursuing student he may not thereafter be permitted to register as an unclassified student.

ADMISSION OF FOREIGN STUDENTS

Foreign students seeking admission to Arizona State University, in addition to meeting the requirements for regular admission either as a freshman or as a transfer with advanced standing credit, must have the American Consul office in the vicinity of their home country forward to the Admissions Office at Arizona State University a certified statement that the student's English reading, speaking, and comprehension ability is such that the student can reasonably be expected to succeed in a university program here. Foreign students also must provide a personal data sheet in duplicate in addition to the application for admission. Foreign students are urged to be certain that their passports and visas are in order before coming to the United States.

Arizona State University has very limited scholarship resources for foreign students. In most instances, financial assistance will not be available. Before a foreign student leaves his home country, he should have a certificate of admission from Arizona State University. Arizona State University cannot provide on-campus employment to aliens because a state law provides that non-citizens cannot be on the Arizona state payroll.

All foreign students are required by Arizona State University to have insurance coverage against illness and accident before being permitted to register. The insurance must be maintained throughout the student's enrollment in the University. The cost of this insurance must be provided by the student. Insurance with a reputable American insurance company, comparable to that available through Associated Students, is acceptable.

RE-ADMISSION TO THE UNIVERSITY

Any former undergraduate student who has not been in continuous attendance at Arizona State University must obtain an application for re-

admission from the records section of the Office of the Registrar and Director of Admissions upon returning. This application should be submitted at least one month prior to the beginning of the semester in which the student plans to re-enter. Official transcripts of any additional work taken elsewhere must be sent from the Office of the Registrar at the institution where such credit was earned directly to the Office of the Registrar and Director of Admissions at Arizona State University.

Students whose cumulative grade point index is below that required for good standing will be denied re-admission. Students who have been denied re-admission may appeal to the University Admissions and Standards Committee.

ADMISSION TO SUMMER SESSIONS

Excepting those who plan to complete the degree requirements in summer sessions only, students will be admitted to the summer sessions without presentation of transcripts.

Registration

Registration Dates. Students should register on the registration dates announced in the University calendar. (See pages 6-7.) New students cannot complete the required aptitude and health examinations and finish registration in one day. Students registering late will be charged a late registration fee. Residence halls will be open to students on the dates scheduled in the University calendar.

Prerequisites to Registration. Before registering in the regular sessions, all students seeking admission must file transcripts of high school or college work, or both, and take the aptitude and health examinations required under the heading, "Admission to Arizona State University." In addition, students must meet special requirements given hereafter. All students, graduate or undergraduate, file applications for admission and transcripts in the Office of the Registrar and Director of Admissions. All students registering in a degree program must obtain an "Approved Program of Studies" form signed by their curriculum adviser.

Classification of Students. Freshmen are those students who at the beginning of the academic year have less than 30 semester hours of credit; sophomores, those with 30 or more semester hours, but less than 60; juniors, those with 60 or more, but less than 90; seniors, those with 90 or more; graduate students, those holding a bachelor's degree from Arizona State University, or any other recognized institution.

Curriculum Advisers. Curriculum advisers are appointed by the dean of each college. Before entering the University, a student should study the curriculums outlined in order to determine the curriculum best suited to his interests and needs. Before registering, each student may select, tentatively at least, a curriculum. The designated curriculum adviser will counsel with the student regarding his proposed curriculum, his choice of courses, and approve both. He advises him as needed throughout his stay in the University, unless another adviser is assigned by the dean.

Course Loads. Students carrying 12 or more semester hours of work are classified as full-time students for University classification purposes. *Male undergraduate students, to qualify as full-time college students for Selective Service classification purposes, must be registered for and complete, each year, one-fourth of the number of semester hours required for a four-year degree program. Thus, male undergraduate students subject to the draft must be registered for a minimum of 12 hours each semester and complete a minimum of 32 semester hours during the 12-month period following the beginning of the Fall semester.* Students may not be registered at any other institution or in an extension class when in regular attendance here, in either the academic year or in summer session, unless prior approval has been granted by the standards committee of the college in which the student is enrolled.

The maximum load for which a student may register is 18 semester hours, except for students enrolled in the Colleges of Architecture and Engineering Sciences. The maximum load for these students is 19 semester hours. Students who wish to register for more than these maximums must petition the standards committee of the college in which they are registered. Freshmen and lower division transfer students attending Arizona State University for the first time will not be permitted to carry an overload. Students having a low scholarship record may be required to carry a light load. Students carrying a full-time school job will be asked to carry a light load unless their previous records in scholarship and on aptitude tests are high. During the semester in which a student is registered for student teaching, the load should not exceed 16 semester hours.

Draft Board Notification. Students who wish to have their Selective Service boards notified of their student status must submit the Selective Service Information Card, properly completed, to the Office of the Registrar and Director of Admissions. This card is placed in the registration packet for the convenience of all male students. Students subject to the draft who fail to request that their board be notified, run the risk of being classified 1A.

Planning the Schedule. The schedule of classes covers both morning and afternoon hours, Monday through Friday, and morning hours only on Saturday. Full-time students are expected to devote both mornings and afternoons to their program of studies. They should not plan to take classes mornings only, or afternoons only, or less than five days per week.

Auditors. Persons wishing to audit courses will register in the regular manner and pay the regular fees. Audited courses carry no credit and only the mark of X will be recorded. Courses audited count toward the student's load. Students once registered for "audit" are not permitted to change to "credit" (and vice versa) after the close of the drop-add period.

Comprehensive Examinations. The purpose of the comprehensive examination is to permit the student an opportunity to establish credit in a field in which he has had adequate preparation or experience, but in which he has not received academic credit. To provide a procedure by which this may be accomplished, the following rules are applicable:

Comprehensive examinations may not be taken in any course for which the student has received admission or transfer credit from any educational

institution. Admission and transfer credit are established through the Admissions Office.

Comprehensive examinations may not be taken in the elementary level of a field in which the student has received credit for advanced work. This includes the prohibition of comprehensives in courses required as prerequisites for a course in which the student has received credit.

Students desiring credit by comprehensive examination should indicate their desire to take such examinations during their first two semesters in residence at Arizona State University. No comprehensive examinations will be given to students who have accumulated 100 or more semester hours of credit.

A student may establish a maximum of 30 semester hours of credit by comprehensive examinations and/or correspondence courses.

Only matriculated students may petition to establish credit by examination.

Applications will be accepted only for courses listed in the current University catalog, *and only for courses in which a comprehensive examination is regarded as a satisfactory measure of accomplishment.*

The fee for such examinations shall be \$7.50 per semester hour of credit. An examination may cover only one course. For example, English 101 and 102 are two courses requiring separate examinations. No examination will be prepared until the fee is paid.

An application blank may be secured from the office of the chairman of the department in which the course is offered. The student will fill out the application giving the number, title, and the number of semester hours of credit for the course in which an examination is desired. The completed application shall carry the recommendation of the student's adviser. The application is filed with the chairman of the department in which the course is offered, and his *approval to take the examination must be granted.*

Ordinarily, an application will be approved for only one course at a time. If a student applies for examinations in sequence of two closely related courses, such as English 101 and 102, permission may be granted to take the second examination upon successful completion of the first.

The number of hours of credit granted shall be the hours specified for the course in the current catalog.

All examinations shall be of a comprehensive type. They shall be prepared and graded by the instructor of the course and the head of the division or chairman of the department and filed in the Records Section.

Examinations will be administered through the office of the chairman of the department in which the course is offered.

Letter grades of A, B, C, D, and E will be used in grading examinations. If the grade is A, B or C, a grade of CR will be entered on the student's permanent record. If the grade on the examination is D or E no entry will be made on his permanent record. Entries on the permanent record of credit by examination shall be so indicated. The student will be notified of the result of the examination. The student will not be given a second opportunity to establish credit by examination for the same course.

Proficiency Examinations. A Proficiency Examination may be required for the waiver of a course requirement or for the validation of transfer credits in professional programs.

Information regarding policies and regulations governing the waiver of course requirements, or validation of transfer of credits in professional programs may be obtained from the office of the dean of the college in which the student is registered.

Late Registration. Students registering on or after the date specified for the beginning of classes each semester will be charged a late registration fee. Late registration for each semester is closed at noon Saturday of the first week of classes. Students registered for six hours or less of evening classes are not charged the late registration fee.

Incomplete Registration. Registration is not complete until all fees have been paid and all required examinations have been taken. Failure to satisfy any of the admission or registration requirements is sufficient cause for dropping a student from all classes.

Changes in Registration. Programs should be carefully planned under the guidance of the curriculum adviser so that changes in registration will not be necessary. After a student has completed his registration, changes may be made only through the Registrar's Office by means of a Drop-Add card. Changes may be made as late as the last day of the first week of classes for the two regular semesters. Changes during Summer Sessions may be made only through the second day of classes.

Dropping Courses After the Close of Registration. The courses for which a student is registered at the close of the late registration period constitute his official registration and semester load. A student may officially drop a course or courses from his approved program of studies after the close of the Drop-Add period and before the end of the first six weeks of the semester. In such cases, the mark of W will be recorded. A student may withdraw after the first six weeks of the semester with a grade of E. Any exception due to injury, death in the family, or other crisis must be approved by the instructor, the dean of the college in which the course is offered, and the student's curriculum adviser. Where exceptions are permitted, the recorded grade will be W or E in accordance with the student's status at that time. No student will be permitted to drop a course during the week in which final examinations begin.

A student who quits a course for which he is officially registered by absenting himself from class will receive a grade of E at the end of the semester.

To drop a course the student will obtain from the Office of the Registrar and Director of Admissions an Authorization for Dropping Course form and process it according to the instructions on the form.

Withdrawal from the University. Students who find it necessary to withdraw from the University should withdraw officially by obtaining and completing an official withdrawal card from the Office of the Registrar and Director of Admissions.

Until a student withdraws officially, he is registered in all courses and

will at the end of the semester receive grades appropriate for his performance in each course. A student who officially withdraws from the University during the first six weeks of a semester receives the mark of W in all courses for which he is registered. Students who officially withdraw from the University later than the sixth week will receive a mark of W or E, depending upon the quality of the work at the time of the official withdrawal. No student will be permitted to withdraw during the week in which final examinations begin. Students who quit attending classes but who fail to officially withdraw will receive grades of E.

GRADING SYSTEM

Scholarship Grades. Scholarship grades on the student's report card and on his permanent record card are indicated by the letters and explanations given below.

A—Highest	D—Lowest passing
B—Above average	Y—Credit
C—Average	E—Failure
P—Pass	

The following marks designate the situations concerning the student's academic program:

W—Withdraw (without penalty)
X—Audit
I—Incomplete, given and removed as specified below

The Mark of Incomplete. A mark of I is given only when a student is unable to complete a course because of illness or other conditions beyond the control of the student. Negligence or indifference are never accepted as reasons for giving an I. It is the sole responsibility of each student receiving a mark of incomplete to contact the instructor or dean of the college in cases where the instructor is no longer available, and complete the course within one calendar year. If an I is not thus removed it becomes a part of the student's permanent record.

Mark of W. The mark of W is given in a course whenever a student (1) officially drops from a course during the first six weeks of the semester; (2) officially withdraws from the University during the first six weeks of the semester; (3) officially drops a course after the first six weeks only if passing at the time of withdrawal; (4) officially withdraws from the University after the first six weeks only if passing at the time of withdrawal.

Repetition of Course. Students may repeat any course in which a grade of D or E was received. When a course is repeated the original grade remains on the student's record and is included in his cumulative scholarship index. A course, however, may only be counted once in meeting the hours required for majors, minors, or graduation.

A student may, by formal petition to the Registrar, request that a grade of E received during his freshman or sophomore year not be included in his cumulative index after he has repeated the course in residence with a passing grade prior to earning 63 semester hours of college work.

Change of Grade. A grade once reported to the Registrar's Office may be

changed only (1) upon the authorization of the faculty member issuing the original grade or (2) when the instructor cannot be reached, by the standards committee of the college in which the course was offered. In either case, the approval of the dean of the college concerned is required.

A change of grade is made by filing an Authorization of Change of Grade Form with the Registrar's Office. The reason for the change of grade shall be entered on the form and signed by the faculty member and by the dean of the appropriate college.

Grade Points. For the purpose of computing the scholarship index, grade points are assigned to each of the grades as follows: A, 4 points for each semester hour; B, 3 points; C, 2 points; D, 1 point; and E, 0 points.

Scholarship Index. The scholarship index is obtained by dividing the total number of grade points earned by the number of semester hours in the student's course load. Courses in which marks of P (pass), W (withdrew), I (incomplete), Y (credit) and X (audit) are received are not included in determining the number of semester hours in the course load.

Reports to Students. Each student receives a Deficient Scholarship Report at the mid-semester for courses in which his grades are D or E.

Grade Reports to Students. Grade reports of all students showing their standing in each class are mailed to their local addresses at the end of the fall semester and to their home addresses at the end of the spring semester and summer sessions. It is therefore urgently necessary that each student keep the Office of the Registrar and Director of Admissions informed concerning his correct addresses. Address changes should be in the Records Section of the Office of the Registrar and Director of Admissions at least four weeks prior to final examinations.

Reports to Arizona High Schools and/or Junior Colleges. A copy of the semester grade report of each student is sent to the Arizona high school and/or junior college from which he graduated.

RETENTION AND ACADEMIC STANDARDS

Dropping Course at Instructor's Request. A faculty member may drop a student from his class with a grade of E, whenever in his judgment, the student's (1) absence from class, except for illness or other reasons beyond his control, (2) continued presence in class is detrimental to the other members of the class, (3) lack of achievement or progress in the work of the course, constitutes justification for this action.

Grade Point Index Required for Good Standing. In order to be classified in good standing, a student who has earned 29 semester hours or less must have at least a 1.60 grade point index; a student who has earned 30 semester hours — but less than 60 semester hours — must have at least a 1.75 grade point index; and a student must have achieved a 2.00 grade point index no later than the semester in which he has earned a total of 60 semester hours. To remain in good standing, a student with over 60 hours or more of credit must maintain a cumulative average of 2.00. The grade point index is computed only on the basis of courses taken at the University, although total hours earned includes transfer credits.

Probation and Disqualification. A student whose cumulative grade average is below the required index is on academic probation. A student on academic probation is required to observe any limitations or rules that his college may require as a condition for his retention. Once a student is on academic probation, he remains in that status until his grade point index reaches the retention level, or he is disqualified from the University.

Any student who has earned the semester hours required for graduation in his college but has not achieved the 2.00 index required for graduation is subject to disqualification unless the standards committee of his college recommends that he not be disqualified.

Students placed on probation or disqualified by a college are notified by the office of the dean in the college in which the student is enrolled.

Reinstatement. A disqualified student may submit an application for reinstatement to the college in which he was last enrolled. If he wishes to transfer to another college within the University for which his aptitudes and qualifications may be more suitable, he should make his application for reinstatement to the University Admissions and Standards Committee. A disqualified student is responsible for providing evidence of ability to bring his academic record up to a satisfactory standard. He may be required to take aptitude tests or receive vocational counseling before being readmitted into a different college.

A disqualified student normally will not be reinstated until at least one semester has elapsed from the date of disqualification. In order to be considered in time for readmission to a particular semester, an application for reinstatement must be submitted at least six weeks before regular registration for that semester.

A student who clearly indicates on his application for reinstatement that he wishes to be heard in person will be given an appointment for interview by the standards committee that is to consider his case. It is the student's responsibility, however, to make any travel arrangements or adjustments in his work schedule that may be necessary for scheduling an interview.

A disqualified student should apply for reinstatement before filing an application for readmission at the Registrar's Office. Reinstatement application forms should be obtained from the college in which the student was last enrolled.

Appeals. Students who wish to appeal the decision of a standards committee of a college may make application for a hearing at the University Admissions and Standards Committee. Actions on appeals before the University Admissions and Standards Committee will be communicated to the student by the Office of the Registrar and Director of Admissions.

Student Membership in the University

Upon an individual's admission, Arizona State University agrees to provide the advisement, instruction, and services to a student during the course of his enrollment in the academic community. These are set forth in the University's published catalogs, bulletins, and official notices. At-

tendance at the University is a voluntary entrance into the academic community and the student voluntarily assumes obligations of performance and behavior compatible with the institution relevant to its lawful role, processes, and functions.

Under the Constitution and laws of the State of Arizona, jurisdiction and control over Arizona State University are vested in the Arizona Board of Regents. The Board of Regents and its agents—the president, administration, and faculty—are granted broad legal authority to regulate student life, subject to basic standards of reasonableness. In exercising this authority, the University is guided as well by considerations of educational policy.

In developing responsible student conduct, the University prefers counseling, guidance, admonition, and example. In the exceptional circumstances when these means fail to resolve problems of student conduct and responsibility, the Student Conduct Committee, whose voting members are students and teaching faculty, may hold hearings on alleged violations of pre-defined standards of conduct. On the basis of its findings, the Committee may prescribe any of the following sanctions: (1) expulsion, (2) suspension, (3) probation, (4) re-enrollment only with permission of the Committee, (5) reprimand, (6) exoneration. Procedural safeguards are provided the student at these hearings.

The student has the right of appeal on the basis of procedural error or new evidence to the Committee on Student Affairs and thereafter to the President and his Advisory Council on any disciplinary action which terminates his academic status, i.e., expulsion or suspension from the University. Appeals for lesser sanctions are to the Student Conduct Committee.

Pending final action on charges brought against a student by the University the status of a student is not altered; nor is his right to attend classes suspended, except for reasons relating to the safety of students, faculty, or University property.

The immediate concern of the Student Conduct Committee is with student behavior on campus and at University-sponsored events off campus.

Misconduct for which students are subject to University discipline falls into the general areas of:

- (1) academic dishonesty—cheating in examinations, laboratory work, written work (plagiarism), forging or altering University records—that is, any attempt to gain credit for work not performed by the student;
- (2) action endangering the safety of others or self;
- (3) disrupting the necessary peaceful processes of the University; and
- (4) theft or destruction of property.

Details of expected student conduct are further elaborated in the *Student Handbook* and the *University Bulletin*.

Fees, Deposits and Expenses

Changes in Fees. The Board of Regents reserves the right to change fees and charges when necessary without notice.

Extending Credit. The University cannot extend credit; therefore, students

must have on hand when registering sufficient funds to pay for non-resident tuition, registration, incidental fees, and books. Room and board may be paid in installments, the first payment being due prior to registration.

Definitions. *Regular fees* are those paid by all students. *Special fees* are those paid by certain students only, and under the conditions indicated.

Deposits are made to cover certain contingencies. All or part of the deposit may be returned depending upon the charges incurred by the student.

GENERAL SUMMARY

Summary of minimum annual expenses:

General University fees	\$ 290.00
Books and supplies	100.00 (approx.)
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Total minimum cost to Arizona resident residing off campus	\$ 390.00
Room and Board	900.00*(approx.)
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Total minimum cost to Arizona resident residing on campus	\$1,290.00
Non-resident tuition	815.00
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Total minimum cost to out-of-state resident residing on campus	\$2,105.00

All students should add to this list incidental personal expenses as needed plus special fees and deposits.

*Rates vary depending on the dormitory in which a student resides and on the basis elected for meals in the University cafeteria.

REGULAR FEES

These fees are paid each semester by all students with the exception of those registering for Extension and Correspondence courses.

General University Fee	\$145.00
<i>(Covers registration for more than six (6) semester hours)</i>	
Registration Fee	\$16.00 per semester hour
<i>(Registration for six (6) semester hours or less)</i>	

SPECIAL FEES

Special fees are paid by certain students under the conditions given below:

Admission Application Fee (Non-resident applicants)	\$ 10.00
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All undergraduate applicants for admission, residing out of the State of Arizona, must pay a non-refundable admission application fee at the time application for admission is made.

Tuition for Nonresident Students (per semester)	\$407.50
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Students who are not legal residents (as defined below) of the State of Arizona are required to pay the nonresident tuition fee in addition to registration fees. Provi-

sions governing the assessment of the nonresident tuition fee have been adopted by the Board of Regents as follows:

1. Every nonresident student carrying 12 or more units in day, late afternoon, and/or evening courses on campus, except graduate assistants, shall be required to pay a nonresident fee of \$407.50 per semester. Those carrying 7 through 11 units will pay a nonresident fee of \$34.00 per unit of work carried. This fee is in addition to other listed fees. The nonresident fee is waived for students carrying fewer than 7 units of work. Nonresident graduate students also pay the tuition fee. Graduate assistants, however, are exempt from the nonresident tuition fee and from laboratory or other fees applicable to courses in the student's major.

2. A student to be considered a legal resident of Arizona for the purpose of registering at Arizona State University must meet the requirements and must present evidence thereof as follows:

A. If under 21 Years of Age—that the parent (or guardian) having legal custody of the student has been a legal resident of the State of Arizona for at least one year next preceding the last day of registration for credit.

In the event that a legal resident of Arizona is appointed guardian of a nonresident minor, the application of the minor for classification as a resident student must be supported by a certified copy of the letters of guardianship issued by an Arizona Superior Court and the affidavit of the guardian that the minor has an estate within this state.

B. If Over 21 Years of Age—that legal residence in the state has been established (independently of the circumstance of attendance at an Arizona institution of learning) for at least one year next preceding the last day of registration for credit, and that he is eligible to become a registered voter. (Sec. 3 of Art. 7, Constitution of Arizona, provides "For the purpose of voting, no person shall be deemed to have gained or lost a residence . . . while a student at any institution of learning . . ."; Sec. 6, Art. 7 provides, "No soldier, sailor or marine . . . shall be deemed a resident of this State in consequence of his being stationed at any military or naval place within this State." These constitutional provisions apply to the establishment of residence in Arizona for tuition purposes.)

C. If a Resident Alien—that the relevant requirements of A or B above have been met by the student and/or his parents, except that pertaining to voting eligibility.

3. The student must have the question of his legal residence passed upon previous to registration and payment of fees. The responsibility of registration under proper residence is placed upon the student. The Residence Affidavit must be completed and filed prior to any adjudication of residence. The affidavit is required upon original registration, or upon a desired change in classification, or after an absence for more than a single semester. If there is any question as to legal residence, the matter should be brought to the attention of the University Comptroller and passed upon previous to registration and payment of fees. A sworn statement of the facts is required, and a form for the purpose is provided at the time of registration. In all cases where the records indicate that the student's legal residence is outside of Arizona, the nonresident fee shall be assessed. Any student found to have made a false or misleading statement concerning his legal residence shall be subject to dismissal from the University.

4. The University has a Committee on Legal Residence. The Comptroller or his authorized representative may, during the registration period, or at other times, refer certain cases to the committee provided the question of legal residence requires further review and additional information. A student who believes the decision regarding his legal residence classification is not consistent with the regulations adopted by the Board of Regents may appeal his case to the Legal Residence Committee. A student's request for appeal should include a written statement of all facts relative to the matter and he may be given an opportunity to appear before the committee. Appeals and claims for refund may be filed at any time within 30 days from the date of registration.

Private Music Instruction

In addition to the usual University Registration Fees, the following fees are charged for private music instruction:

- ½-hour lesson per week\$27.00 per semester
- 1-hour lesson per week\$40.00 per semester

Music majors will pay a flat fee of \$40.00 when registering for one or more hours of private instruction.

Special Law Fee (per semester)\$32.00

College of Nursing Examination Fee\$ 8.00

To cover cost of the Graduate Nurse Examination (GNE)

Field Study and Field Trips

A special fee may be charged for field study or field trips to cover travel, meals and lodging. Arrangements for the payment of such fees will be made in advance with the student.

Transcript Fee\$ 1.00

Requests for transcripts should be made to the Registrar and Director of Admissions one week in advance of the time desired.

Senior Check-Out

Each senior is entitled to one official check-out, at the time of application for graduation is filed, without charge, under the curriculum designated in his application for graduation. A fee of \$1.00 will be charged for any additional check-outs.

Auditor's Fees

Those taking courses for audit will register and pay the regular fees.

Graduate Entrance Examination Fees\$3.50 to \$10.00

Not required of all applicants. When applicable the prospective student will be notified by the office of the Dean of the Graduate College.

Master's Thesis Binding Fee\$ 5.00

Education Specialist Report Binding Fee\$ 10.00

Doctoral Dissertation Binding Fee\$ 10.00

Doctoral Dissertation Registration Fee\$145.00

A graduate student must be registered on a full-time basis for a minimum of two semesters for dissertation at full semester fee, and be registered in the semester in which the degree is granted, beginning with the fiscal year July 1, 1962.

Doctoral Dissertation Micro-Film Fee\$ 30.00

Special Examination Fee\$ 1.00

When, because of absence, or for any reason, it becomes necessary for a student to request a special examination in any course, a fee of \$1.00 may be required for this special privilege.

Comprehensive Examination Fee\$7.50 per semester hour

Paid by all students seeking to establish credit by examination.

Test Fees — Vocational\$.50

A nominal fee is charged to pay the cost of test materials only.

Graduation Fees	\$ 5.00
A graduation fee in the amount of \$5.00 applies if paid on or before the dates specified in the section of the catalog headed <i>Graduation Requirements</i> . After that date, the fee is \$10.00.	
Cap and Gown Rental Fee	\$4.00 to \$9.25
Bachelor's cap and gown for baccalaureate and commencement exercises, \$4.00. Master's cap, gown, and hood, \$8.75. Education Specialist cap, gown and hood, \$9.25. Doctor's cap, gown, and hood, \$9.25. These are approximate amounts and subject to change.	
Fee for Dropping Course	\$ 1.00
Charged following last day of registration.	

LATE FEES

Late Registration	\$ 10.00
All students, excepting those registering for night classes only, who register on the date specified for the beginning of classes, or thereafter, pay this fee.	
Late Aptitude Tests	\$ 2.00
Paid by students taking the aptitude tests on the date specified for the beginning of classes or thereafter.	
Late Physical Examination	\$1.00 to \$3.00
Charged beginning at noon of the last day scheduled for registration.	
Late X-ray	Actual Cost
Charged all students who fail to take the X-ray on the date specified by the University.	

DEPOSITS

Deposits are required of those students wishing certain privileges or services. The deposits are returnable less any charges which may have been incurred during the term of the services being rendered. See page 86 pertaining to forfeiture of refunds.

Science Breakage Deposits

All chemistry laboratory courses require a science breakage deposit ranging from \$5.00 to \$25.00. If breakage exceeds the initial deposit, an additional amount will be required.

Military Uniform Deposit	\$ 25.00
Deposit refunded upon return of uniform in good condition.	
Student Housing Application Deposit	\$ 50.00
Reservations for rooms are obtained by filing an application and \$50.00 deposit with the Housing Office. See page 86 pertaining to forfeiture of refunds.	

General Expenses

ROOM AND BOARD PAYMENTS

Payment for residence halls may be made in advance for the entire semester, or on an installment schedule as outlined in the Housing Contract.

The advance should be paid prior to registration by sending a check to the ASU Business Office. Please indicate the student's full name, social security number, specific hall assigned to, and purpose of the payment.

The Memorial Union Dining Hall offers meal tickets on a 5-day or 7-day basis with as many additional servings as the student desires at no extra cost. The meal ticket costs are based on a rate of approximately \$2.30 per day. Individual meals are also available a la carte at a higher rate.

Rooms are available in the University residence halls at rates listed below:

<i>Halls</i>	<i>Semester Rate</i>	<i>Academic Year Rate</i>
Quad, Gammage, Irish	\$180.00	\$360.00
Hayden, Wilson	\$200.00	\$400.00
M. O. Best, McClintock	\$210.00	\$420.00
Palo Verde, Sahuaro, and Manzanita (includes meals served 7 days per week)	\$458.00	\$916.00

PAYMENT AND REFUND OF FEES

Refunds (Rent and Board). Refunds to students departing from residence halls prior to the end of the academic year are computed on the following basis:

- (a) *Deposit:* Students forfeit their \$50.00 room deposit when check-out occurs prior to the tenth week of the spring semester.
- (b) *Rent:* Students will be charged 10 per cent of the total semester rate for each week or partial week of registered occupancy up to the tenth week of the semester.
- (c) *Board:* Departing students shall be charged for meals through the end of the week in which formal check-out occurs. Students departing during the last two weeks of the semester shall be charged the full semester rate for meals. No refunds are made for meals missed at any time prior to the end of the charge periods as indicated above.

Payment of Fees. The payment of fees cannot be deferred. By regulations of the Board of Regents based on a ruling of the Attorney General, registration and other University fees are payable on the day of registration.

Method of Payment. Payments to the University should be made by currency, travelers check, bank money order, cashier's check, or certified check. Personal or company checks requiring change will not be accepted during registration and during a period of one week preceding and two weeks immediately following registration. Personal or company checks in the exact amount of charges being collected by an individual cashier will be accepted. (Separate cashiers are used on registration, bookstore, board, and room charges.)

Refunds (Activities and Other Fees Including Laboratory). Students withdrawing from school or dropping classes will receive a refund based on a percentage of the total semester fees paid, in accordance with the following schedule:

	Percent
1 thru 14 days	80
15 thru 21 days	60
22 thru 28 days	40
29 thru 35 days	20
After 35th day	None

The days referred to are calendar days, beginning with the first day college classes begin. Percent of refund will be determined by date refund is applied for in the Business Office.

Exception: (1) In case an applied music course is dropped, because of actual illness, or other emergency beyond the control of the student, not more than half of the semester fee paid may be refunded. (2) The above refunds do not apply to Summer Sessions. If the last day of the refund period falls on a Sunday or holiday, the refund must be picked up during the regular office hours of the preceding day.

Forfeiture of Refunds. All refunds and deposits due students for any reason whatsoever will be forfeited unless called for on or before June 30 of the college year in which they are due. Refunds will not be made without student receipt card. Should June 30 fall on Sunday or on a day when the Business Office is closed, the refund will be made on the next business day.

Reserve Officers Training Corps (ROTC)

Arizona State University offers basic and advanced courses in Military Science and Aerospace Studies. The basic courses are designed to provide training in basic leadership techniques, to develop an understanding of the roles of the Army or Air Force in the defense of the United States, and to prepare the student for the advanced courses. The advanced courses, offered only to selected students, provide training which qualifies the student to perform the duties of commissioned officers in the Army or Air Force. Upon graduation, each student who satisfactorily completes the Advanced Course will receive a commission in the Army or Air Force Reserve. Appointments as Second Lieutenants in the Regular Army or Regular Air Force are available to outstanding students.

Beginning with the Fall Semester of 1969-70, the Arizona Board of Regents has changed ROTC from a required to an optional program. Participation in ROTC is no longer a prerequisite for graduation from the University.

Aerospace Studies (AIR FORCE ROTC)

PURPOSE

The Department of Aerospace Studies curriculum consists of the General Military Course (GMC) and the Professional Officer Course (POC). The goal of this professional education is to provide the foundation of military knowledge and skills needed by an Air Force Second Lieutenant entering on active duty. Upon graduation, each student who satisfactorily completes the Professional Officer Course and degree requirements will receive a commission in the Air Force Reserve.

Appointments as Second Lieutenants in the Regular Air Force are available to outstanding students who desire a career in the military service.

GENERAL QUALIFICATIONS

A student entering AFROTC must: (1) be a male citizen of the United States (noncitizens may enroll, but must obtain citizenship prior to commissioning); (2) be of sound physical condition; (3) be at least 17 years of age. If designated for pilot training, be able to complete all commissioning requirements prior to age 26½ (otherwise, be able to complete all commissioning requirements prior to age 30).

QUALIFICATIONS FOR ADMITTANCE TO PROFESSIONAL OFFICER COURSE

(1) For the four-year student, successfully complete the General Military Course. (2) For the two-year applicant, complete six-week Field Training Course. (3) Pass the Air Force Officer Qualification Test (AFOQT). (4) Pass the Air Force physical examination. (5) Maintain a minimum grade point average of 2.0.

FOUR-YEAR PROGRAM

In the four-year program, the qualified college student normally enrolls in Air Force ROTC during his freshman year at the same time he enrolls in his other college courses. He pursues the General Military Course (GMC) during his first two years. GMC students receive 1.0 semester hour of credit for each hour of class and each hour of Leadership Laboratory period completed during his freshman and sophomore years, a total of 8.0 semester hours. If he desires to earn a commission, the student must pass an Air Force aptitude test and physical screening and be selected by an interview board of Air Force officers. If selected, the student then enrolls in the Professional Officer Course (POC)—the last two years of the Air Force ROTC curriculum. He normally attends a four-week Field Training Course, between his junior and senior year, at an Air Force Base. Upon successful completion of the POC and the college requirements for a degree, the student is commissioned in the U. S. Air Force as a Second Lieutenant. The new officer then enters active duty or is granted an educational delay to pursue graduate work.

TWO-YEAR PROGRAM

The basic requirement for entry into the two-year program is that the student have two academic years of college work remaining, either at the undergraduate or graduate level, or a combination of the two. This program is designed primarily for students who transfer from junior colleges or have attended universities where the four-year Air Force ROTC program was not available. Applicants seeking enrollment in the two-year program must pass an Air Force aptitude and Air Force medical examination, and be selected by an interview board of Air Force officers. After successfully completing a six-week Field Training Course at an Air Force Base, the applicant may enroll in the Professional Officer Course in the Air Force ROTC program. Upon completion of the POC and the college requirements for a degree, the student is commissioned in the U.S. Air Force as a Second Lieutenant. Unless he is granted an educational delay to pursue graduate work, he may enter active duty shortly after graduation.

PAY AND ALLOWANCES

POC members in their junior and senior year receive pay at the rate of \$50 per month for the 20 months of attendance in the Professional Officer Course. The student will also receive pay at the rate of \$170 per month for attendance at the required summer camp. Uniforms, housing, and meals are provided at camp without cost to the student. The student is also reimbursed at the rate of 6c per mile for his travel to and from the summer camp.

DRAFT DEFERMENT

Draft deferments are available for certain freshmen and sophomores enrolled in the basic course. Those juniors and seniors who qualify and are enrolled in the Professional Officer Course are granted deferment from induction by local Selective Service Boards.

DEPOSIT

All students registering for Air Force ROTC will make a deposit of \$25 with the Military Property Custodian as the basis for issue of the prescribed uniform, textbooks, other authorized materials and to cover certain authorized social activities. This deposit, less deductions to defray the above costs, or loss or damage of uniforms or textbooks through personal neglect, will be refunded at the end of each semester by the Military Property Custodian.

FLIGHT INSTRUCTION PROGRAM

All qualified senior students interested in becoming Air Force pilots may participate in the Flight Instruction Program (FIP) during their last year in college. Those who complete this program and pass the Federal Aviation Administration (FAA) examinations, may receive their private pilot's licenses. Each student receives 36½ flying hours of instruction at an FAA approved flying school at no expense to the student. This training also includes ground school instruction in weather, navigation and Federal Aviation Regulations.

Military Science (ARMY ROTC)

PURPOSE

The Department of Military Science curriculum consists of the Basic Course (freshmen and sophomores) and the Advanced Course (juniors and seniors). The goal of this professional education is to provide the basic military skills and to develop the leadership abilities required of an Army Second Lieutenant entering on active duty. Upon graduating from the University each student who has successfully completed the Advanced Course will receive a commission in the U. S. Army Reserve.

Appointments as Second Lieutenants in the Regular Army are available to outstanding students who desire a career in the military service.

GENERAL QUALIFICATIONS

A student entering Army ROTC must: (1) be a male citizen of the United States (noncitizens may enroll but must obtain citizenship prior to commissioning); (2) be of sound physical condition; (3) be at least 17 years of age for entrance into the Advanced Course and be able to complete all commissioning requirements prior to age 28.

QUALIFICATIONS FOR ADMITTANCE TO THE ADVANCED COURSE

(1) Successful completion of the basic course for the student in the four-year ROTC program. For the student in the two-year program, selection for and successful completion of the six weeks basic summer camp. (2) Successfully pass the Officer Qualification Test (RQ Test). (3) Pass the Army physical examination. (4) Have attained a minimum cumulative grade point average of 2.0 ("C") for the first two years of college work and maintain that minimum during the period in which he is a student in the Advanced Course.

FOUR-YEAR PROGRAM

In the four-year program, the qualified college student normally enrolls in Army ROTC during his freshman year. He takes the Basic Course during his first two years, receiving a total of 8 semester hours credit for the four semesters of study. If he desires to earn a commission, the student must pass the Army aptitude test, Army physical examination, and be selected by an interview board of Army officers. If selected, the student then enrolls in the Advanced Course, the last two years of the Army ROTC program. He will earn 10 semester hours of credit for the four semesters of study. In addition, he will attend a six-week Advanced Summer Camp between his junior and senior years at an Army post. Upon successful completion of the Advanced Course and requirements for a degree, he is commissioned as a Second Lieutenant in the U. S. Army Reserve. The new officer then enters on active duty for two years or is granted an educational delay to pursue graduate work.

TWO-YEAR PROGRAM

The basic requirement for entry into the two-year program is that the students have two academic years of college work remaining, either at the undergraduate or graduate level, or a combination of the two. This program is designed primarily for the junior college transfer or for the student transferring from a university where the four-year Army ROTC program was not available. Students seeking enrollment in the two-year program must make application during January or February of the year in which they desire to enter the program. They must pass the Army aptitude and Army physical examinations and must be selected by an interview board of Army officers. After successfully completing a six-week Basic Summer Camp at an Army Post (normally conducted during June and July), the student may enroll in the Advanced Course of the Army ROTC program. He now follows the same program and meets the same requirements as stated for Advanced Course students in the four-year program. Upon completion of the Advanced Course and the University's requirements for a degree, he is

commissioned as a Second Lieutenant in the U. S. Army Reserve. The new officer then enters on active duty for two years or is granted an educational delay to pursue graduate work.

PAY AND ALLOWANCES

Advanced Course students in their junior and senior years receive \$50 per month for the 20 months of attendance in the Advanced Course. The student also receives one-half the pay of a Second Lieutenant (the same as cadets at the U.S. Military Academy) during his attendance at the six-week Advanced Summer Camp. Uniforms, housing and meals are provided at camp without cost to the student. The students are reimbursed at the rate of 6c per mile for his travel to and from the camp. Students who enter the two-year program will receive the pay of an Army Recruit during attendance at the Basic Summer Camp as well as 6c per mile for travel to and from the camp. Upon admittance to the Advanced Course, the pay of two-year students is the same as that for four-year students.

SCHOLARSHIP PROGRAMS

The Army ROTC offers two scholarship programs for outstanding young men who are motivated toward a career as professional officers in the Regular Army. A four-year scholarship which pays for all fees, and tuition, books and \$50 per month for the four years of the scholarship is available to freshmen who will enter the four-year program. Applications must be submitted during the senior year in high school and selection is made on a nation-wide basis. Two-year scholarships are available to outstanding students in the four-year program when they enter the Advanced Course. Applications are submitted along with the request to enter the Advanced Course and selection is made by an interview composed of University faculty members and Army officers in the ROTC detachment. The two-year scholarship provides the same assistance during the final two years in the Army ROTC program as does the four-year scholarship.

DRAFT DEFERMENT

Draft deferments are available to scholarship students while they are freshmen and sophomores enrolled in the Basic Course. Those students enrolled in the Advanced Course are granted deferments from induction by all Selective Service Boards.

DEPOSIT

All students registering for Army ROTC will make a deposit of \$25 with the Military Property Custodian. This covers the issue of the prescribed uniforms, Army ROTC textbooks and other authorized materials. This deposit, less authorized deductions to cover cleaning, laundry or loss or damage to uniforms or textbooks through personal neglect, will be refunded at the end of each semester by the Military Property Custodian.

FLIGHT PROGRAM

All qualified students interested in becoming Army Aviators may participate in the Flight Program during their last year in college. Those who

complete this program and pass the Federal Aviation Administration examinations, may receive a private pilot's license. Each student receives 36½ flying hours of instruction at an FAA approved flying school at no expense to the student. The training includes ground school instruction in weather, navigation and Federal Aviation Regulations.

ACTIVE DUTY REQUIREMENTS

Graduates of Army ROTC are required to spend two years on active duty. Scholarship students, students who receive Flight Training, and those students who desire an Army career and receive a Regular Army commission, have additional amounts of time added to their basic two-year commitment. A delay from call to active duty for up to four years is available to outstanding students who desire to earn a graduate degree.

General Studies

Arizona State University students are required to demonstrate a satisfactory level of basic knowledge in the humanities and fine arts, social and behavioral sciences, and sciences and mathematics. Specific patterns of general studies requirements are established by the colleges of the University within the overall program approved by the General Studies Council. Since requirements under this program vary somewhat from one curriculum to another, the student should refer to the catalog description of the recommended general studies program in his college. Students from approved institutions of higher education ordinarily will be given credit, hour for hour, for work done in those institutions insofar as it is equivalent in content to general studies courses at this University.

All students who are candidates for a bachelor's degree in any curriculum are required to complete a total of 36 semester hours in general studies courses. The program requires a minimum of eight semester hours chosen from appropriate courses in each of the following fields:

HUMANITIES AND FINE ARTS

Architecture, Art, Dance, Drama, English, Foreign Languages, Interdisciplinary Humanities, Music, Philosophy, Speech.

A student selects with the approval of his adviser two or more courses which comprise a pattern designed to enhance his ability to develop a discriminating appreciation and understanding of the humanities, fine arts, and philosophical ideas. This pattern is intended to develop standards of critical judgment, ability to assess and evaluate humanistic ideas and values, and competence in the basic arts of communication and self expression.

SOCIAL AND BEHAVIORAL SCIENCES

Aerospace Studies, Agriculture, Anthropology, Business Administration, Cultural Geography, Economics, Education (Educational Foundations), Engineering, Health Education, History, Home Economics, Mass Communications, Military Science, Political Science, Psychology-PX, Sociology.

A student selects with the approval of his adviser two or more courses

which comprise a pattern of study in the social and behavioral sciences. This pattern should be designed to expand knowledge of the individual and his relation to society; to deepen the historical appreciation of American and other cultures; to estimate the impact of science, technology, and changing business and economic conditions on human societies; and to increase awareness of the major social issues of the time.

SCIENCES AND MATHEMATICS

Botany, Chemistry, Engineering, Geology, Mathematics, Physical Geography, Physics, Psychology-PY, Zoology.

A student selects with the approval of his adviser two or more courses which comprise a coherent pattern designed to explore the fundamental concepts of science and mathematics; to reveal the role of observation and experiment, inductive and deductive reasoning, and the quantitative approach in modern physical, biological and engineering science; and to bring into sharp focus the scientific forces that influence the destiny of man.

To complete the total requirements of 36 semester hours, the student shall select with the approval of his adviser appropriate electives from the above fields or from other fields approved within the framework established by each college. Requirements in these fields of general studies may be met by advanced standing credit or may be waived by virtue of acceptable performance on a proficiency examination. In such cases, the prescribed requirements are correspondingly reduced.

UNIVERSITY ENGLISH PROFICIENCY REQUIREMENT

EN 101, 102 First Year English-3, 3, is required of all students. The requirement of EN 101 or 102 may be waived upon demonstration by examination of such exceptional proficiency as the English Department may require. Students who pass an exemption examination in EN 101 will register for EN 104 Advanced First Year English-3, instead of EN 102.

Honors Program

PURPOSE

The Honors Program is designed for students of exceptional ability who are interested in scholarly attainment. Through this program, it is hoped to encourage the student to develop an awareness of the inter-relatedness of all knowledge and experience, and to make him more concerned with basic values—intellectual, aesthetic, social and ethical. Wide reading, thorough scholarship, and independent creative work are emphasized throughout the program.

ADMISSION

Students may be admitted to the Honors Program on the basis of their previous academic record, specialized tests and a conference with an examining committee of the Honors Council of the College in which the student is enrolled.

DESCRIPTION

Students admitted to the Honors Program will spend a considerable portion of their time in the serious study of the general field of their major and also will do some work in related fields and in general studies. The work includes: (1) general reading and discussion covering the entire major field, with emphasis on those areas not covered by formal courses, plus such work in related fields as may seem desirable; (2) specialized and intensive work in some phase of the major field selected by the student in consultation with his Honors adviser and approved by the department of his major. The student's thesis, or creative project, will be within this field of specialized work.

The program has the same general requirements for graduation as exist within the regular degree programs. In order to stimulate the student to do outstanding work, the adviser, operating under the rules established by the Honors Council in each college, may substitute work on a higher level than that stipulated in the general studies or major requirements but always within the same field.

GRADUATION REQUIREMENTS

For graduation with honors, the student must pass a comprehensive examination in his major area. In addition, he must present to the Honors Council an acceptable honors project consisting of a thesis or an equivalent creative project. The student may be required to defend the thesis or creative project before an examining committee of the Honors Council. A cumulative grade index of 3.25 is required for graduation with honors.

Students successfully completing the program will be graduated *magna cum laude* or *summa cum laude* in recognition of their scholarly achievements.

For specific details of individual College Honors Programs, see the individual college sections of the catalog.

Baccalaureate Degree Requirements

The University grants the following baccalaureate degrees: Bachelor of Arts, Bachelor of Science, Bachelor of Architecture, Bachelor of Science in Engineering, Bachelor of Science in Nursing, Bachelor of Arts in Education, Bachelor of Music, Bachelor of Fine Arts. To obtain a second bachelor's degree, the student must do an additional 30 hours of work or more and meet all of the requirements of the particular degree.

The Unit of Credit. The semester-hour is the unit of credit. It represents one 50-minute class exercise per week per semester with two hours of outside preparation.

Credit Requirements. A minimum total of 126 semester hours is required for graduation with a bachelor's degree. Forty per cent of the semester hours required for graduation must be in upper division courses numbered 300 or 400.

Credit earned in correspondence courses may be applied toward the bachelor's degree; however, not more than 30 semester hours of credit in

correspondence courses and/or by comprehensive examination will be accepted for credit toward the degree. (See section on "Extension Division.")

Meeting New Course Requirements. Students whose registration and attendance is continuous may graduate under the curriculum and course requirements or equivalent, and regulations for graduation, as stated in the catalog for the year the student first registered.

Effective for students enrolling for the first time after September 1, 1965, continuous residence shall be construed to apply or be in effect, provided the student receives credit for at least three semester hours for each semester, for a total of up to eight semesters. If the continuous enrollment extends beyond eight semesters, the credit received for each must not be fewer than three for each semester and must average six semester hours of credit received for the next eight semesters. Continuous residence will not apply for any degree program beyond 16 semesters and the student will then be required to meet the graduation requirements of the catalog in effect at the time of graduation. Summer Sessions enrollment does not affect continuous residence interpretations.

When registration and attendance is not continuous, the student will be required to meet the curriculum and course requirements and regulations for graduation as stated in the catalog for the year the student registers for final continuous residence prior to graduation.

Physical Education. Although physical education is not required for graduation, the Department of Health, Physical Education, and Recreation provides an opportunity for students to enroll for elective credit in physical activity courses.

Scholarship Requirements. In order that a student may be eligible for graduation, his cumulative scholarship index must be 2.00 or better for all work taken while a student at this University.

Graduation With Distinction. Students who have a cumulative scholarship index of 3.00 through 3.49 will be graduated "With Distinction." Students who have a cumulative scholarship index of 3.50 through 4.00 will be graduated "With High Distinction." Students to qualify for graduation with these designations must have completed at least 60 semester hours in residence at Arizona State University and all transfer credits must be at least of equal academic quality.

Graduation With Honors. Students in the Honors Program who have a cumulative scholarship index between 3.25 and 3.49 and are approved for scholarly achievement by the Honors Council will graduate *magna cum laude*. Those in the index range of 3.50 to 4.00, on approval of the Honors Council, will graduate *summa cum laude*.

Residence Requirements. A minimum of one year residence as a regular student is required of every candidate for the bachelor's degree, and the final 12 semester hours immediately preceding graduation must be taken in residence. For purpose of record, a year in residence is defined as 30 semester hours of credit earned either in on-campus courses or in established residence centers of Arizona State University. It has no reference to living in residence halls or in Tempe.

Credit earned in correspondence courses cannot be used to meet

residence requirements. The 12 semester hours of final residence may be taken during a semester of the regular academic year or during the summer terms. Exception to the final 12-semester hour regulation may be made by the University Admissions and Standards Committee. Petitions for an exception must be made in writing and addressed to the Registrar and Director of Admissions.

Application for Graduation and Teaching Certificates. Students who plan to complete requirements for graduation at the end of either summer term or the first semester should pay the Application for Graduation fee and file their application for graduation with the Registrar and Director of Admissions before registering for their final term or semester. Those planning to complete degree requirements during the first semester must file an Application for Graduation prior to April 1 of the preceding academic year. Those planning to complete requirements for graduation in May should pay the Application for Graduation fee and file their application for graduation with the Registrar and Director of Admissions before November 15. A \$5.00 late fee is charged students planning to graduate in May who do not file the Application for Graduation by the November 15th deadline. The filing of late applications for May commencement extends from November 16 to the last day of late registration for second semester. Students cannot change their application from one degree to another after the beginning of the final semester's work.

Application blanks are obtained in the Office of the Registrar and Director of Admissions. Candidates who fail to pay the Application for Graduation fee and file applications at the time specified are required to pay the late fee, and may be scheduled for graduation at a later date. Upon filing an Application for Graduation, a final check on graduation requirements is made by the Office of the Registrar and Director of Admissions. A check sheet showing the remaining requirements for graduation under the curriculum designated in the application is furnished the student as a guide to his final semester's registration.

Applications for teaching certificates should be obtained at the Office of the Registrar and Director of Admissions at the time of filing Applications for Graduation. Applications should be filed promptly after taking the oath of allegiance.

Financial Clearance. Before a student may receive his diploma or any transcript, he must obtain financial clearance at the Business Office. Financial clearance indicates that the regular fees, library, housing charges, dining hall, parking sanctions, and other fees have been paid.

ADVANCED DEGREES

The University grants the following advanced degrees: Master of Arts, Master of Science, Master of Arts in Education, Master of Science in Engineering, Master of Fine Arts, Master of Public Administration, Master of Music, Master of Social Work, Master of Counseling, Master of Science in Nursing, Education Specialist, Doctor of Philosophy, Doctor of Education, Doctor of Business Administration and Juris Doctor.

See section of the catalog headed "Graduate College" for statements of requirements for these degrees. (Page 200.)

Student Services, Organizations and Activities

George F. Hamm, Ph.D.
Vice President, Student Affairs;
Dean of Students



Hayden Library on University Mall

University Counseling Program

Arizona State University offers an advisement and counseling program designed to assist the student to develop an educational program relevant to his individual needs and aspirations. Elements of the program include orientation, counseling and testing, curriculum advisement, and diagnostic services.

Orientation. An orientation program is provided for new students. It includes placement testing, health examinations, social events and review of university curriculums and services.

Personal and Program Guidance. Personal counseling is available to individual students in the Office of the Dean of Students. In addition to individual counseling, the personnel deans have responsibility for guidance and direction of the out-of-class programs of organizations, honor societies, activities, fraternities and sororities, residence hall living and student government.

Student Counseling Service. A staff of clinical and counseling psychologists is available for confidential interviews. Appointments may be made to dis-

cuss such matters as personal-social adjustment, understanding of self, and evaluation of long-term goals.

The University Testing Service. Located in the Hiram Bradford Farmer Education Building, it administers and scores group tests for orientation and guidance purposes, provides a research service for the University, and scores examinations administered by the academic departments. Tests are also administered to individuals by the Research and Testing Service, and Counseling Center, Reading Clinic, and the Psychological Clinic in connection with individual counseling.

Curriculum Advisement. Every student needs a plan of study by which he pursues his main objectives in collegiate education. This plan of study is his curriculum. Entering students frequently need advice and assistance in deciding upon their curriculums. Arizona State University attempts to meet this need by providing opportunities for each student to consult with an academic adviser and to select an academic area which seems to meet the professional interests and abilities of the student. The student may keep this curriculum and major field, and may continue to discuss his academic plans with the same adviser throughout his college career; or he may change to another major field and adviser in the future.

Speech and Hearing Clinic. The Speech and Hearing Clinic provides the opportunity for students to gain practical experience working with children and adults handicapped by speech or hearing disorders, and in giving examinations and therapy for those who need help. The service is made as available as possible to University students, the public schools, educational and medical agencies, and individuals in the community.

Honors Advisers. Honors advisers are available in the departments of each of the colleges offering the Honors Program.

Housing

Despite differences in location, age, physical facilities and environment, all residence halls make a very real contribution to the educational program at Arizona State University. The primary objective of the residence hall program is to provide an atmosphere conducive to exploration, study and challenge in terms of the student's potential. It emphasizes intellectual, cultural and social development.

There are eight halls for women and nine for men. In order to provide a variety of possible living experiences, there are freshman, upperclass and all-class halls. McClintock is an honor hall for upperclass women with special requirements for residency. Each hall provides mail service, basic library and resource facilities, weekly linen changes, and desk services. In some halls cafeteria facilities are available. Telephones are provided in all student rooms.

Reservations. Application materials obtained from the Housing Office will include forms to be completed by prospective students desiring living quarters in University Residence Halls. The housing application includes a Housing Agreement form and Room Reservation card. Male freshmen under 21 years of age who elect to live in University residence halls during any given

semester will be required to retain their residence hall accommodations for the remainder of the academic year. Women students under 21 years of age are required to live in University residence halls. (See "Housing Regulations for Women Under 21," below).

Housing applicants must forward the completed Hall Reservation card and Housing Agreement form together with room deposit to the Housing Office. Although room reservations will not be confirmed until the applicant has been cleared for admission to the University by the Admissions Office, prospective students are urged to file their applications for housing *before* being admitted to the University.

Preferences of residence halls may be stated at the time of making reservations. Assignments to halls are made by the Housing Office in accordance with policies established by the University. Assignments to the honor hall for women are made through the office of the Coordinator of Residence Halls. Room assignments are made by the Head Residents under the supervision of the Coordinator of Residence Halls.

Residence in halls, sorority or fraternity houses is restricted to students registered for 12 or more units of regular work. Any exception must be approved by the Dean of Students' office. The University reserves the right to change the residence of any student or to deny or cancel residence accommodations of any students in cases where such action is deemed desirable.

Residence Regulations for Women Students. Women may be absent from the halls overnight only with the written consent of their parents, which must be on file with the Dean of Students' office and the head resident at the time of departure. On these occasions residents sign out, indicating where they may be reached in case of emergency.

Housing Regulations for Undergraduate Women Students Under 21 Years of Age. Undergraduate women students under 21 years of age are required to live in the University residence halls and are expected to carry an academic load of at least 12 semester hours. Exceptions are made for those women who live with their parents, guardians, or close relatives, or who work in a private home for their room and board.

In the event that all women's residence halls are filled, upperclass students may obtain permission to arrange for suitable off-campus housing, which must also meet with their parents' approval, by filling out the appropriate forms in advance in the Office of the Dean of Students. Such off-campus housing is not officially under University inspection or supervision; therefore, the University cannot assume responsibility for students living off-campus. However, the University reserves the right to move students whose conduct or quarters are found to be undesirable.

Graduate students and women over 21 may live in the residence halls if space is available, providing they conform to all regulations of the residence units in which they live.

Married women may live in the residence halls only with special permission of the Office of the Dean of Students. Students in women's residence halls must report changes in marital status immediately.

Health Service

Student Health Service. This service is maintained for the purpose of constant supervision over the health of students. It is administered under the Office of the Dean of Students. A dispensary and infirmary are staffed by physicians and registered nurses.

A physical examination, within six months prior to registration by a practicing physician and surgeon and recorded on a form provided by the University, is required of all new students who register for more than six class hours before registration can be completed. Also required is a certificate of smallpox vaccination done within the past three years and proof of having completed a tetanus toxoid series. A chest X-ray is required as part of the physical examination, but if a report of one is not enclosed, the student may have an X-ray made at the Student Health Service on dates announced during the summer, or during Orientation Week.

Former students who have not been in attendance at the University for two years or more will meet the same requirements as new students.

Students are urged to have all immunizations brought up to date, and all remediable defects, such as in eyes, ears, teeth, tonsils, etc., corrected in advance of matriculation to prevent possible loss of time from studies. The Student Health Service makes the recommendations concerning activities of students in which health may be a factor.

Dispensary and Infirmary Treatment. Dispensary services are available during regularly posted hours, and at any hour for emergencies, to all students registered for more than six semester hours. No illness will be cared for in the residence halls, nor will any prescription be made for a student not reporting in person to the Health Service. Bedside care will be given in the infirmary for one week per semester without charge. A very nominal charge is made after that time, should further care be needed. Students who do not have meal tickets at one of the University dining halls will pay for meals served while in the infirmary. There is no limitation on number of clinic visits. Contagious illness will be cared for in the infirmary whenever possible, but diseases requiring long periods of isolation must be treated either at home or in a local hospital at the student's expense.

Illness or Injury Must Be Reported. Any illness or injury must be reported to the Student Health Service without delay. A campus resident is required to report illness immediately to the head resident of his or her hall. Failure to do so may result in one being asked to leave the hall. Health reports are sent to the family physician upon request of the student. Parents will be notified at once of any serious illness or need for hospitalization; however, they are not routinely notified of all admissions to the infirmary.

Financial Responsibilities. With the payment of the General University Fee each semester, all regularly registered students are entitled to Student Health Service care according to established policies. Students may be referred to consultant specialists when the University physicians consider it advisable, but such fees must be borne by the student. When hospitalization is considered necessary, the University assumes no financial responsibility. Parents are consulted in advance of hospitalization if at all possible.

Student Insurance. Insurance policies are available through Associated Students which help defray the cost of accidents or any necessary hospitalization. Students are expected to take advantage of these plans which supplement the Student Health Service. Insurance coverage is mandatory for international students. Graduate and undergraduate students enrolled for seven or more semester hours are eligible for the two programs offered: (1) Accident and Sickness Insurance—covers 24 hours a day, around the world, September to September. (2) Life Insurance—\$5,000 or \$10,000 coverage for one year from the date of issue.

Placement Service

The Placement Service is maintained to assist undergraduates, graduates, and alumni in obtaining employment according to their training, ability, and experience. It is the purpose of the office to serve the state, region, and nation by providing adequately trained personnel for business, industry, government, and education. Although the Placement Service does not guarantee placement, every effort is made to aid students and those in the field who desire placement assistance. Candidates for employment may register by filling out the appropriate forms. Upon registering, candidates receive full information and instructions relative to securing employment.

Student Placement. The Placement Service aids students attending the University in securing part-time and summer employment, both on and off the campus, which tends to supplement their income and educational goals. All students who are interested in on- or off-campus placement should register with this office.

Educational Placement. The Placement Service assists graduating students and alumni in obtaining teaching and administrative positions in elementary schools, secondary schools, and in institutions of higher education. It seeks, at the same time, to serve the best interests of these institutions by referring candidates adapted to their particular needs.

Commercial Placement. The Placement Service serves graduating students and alumni who are interested in commercial, industrial, and governmental placement. Efforts are made to place students in their chosen fields, and at the same time, aid employers to obtain properly trained personnel.

All correspondence should be addressed to the appropriate division in the Placement Service.

Alumni Association

The Alumni Association was organized under the leadership of Principal E. L. Storment in June, 1894.

Membership. There are approximately 47,000 graduates including the class of 1969. All students become active members when they graduate. Those students who have attended the University at least one semester may become associate members.

Alumni House. The campus center for alumni of the University is Alumni House, situated just east of Old Main. Formerly the presidents' home, Alum-

ni House was renamed in 1960 by the Board of Regents. Three presidents of the institution lived in the house, built in 1907: A. J. Matthews, Ralph W. Swetman, and Grady Gammage.

Alumni House includes offices of the Association's executive director, the assistant director, the editor of the alumni magazine, and alumni records offices, as well as meeting rooms and tastefully appointed living room and reception areas. Alumni, students, and faculty are encouraged to visit Alumni House.

Alumni Fund. Annual alumni giving was inaugurated in 1961. The Fund is used for scholarships, loan funds, the University Library, or for other purposes deemed appropriate by the University.

Endowment Fund. Under the leadership of the late Clarence M. Paddock, '03, and Leona M. Haulot, '02, the Association raised an endowment fund of \$10,000 for the assistance of worthy students. The fund has now increased to more than \$55,000 and approximately 500 students each year receive aid from the fund. Loans are made only to juniors, seniors, or graduate students.

Alumni Magazine. The Association's official magazine, the *Arizona Statesman*, is published bi-monthly for all active members. Present circulation is approximately 42,000.

Alumni Register. The Alumni Association maintains a card file of the names and addresses of all its active members. Since it is difficult to keep up with address and name changes, alumni and friends can be of real service by sending a post card to the Alumni Secretary giving changes.

Alumni Faculty Awards. The Alumni Association annually presents two awards to individual faculty members in recognition of distinguished teaching and professional achievement. The Distinguished Teacher Award is based on the professor's knowledge of his field, effective presentation and ability to stimulate students to their highest efforts. The Faculty Achievement Award is given a professor who gains recognition and brings credit to higher education through his contributions in the professional world.

Scholarships, Fellowships and Loans

ARIZONA STATE UNIVERSITY SCHOLARSHIPS

REGENTS' SCHOLARSHIPS. The Board of Regents has created a number of scholarships, which are awarded annually by Arizona State University to new and currently enrolled students who meet the qualifications established by the Regents. The financial need of applicants is one of the factors considered in selecting recipients of these scholarships. Deposits are waived for all students awarded those Regents' scholarships which provide for the remission of fees (including non-resident tuition, if applicable).

ACADEMIC SCHOLARSHIPS. These scholarships are available to students who give promise of high scholastic achievement. They provide for the remission of the general University fee and, in the case of out-of-state students, non-resident tuition.

RESERVATION INDIAN SCHOLARSHIPS. Two four-year scholarships are awarded annually to Arizona Reservation Indians who have demonstrated ability in the fields of scholarship and leadership. These scholarships cover the general University fee for four years.

FOREIGN STUDENT SCHOLARSHIPS. Graduate and undergraduate scholarships are available to qualified students from foreign countries who have previous satisfactory scholastic records and show promise of achievement in promoting good international relations. These scholarships cover regular registration and class fees and non-resident tuition. The ability to read and speak the English language is required.

ACTIVITY SCHOLARSHIPS. These scholarships are available to new and currently enrolled students who give promise of satisfactory scholastic achievement, of outstanding success for skills or talent in the institution's program of approved activities, and of developing desirable qualities of character and leadership. Freshmen must have graduated in the upper two-thirds of their high school classes in order to be considered for these scholarships. The scholarships listed immediately below make up the category, "activity scholarships." Although the promise of superior performance in extra-curricular activities is one of the factors considered in awarding these scholarships, the recipients must, nevertheless, have met the fundamental requirements of academic ability.

Athletic Scholarships. These scholarships provide for the remission of the general University fee and, in the case of out-of-state students, non-resident tuition. In addition, recipients of these scholarships may qualify for room and board awards under the Sun Angel Scholarship Fund.

Band Scholarships. These scholarships provide for the remission of the general University fee and, in the case of out-of-state students, non-resident tuition. A limited number of them also provide for the remission of fees for private music lessons.

Choral Scholarships. These scholarships provide for the remission of the general University fee and, in the case of out-of-state students, non-resident tuition.

Orchestra Scholarships. These scholarships provide for the remission of the general University fee and, in the case of out-of-state students, non-resident tuition. In addition, they may provide for the remission of fees for private music lessons.

Voice and Piano Scholarships. These scholarships provide for the remission of the general University fee. They also provide for the remission of non-resident tuition where applicable.

All the Arizona State University Scholarships listed above may be renewed annually upon re-application by the student and approval by the Scholarship Committee.

SPONSORED SCHOLARSHIPS AND FEDERAL PROGRAMS

In addition to the Arizona State University Scholarships described above, several hundred scholarships are offered through the University

which are sponsored through private or public sources. Arizona State University participates in the following Federal Programs: National Defense Student Loans; Nurses Training Act Loans; Educational Opportunity Grants and the College Work-Study program. For complete information concerning these programs, see a special brochure available from the Director of Financial Aids.

UNIVERSITY LOAN FUNDS

Loans are available for students enrolled in the University in a full-time program to meet the needs of any reasonable educational expense. The extent of this financial need must be clearly established by providing a complete statement of the applicant's financial resources and expenses for the academic year.

Loans are not available for any non-educational expense which is normally financed by a commercial lending institution, nor are they available for the repayment of any previously incurred indebtedness.

The maximum loan limit shall be determined by a number of considerations. One of primary importance is the ability to repay. Generally, undergraduate students may borrow in modest amounts repayable within the academic year or before the beginning of the next school year. For graduate students, such factors as degree program and professional objectives shall be taken into account in determining the extent of credit and repayment schedule. Most University loans carry a nominal rate of interest or a small service charge. Applications may be filed at any time during the school year. A special brochure providing additional information on loans is available from the Director of Financial Aids.

Honors and Awards

Requirements are listed after award or honor title. Areas of interest having more than two awards are listed by subject matter.

SCHOLASTIC ACHIEVEMENT AWARDS

Moeur Award. Given by Annie Lassator Moeur, graduate of the Class of 1914, and the Alumni Association, this award is presented to the graduate of any four-year curriculum who attains the highest standing in academic work during the four years immediately preceding graduation.

American Association of University Women. Arizona State Division and Phoenix and Tempe Branches: Senior women.

Arizona Historical Foundation Award. Senior.

Art Purchase Prizes and Awards. Four Divisions.

ASASU Academic Achievement Award. Senior.

Associated Women Students' Outstanding Senior Woman Award.

Albert P. Ball Memorial Award. Essay on Psychology.

Chi Omega Social Science Award. Women, Sociology and Anthropology.

College of Nursing Achievement Award. Senior.

Thomas J. Croaff Award. Senior, research paper in Political Science.

Freshman Art Award.

La Liga Panamericana Award. Senior, service to club and Spanish proficiency.

Man of the Year Award. Senior.

Phi Eta Sigma Award. Man, sophomore.

Phi Kappa Phi Award. Junior.

Pi Kappa Delta Awards. National forensic honorary; Order of the Brown Cow; Man and Woman Debaters of the Year.

Women's Physical Education Award. Senior.

ARCHITECTURE: *American Institute of Architects Awards; American Institute of Architects School Medal, Senior; Weaver and Drover Prize for Architectural Design.*

BUSINESS ADMINISTRATION: *Arizona Society of Certified Public Accountants' Award; Delta Sigma Pi Scholarship Key, Senior; National Business Education Award of Merit.*

CHEMISTRY: *American Institute of Chemists Award; Senior; Chemical Rubber Publishing Company Awards in Chemistry and Physics, Freshmen; Merck Index Award.*

EDUCATION: *Association for Childhood Education, Student Branch Award; Kappa Delta Pi Award, Junior; Kappa Delta Pi Scholarship Key, Senior; Student National Education Association Award (ASU Chapter).*

ENGINEERING: *American Institute of Chemical Engineers Scholarship Award, KE Junior; Eta Kappa Nu Outstanding Electrical Engineering Student Award, Senior; Institute of Electrical and Electronic Engineers Prize Paper Awards (Arizona Section); Lewis S. Neeb Award, Senior, industrial education; Tau Beta Pi Essay Award, Engineering honorary pledge.*

HOME ECONOMICS: *Beta Chi Award, Senior woman; Mary Essig Award, Senior, home management; Home Economics Senior and Sophomore Awards; Phi Upsilon Omicron Freshman Award.*

MASS COMMUNICATIONS: *W. A. Krueger Company-Tyler Division Award; McGrew Printing Journalism Award; Mesa Tribune Award; Sigma Delta Chi Outstanding Male Graduate Award; Tempe Daily News Journalism Award.*

MUSIC: *Kappa Kappa Psi Award, Beta Omicron Chapter, band; Man of Music Award (Kappa Nu Chapter of Phi Mu Alpha); Ralph H. Morris Instrumental Music Award; Sigma Alpha Iota, Gamma Mu Chapter, Phoenix Alumnae Awards, best musical performer of pledge class, chapter member with high scholastic ability and musical performance, Patroness Scholarship, Dean's honor award to a senior; Tau Beta Sigma Award, University Band member.*

RESIDENCE HALLS: *M. O. Best B Hall Award; Hayden Hall Scholarships; Interhall Council Award; Mortar Board Outstanding Hall Scholarship Award; Quadrangle Unit Award.*

RELIGION: *Hillel Honor Awards; John Henry Newman Awards; Newman Catholic Students Association Service Award, Senior woman; Religious Activities Awards, man and woman; Student Interfaith Council Awards.*

SORORITIES - PANHELLENIC: *Outstanding Pledge Award; Scholarship Cup; Scholarship Plaque; Woman of the Year, Junior or Senior.*

WRITING: *Glendon and Kathryn Swarthout Prizes in Creative Writing, first and second prizes in poetry and fiction to two undergraduate and two graduate students.*

ATHLETIC AWARDS

Blue Key Award. (Baseball, outstanding player)

Charles Christopher Memorial Award. (Trophy, general athletic and scholastic ability, freshman)

Bob Gehres Blue Key Award. (Baseball, most valuable player)

Glen Hawkins Sportsmanship Award. (Football)

Interhall Council Award. (Intramurals, presented to residence hall)

Most Valuable Player Award. (Basketball, trophy)

Old Timers Award. (Outstanding letterman)

Rosenzweig Trophy. (Outstanding letterman)

RESERVE OFFICER TRAINING CORPS AWARDS (Military Science and Aerospace Studies)

Academic Vice President's Awards. (Decoration to senior year Squadron and Company Commanders)

Air Force Association Medal. (Outstanding advanced course cadet successfully completing Summer Training Encampment)

Air National Guard Award. (Trophy to outstanding cadet fulfilling six requirements)

American Legion Medals. (Two presented by William A. Bloys Post Number 2 to second-year basic course cadets)

Arizona National Guard Award. (Trophy)

Armed Forces Communication and Electronic Association Award. (Medals to the outstanding Army and Air Force ROTC senior cadets)

Arnold Air Society Award. (AFROTC cadet, second-year course)

Association of the United States Army Medal. (First-year advanced course cadet, Army ROTC)

Association of the United States Army Military History Award. (Sophomore Army ROTC cadet achieving highest grades in semester military history is studied)

Commandant's Marksmanship Award. (Top marksman on Army ROTC rifle team)

Dean of the College of Liberal Arts Awards. (Decorations to junior year platoon officer and flight commander)

Dean of Students ROTC Awards. (Decoration for leadership, Army and Air Force cadets)

General Dynamics Award. (Model aircraft to second-year basic AFROTC cadet accepted for advanced study)

Governor's Medal (Commanders of Army and Air Force Corps of Cadets)

Military Order of World Wars Medals. (Outstanding records by Army and Air Force cadets in summer training period)

Outstanding Kaydette Award. (Member of Kaydettes, Army ROTC women's auxiliary, contributing most to furthering ideals and goals of organization)

Pershing Rifles Award. (Outstanding ROTC cadet member)

President's Awards. (Decorations to two outstanding cadets of second-year advanced course in Army and Air Force Cadet Corps)

Reserve Officers' Association Medals. (Medals and certificates to Army and Air Force cadets showing leadership, promotion potential and an "A" average in ROTC subjects)

ROTC Awards. (For greatest personal contribution to Army and Air Force ROTC programs at ASU)

Sons of American Revolution Award. (Two cadets of second-year basic courses in Army and Air Force ROTC having highest academic and military class standing, service to department and ASU)

Superior Cadet Ribbons. (Department of Army award to one Army ROTC cadet in each academic class)

Veterans of Foreign Wars Medals. (Bob Finch Post Number 3632, to two cadets in first-year basic course of both Air Force and Army ROTC)

Associated Students

Every student registering for more than six hours is automatically a member of the Associated Students of Arizona State University. The purpose of ASASU is to promote the educational values of student life. These objectives are accomplished by a structure of student representation designed to express student views and consider their needs. In addition, emphasis is placed upon unity of purpose among students, faculty and administration. Women students are also members of Associated Women Students, which recommends policy relating to women's activities and organizations.

ACTIVITIES AND ORGANIZATIONS

Student Activities Program. See Student Handbook.

Student Organizations. See Organization Directory. Further information may be obtained from the Office of the Dean of Students.

In order to be eligible for membership in any student organization, a student must be in good academic standing, and to run for office must have a minimum cumulative GPA (Grade Point Average) of 2.00.

COUNCILS

For Men

Interfraternity Council (See Sororities and Fraternities)

For Women

Junior Panhellenic Council (See Sororities and Fraternities)
 Panhellenic Council (See Sororities and Fraternities)

For Both Men and Women

Business Administration Student Council
 College of Education Academic Council
 Residence Hall Council (See Residence Halls, Sororities and Fraternities)
 Student Interfaith Council (See Religious Groups)

SCHOLASTIC HONORARY GROUPS*For Men*

Chemistry Society of A.S.U., Honorary
 Phi Eta Sigma (National scholastic honorary for freshman men)
 Tau Beta Pi Association, Beta of Arizona Chapter
 (Engineering honor Society)

For Women

Alpha Lambda Delta (National scholastic honorary for freshman women)
 Alpha Pi Epsilon (National secretarial honor organization)
 Mortar Board (Senior women's honorary)
 Phi Upsilon Omicron (Home economics)
 Pi Lambda Theta—Beta Kappa Chapter (Honor and professional association for women in education)

For Both Men and Women

Alpha Epsilon Delta (National pre-medical honorary)
 Alpha Mu Gamma (Foreign language)
 Beta Beta Beta (National biological society)
 Beta Gamma Sigma, Beta of Arizona (National honor society for junior and senior students in the College of Business Administration)
 Delta Pi Epsilon—Alpha Sigma Chapter (National honorary graduate fraternity in business education)
 Delta Tau Kappa—Alpha Sigma (International social science honor society)
 Eta Kappa Nu—Epsilon Beta Chapter (National electrical honor society)
 Kappa Delta Pi—Beta Phi Chapter (National honor society in education)
 Mu Kappa Tau (Marketing)
 National Slavic Honor Society—Epsilon Epsilon Chapter
 Omicron Delta Epsilon Honor Society in Economics—
 Arizona Alpha Chapter
 Phi Kappa Phi—Arizona State University Chapter (National honorary scholastic society)
 Pi Mu Epsilon—Arizona Beta Chapter (Mathematics honorary)
 Pi Omega Pi—Alpha Iota Chapter (National business education honorary)
 Psi Chi National Honor Society in Psychology
 Sigma Iota Epsilon—Pi Chapter (Business management)
 Sigma Tau Delta (Honorary English fraternity)

HONORARY GROUPS*For Men*

- Alpha Zeta, Arizona Beta Chapter (Agricultural fraternity)
- Archons (Fraternity leadership and service)
- Blue Key Fraternity (National honorary service)
- Company D, Tenth Regiment, Pershing Rifles
(National professional honorary for ROTC cadets)
- Delta Phi Kappa Honorary Fraternity (L.D.S. returned missionaries)
- Kappa Kappa Psi National Band Honorary Fraternity
- Sigma Delta Psi (Honorary athletics)
- Silver Wing (Organization of the Air Force
Reserve Officers Training Corps)

For Women

- Angel Flight (Auxiliary to the Squadron of the Arnold Air Society)
- Arkesis (Fraternity leadership and service)
- Kaydettes (Sponsors for the Army Reserve Officers Training Corps)
- Manzanita Hostesses
- Naiads (Swim honorary)
- Natani (Junior women's honorary)
- Spurs (Honorary service organization)
- Stardusters (of Kappa Sigma Fraternity)
- Tau Beta Sigma (National band sorority)
- Women's "A" Club (Honorary association in sports)

For Both Men and Women

- Alpha Pi Mu (Industrial engineering honor society)
- Beta Alpha Psi—Beta Tau Chapter (Accounting honorary fraternity)
- Devils Advocates
- National Collegiate Players (Drama)
- Orchesis (Dance honorary)
- Phi Alpha Theta (National history honorary)
- Pi Kappa Delta (Forensic fraternity)
- Pi Sigma Alpha (National political science honorary)
- Sigma Gamma Epsilon—Beta Chi Chapter (Earth science)
- Sigma Lambda Chi—Eta Chapter (Building construction)

PROFESSIONAL AND ACADEMIC GROUPS*For Men*

- Alpha Delta Sigma (National advertising honorary fraternity)
- Arnold Air Society (National honorary Air Force
fraternity for advanced cadets)
- Delta Sigma Pi, Gamma Omega Chapter (Business professional fraternity)
- Phi Delta Kappa (Professional education fraternity)
- Phi Epsilon Kappa—Alpha Phi (Men's physical education fraternity)
- Phi Mu Alpha Sinfonia
- Physical Education Majors and Minors Club (PEMM)
- Pi Sigma Epsilon (National professional fraternity in marketing, sales
management, and selling)
- Sigma Delta Chi (National professional journalism fraternity)

For Women

Gamma Alpha Chi (National professional advertising fraternity for women)
 Phi Chi Theta—Gamma Gamma Chapter (Business education and training)
 Physical Education Majors and Minors Club (PEMM)
 Sigma Alpha Iota (Women's national music fraternity)

For Both Men and Women

Accounting Club
 Alpha Beta Alpha (Librarian brotherhood)
 American Chemical Society, Student Affiliates
 American Guild of Organists, Guild Student Group
 American Institute for Design and Drafting, Student Chapter No. 345
 American Institute of Aeronautics and Astronautics, Inc., Student Branch
 American Institute of Architects, Student Chapter
 American Institute of Chemical Engineers, Student Chapter
 American Institute of Industrial Engineers, Student Chapter
 American Society of Civil Engineers, Student Chapter
 American Society of Mechanical Engineers
 American Society of Tool and Manufacturing Engineers—Student Chapter
 Arizona Association of Student Nurses—District No. 5
 Associated General Contractors, Student Chapter
 Association of the United States Army
 Association for Childhood Education International
 Council for Exceptional Children
 Economics Club
 Gamma Theta Upsilon — Theta Chapter (National honorary professional geographic fraternity)
 Home Economics Club, University — Beta Chi Epsilon Chapter
 Industrial Arts Association
 Institute of Electrical and Electronic Engineers
 Pre-Law Club
 Prospective English Teachers of Arizona
 Society for the Advancement of Management
 Society of Automotive Engineers, Student Group
 Society of Physics Students
 Student Association of Social Workers
 Student Marketing Club
 Student National Education Association
 Undergraduate Social Service Organization
 Wildlife Society

SPECIAL INTEREST GROUPS*For Men*

Alpha Phi Omega — Eta Eta Chapter (National service fraternity)
 Army ROTC Band/Drum and Bugle Corps
 Army ROTC Drill Team
 Army ROTC Men's Chorus
 Army ROTC Rifle and Pistol Team
 Circle K Club (Service club)

Desert Rangers (Army ROTC Counterinsurgency Unit)
 Lacrosse Club
 Semper Fidelis Society, Beta Epsilon Chapter (United States
 Marine Corps)
 Soccer Club

For Women

Association for Women's Active Return to Education
 Crescents (Auxiliary to Lambda Chi Alpha)
 Daughters of Diana (Auxiliary of Tau Kappa Epsilon)
 Little Sisters of Minerva (Auxiliary of Sigma Alpha Epsilon)
 Maltesians (Auxiliary to Alpha Tau Omega)
 Memorial Union Hostesses
 Par Busters (Women's golf)
 Phrateres International (National off-campus women's group)
 Pom Pon Girls
 Racquet Club (Tennis)
 Wives-In-Law of Arizona State University
 Women's Recreation Association

For Both Men and Women

Arab Students Chapter
 Black Liberation Organizational Committee
 Chinese Club
 Civil Liberties Union
 Civil Rights Board
 Committee to End the War in Viet Nam
 Dawa-Chindi American Indian Club
 Deutscher Klub (German)
 Feather Dusters (Badminton)
 Fencing Club
 Foreign Student Club
 Forum (Discussion and debate)
 4-H Service Club
 French Club (L'Amicale des Gaulois)
 Horns 'N' Halos (Square Dance)
 International Relations Club
 Judo Club
 Karate Club
 La Liga Panamericana (Promotes friendly relations among those interested
 in things Spanish)
 Los Aficionados de America Latina (Latin American history and culture)
 Mexican-American Student Organization
 Oriental Students Club
 Outing Club (Promotes outdoor activity)
 Players Club
 Russian Club
 Students for a Democratic Society
 Sun Devil Archers
 Sun Devil Band
 Sun Devil Rodeo Association

Table Tennis Club
 Veterans Club
 Young Americans for Freedom
 Young Democrats
 Young Republicans
 Young Socialist Alliance

RELIGIOUS GROUPS

For Women

Lambda Delta Sigma — Phi Omega, Phi Psi and Phi Chi (L.D.S.)

For Both Men and Women

American Baptist Student Movement
 Arizona Bible Student Center (Church of Christ)
 Baha'i College Club
 Baptist Student Union
 Bresee Fellowship (Nazarene)
 Campus Crusade For Christ (Non-denominational)
 Canterbury Association (Episcopalian)
 Catholic Student Association
 Christian Science College Organization
 Church of God Collegiate Fellowship
 Conservative Baptist Youth
 Hillel Counsellorship of Arizona State University (Jewish)
 Inter-Varsity Christian Fellowship
 Liahona Fellowship (Reorganized Church of Jesus Christ of
 Latter-Day Saints)
 Lutheran Students Association
 Martin Luther Society
 Student Religious Liberals (Unitarian)
 Tempe Peace Council
 United Campus Christian Fellowship
 Wesley Foundation (Methodist)

RESIDENCE HALLS, SORORITIES AND FRATERNITIES

Residence Hall Council. The Residence Hall Council is composed of two or more elected representatives from each of the residence halls, one being the president of the hall.

Residence Halls. The following are the residence halls on the campus:

Dixie Gammage Hall	Quadrangle
Hayden Hall	Palo Verde
Irish Hall	Palo Verde East
Manzanita Hall	Palo Verde West
M. O. Best A, B, C Wings	Sahuaro A, B, C, D Wings
McClintock Hall	Wilson Hall

Panhellenic Council. The Panhellenic Council is composed of two elected representatives from each sorority.

Junior Panhellenic Council. The Junior Panhellenic is composed of two elected representatives from the pledge class of each sorority.

Sororities. The following national Greek letter sororities carry on the traditional objectives of each group:

Alpha Delta Pi	Gamma Phi Beta
Alpha Epsilon Phi	Kappa Alpha Theta
Alpha Phi	Kappa Delta
Chi Omega	Kappa Kappa Gamma
Delta Gamma	Pi Beta Phi
Delta Delta Delta	Sigma Sigma Sigma

Interfraternity Council. The IFC is composed of two elected representatives from each member fraternity, one being the president of the chapter.

Fraternity Chapters. The following national fraternities are represented on the campus and carry out their traditional objectives:

Alpha Epsilon Pi	Phi Kappa Psi
Alpha Gamma Rho	Phi Sigma Kappa
Alpha Rho Chi	Pi Kappa Alpha
Alpha Tau Omega	Sigma Alpha Epsilon
Delta Chi	Sigma Chi
Delta Sigma Phi	Sigma Nu
Kappa Alpha Psi	Sigma Phi Epsilon
Kappa Sigma	Tau Kappa Epsilon
Lambda Chi Alpha	Theta Chi
Phi Delta Theta	Theta Delta Chi
Phi Gamma Delta	Zeta Beta Tau

GROUP ACTIVITIES

Musical Activities. Opportunities are offered to all university students to become members of the performing organizations maintained by the Music Department. College credit is given for regular work in the Symphony Orchestra, Bands, University Chorus, Concert Choir, Opera Workshop, Men's Glee Club, Women's Chorus, and in special instrumental and vocal ensembles. Participation in any of the above groups without credit is also possible. Students in these organizations give local concerts, radio and TV performances, and regional and national tours.

Intercollegiate Athletics—Men. The University is a member of the Western Athletic Conference and the National Collegiate Athletic Association. Under the regulations of the Arizona Board of Regents, the Conference and the NCAA, intercollegiate athletics at Arizona State University is governed by the joint faculty-student Athletic Board, and policies are administered under the President of the University by the Director of Athletics. All athletic grants and scholarships are administered by the University Faculty Committee on Scholarships and Student Aid. Conference participation includes such sports as football, basketball, track and field, tennis, golf, wrestling, swimming and gymnastics.

Intercollegiate Athletics—Women. Intercollegiate athletics for women is sponsored by the Women's Athletic Association with membership on teams

open to all college women. Competition includes sports days with other colleges in the state. Telegraphic, sectional and national meets and tournaments in tennis, golf, badminton, and archery are conducted. Competition is in only those sports activities offered in regular instructional class periods.

Intramurals—Men. The University has a well-rounded intramural sports program designed to serve the needs of all men students. The sports are geared to individual and team competition. Included are: tennis, volleyball, horseshoes, basketball, track and field, cross-country, tag football, golf, bowling, wrestling, and recreational sports.

Intramurals—Women. The program of intramurals for women is sponsored by the Women's Athletic Association, a member of the National ARFCW, and includes both the restricted student and the physically normal student. The program for both groups includes only those sport and dance activities offered in instructional class periods. Activities are open to all women in the University and are broad enough in scope to meet the interest of all women students.

Recreational Facilities. In addition to the recreational facilities provided by the residence halls and the Memorial Union, there is a heated swimming pool, two gymnasiums, tennis courts, a number of playing fields, and athletic and recreational equipment for student use.

Forensics. Arizona State University sponsors a debate squad which is associated with Pi Kappa Delta national forensic honorary. Each year the squad travels to a minimum of ten trophy tournaments sponsored by major universities throughout the United States. Participants engage in national competition in extemporaneous speaking, impromptu speaking, oral interpretation and oratory, as well as debate. Students may enroll for credit under SE 214 or participate in the forensics programming as an extra-curricular activity.

Drama. All plays are produced by the University Players under the supervision of the Speech and Drama Department. In their modern theater in the Lyceum Building and in the Gammage Auditorium, the Players present nine major productions during the regular school year, plus many student-directed plays. All students are invited to participate in these activities. Outstanding upperclassmen are honored by membership in National Collegiate Players, the national honorary dramatic fraternity.

Radio and Television. The Bureau of Broadcasting provides students enrolled in Mass Communications classes with a working laboratory completely equipped with the finest professional radio facilities.

Students majoring in radio-television, and others interested in participating on an extra-curricular basis, assist in the operation of KAET, the University's educational television station.

STUDENT PUBLICATIONS

The State Press. Under the Board of Student Publications and in cooperation with the Department of Mass Communications and the Associated Students, there is published throughout the year a university-owned, student operated newspaper, the *State Press*. It is distributed to students on campus,

student subscriptions being included in the activity fee. Staff work on the *State Press* serves as professional training for students enrolled in journalism courses.

Sahuaro. The University yearbook, *Sahuaro*, is student-edited and published. Art and photography students, future teachers planning to supervise high school publications, and others interested in a major student activity find *Sahuaro* work especially rewarding.

Memorial Union

The Memorial Union is a gathering place for the University family. It is a "place apart" for students and faculty to seek friendships, new appreciations of the fine arts, and happy hours of relaxation. Facilities of the Union include comfortable lounges on each floor. The first floor lounge is a social lounge, with a piano for everyone's use, and magazines and newspapers. A fine arts lounge is located on the second floor for art exhibits, gallery talks, and casual lounging. The Games Room in the lower level provides bowling lanes, billiards and ping-pong tables. A variety of meeting and dining facilities are available. Group reservations for banquets or meetings are made through the Memorial Union Reservation Office.

The University Bookstore is located in the Memorial Union which is also headquarters for Associated Students and the *Sahuaro*. Services of the Union include a general campus information desk, lost and found department, computer file and a free courtesy phone.

Memorial Union Student Program plans many activities throughout the year including "Pop-Ups" which occur "somewhere in the Union," Friday Film Festivals, traditional seasonal parties, art exhibits and seminars. Freshman women serve as Memorial Union Hostesses for all events held in the building.

College of Liberal Arts

George A. Peek, Jr., Ph.D.

Dean



Social Science Building classrooms

PURPOSE

The purpose of the College of Liberal Arts is to provide the student an opportunity to obtain a well-rounded, broad, liberal education. In order to comprehend and participate actively in a highly complex, dynamic industrial society, a person needs to know something of how this society came to be as it is. He must have some appreciation of modern science, of the roots of our Western civilization, of the nature of our present world, of the expression of this world in literature, philosophy and the arts. The Liberal Arts College attempts to give the student some understanding of this world in all its complexity and variety. This kind of broad training is not vocational in the narrow sense of the word; it is vocational in the sense that the student is enabled more effectively to lead a full and satisfying life in our present age. As a consequence the College does not, for the most part, offer professional and vocational training designed to prepare a student to take on a particular job; it offers, more significantly, a broad education designed to help the student in the career of living.

Within the framework of the curriculum, each student, with the assistance of a faculty adviser, determines his own program to fit his particular aims. In this context vocational interests are taken into consid-

eration and students may prepare for professional schools, graduate work or particular careers.

ORGANIZATION

The College of Liberal Arts is organized into the following departments of instruction:

Aerospace Studies	Home Economics
Anthropology	Mass Communications
Botany	Mathematics
Chemistry	Military Science
English	Philosophy
Foreign Languages	Physics
Geography	Political Science
Geology	Psychology
Health, Physical Education and Recreation	Sociology
History	Zoology

Degrees

BACHELOR OF ARTS DEGREE

The curriculum for the degree of Bachelor of Arts is designed to give the student a broad, general background in the principal fields of human knowledge and a reasonable amount of specialized training in a selected area.

A major consists of approximately 45 semester hours of credit. Normally, not more than 30 semester hours will be taken in the subject field of the major, and approximately 15 semester hours in one or more related fields. The exact content of the major is selected by the student in consultation with the adviser under the rules and regulations of the department concerned. No credit will be granted toward fulfilling major requirements in any upper division course in the student's major unless the grade in that course is at least a "C".

Knowledge in *one* foreign language is required equivalent to the level obtained through 16 hours of instruction in the elementary and intermediate courses on the college level. A student who desires to fulfill the requirement in whole or in part through foreign language study in secondary schools, or in other non-collegiate institutions, must take a proficiency examination given by the Department of Foreign Languages to determine the level of placement. Students who transfer from other colleges with less than two years of credit in a foreign language will be placed in a course at the next level above the work completed.

BACHELOR OF SCIENCE DEGREE

The curriculum for the degree of Bachelor of Science is designed to give the student a broad, general background in the principal fields of human knowledge and an opportunity to specialize in one specific selected area of scientific endeavor.

The requirements for the major are determined by the department concerned. The exact content of the major is selected by the student in consultation with the adviser. No credit will be granted toward fulfilling

major requirements in any upper division course in the student's major unless the grade in that course is at least a "C".

Degree Requirements

A. All candidates for graduation in the Bachelor of Arts and Bachelor of Science degree curriculums are required to present at least 126 semester hours of credit of which at least 50 hours must consist of upper division courses.

B. In order to be classified in good standing in the College of Liberal Arts, a student who has earned 29 semester hours or less must have at least a 1.60 cumulative grade point index, a student who has earned 30 semester hours but less than 60 semester hours must have at least a 1.75 cumulative grade point index, and a student must have achieved a 2.00 cumulative grade point index no later than the semester in which he has earned a total of 60 semester hours. A cumulative grade point index of 2.00 is required for graduation.

C. All students must demonstrate reasonable proficiency in written English. If a student receives a grade of "C" or better in both EN 101 and EN 102, or in EN 104 or its equivalent, or if he exempts EN 102, he will be presumed to have demonstrated the necessary degree of writing proficiency. Otherwise, he must successfully complete a written English Proficiency Examination. The examination will be given at least twice a year, and a student must take it during the semester immediately following the completion of EN 102 or EN 104 or its equivalent. A student who does not complete the examination successfully on the first try must enroll in an English course prescribed by the Director of Freshman English. A student who receives a grade of "C" or better in such a course will be considered to have satisfied the proficiency requirement. Otherwise, he must repeat the above procedure until he has demonstrated the necessary degree of writing proficiency. Any questions concerning the English Proficiency Requirement should be addressed to the Director of Freshman English.

GENERAL STUDIES PROGRAM

To meet the General Studies requirement in Liberal Arts, all students must take a minimum of 54 semester hours of credit from the departments listed below, EXCLUDING courses in the subject field of the major but INCLUDING courses in related fields normally considered as part of the major. All students who complete this requirement will automatically satisfy the University General Studies requirement.

To assure breadth and encourage depth within the 54-hour requirement all Liberal Arts students must meet the following *minimum* distribution pattern:

<i>Humanities and Fine Arts</i>	<i>Social and Behavioral Sciences</i>	<i>Sciences and Mathematics</i>
12 hours	12 hours	12 hours

Humanities and Fine Arts. Courses in the following departments fulfill the minimum 12 hour requirement:

- Architecture (AP courses *only*)
- Art History (AH courses *only*)

English (all courses *except* EN 101, 102, 104)
 Foreign Languages (all courses *except* 101, 102, 201, 202 sections)
 Humanities
 Music (MU courses *only*)
 Philosophy

Social and Behavioral Sciences. Courses in the following departments fulfill the minimum 12 hour requirement:

Anthropology
 Economics
 Geography—Cultural (GC courses *only*)
 History
 Political Science
 Psychology (PX courses *only*)
 Sociology

Sciences and Mathematics. Courses in the following departments fulfill the minimum 12 hour requirement. At least one course *must* include a laboratory section and at least two courses *must* be taken in the same department:

Botany (all BI, BO, and MI courses)
 Chemistry
 Geography—Physical (GP courses *only*)
 Geology
 Mathematics (all courses *except* MA 116)
 Physics (PH and PA courses *only*)
 Psychology (PY courses *only*)
 Zoology (all BI, ET, and ZO courses)

To complete the 54-hour requirement, additional courses may be taken from the above departments as limited by the exceptions indicated, and from the following:

Art
 Health, Physical Education and Recreation (HE 100, 481; PE 160, 161, 280, 380, 385, 386; RE 260, 372 *only*)
 Home economics (CD 232; MF 231, 254, 331, 354, 435; FN 141; DA 171, 474 *only*)
 Mass Communications
 Music
 Speech and Drama

MAJORS OFFERED IN THE COLLEGE OF LIBERAL ARTS

For specific major requirements, see statements under each department in the catalog section "Courses of Instruction."

MAJORS WITH DEGREES OFFERED:	DEPARTMENT:
Anthropology (B.A., B.S.)	<i>Anthropology</i>
Biology (B.S.)	<i>Botany; Zoology</i>
Botany (B.S.)	<i>Botany</i>
Boys' Club Administration (B.S.)	<i>Health, Physical Education and Recreation</i>
Chemistry (B.A., B.S.)	<i>Chemistry</i>

Chinese (B.A.)	<i>Foreign Languages</i>
Economics (B.A., B.S.)	<i>Economics</i>
English (B.A.)	<i>English</i>
Entomology (B.S.)	<i>Zoology</i>
French (B.A.)	<i>Foreign Languages</i>
Geography (B.A., B.S.)	<i>Geography</i>
Geology (B.A., B.S.)	<i>Geology</i>
German (B.A.)	<i>Foreign Languages</i>
Health Education (B.S.)	<i>Health, Physical Education and Recreation</i>
History (B.A.)	<i>History</i>
Home Economics (B.A., B.S.)	<i>Home Economics</i>
Journalism (B.A., B.S.)	<i>Mass Communications</i>
Mathematics (B.A., B.S.)	<i>Mathematics</i>
Medical Technology (B.S.)	<i>Botany</i>
Microbiology (B.S.)	<i>Botany</i>
Philosophy (B.A.)	<i>Philosophy</i>
Physical Education (B.S.)	<i>Health, Physical Education and Recreation</i>
Physics (B.S.)	<i>Physics</i>
Political Science (B.A., B.S.)	<i>Political Science</i>
Psychology (B.A., B.S.)	<i>Psychology</i>
Radio-Television (B.A., B.S.)	<i>Mass Communications</i>
Recreation (B.S.)	<i>Health, Physical Education and Recreation</i>
Russian (B.A.)	<i>Foreign Languages</i>
Sociology (B.A., B.S.)	<i>Sociology</i>
Spanish (B.A.)	<i>Foreign Languages</i>
Wildlife Biology (B.S.)	<i>Zoology</i>
X-Ray Technology (B.S.)	<i>Botany</i>
Zoology (B.S.)	<i>Zoology</i>

Graduate Degrees

MASTER'S DEGREES

A graduate program consisting of a minimum of 30 semester hours of approved work in a special field of study leads to the degrees of Master of Arts, Master of Science, Master of Natural Sciences, and Master of Public Administration. For specific reference to these degrees, see Graduate College section of this catalog.

DOCTOR OF PHILOSOPHY DEGREE

A graduate program consisting of three academic years of work beyond the bachelor's degree as prescribed by the Graduate Council leads to the Doctor of Philosophy degree. For specific reference to this degree, see Graduate College section of this catalog.

Special Programs

HONORS PROGRAM

The Honors Program in the College of Liberal Arts is intended for the outstandingly competent student whose interests and specific curriculum indicate that definite advantages may accrue from a program emphasizing individual study. For a general description of Honors work, see page 92 of this catalog.

Honors majors are offered in the Departments of: Botany, Chemistry, Economics, English, Foreign Languages, Geography, Geology, History, Mass Communications (Journalism), Mathematics, Philosophy, Physics, Political Science, Psychology, Sociology, and Zoology. Other Honors majors may be offered with the approval of the Honors Council.

PASS-FAIL COURSES

The Liberal Arts Pass-Fail program is intended to broaden the education of students in the College of Liberal Arts by encouraging them to take advanced courses outside their fields of specialization. When a student is enrolled in a course for Pass-Fail, he will receive either the mark of "P" or the grade of "E". The mark of "P" results in credit for the course, but does not affect the cumulative grade point index. A grade of "E" will be averaged into the index as usual.

Under the conditions stated below, students enrolled in the College of Liberal Arts may take for Pass-Fail any courses in the 300 and 400 series offered by the College of Liberal Arts with the exception of Independent Study 499.

1. Enrollment in a course for Pass-Fail must be explicitly indicated during registration. After the close of Late Registration, no student may change registration in any course to or from Pass-Fail.

2. No course may be taken for Pass-Fail which is offered by the student's major department, or counted towards the major, or is required by the department to support or supplement the major. Up to four courses of Pass-Fail may be counted toward graduation requirements other than the major.

3. Pass-Fail courses may be taken only by students with a total of at least 60 semester hours of earned credit and a cumulative grade point index of at least 2.00.

4. One Pass-Fail course may be taken during a semester. The minimum semester load, including the Pass-Fail course, must total at least 12 hours. No overloads can be authorized for the semester in which the Pass-Fail course is taken.

5. Pass-Fail courses may not be taken during the summer sessions, in extension, or by correspondence.

UNDERGRADUATE CREDIT FOR GRADUATE COURSES

To enable interested students to benefit as much as possible from their undergraduate studies, the Graduate College and the College of Liberal Arts extend to undergraduate students, with a grade point index of at

least 2.00, the privilege of taking 500 level graduate courses for undergraduate credit with the approval of the instructor. Application for admission to a graduate course for undergraduate credit must be completed in advance of the regular registration period. The application must be approved by the adviser, the instructor of the 500 level graduate course, and by the chairman of the department which offers the course.

INTERDISCIPLINARY STUDIES

Within the framework of a regular major chosen from those listed on pages 118, 119, a student may, in consultation with his adviser, use courses outside his major subject field to put together a program of interdisciplinary studies. Recommended programs in Latin American Area Studies, Asian Studies, and American Studies are described below. For further information, consult the Director of the Center for Asian Studies or the Director of the Center for Latin American Studies. Students interested in American Studies may consult the Chairman of the History Department.

American Studies. The American experiment has inspired men and women for over three centuries. Founded on faith in the dignity of the individual, in the free and open society, the United States has produced a national culture unique in history.

A wider knowledge and keener appreciation of American history, literature, government, economics and culture generally, must be a vital part of every American's heritage. Furthermore, its constant re-evaluation, re-examination and development constitute an unique, interdisciplinary task, for which universities are especially suited. It is the purpose of the Center for American Studies at Arizona State University to undertake some of these tasks through regularly scheduled courses, and through lectures, seminars, and discussions open to students and the public.

A student majoring in History, English, or Political Science can shape a program of American Studies, with the assistance of his adviser, by choosing appropriate courses from the major and other fields and supplementing them with electives from the departments of Art, Architecture, Geography, Philosophy, Sociology, or Anthropology.

Another possible emphasis in this special program in American Studies can be centered on the Afro-American courses, or related courses, offered by the departments of English, History, Sociology, Political Science, Art and others.

Asian Studies. In response to the growing importance of Asia in world affairs, the Center for Asian Studies has been established to encourage and coordinate student, faculty, and public study of the area through the support of public lectures, research, and curricular development. An interdisciplinary undergraduate program has been designed to prepare undergraduates for governmental or private employment or for admission to graduate programs at other institutions.

In this program a separate major in Asian Studies is not offered. Instead, the student must fulfill the requirements of a major in one of the participating departments (Anthropology, Art, Foreign Languages, Geography, History, Philosophy, Political Science), as well as the other

degree requirements of the College of Liberal Arts or College of Fine Arts. The Asian Studies requirements of this program consist of a minimum of two years of Chinese or Japanese and 30 semester hours of strictly Asian courses. In consultation with the Asian Studies adviser in his major, the student can design a program of studies which will be largely integrated into general requirements by carefully drawing upon Asian courses in the major, those acceptable as related field courses in the major, and those suitable for fulfillment of the General Studies requirements in the humanities and social sciences. Fulfillment of these requirements will qualify able students for admission to graduate programs and will be recognized at graduation. For further information, consult the Director of the Center for Asian Studies.

Latin American Area Studies. Arizona and Latin America have been entwined by history and geography. With a large Spanish-speaking population and a location near the Mexican border, the Phoenix-Tempe area has a genuine continuing interest in Latin America. At Arizona State University, the Center for Latin American Studies guides the students whose degree programs include an emphasis in Latin American course work and research.

The area studies program gives students an understanding of public affairs, culture, and national trends in the Latin American nations. The course of study stresses a knowledge of politics, history, Spanish, geography, economics, and related topics.

The student should major in political science, history, Spanish, geography, or economics, completing 30 semester hours in one of these disciplines. A student in Latin American studies must also complete 15 hours of Latin American content courses in related fields other than his major field, with his total of Latin American courses being 30 semester hours when major and related fields are counted. A reading knowledge of Spanish is required and a reading knowledge of Portuguese is recommended.

The Center for Latin American Studies issues research reports on the current public affairs of Latin America and publishes the journal *Latin American Digest*, with a readership encompassing scholars in major universities and many libraries in the United States and foreign countries.

The Center serves as a university liaison with various organizations throughout the state and nation involved with Latin America, such as the Mexican-American Chamber of Commerce, Friends of Mexican Art, Hispanic Society of America, Inter-American Press Association, and Arizona-Sonora Trade Commission. The Center is a member of the Latin American Studies Association, the Rocky Mountain Council on Latin American Studies, the Pacific Coast Council on Latin American Studies, and the Southwestern Council on Latin American Studies.

PROFESSIONAL PROGRAMS

Secondary Education. A student majoring in the College of Liberal Arts may obtain a Bachelor of Arts or Bachelor of Science degree in Liberal Arts and meet the requirements for a secondary education certificate. The student must meet all requirements established by the College of Education,

including professional education courses and directed teaching, and all the College and departmental requirements for the major degree program in the College of Liberal Arts. For information regarding the requirements of the College of Education, the student should consult the Department of Secondary Education.

Medical Technology and X-Ray Technology. These two programs are offered as majors for the degrees of Bachelor of Arts or Bachelor of Science in the Department of Botany. Information regarding these major degree programs may be obtained from the medical technology and X-ray technology advisers in the Department of Botany.

Reserve Officers Training Program. The Departments of Aerospace Studies and Military Science offer professional training through which students may become commissioned officers in the armed services. The training programs are described in the catalog on pages 86-91. These programs are available to properly qualified students in all colleges at the University, and are taken along with the regular academic degree program in which the student may be enrolled.

PRE-PROFESSIONAL PROGRAMS

The College of Liberal Arts offers, through the regular major degree programs listed on pages 118-119, preparation for graduate professional study and for future in-service training. The locations of faculty advisers who can provide information regarding the listed professional fields are indicated below.

PROFESSIONAL FIELD:	OFFICE WHERE ADVISER IS LOCATED:
Bilingual Secretarial Program	<i>Department of Foreign Languages</i>
Dentistry*	<i>Pre-Medical Office</i>
Foreign Service	<i>Department of Political Science</i>
Law	<i>Department of Political Science</i>
Medicine*	<i>Pre-Medical Office</i>
Ministry	<i>Department of Philosophy</i>
Occupational Therapy	<i>Department of Health, Physical Education and Recreation</i>
Optometry	<i>Department of Physics</i>
Osteopathy*	<i>Pre-Medical Office</i>
Pharmacy	<i>Department of Chemistry</i>
Physical Therapy	<i>Department of Health, Physical Education and Recreation</i>
Public Safety	<i>Institute of Public Administration and Department of Sociology</i>
Public Service Training Program	<i>Institute of Public Administration</i>
Social Welfare	<i>Department of Sociology</i>

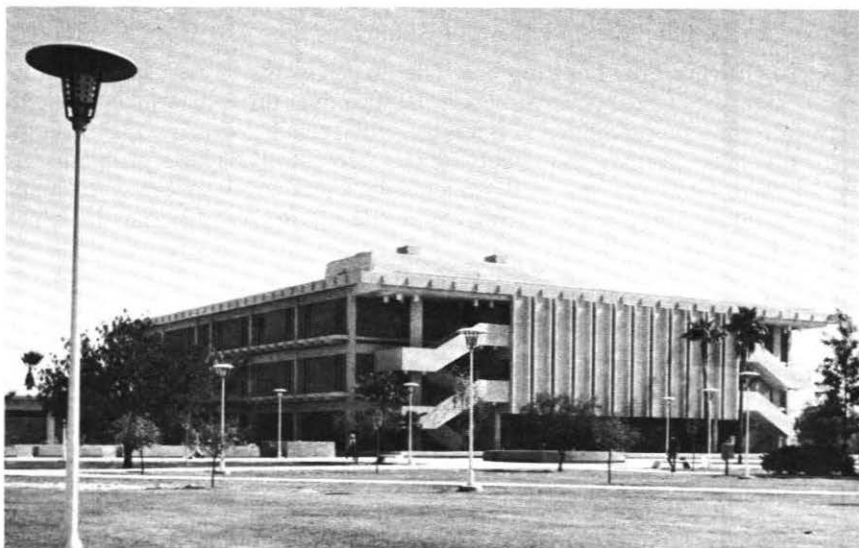
*In addition to choosing an appropriate major, students preparing for medicine, dentistry, or osteopathy should register with the Pre-Medical Office located in the Office of the Dean, College of Liberal Arts.

In addition to consulting advisers, students preparing for admission to professional schools should obtain information regarding admission requirements by writing directly to the schools in which they may be interested.

College of Business Administration

Glenn D. Overman, D.B.A.

Dean



Business Administration Building

PURPOSE

The primary purpose of the College of Business Administration is to prepare students for positions of responsibility in the business community. The undergraduate and graduate degree curricula are designed to provide (1) a basic background of general education helpful to informed, thinking citizens in a democracy, (2) a mastery of basic business tools and skills and an understanding of business procedures, and (3) a specialized and professional knowledge of a selected field of business. To attain these objectives in the undergraduate program, the curriculum has been devised so that the student completes 45 per cent of his work in general education and other non-business courses and 45 per cent in courses offered by the College of Business Administration, with the remaining 10 percent selected from either area by the student in consultation with his adviser.

The College is a member of the American Association of Collegiate Schools of Business, the official accrediting organization in the field of business administration. Both the undergraduate and graduate programs of the College of Business Administration are accredited by this association.

In addition to the regular degree curricula, other programs of study in the College are designed to meet special needs. Preparation for the

teaching of business subjects in the secondary schools is offered in cooperation with the College of Education. Evening and extension courses are conducted for qualified persons who are regularly employed and who otherwise would be unable to enroll in college courses. Short courses and institutes of a non-credit basis are organized in cooperation with various business groups for the furtherance of in-service training of employed personnel.

ORGANIZATION

The courses of instruction offered by the College of Business Administration are organized into groups in order that a related sequence may be established for the various subject fields.

For administrative purposes these fields are organized into the following departments: Accounting, Economics, General Business Administration, Management, Marketing, Office Administration and Business Education, Quantitative Systems.

The Bureau of Business and Economic Research is organized to help business meet the challenges of an increasingly complex economic and technical environment. In cooperation with faculty and students, government agencies, and the business community, it conducts and sponsors research projects. By functioning as the focus of the research and dissemination process in the College of Business Administration, the Bureau provides support for faculty research, opportunities for publication by faculty and advanced graduate students, and information for use by the business community.

The Center for Executive Development serves the needs of the community with continuing education programs designed for businessmen and open to government officials and the general public.

Degrees

BACHELOR'S DEGREES

The College of Business Administration awards the Bachelor of Science degree upon successful completion of a four-year curriculum of 126 semester hours as prescribed on the following pages. Students may select one of the following 11 fields of specialization:

Accounting	Management
Advertising	Marketing
Economics	Office Administration
Finance	Real Estate
General Business Administration	Quantitative Systems
Insurance	

Students who wish to qualify to teach business subjects at the secondary and post-secondary levels should major in business education. Under this program, the student enrolls in the College of Education but specializes in business courses for his major teaching field. This curriculum leads to the Bachelor of Arts in Education degree and certification for teaching business subjects in the Arizona secondary schools. The courses required in business for this curriculum are listed under the secondary curriculum section of the College of Education.

MASTER'S DEGREES

The Master of Business Administration degree and Master of Science degree in the fields of accounting and economics are awarded upon successful completion of programs detailed in the *Graduate Catalog*.

Master of Business Administration Degree: Designed to meet the needs of students who seek a broad, integrated program in the various functional fields of business. The program of study emphasizes the managerial responsibility of policy formulation, problem solving and decision making. Students with undergraduate backgrounds in general education or engineering as well as those with bachelor's degrees in business administration will find the program well suited to their needs. Students without prior courses in business administration must complete approximately two years of study while those with an undergraduate degree in business administration may complete requirements in one calendar year.

Master of Science in Accounting Degree: Provides a specialized program emphasizing preparation for public accounting and college and university teaching, with sufficient flexibility to include courses in managerial accounting, tax accounting, and governmental accounting as well as in allied fields.

Master of Science in Economics Degree: A specialized program for students who desire to teach in colleges and universities, to prepare for research positions, or to take additional graduate work in economics. The Master's program in economics requires graduate work in macro-economic analysis, micro-economic analysis, and quantitative methods. A thesis is also required.

DOCTOR OF BUSINESS ADMINISTRATION DEGREE

The Doctor of Business Administration degree is awarded upon successful completion of the program as described in the *Graduate Catalog*. Primary objectives of this degree program are to prepare persons for teaching and research in institutions of higher learning, and to develop proficiency for effective service in a leadership capacity in either private business or government. The degree is granted upon the completion of high academic attainment in graduate study, an original research project presented in a dissertation, and comprehensive oral and written examinations.

BACHELOR OF SCIENCE IN BUSINESS ADMINISTRATION

Students seeking a Bachelor of Science degree in the College of Business Administration must satisfactorily complete a curriculum of 126 semester hours as indicated below.

General Studies requirements and other general courses	57 sem. hrs.
Business Administration core curriculum	33 sem. hrs.
Field of Specialization	24 sem. hrs.
Electives	12 sem. hrs.
Total	126 sem. hrs.

GENERAL STUDIES REQUIREMENTS

All students in the College of Business Administration are required to complete a total of 57 semester hours in general studies courses, with the

designated minimum semester hours in each of the following fields. (Courses of a specialized, vocational, technical or professional nature may not be included.)

Humanities and Fine Arts8 sem. hrs.
 Architecture, Art, Dance, Drama, English, Foreign Languages, Interdisciplinary Humanities, Music, Philosophy.

Behavioral and Social Sciences12 sem. hrs.
 Agriculture, Anthropology, Cultural Geography, Economics, Education (Educational Foundations), Engineering, Health Education, History, Home Economics, Mass Communications, Political Science, Psychology (PX courses *only*), Sociology.

All students in the College of Business Administration must complete EC 201 and 202 Principles of Economics, as part of the 12 semester hour minimum.

Sciences and Mathematics8 sem. hrs.
 Botany, Chemistry, Engineering, Geology, Mathematics, Physical Geography, Physics, Psychology (PY courses *only*), Zoology.

All students in the College of Business Administration must complete MA 141 Mathematical Analysis, or higher level approved course in mathematics, as part of the eight semester hour minimum.

Other General Courses29 sem. hrs.
 Additional General Studies courses or similar courses which provide breadth and cultural background must be selected in consultation with the student's adviser. All students must complete EN 101, 102 First-year English, and a course in Speech, unless waived, as a part of these 29 semester hours.

Military Science or Aerospace Studies at the freshman and sophomore levels may be included.

Total General Studies and other General Courses57 sem. hrs.

BUSINESS ADMINISTRATION CORE REQUIREMENTS

In order to obtain an understanding of fundamentals of business operation and to develop a broad business background, every student seeking a Bachelor of Science degree in the College of Business Administration must complete the following courses:

GB 101 Elements of Business Enterprise	3
AC 101 Elementary Accounting	3
AC 102 Elementary Accounting	3
QS 161 Quantitative Analysis and Statistics	3
QS 221 Quantitative Analysis and Statistics	3
GB 223 Business Communications	3
MK 300 Principles of Marketing	3
MG 301 Principles of Management	3
GB 305 Business Law	3
FI 300 Fundamentals of Finance	3
MG 463 Business Policies	3
Total	33 sem. hrs.

Field of Specialization Requirements

A field of specialization consists of a pattern of 24 semester hours in related courses falling primarily within a given subject field. Fields of specialization are available in accounting, advertising, economics, finance, general business administration, insurance, management, marketing, office administration, quantitative systems, and real estate.

Accounting. Accounting is a fast-growing field. This field of specialization includes the essential academic training for: (1) those wishing to prepare themselves for professional careers in public accounting; (2) those seeking positions as controllers, heads of accounting divisions, cost accountants, or internal auditors; (3) those wishing to serve in any of the numerous accounting positions offered in federal, state, and local governments; and (4) those planning to operate their own businesses.

A field of specialization in accounting shall consist of a minimum of 24 semester hours. The following 21 hours must be included:

AC 201 Intermediate Accounting	3
AC 202 Intermediate Accounting	3
AC 331 Cost Accounting	3
AC 383 Advanced Accounting	3
AC 451 Income Tax Accounting	3
AC 481 Auditing Theory and Practice	3
QS 302 Information Systems	3

To complete the field of specialization the student, with the approval of his adviser, shall select one additional 400-level accounting course.

Note: All accounting majors must complete MA 142 Mathematical Analysis II, or the equivalent, as a part of the program. All accounting majors must take the AICPA Level II Achievement Examination in the regular semester nearest preceding their completion of degree requirements.

Advertising. Use of the mass communications media for conveying ideas and information to customers, employees, stockholders, and the general public is an essential part of modern business operation. This field of specialization offers students an opportunity to prepare for careers in advertising, public relations, and related activities dealing with mass communications. Employment opportunities include positions with advertising agencies, retail stores, manufacturing firms, newspapers, and broadcasting stations.

A field of specialization in advertising shall consist of a minimum of 24 semester hours. The following 19 hours must be included:

AD 301 Advertising Principles	3
AD 311 Advertising Campaigns I	2
AD 312 Advertising Campaigns II	2
AD 371 Radio and Television Advertising	3
AD 461 Advertising Management	3
MK 310 Principles of Selling	3
MK 451 Marketing Intelligence	3

To complete the field of specialization the student, in consultation with his adviser, shall select five hours or more from the following group:

MC 110 Mass Communications	3
AD 453 Advertising Campaign Problems	2
MK 302 Marketing Environments	3
MK 321 Principles of Retailing	3
MK 401 Public Relations in Business	3
MK 411 Sales Management	3
MK 460 Marketing Decision Making	3

Economics. The study of economics affords an opportunity for the student to acquire a general knowledge of the operation of business and economic systems. This knowledge provides a sound basis for successful business ownership and control. Specialized courses are included to develop ability in the use of the tools of economic theory and analysis. Such tools are essential for graduates who wish to qualify for government or business positions requiring formal training in economics.

The field of specialization in economics shall consist of a minimum of 24 semester hours. The following six hours must be included:

EC 401 Intermediate Price Analysis	3
EC 402 Economics of Income and Employment	3

In addition the student shall select a minimum of 18 semester hours from the group below to complete the field of specialization:

EC 301 Money and Banking	3
EC 311 Economic Development	3
EC 321 Labor Economics	3
EC 331 Comparative Economic Systems	3
EC 336 International Economics	3
EC 341 Public Finance	3
EC 361 The Soviet Economy	3
EC 371 Latin American Economics	3
EC 408 Mathematical Economics	3
EC 412 Business Fluctuations and Forecasting	3
EC 421 State and Local Finance	3
EC 441 History of Economic Thought	3
EC 451 Economics of Public Utilities	3
EC 453 Government and Business	3
EC 461 Current Economic Problems	3
GB 341 Transportation	3
QS 422 Advanced Business and Economic Statistics	3

Note: All undergraduate majors in economics are required to complete MA 142 Mathematical Analysis II, or the equivalent.

Finance. Courses in finance provide students with an opportunity for increased understanding of the management problems of acquiring, allocating and managing funds within business firms, as well as introductions to the fields of investment management, financial institution management and the securities markets.

A field of specialization in Finance shall consist of a minimum of 24 semester hours of courses selected from the two groupings below. The following 12 hours shall be included:

EC 301 Money and Banking	3
FI 421 Investments	3
FI 431 Financial Markets	3
FI 461 Financial Management Cases	3

In addition, the student in consultation with his adviser shall select 12 hours or more from the group below:

AC 201 Intermediate Accounting	3
AC 202 Intermediate Accounting	3
AC 301 Management Uses of Accounting Data	3
AC 331 Cost Accounting	3
AC 415 Financial Statement Analysis	3
AC 432 Advanced Cost Accounting	3
AC 447 Accounting Information Systems	3
EC 336 International Economics	3
EC 341 Public Finance	3
EC 401 Intermediate Price Analysis	3
EC 402 Economics of Income and Employment	3
QS 322 Managerial Statistics	3
QS 422 Advanced Business and Economic Statistics	3
QS 302 Information Systems	3
QS 407 Systems Analysis	3
RE 331 Real Estate Finance	3
FI 305 Credit Management	3
FI 436 Financial Institution Management	3
FI 498 Pro-Seminar	3
MG 433 Managerial Decision Making	3
MG 459 International Management	3

General Business Administration. Offering the opportunity for a broad survey of all phases of business operation, this program is particularly suitable for (1) those students who are planning to operate their own businesses and who seek a broad business background, (2) those who are preparing for jobs in large organizations with training programs in which specialization is taught after employment, and (3) those who desire a general business background at the undergraduate level prior to taking more specialized graduate work.

A minimum of 24 semester hours in economics and business administration is required with a maximum of nine hours in one subject field. Four senior level courses must be included.

The 24 semester hours in economics and business administration may be selected from any 300 and 400 level courses, and, in addition, may include IN 251 Principles of Insurance, RE 251 Real Estate Principles, AC 201 and AC 202 Intermediate Accounting, with the limitation that no more than six hours of course work may be included at the 200 level.

General Business Administration students desiring to emphasize transportation should select nine hours from the following:

GB 341 Transportation	3
GB 345 Industrial Traffic Management	3
GB 460 Commercial Motor Transportation	3
GB 461 Air Transportation	3
GB 462 Problems in Transportation and Traffic	3
GB 463 International Transportation	3

To complete the field of specialization in General Business Administration with an emphasis on transportation, the student, in consultation with his adviser, should select 15 hours or more from the following:

EC 451 Economics of Public Utilities	3
EC 453 Government and Business	3
MG 355 Purchasing	3
MG 432 Materials Management	3
MK 302 Marketing Environments	3
MK 335 Foreign Trade	3
MK 434 Industrial Marketing	3

Insurance. Academic preparation for professional work in insurance sales, insurance adjustment, and insurance management is offered through this program. A field of specialization in insurance shall consist of a minimum of 24 semester hours. The following 12 hours must be included:

IN 251 Principles of Insurance	3
IN 321 Life Insurance	3
IN 331 Property Insurance Principles and Coverages	3
IN 451 Social Insurance	3

To complete the field of specialization, select 12 or more hours from the following:

IN 425 Current Problems in Insurance	3
IN 432 Property Insurance Administration	3
EC 301 Money and Banking	3
AC 451 Income Tax Accounting	3
FI 421 Investments	3
GB 306 Business Law	3
MK 310 Principles of Selling	3
MK 411 Sales Management	3
QS 302 Information Systems	3
QS 391 Operations Research	3
RE 251 Real Estate Principles	3

Management. The management function includes the planning, organizing, motivating, and controlling of business operations. It deals with both human elements and material or physical factors. Through selection of courses, as outlined below, the student may place his major emphasis upon personnel management, production management, or the broad aspects of management philosophy and practice. A field of specialization in management shall consist of a minimum of 24 semester hours. The following 18 hours must be included:

MG 311 Personnel Administration	3
MG 331 Production and Operations Management	3
MG 368 Management Systems	3
MG 433 Managerial Decision Making	3

MG 434 Management Responsibility in Society 3
 MG 451 Human Relations in Business 3

The remainder of the required courses shall be selected by the student in consultation with his adviser as follows:

Those students planning careers in industrial relations or personnel management shall select at least six semester hours from:

MG 413 Wage and Salary Management 3
 MG 423 Industrial Relations and Collective Bargaining 3
 EC 321 Labor Economics 3
 IN 451 Social Insurance 3

Those students planning careers in industrial and production management shall select at least six semester hours from:

MG 335 Methods Management 3
 MG 355 Purchasing 3
 MG 432 Materials Management 3
 QS 491 Operations Research 3
 AC 301 Management Uses of Accounting 3
 AC 331 Cost Accounting 3

Those students seeking preparation in the broad aspects of management philosophy and practice shall select at least six semester hours from:

MG 422 Employee Training and Supervision 3
 MG 423 Industrial Relations and Collective Bargaining 3
 MG 459 International Management 3
 QS 491 Operations Research 3
 AC 301 Management Uses of Accounting 3
 EC 453 Government and Business 3
 MK 401 Public Relations in Business 3

Marketing. Study in the field of marketing involves analysis of the ways business firms plan, organize, administer, and control their resources to achieve marketing objectives. Focus is placed on market forces, growth and survival of firms in competitive markets, and the marketing strategy and tactics of the firm. Through proper selection of courses, a student may place emphasis upon preparation for a career in (1) general marketing administration, (2) selling and sales management, (3) retail merchandising and management, (4) market research and planning, (5) industrial marketing, or (6) international marketing.

A field of specialization in marketing shall consist of a minimum of 24 semester hours in the four categories listed below. These 24 hours are in addition to the business core course, MK 300, Principles of Marketing (which course is oriented to marketing management, strategy, and decision-making within the firm).

Required Courses

MK 302 Marketing Environments 3
 MK 451 Marketing Intelligence 3
 MK 460 Marketing Decision-Making 3

Marketing Communications. One course must be included from the following: 3

MK 310 Principles of Selling, MK 401 Public Relations, MK 411 Sales Management, AD 301 Principles of Advertising.

Marketing Institutions and Functions. One course must be included from the following: 3

MK 321 Principles of Retailing, MK 424 Retailing Management, MK 335 Foreign Trade, MK 434 Industrial Marketing.

Courses to complete the field. Nine additional semester hours to complete the marketing major are to be selected in consultation with the student's adviser.

Office Administration. The course work in this field is designed to prepare students for either secretarial or office management positions. Through the selection of courses, as outlined below, the student may place his major emphasis upon either of these fields.

A field of specialization in office administration shall consist of a minimum of 24 semester hours. The following 15 hours must be included:

OA 201 Advanced Typewriting	3
OA 344 Administrative Services	3
OA 351 Principles of Office Management	3
OA 432 Records Management	3
QS 302 Information Systems	3

To complete the field of specialization the student, in consultation with his adviser, shall select the remainder of the 24-hour major requirement from the following courses:

For those planning careers in secretarial administration:

OA 214 Shorthand	3
OA 312 Transcription	3
OA 331 Secretarial Administration	3
AC 201 Intermediate Accounting	3
GB 431 Business Report Writing	3
MG 311 Personnel Administration	3
MK 401 Public Relations in Business	3
SE 411 Business and Professional Speech	3

For those planning careers in office management:

AC 201 Intermediate Accounting	3
AC 202 Intermediate Accounting	3
GB 431 Business Report Writing	3
MG 311 Personnel Administration	3
MG 422 Employee Training and Supervision	3
MG 451 Human Relations in Business	3

Real Estate. Courses in real estate are designed to acquaint students with the basic information, knowledge, and practices pertaining to real property and the real estate business. This field of specialization is the academic foundation for careers in various aspects of real estate work: sales, acquisition and development, taxation, management of property, title searching and legal work, appraisal, and finance.

A field of specialization in real estate shall consist of a minimum of 24 semester hours. The following 12 hours must be included:

RE 251 Real Estate Principles	3
RE 302 Real Estate Management	3

RE 331 Real Estate Finance	3
RE 411 Real Estate Law	3

To complete the field of specialization the student, in consultation with his adviser, shall select 12 hours or more from the following:

RE 401 Real Estate Appraisal	3
RE 441 Real Estate Land Development	3
RE 461 Real Estate Problems	3
AC 451 Income Tax Accounting	3
AD 301 Advertising Principles	3
FI 421 Investments	3
GB 306 Business Law	3
IN 251 Principles of Insurance	3
MK 310 Principles of Selling	3
QS 302 Information Systems	3
QS 391 Operations Research	3

Quantitative Systems. This field of specialization prepares the student to approach the management of any of the business functions of production, marketing, and finance from a statistical and quantitative viewpoint. Though specific professional opportunities exist in applied statistics, operations research, and the management of information (data processing) systems, the program is oriented toward the overall managerial application of the systems and quantitative approach to any area of business operations.

A field of specialization in quantitative systems shall consist of a minimum of 24 semester hours. The following 18 hours must be included.

QS 302 Information Systems	3
QS 322 Managerial Statistics	3
QS 391 Operations Research	3
QS 402 Programming Systems	3
QS 407 Systems Analysis	3
QS 422 Advanced Business and Economic Statistics	3

To complete the field of specialization, the student, with the approval of his adviser, shall select a minimum of six semester hours from the group of courses below. It is recommended that these six hours be completed in one of the sequenced pair of courses in the same area, as identified below, so that the student can gain facility in applying the quantitative systems approach in a specific functional area.

AC 301 Managerial Accounting
AC 331 Cost Accounting
EC 408 Mathematical Economics
EC 412 Business Fluctuation and Forecasting
FI 421 Investments
FI 461 Financial Management Cases
MG 331 Industrial Management
MG 432 Materials Management
MK 302 Marketing Environments
MK 451 Marketing Intelligence

Note: All Quantitative Systems majors must complete MA 142 Mathematical Analysis II, or the equivalent, as a part of the program.

ELECTIVE COURSES

Sufficient elective courses are to be selected by the student to complete the total of 126 semester hours required for graduation.

HONORS PROGRAM

Students with outstanding academic records may be admitted to the Honors Program by application to the Honors Council of the College of Business Administration. This program provides an opportunity for students with exceptional ability to select an academic program to meet their individual needs. Although the general curriculum requirements must be completed, considerable opportunity is given for independent study under the direction of an Honors Adviser. A thesis or an equivalent creative project is required for graduation.

For further details regarding the Honors Program see the University Honors Program description on page 92 or consult the Office of the Dean of the College of Business Administration.

GENERAL REGULATIONS

Each student enrolling in the College of Business Administration will be assigned an adviser upon the basis of the subject-matter field in which he is primarily interested. The student should follow the sequence of courses suggested in the four-year curriculum outline and the recommendations of his adviser in completing the prescribed background and tool courses in preparation for the subsequent professional program.

All students in the College of Business Administration must attain a minimum cumulative grade point index of 1.60 at the end of the freshman year.

THE PROFESSIONAL PROGRAM

The third and fourth years constitute the professional program of the undergraduate curriculum. For admission to the professional program, the student must have completed:

- (1) At least 60 semester hours with a minimum cumulative grade point index of 2.00;
- (2) All Business Administration core curriculum courses numbered below 300 and EC 201, 202, Principles of Economics, with a minimum cumulative grade point index of 2.00;
- (3) At least 32 semester hours in general studies and other cultural background courses.

Failure to meet the requirements for admission to the professional program may result in the student's becoming ineligible to enroll for 300 and 400 level courses in the College of Business Administration.

To be accepted for credit as part of the professional program in Business Administration, all courses transferred from other institutions must carry prerequisites similar to those of the courses which they are replacing at Arizona State University.

GRADUATION REQUIREMENTS

In addition to completion of the pattern of courses outlined on page 127, to be eligible for the Bachelor of Science degree in the College of Business Administration, a student must fulfill the following requirements:

- (1) Have completed at least 30 semester hours, including 24 in professional business courses (numbered 300 or above), after admission to the professional program.
- (2) Have attained a cumulative grade point index of 2.00 or better:
 - (a) for all courses taken while a student at the University;
 - (b) for all courses included in the Business Administration core curriculum;
 - (c) for all courses comprising his field of specialization.
- (3) Have accumulated a minimum of 51 semester hours in courses designed primarily for junior or senior students and completed in an accredited, four-year degree-granting institution.

Any exceptions to the core curriculum and field of specialization requirements of the College of Business Administration must be approved by the Standards Committee.

SUGGESTED FOUR YEAR CURRICULUM OUTLINE**FIRST YEAR**

	Sem. Hrs.
GB 101	3
QS 161	3
EN 101, 102	6
MA 141 (or other approved mathematics course)	4
Humanities, Fine Arts	3
Behavioral and Social Sciences	6
Science or additional Mathematics	3-5
Electives	3-5
	31-35

SECOND YEAR

	Sem. Hrs.
AC 101,102	6
EC 201, 202	6
QS 221	3
GB 233	3
SE 100 or 300	3
Science and Mathematics	3
General Studies	8
	32

THIRD YEAR

MK 300	3
MG 301	3
GB 305	3
FI 300	3
Behavioral and Social Sciences	6
Field of Specialization and Electives	14
	32

FOURTH YEAR

	Sem. Hrs.
MG 463	3
Field of Specialization and Electives	28
	31

Note: Students registering in the accounting field of specialization should enroll in AC 101 and AC 102 the first year, postponing science, mathematics or electives until later in the program. In some other fields of specialization, students should schedule beginning courses in their field during the sophomore year, postponing one of the general studies courses until later. The student should consult his adviser for details of the course sequence in the field of specialization.

PRE-LAW CURRICULUM

Pre-law students may pursue a program of study in the College of Business Administration as well as in the College of Liberal Arts. Courses in accounting, economics, finance, insurance, labor relations, and statistics are recommended for any student planning to enter the legal profession.

The admission requirements of colleges of law differ considerably. The student should communicate with the dean of the law school he hopes to attend and plan his program to meet the requirements of that school. Most law schools, including Arizona State University, requires a baccalaureate degree for admission, although some permit admission upon completion of three years of college work.

Students who plan to take a bachelor's degree prior to entering law school may follow any of the standard curricula in the College of Business Administration. Many pre-law students find it desirable to major in General Business Administration. This gives the student a broad background for the study of law. Within the General Business Department there are faculty members who are lawyers. These faculty members will be the advisers for the students desiring a pre-law business administration major in General Business Administration. There are advisers in each field of Business Administration who will assist the student in selecting both required and elective courses which will be of particular value in the study of law in the event a student desires a major other than general business.

BILINGUAL SECRETARIAL PROGRAM

(French, German, Russian, Spanish)

This degree program is offered jointly by the Department of Foreign Languages and the Department of Office Administration and Business Education. Students interested in this program should consult the Chairman, Department of Foreign Languages.

College of Education

H. K. Newburn, Ph.D.

Dean



College of Education Complex

PURPOSE

The central purpose of the College of Education is to provide initial preparation and continuing education to teachers and other professional personnel engaged in the educational programs of schools, colleges and other public and private agencies. This is accomplished primarily through direct relationships between the teaching faculty and their students.

Other purposes corollary to this are:

1. To contribute to the body of professional knowledge in the field of education through research, the development of educational theory, and innovation and experimentation in educational method and organization.
2. To offer leadership beyond the campus through the dissemination of information and ideas and through cooperative involvement with other agencies engaged in education.
3. To provide services to other agencies engaged in education in such manner as to promote improved educational practice throughout a widening sphere of influence.

ORGANIZATION

The courses of instruction offered by the College of Education are organized into departments so that a well-related sequence is established for important areas of concentration or specialization. These subject fields allow better organization in selecting courses which meet requirements for

the various teacher education curriculums. A wide array of specialization possibilities thus exists.

For administrative purposes, these subject fields are organized into the following departments: Elementary Education, Secondary Education, Educational Administration and Supervision, Educational Foundations, Counseling and Educational Psychology, Special Education, and Library Science. The subject fields which are offered follow:

Adult Education	Indian Education
Audio-visual Education	Instructional Materials
Counselor Education	Library Science
Educational Administration and Supervision	Reading Education
Educational Foundations	Safety Education
Educational Psychology	Secondary Education
Educational Technology	Social and Philosophical Foundations
Elementary Education	Special Education
Higher Education	

There are several bureaus, centers or special laboratories which directly assist in the work of the College of Education. These include the University Testing Services, the Bureau of Educational Research and Services, the I. D. Payne Laboratory, the Indian Education Center, the Reading Center, the Counseling Center, the Center for Higher Education, and others throughout the University. All of these facilities serve as laboratories for educational training.

Degrees

BACHELOR OF ARTS IN EDUCATION DEGREE

Several undergraduate programs are available leading to the degree Bachelor of Arts in Education and requiring a minimum of 126 semester hours of credit. Each of these programs is designed to prepare the student for work in some particular educational area.

MASTER OF ARTS IN EDUCATION DEGREE

A graduate program consisting of a minimum of 30 semester hours of properly arranged work leads to the degree of Master of Arts in Education. Students who complete any of the teacher education curriculums at Arizona State University may arrange for a program of studies leading to the degree of Master of Arts in Education. This degree is also available to graduates of other recognized institutions of higher learning by meeting the prescribed requirements. For specific reference to this program, see Graduate College section in this catalog.

MASTER OF ARTS IN COUNSELING DEGREE

A first level professional degree, Master of Counseling, is awarded upon the satisfactory completion of a two-year (60 semester hours) program of approved graduate studies. This program provides for preparation in a core of required professional studies supported by required and elective subjects to related disciplines, and for professional specialization options in one of four occupational settings—elementary school counseling; secondary school counseling, college counseling and student personnel work or

employment and adult counseling. Satisfactory completion of the program leads to professional counselor certification in Arizona and other states, and to further advanced professional preparation at the doctoral level.

EDUCATION SPECIALIST DEGREE

The degree Education Specialist is awarded for satisfactory completion of the Specialist Program of graduate studies. For specific reference to this degree, see Graduate College section in this catalog.

DOCTOR OF EDUCATION DEGREE

The degree Doctor of Education is awarded for satisfactory completion of the Doctoral Program of graduate studies. For specific reference to this degree, see Graduate College section in this catalog.

DOCTOR OF PHILOSOPHY DEGREE

The degree Doctor of Philosophy is awarded for satisfactory completion of this Doctoral Program of graduate studies. For specific reference to this degree see Graduate College section in this catalog.

Certification

Arizona Certification. For complete details concerning certification, students should refer to the Rules and Regulations published by the State Board of Education, or refer to the Office of the Dean of the College of Education.

The College of Education at Arizona State University is accredited by the National Council for Accreditation of Teacher Education for the preparation of elementary and secondary teachers and school service personnel with the Doctor's degree as the highest degree approved.

Students who complete the teacher education curricula meet the requirements for the appropriate Arizona certificate and are eligible for certification in all states participating in the NCATE reciprocity practice.

Admission to Undergraduate Programs

Beginning September 1, 1969, undergraduate students will be admitted to the College of Education at the end of the sophomore year of study, rather than as freshmen. Students planning to qualify as elementary or secondary teachers, or as teachers in special education will enroll during their first two years in the College of Liberal Arts or other appropriate colleges, and will apply for admission to the College of Education during the second semester of their sophomore year. *Those students admitted to the College of Education and enrolled for study prior to September 1, 1969, will be continued in this College even though they do not have upper division status.*

To enroll in Elementary Education, Secondary Education or other undergraduate programs leading to the Bachelor of Arts in Education degree, the student must have been admitted officially to the College of Education. To be admitted to the College and thus to any of the teacher

education programs, the student must have reached junior status (defined here as a minimum of 56 semester hours) and must have a cumulative grade point average of at least 2.00 (C). In addition, applicants may be requested to take selected physical and psychological examinations, and/or meet other criteria for admission. During his first two years of college study and preceding his admission, he should have completed those course requirements which have been established as prerequisites for entrance to the College of Education.

During the freshman and sophomore years, the student planning admission to the College of Education at the end of his second year will register as follows:

1. If interested in *teaching in the secondary school*, he will enroll in the appropriate college for his first two years and will list his proposed teaching field as his major followed in parentheses by the term "Pre-Secondary." Examples are shown below to indicate specifically how this will be accomplished.

<i>College</i>	<i>Teaching Field</i>	<i>Major first two years</i>
Liberal Arts	English	English (Pre-Secondary)
Fine Arts	Instrumental Music	Instrumental Music (Pre-Secondary)
Business Administration	Business	Business (Pre-Secondary)
Engineering	Industrial Arts	Industrial Arts (Pre-Secondary)

The major teaching fields available are shown under the Secondary Curriculum section of this catalog.

The College in which the student is enrolled will assign an adviser from the appropriate major department in cooperation with the College of Education.

2. If interested in *teaching in the elementary school*, he will register in the College of Liberal Arts but will list his major as "Pre-Elementary Education." Such students will be assigned an adviser from the College of Education as soon as this major is listed even though they will not be admitted to the College of Education until they have completed the first two years of study.
3. If interested in *teaching in the area of special education*, he will register in the College of Liberal Arts but will list his major as "Pre-Special Education." Such students will be assigned an adviser from the College of Education Department of Special Education even though they will not be admitted to the College until they have completed the first two years of study.

RETENTION POLICY

The Retention Policy of the College of Education has inherent in it the following purposes:

1. To select those students for admission to a teacher education curriculum who are capable of pursuing and completing the curriculum.

2. To assist students in identifying their strengths and weaknesses so that they may realize their greatest potential in education.
3. To improve the quality of the teachers prepared at this institution.
4. To attract able students to the profession and more specifically to the various curricula of the College of Education.
5. To provide a framework for follow-up research on the education of teachers.

GENERAL STUDIES

A total of 36 semester hours of general studies (general education) must be completed before the student is eligible for graduation in any of the undergraduate curricula offered by the College of Education. It is anticipated that heavy emphasis will be placed on these requirements during the first two years of study and before formal admission to the College of Education. The following minimum requirements exclusive of education courses indicate the general nature of the distribution which must be met as the student completes this basic requirement:

1. At least two courses for a minimum of eight semester hours credit in the Humanities and Fine Arts (exclusive of freshman English);
2. At least two courses for a minimum of eight semester hours credit in the Social and Behavioral Sciences;
3. At least two courses for a minimum of eight semester hours credit in Sciences and Mathematics.

The student should consult with his adviser for specific recommendations or requirements within the area of general studies in order to build an acceptable pattern of courses and to be qualified for admission to and graduation from the College of Education.

Graduation Requirements. To be eligible for the Bachelor of Arts in Education the student must fulfill the following requirements:

- a. Complete an approved teacher education curriculum as outlined in this catalog;
- b. Complete at least 126 semester hours of study with a cumulative grade point index of 2.00 or better;
 - (1) For all courses taken while a student at the university;
 - (2) For all courses included in his major teaching field;
 - (3) For all professional education courses;
- c. File a written application for graduation acceptable to the College of Education Standards Committee;
- d. Be recommended for graduation by the faculty of the College of Education.

Student Teaching

Undergraduate students in the Elementary Education Curriculum must be approved by their advisers, the chairman of the Department of Elementary Education, and the Standards Committee of the College of Education. Undergraduates in the Secondary Education Curriculum must

be approved by their advisers, the chairman of the Department of Secondary Education, the Standards Committee, and the representative of the faculty fielding the major in which they will be assigned for student teaching. Graduate students must be approved by the same agencies as undergraduates. Students must be admitted to the College of Education and enrolled in an approved teacher education program to be eligible for admission to student teaching.

APPLICATION

Students who apply for student teaching **MUST HAVE COMPLETED AT LEAST 12 SEMESTER HOURS OF COURSES AT ARIZONA STATE UNIVERSITY** prior to the date on which they begin their student teaching assignment.

Application for student teaching must be made with the Director of Student Teaching between the dates of March 15 and July 15 for an assignment during the fall semester, between the dates of September 15 and November 15 for an assignment during the spring semester, and between the dates of December 15 and April 15 for an assignment during the summer session.

Applications for summer session student teaching will be accepted only from those students who will have completed all other requirements for degrees and certificates except the student teaching requirement, and a limited number of assignments will be made on a first-come, first-served basis. The opportunities for student teaching experiences in the summer are extremely limited, and no student should definitely plan to meet this requirement during the summer.

Students who apply for student teaching after the deadlines named above may not be assigned to student teaching until the next following spring or fall semester.

REQUIREMENTS

Students in the Elementary Education Curriculum, whose programs permit, devote their full time to student teaching all day in the cooperating schools, one full week for each semester hour of credit in student teaching. Others teach in the cooperating schools for one-half day for one semester. In either case, student teaching occurs during the second semester of the junior year or in the first or second semester of the senior year for elementary education students.

Students who are preparing for secondary certification teach for one-half school day for one semester during the first or second semester of their senior year.

The student's course load is limited to 16 semester hours during the semester in which he is teaching. Student teachers are not permitted to take part in activities that interfere with their student teaching conferences, seminars, or other activities related to teaching in the cooperating school.

Student teachers are required to adhere to the rules, regulations and philosophy of the cooperating school to which they are assigned.

TRAINING SCHOOLS AVAILABLE

Excellent schools and school systems cooperate with the College of Education in the training of student teachers. Each of the schools presents its own particular type of organization and problems so that the student may receive training in any type of work desired from the kindergarten through the high school. Each student teacher is under direct guidance of a supervising teacher, a college supervisor and the Director of Student Teaching.

STUDENT TEACHING WAIVER

Students who have been employed as regularly state-certified teachers in accredited private, public, parochial, or Indian schools, may apply to the Director of Student Teaching, College of Education, for waiver of the student teaching requirement. Substitute teaching experience is not acceptable as a replacement for student teaching. Waiver of student teaching in the required grade level is granted by the Director of Student Teaching. Waiver of this requirement in no way changes the total number of semester hours required for graduation or for establishing residence.

Regular teaching experience in the required grade level of two years duration within the past five years will be considered sufficient to waive the total student teaching requirement.

Regular teaching experience in the required grade level of one year's duration within the past five years will be considered sufficient to waive one-half the student teaching requirement.

Regular teaching experience in the required grade level of two or more years' duration prior to the past five years will be considered sufficient to waive one-half the student teaching requirement.

The required grade level is described as follows: elementary level includes kindergarten through eighth grade; secondary level includes grades seven through twelve.

Students who have met the full student teaching requirement of another American Association of Colleges for Teacher Education member institution, which is also accredited by the National Council for Accreditation of Teacher Education, may petition through the College of Education Standards Committee to have their student teaching experience requirement interpreted as fully met.

HONORS PROGRAM

An Honors Program is available within the College of Education for the exceptional student. It is administered by the Standards Committee which serves as an Honors Council. A more detailed description of this program will be found in the Honors Program section of this catalog, page 92.

Bachelor of Arts in Education

ELEMENTARY EDUCATION CURRICULUM

The Elementary Education Curriculum offers professional education courses designed to prepare students to teach all levels of the elementary school. Students may also develop special competency in such areas as early childhood education, art, music, social studies, mathematics, language arts, library science, physical education, science, and foreign language by using elective hours to take additional course work prescribed by their advisers.

This curriculum leads to the degree of Bachelor of Arts in Education and to certification for teaching in the kindergarten and grades one through eight.

Major Teaching Field. The major in this program is elementary education.

Academic Minor. An Academic minor of 18 semester hours is required of all elementary majors. While any academic minor may be selected, consideration should be given to those minors which will contribute most to elementary teaching. Students preparing to teach in the upper elementary grades may use elective hours to develop a second minor or to complete a major in an academic field.

Suggested Pattern. A program of 126 approved semester hours is required.

This is divided as follows:

General Studies36 semester hours

For specific courses, see General Studies listings on page 91.

Freshman English3-6 semester hours

Elementary Professional Education36 semester hours

Academic Minor18 semester hours

Electives30-33 semester hours

Advisers in this curriculum have check sheets with recommended and required courses for each year of work. These check sheets contain appropriate patterns of course work for the age level of pupils with whom the students as teachers will want to work. The check sheets also contain recommendations for electives. It is necessary for students to consult advisers in this curriculum in order to insure the best possible program of training. This is particularly important inasmuch as the adviser must sign the check-out sheet for graduation which indicates that an approved program of course work has been developed.

Students interested in learning to work with children and youth, but not in certification, may elect some elementary education courses.

SECONDARY CURRICULUM

This curriculum prepares students for service in the secondary school. Majors and minors are completed in the teaching fields desired. The curriculum has considerable flexibility for those who wish to pursue specialized work in addition to the regular expectations for teaching. This curriculum

leads to the degree of Bachelor of Arts in Education and to the certification for teaching in the secondary school.

Suggested Pattern. A program of 126 approved semester hours is required.

This is divided as follows:

General Studies36 semester hours

For details, see General Studies, page 91.

Freshman English3-6 semester hours

Major Teaching Field45 semester hours

Minor Teaching Field18 semester hours

Professional Education25 semester hours

Advisers in this curriculum have check sheets with recommended courses for each year of work. The check sheets include recommendations for electives. Students should consult advisers in this curriculum in order to insure the best possible program of training. This is necessary for the following reasons: (1) An adviser approves a program of studies prior to registration each semester. (2) An adviser signs the graduation check-out sheet for the student. (3) Check sheets are revised each year on the basis of refinements which are incorporated into the program. (4) Check sheets offer excellent opportunity for the student to keep a record of his progress throughout the curriculum.

Major and Minor Teaching Fields. Students under the secondary curriculum are required to complete a major and a minor teaching field.

A major teaching field shall consist of 45 semester hours. A minimum of 18 semester hours in the major teaching field should be upper division courses. Wherever practicable, general education courses which are appropriate should be used to meet the requirements of a major teaching field. Courses included in the general education requirements or options, if taken, may be applied toward meeting the semester hour requirements of a major teaching field if such courses are specified as required courses for the major teaching field or if approved by the adviser as satisfying major teaching field requirements. However, students should not use hours credited to the development of a major to apply on hours needed to develop a minor.

A minor teaching field shall consist of 18 semester hours in a subject field from one department or division. In order to meet the various graduation requirements under the secondary curriculum, it is usually necessary to use general education courses to build the minor teaching field, as approved by the adviser.

In selecting major and minor teaching fields, students should keep in mind the requirements of the North Central Association and the combinations usually assigned beginning teachers in Arizona high schools. Information concerning these matters may be obtained at the office of the Chairman of the Department of Secondary Education.

MAJOR TEACHING FIELDS AVAILABLE

Art	German
Biological Sciences	Health Education
Business	History
Chemistry	Home Economics
Choral Music	Industrial Arts
Dance	Instrumental Music
Economics	Journalism
Distributive Education	Mathematics
Engineering Sciences	Physical Education
English	Physics
French	Political Science
General Science	Russian
Geography	Spanish
Geology	Speech and Drama

MINOR TEACHING FIELDS AVAILABLE

In addition to minors in the above fields, the following minors are available:

Anthropology	Metals
Chinese	Music
Drafting	Physical Science
Drama	Psychology
Driver Training and Safety Education	Reading
Electronics	Secretarial
General Business	Sociology
Humanities	Special Education
Latin	Speech
Library Science	Transportation and Power

Other minors can be developed with the approval of the chairman of the department under which the minor is developed or the Dean of the College of Education.

Considerable attention should be given to the selection of teaching combinations. In many instances, teachers must assume positions which call for a major and one or two minors. Although there is no definite pattern concerning teaching subject combinations, it should be profitable to consider the more prevalent ones. Information regarding these may be obtained from the student's adviser, the Director of Placement, or a Member of the Secondary Education Department.

Professional Education. In addition to the courses listed under other requirements, all students registered under the secondary curriculum are required to take 25 semester hours of work in Education. The following must be included: EF 111, 322, 333; SE 311, 411, Methods of Teaching in the Major Teaching Field and SE 433.

Recommended Electives and Specialization. Students are urged to plan electives in conjunction with suggestions from their advisers.

REQUIRED COURSES IN MAJOR AND MINOR TEACHING FIELDS

The major teaching field requires a minimum of 45 semester hours developed in consultation with the adviser. The minor teaching field requires a minimum of 18 semester hours developed in consultation with the adviser. For specific course requirements in the major and minor teaching fields see statements in the Departments of Instruction section of the catalog at the beginning of each department offering a major or minor teaching field.

LIBRARY SCIENCE

Students who desire to prepare for librarianship may choose a minor field in library science. The undergraduate program of professional education for librarians should also include a systematic survey of the various fields of knowledge, concentration in one or more subject fields taught in Arizona schools, background courses of special value in library science, study of professional principles and methods common to all libraries.

Students who have completed a minor field in library science at the undergraduate level may select library science as a field of specialization at the graduate level.

Seniors having a Library Science minor in the Elementary Education program may divide their nine hours of Student Teaching into a combination of five hours of credit at a grade level and four hours of credit in the school library. Those graduate students who hold a teaching certificate, and who complete a library science minor for the state library stamp, may elect to enroll independently in LS 483 Library Practice.

Minor Field in Library Science. The minor in library science consists of 18 semester hours as prescribed by the department. These courses vary in terms of the needs and interests of the student.

Special Programs

SPECIAL PROGRAMS OF TEACHER PREPARATION

Several fields of specialization are available on the undergraduate level in connection with any of the undergraduate curriculums. These are available as a sequence of courses to be taken in addition to the regular requirements of the undergraduate curriculum.

TEACHING THE HEARING-HANDICAPPED CHILD

Students pursuing the elementary program may, in the junior year, with the approval of the adviser, elect to make a special sequence preparatory to the teaching of hearing-handicapped children to regular or special classroom situations. These students shall be required to complete satisfactorily the basic elementary program. Specific requirements for this minor may be obtained from the regular adviser, or from the adviser in Special Education.

Students pursuing a major teaching field in secondary education may also include this field of Special Education. Such students shall be required

to complete satisfactorily the basic secondary major. The special courses follow:

SP 311 Orientation to Education of Exceptional Children	3 sem. hrs.
SE 324 Phonetics	2 sem. hrs.
SE 395 Speech Correction	4 sem. hrs.
SE 425 Audiology	3 sem. hrs.
SE 426 Audiometry	3 sem. hrs.
SE 427 Clinical Practice in Audiology and Audiometry	3 sem. hrs.
EE 478 Directed Teaching in the Elementary School	5 sem. hrs.
or SP 455 Education of the Hearing-Handicapped	3 sem. hrs.
SP 456 Education of the Hearing-Handicapped	3 sem. hrs.

26 or 28

TEACHING INDIAN CHILDREN

Students pursuing the elementary program may, in the junior year, with the approval of the adviser, elect to take a special sequence preparatory to the teaching of Indian children. This is appropriate for those who will have only a few Indian children in a classroom, or for those who will have a classroom composed only of Indian children. These students shall be required to complete satisfactorily the basic elementary program.

Students pursuing a major teaching field in secondary education may also take this special training for teaching Indian children. Such students shall be required to complete satisfactorily the basic secondary major.

IE 422 Methods of Teaching Indian Children	3 sem. hrs.
IE 424 Curriculum and Practices for Indian Education	3 sem. hrs.
IE 490 Problems of Teachers of Indian Children	3 sem. hrs.
EE 478 Directed Teaching in the Elementary School	5 sem. hrs.
or	
SE 433 Directed Teaching in the Secondary School (3)	
AN 221 Indians of the Southwest	3 sem. hrs.
AN 421 The American Indian	3 sem. hrs.

18 or 20

TEACHING SPANISH IN THE ELEMENTARY SCHOOL

Students pursuing the elementary program may, with the approval of the adviser, elect to take a special sequence preparatory to the teaching of Spanish in the elementary school. These students shall be required to complete satisfactorily the basic four-year elementary program.

SP 201, 202 Intermediate Spanish	8 sem. hrs.
SP 311, 312 Spanish Conversation	6 sem. hrs.
SP 313, 314 Spanish Composition	6 sem. hrs.
SP 417 Spanish Phonetics	3 sem. hrs.

23

SP 485, 486 Spanish for Elementary Teachers is designed for teachers interested in introducing the teaching of Spanish in the elementary grades. It emphasizes the fundamentals of Spanish, integrating the techniques of

teaching at the elementary level. Other suggested courses are SP 321, 322 Spanish Literature, SP 472 Spanish-American Civilization, FL 480 Methods of Teaching Foreign Languages, and FL 421 Directed Reading for Majors.

OTHER SPECIAL PROGRAMS

Students pursuing the elementary program may, with the approval of the adviser, elect to take a special sequence preparatory to specialization in a special field in the elementary school. Examples of this are in the field of Art, Physical Education, Home Economics, Music, Industrial Arts, Conservation Education, Safety Education, and others. These students shall be required to complete satisfactorily the basic elementary program.

Five-Year Program to Prepare Teachers of Mentally Retarded Children

Students who elect to do so may pursue a five-year specialized program which prepares teachers of mentally retarded children. This program contains much of the undergraduate program for elementary school teachers with a fifth year of graduate level specialization for working with mentally retarded children. The total program can be completed within four calendar years, including three summers. The completed program results in the student receiving a Bachelor's and a Master's Degree, and Certification in Mental Retardation and in Elementary Education.

Suggested Pattern. A program of 157 approved semester hours is required. This is divided as follows:

General Studies	36 sem. hrs.
For specific courses, see General Studies listings on page 91.	
Freshman English	3-6 sem. hrs.
Special Education	36 sem. hrs.
Elementary Professional Education	30 sem. hrs.
Academic Minor	18 sem. hrs.
Other Required Courses	17 sem. hrs.
Electives	14 sem. hrs.

Advisers in this curriculum have check sheets with recommended and required courses for each year of work. The check sheets also contain recommendations for electives. It is necessary for students to consult advisers in this curriculum in order to insure the best possible program of training. This is particularly important inasmuch as the adviser must sign the check-out sheet for graduation which indicates that an approved program of course work has been developed.

Recommended Minor in Special Education

Majors in Elementary and Secondary Education, in consultation with their advisers, may select the following minor in Special Education:

Required:

- SP 311 Orientation to Education of Exceptional Children
- SP 312 Mental Retardation
- SP 320 Participation with Mentally Retarded Children
- SP 321 Methods of Teaching the Mentally Retarded
(SP 320 and SP 321 to be taken concurrently)

Six semester hours additional selected from the following:

- SP 436 The Emotionally Disturbed Child
- SP 446 The Disadvantaged Child
- SP 471 Art, Music and Crafts for the Handicapped
- SP 474 Educational Evaluation of the Handicapped

THE CENTER FOR THE STUDY OF HIGHER EDUCATION

The Center has as its purpose the coordination of present and potential institutional resources to provide for three general services to higher education: graduate instruction; research and development; and field service.

Instructional programs are available at the graduate level to prepare administrative officers for universities, colleges and junior colleges. The only graduate degree offered presently is the Ph.D. with specialization in Higher Education—Administration.

Inquiries should be addressed to the Director, Center for the Study of Higher Education, College of Education, Arizona State University.

College of Engineering Sciences

Lee P. Thompson, Ph.D.

Dean



Engineering Sciences G Wing

PURPOSE

The purpose of the College of Engineering Sciences is to provide a university education of such fundamental background and scope that a student may achieve competency in one of the fields of engineering, agriculture, technology, or construction. Every effort is made to carry on a well-rounded, well-integrated program which will not only give the student proficiency in his professional field but also will develop character, judgment, ideals, breadth of view, general culture, and physical well-being. The Research Center provides an opportunity for students to augment their theoretical knowledge with research, development, and experience.

ORGANIZATION

The College of Engineering Sciences is organized as follows:

School of Engineering

Engineering Science Core

OPTIONS:

Chemical Engineering

Civil Engineering

Electrical Engineering

Engineering Mechanics

Engineering Science

Industrial Engineering

Mechanical Engineering

Division of Technology*Aeronautical Technology**Electronic Technology**Graphic Arts Technology**Industrial Technology**Technical Education Technology***Division of Agriculture***Agricultural Economics**Animal Agriculture**Plant Agriculture***Division of Construction****Computer Center****Research Center**

Degrees

BACHELOR'S DEGREE

The completion of a four-year curriculum in agriculture, technology, and construction leads to the degree of Bachelor of Science. The completion of a four-year curriculum in engineering leads to the degree of Bachelor of Science in Engineering. General fields for this degree are: chemical engineering, civil engineering, electrical engineering, engineering mechanics, engineering science and mechanical engineering.

MASTER OF SCIENCE IN ENGINEERING DEGREE

The Master of Science in Engineering degree is awarded upon successful completion of prescribed graduate level course work, engineering projects and research endeavor. The student's program of study is administered under an adviser with the approval of the Dean. Areas of specialization available are: chemical, civil, electrical, industrial, mechanical, engineering mechanics and engineering science. Within programs of study, interdisciplinary emphasis can be arranged.

MASTER OF SCIENCE DEGREE (Engineering)

This graduate program is designed to provide the competent student in engineering or other selected fields an opportunity to specialize in a particular subject area within engineering. Normally this objective may be attained through the satisfactory completion of graduate-level coursework, engineering projects and research endeavor.

MASTER OF SCIENCE DEGREE (Agriculture)

This graduate program provides competent students with opportunities to specialize in agricultural economics, animal science and plant science.

DOCTOR OF PHILOSOPHY DEGREE (Engineering)

The degree Doctor of Philosophy is awarded in engineering upon the satisfactory completion of an approved program of graduate study and research. For specific reference to this degree, see the "Graduate College" section.

GENERAL STUDIES

Higher education should provide the student not only with competency in his chosen subject field, but also with experiences which facilitate the student's growth in ability to perceive significant relationships, to make intelligent value judgments, to express himself with ease, clarity, and good taste, and to develop the qualities of character and personality requisite for a successful career. The development of moral, ethical and social concepts, along with a sound professional attitude, is required. It is expected that the attainment of an interest and pleasure in the above pursuits will be an inspiration to continued study. Courses are selected with the aid of an adviser to provide planned sequences and to place emphasis on the inter-relationships that exist among fields of knowledge.

The General Studies requirements for each of the curricula offered in the College of Engineering Sciences include selections from the following:

- BEHAVIORAL AND SOCIAL SCIENCES 8 sem. hrs. minimum
Aerospace studies, agriculture, anthropology, business administration, cultural geography, economics, education (educational foundations), engineering, health education, history, home economics, mass communications, military science, political science, psychology (PX courses ONLY), sociology.
- HUMANITIES AND FINE ARTS 8 sem. hrs. minimum
Architecture, art, dance, drama, English, foreign languages, interdisciplinary humanities, music, philosophy, speech.
- SCIENCES AND MATHEMATICS 8 sem. hrs. minimum
Botany, chemistry, engineering, geology, mathematics, physical geography, physics, psychology (PY courses ONLY), zoology.
- GENERAL STUDIES ELECTIVES 12 sem hrs. minimum
 English proficiency is expected and may be satisfied by completing EN 102 or EN 104.

HONORS PROGRAM

Students in the College of Engineering Sciences are eligible to participate in the Honors Program as administered by the School or Division in which the student is enrolled. See page 92 for further information.

School of Engineering

LEE P. THOMPSON, Ph.D., Director

PURPOSE

The Engineering Program seeks the attainment by each graduate of certain broad objectives, and it is designed to make effective a philosophy of education for careers in applied science, engineering, and industry for leadership. Society's needs in the decades ahead call for engineering talent on a scale not previously seen. Engineering education should, therefore, provide an opportunity for the optimum development of a wider variety of activities, aptitudes and interests, including moral, ethical and professional concepts.

The curricula and courses offered are designed to meet the needs of the following students: (1) Those who wish to obtain a Bachelor of Science

in Engineering degree and who plan careers in fields where science, mathematics, and analytical methods are of special value; (2) Those who wish to do graduate work in engineering; (3) Those who wish one or two years of training in mathematics, applied science, and engineering in preparation for a technical program; (4) Those who desire pre-engineering for the purpose of deciding which engineering field to undertake or those who desire to transfer to another college or university; (5) Those who wish to take certain electives in these fields while pursuing another curriculum in the University.

ADMISSION

Students who wish to be admitted to full freshman standing in Engineering should present certain secondary school units in addition to the minimum University requirements. A total of 3½ units is required in mathematics. Included must be: advanced algebra, geometry, and trigonometry. Calculus is recommended. The laboratory sciences chosen must include at least one unit in physics and one unit in chemistry. One unit of biology is strongly recommended.

Students who have omissions or deficiencies in subject matter preparation may be required to complete additional university credit coursework which may not be applied toward an engineering degree. One or more of the courses—MA 117 College Algebra, MA 118 Trigonometry, PH 111 General Physics, EN 101 College English, CH 113 General Chemistry — are usually taken to satisfy omissions or deficiencies.

Credit is granted for transferred courses which are substantially equivalent to corresponding courses in an engineering program, subject to grade and senior resident requirements. Such credits are provisional and become final only after the student has demonstrated his ability to do satisfactory work. Credits will be accepted by transfer from a junior college to meet lower division requirements only. The status of a student and the specific credits acceptable toward his degree are determined by the Dean of the College.

Well-prepared students can usually complete the plan of study leading to the degree of Bachelor of Science in Engineering in any of the engineering curricula in four years, or fewer than four by attending Summer Sessions. Many students, however, may find it advantageous or necessary to devote more than four years to the undergraduate engineering programs of study by pursuing, in any semester, fewer studies than are regularly prescribed. In cases of inadequate secondary preparation, poor health, or financial necessity requiring much time for outside work, the undergraduate course should be extended to five years or longer. A student who so desires may devote additional time to his undergraduate work and include additional instruction in the humanities, the social sciences, the physical sciences or mathematics.

ORGANIZATION

The engineering core consists of a highly correlated group of courses of fundamental importance and basic concern to engineers. It constitutes a broad base of science, mathematics, and engineering upon which the

various fields of specialization are founded. Instructional patterns are basically variations of a single curriculum, and the student is allowed considerable latitude in developing an instructional pattern to fit his particular interests. In each of the several fields of specialization, the scientific knowledge and techniques are applied and further developed through analysis, synthesis, and design in a definite engineering discipline. For convenience, all of the fields of specialization offered are designated as KE, CE, EE, EM, IE, and ME. In addition, an Engineering Sciences (ES) program accommodates those students whose educational objectives require more flexibility than is possible in the engineering field programs. Thus, to reach a given objective, a student in the ES program would complete the engineering core and then, with the aid of an adviser, select one of the approved patterns of coursework to complete the degree requirements.

BACHELOR OF SCIENCE IN ENGINEERING

The satisfactory completion of a curriculum of a minimum of 127 semester hours, including general studies, the engineering core, and both required and elective courses of study in the ES program or in a field of specialization, leads to the degree of Bachelor of Science in Engineering. Where omissions or deficiencies exist, *i.e.*, in chemistry, English, physics, or mathematics, the student will need to complete more than the minimum of 127 semester hours.

The principal fields of specialization in the engineering curriculum are devoted to the basic sciences, mathematics, the fundamentals of engineering science, and their application to the solution of engineering problems. These courses are not training courses for any of the mechanical or manipulative skills, but, rather, are planned to provide preparation for development, design, research, graduate work, and, with certain electives, for operation, production, testing, maintenance and management.

In any specialization the degree requirements consist of the engineering core, the general studies, and the courses in the field of specialization.

For assistance and counsel in planning a program, each student will be assigned an adviser from the faculty in his special interest field. In addition, a Coordinator for Student Advisement is available for help and assistance.

ENGINEERING CORE REQUIREMENTS (Minimum)

MA 120	Analytical Geometry and Calculus I	5
MA 121	Analytical Geometry and Calculus II	5
MA 212	Analytical Geometry and Calculus III	5
PH 251	Sound and Optics	2
PH 361	Modern Physics	3
	or PH 461 Modern Physics	
	or ES 411 Nuclear Engineering	
CH 114	General Chemistry	4
	or ES 118 Chemical Foundations of Engineering	
	or ZO 100 General Zoology	
ES 102	Engineering Analysis and Design	3
ES 103	Computer Programming	2

ES 104 Engineering Graphics	2
ES 211 Engineering Mechanics (<i>Statics</i>)	3
ES 231 Electrical Science	4
ES 312 Engineering Mechanics (<i>Dynamics</i>)	3
ES 321 Mechanics of Materials	4
ES 330 Electrical Networks	4
ES 331 Electronic Engineering	4
or ES 361 Measurement Engineering Systems	
or ES 364 Chemical Process Instrumentation	
ES 350 Structure and Properties of Materials	3
ES 371 Fluid Mechanics	4
ES 381 Thermodynamics	3
ES 400 Engineering Communications	3
ES 441 Probability for Engineers	3
or ES 442 Engineering Statistics	
or ES 346 Methods in Engineering Analysis	
or ES 348 Applied Mathematical Analysis	
or ES 444 Numerical Analysis in Engineering	
or MA 362 Engineering of Mathematics	
Engineering Analysis and/or Synthesis Elective	3
Engineering Design and/or Systems Elective	3

Except as noted below, the engineering core is common to all patterns and fields of specialization. This arrangement gives the student time to become adjusted, and to choose that for which he is best adapted. Counseling is provided in order that the student may be aided in making his choice.

To obtain the necessary chemical science background, chemical engineers may use the following alternatives: CH 441, 442 for PH 361 and ES 350, and KE 331 for ES 371.

Engineering students will complete the engineering core courses, the general studies courses (including a total of 18 semester hours minimum from two categories—behavioral and social sciences, and the humanities and fine arts), and the field requirements. Engineering students are required to complete EC 201 Principles of Economics from the behavioral and social sciences. They may not include courses from aerospace studies, military science or health education in this category. Only certain courses taught within the other areas are approved to meet the behavioral and social sciences and humanities and fine arts requirements, and the student must receive approval from his faculty adviser prior to enrollment in them. Required and elective courses for each field are listed below and changes may be made only with the approval of the Dean.

Technical electives are selected with the approval of the student's faculty adviser and may be made from 300-level courses or above in engineering, mathematics, the sciences, or business administration.

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the Dean. The Dean may assign supplementary work, including additional coursework, consistent

with the needs of the student. The granting of a degree may be delayed until the work is completed satisfactorily.

Prior to enrolling in courses at the 300 level, each engineering student must: (1) Receive approval from the Office of the Dean of Engineering; (2) Secure from his adviser an approved course of study for his remaining work. Generally, students with a 2.00 scholarship index (C average), or higher will receive approval.

All the undergraduate options of engineering—chemical, civil, electrical, mechanical, engineering mechanics, and engineering science—are accredited by the Engineers' Council for Professional Development (ECPD). The first degree program in industrial engineering—the Master of Science in Engineering—is also accredited by ECPD.

CHEMICAL ENGINEERING

The chemical engineer is generally concerned with processes involving a chemical change or separation. He applies science, especially chemistry and physics, to the development, design, and operation of process and medical equipment. Mathematics is his tool and economics his guide in practice. His training often leads to research and development activities for which graduate study is desirable, but the bachelor's degree has sufficed for the majority. Since chemistry is involved in most activities, the chemical engineer is found in a diversity of industries which manufacture metals, ceramics, space propellants, solid state devices, petroleum products, plastics, food, drugs, medical equipment, fermentation products, petrochemicals, and conventional chemicals. Extractive metallurgy, biomedical and nuclear engineering are chemically based fields which come within the realm of chemical engineering. Training in chemical engineering provides a broad background which prepares one for a variety of occupations.

CHEMICAL ENGINEERING CORE

KE 211 Chemical Process Calculations	2
KE 331 Transport Processes	(4)
KE 332 Chemical Engineering Operations	4
KE 333 Transport Phenomena Laboratory	1
KE 382 Applied Chemical Thermodynamics	2
KE 442 Chemical Process Principles	3
KE 451, 452 Chemical Engineering Laboratory	4
KE 461 Process Control	(3)
KE 462 Process Design	(4)
CH 331, 332, 335, General Organic Chemistry	7
CH 441, 442 General Physical Chemistry	(6)
CH 443 Physical Chemistry Laboratory	1
Approved Electives	7

The chemical engineering core gives a general fundamental chemical engineering education with a choice of electives to satisfy the student's interests. Chemical engineering students may take their electives as specified below to specialize in one of the elective options of biomedical engineering, material science, or nuclear engineering.

Biomedical Engineering: KE 411 in addition to 4 credits of electives selected from KE 413, CH 461, CH 462, CH 467, ZO 201, ZO 202, or EM 372.

Materials: Seven semester hours of electives selected from ES 350, EM 450, EM 451, EM 452, KE 423 or KE 498.

Nuclear Engineering: ES 411, ME 412, and ME 413.

CIVIL ENGINEERING

Civil engineers are responsible for the planning, research, design, analysis, construction, operation and maintenance of many structures and systems which form the basis of our modern civilization. These include buildings of all types, bridges, highways, dams, canals, irrigation, and multipurpose hydraulic systems. Civil engineering further encompasses environmental engineering; including city planning, water and atmospheric resources, waste treatment and pollution, and engineering aspects of environmental health. Education in this field is founded on scientific fundamentals with extensive training and practice in one or more fields of professional specialization including structures, hydraulics, soil mechanics, transportation, and environmental engineering.

CIVIL ENGINEERING CORE

CE 241 Surveying	3
CE 321 Structural Mechanics	(4)
CE 322 Fundamentals of Structures	4
CE 381 Applied Fluid Mechanics	3
CE 451 Soil Mechanics	3
CE 461, 462 Environmental Engineering	5
CE 472 Transportation Engineering	3
Approved Science Course	3
Approved Design Courses	(3) plus 1-3
Approved Technical Electives	1-3

Each student must elect two design courses from the following: CE 423, CE 452, CE 466, CE 475, and CE 481.

ELECTRICAL ENGINEERING

Many modern scientific and engineering developments are either essentially electrical in character or depend on electrical equipment and techniques. The field is very broad since it enters into much of industry where power is utilized, intelligence is transmitted, or control is exercised over physical, chemical, or mechanical operations. Areas of current interest include solid state electronic devices, computer system design, computer science, communications, control systems, electro-optics, power systems, radar, medical electronics, electromechanics, electronic instrumentation, space electronics and undersea electronics.

While all students in electrical engineering pursue a common program in fundamentals, opportunity for study in greater depth in various technical areas is provided through a choice of technical electives. These technical electives are based on a common core of electrical engineering fundamen-

tals. The electrical engineering core is in addition to, and integrated with, the engineering core.

ELECTRICAL ENGINEERING CORE

PH 361 Modern Physics	(3)
or PH 461 Modern Physics	(3)
CH 114 General Chemistry	(4)
or ES 118 Chemical Foundation of Engineering.....	(4)
ES 331 Electronic Engineering	(4)
MA 362 Engineering Mathematics	(3)
EE 302 Electrical Networks	(3)
EE 332 Electronic Engineering	4
EE 341 Electromagnetic Fields	3
EE 357 Semiconductor Materials and Devices	3
EE 362 Electromechanics	4
EE 401 Electrical Networks	4
EE 480 Feedback Systems	(4)
EE 496 Professional Seminar	0
Approved Technical Electives, Minimum Total	13

APPROVED TECHNICAL ELECTIVES (13 Semester Hours)

At least one course should be selected from Group A. At least two courses should be selected from one of the other groups.

GROUP A (*Applied Math*) EE 320, 426, 434, 452, 483; EM 465, 466; ES 441; MA 342, 426, 442, 461, 462

GROUP B (*Fields and Waves*) EE 434, 441, 443, 445, 448

GROUP C (*Solid State Electronics*) EE 431, 432, 433; KE 423

GROUP D (*Networks*) EE 402, 405, 406, 425, 445, 490, 495

GROUP E (*Controls*) EE 320, 425, 428, 452, 455, 483, 484; ES 441

GROUP F (*Communications*) EE 455, 456, 483; ES 441

GROUP G (*Digital Systems and Computer Science*) EE 320, 329, 421, 422, 423, 425, 426, 427, 428, 429

GROUP H (*Power Systems and Machinery*) EE 461, 471.

These courses and additional elective courses will be selected by the student with consent of his adviser with the aim of providing the best preparation of the individual student.

ENGINEERING SCIENCE

The engineering science program accommodates students whose educational objectives require more curricular flexibility than traditional engineering curricula generally permit. Some students regard engineering as primarily a preparation for professional engineering where skill in the application of science and the application of both physical and social technologies can be brought to bear on problems of larger scope. What these students seek is frequently not well served by branching from existing engineering disciplines but rather by a merging of principles and approaches drawn from all fields of engineering and other disciplines. As an answer to this need, two types of course arrangements are available: (1) Regular patterns of engineering science; and (2) Engineering-based interdisciplinary patterns. Both are developed beyond the engineering core.

Both the regular patterns of engineering science and the engineering-based interdisciplinary patterns must be approved by the Engineering Science Advisory Council. Each pattern consists of both required and elective courses. A minimum of three semester hours of coursework must be included in each pattern in engineering analysis and/or synthesis to satisfy this requirement in the engineering core. Some typical patterns that have received approval are shown below. Others may be designated as student needs appear.

REGULAR PATTERNS OF ENGINEERING SCIENCE

Production Systems. The production systems pattern is designed for students who wish to pursue an industrial engineering career concerned with the design, improvement, and installation of integrated systems of men, materials, and equipment. The pattern is designed to give a firm engineering and mathematical foundation upon which is built the ability to analyze current systems for improvement and to predict the consequences of decisions prior to their implementation. The ability to apply the digital computer in the analysis process is stressed and developed. The term “production” is used in its broadest sense, and would be applicable to a wide spectrum of activities, typical of which would be transportation optimization, bank activity analysis, hospital procedures improvement, manufacturing systems, and processing activities.

- Required courses: IE 311, 374, 375, 422, 431, 461,
473; AC 332; ES 442, 49229
- Approved engineering electives from an area of specialization8
- NOTE: ES 441 must be selected in the Engineering Core.

Computer Science. The computer science pattern is designed to give the student a good background in computers and computer methods, both digital and analog. Emphasis is placed upon the structure of information, the use of the computer in problem solving, and information processing systems.

- Required courses: IE 375, 473; EE 320, 325, 429;
MA 464, 465; ES 442, 49227
- Approved engineering electives from an area of specialization10
- NOTE: ES 441 must be selected in the Engineering Core.

Operations Research. The operations research pattern is designed to enable the engineering science student to formulate operational problems both of an engineering and socioeconomic variety. Emphasis in the program is on the quantitative tools and techniques used by operations researchers in solving such problems. Problems are described in a decision-theory framework involving objectives and constraints. The constraints typically imposed result from budgets, corporate policy, and federal regulations. It is the intent of this pattern to introduce to the student sufficient material so that he will be able to approach problems quantitatively within a given framework.

- Required courses: IE 311, 375, 431, 461, 473, 475,
476; MA 460; ES 442, 492.....29
- Approved engineering electives from an area of specialization8
- NOTE: ES 441 must be selected in the Engineering Core.

Quality Control. The quality control pattern has been designed to answer industrial managements' increasing demand for improved product quality. Quality control personnel are needed at the engineering research, development and management levels. This pattern is intended to increase the engineering student's understanding of probability and statistics and their application to quality control. Management aspects of quality control also receive special attention.

- Required courses: IE 311, 374, 431, 461, 474;
AC 332; ME 462; ES 442, 49226
- Approved engineering electives from an area of specialization11

NOTE: ES 441 must be selected in the Engineering Core.

Measurement Systems Engineering. Today's technology in all fields exceeds the capabilities of purely theoretical approaches. Experimental work of increasingly sophisticated nature is necessary to study phenomena in all branches of engineering. The engineering of these measuring systems is a new, exciting, and challenging field. Measurements are made in all disciplines, and all disciplines contribute to the design of measuring systems. Thus measurement engineering is among the broadest and most general areas of engineering.

- Required courses: EE 302, 341, EE 480 or ME 465, EE 483,
EM 351, or 452; ME 462, 463, 488; ES 49228
- Approved engineering electives from a field of specialization10

NOTE: ES 346 and ES 361 must be selected in the Engineering Core.

Materials Engineering. Progress in many fields of engineering depends upon the discovery of new materials as well as the acquisition of a better understanding of the behavior of existing materials. Interest in new materials for solid state devices and for the applications of nuclear energy and for space technology have increased the need for men educated in the science and technology of materials. These new interests do not in any way depreciate the continued search for a better understanding of the behavior of materials in the design of structures, automobiles, aircraft, electrical machinery, etc. This pattern in materials engineering is designed to produce graduates for development, research, and operation careers in industry or for graduate study in materials engineering and materials science.

- Required Courses: EM 351, 353, 451, EM 452 or PH 481;
CH 441, 442; KE 423 or CH 331, PH 471 or CH 332
or EE 434; ES 49227
- Approved engineering electives from an area of specialization10

NOTE: ES 361 must be selected in the Engineering Core.

Engineering Mathematics. The engineer of the future, as in the past, will utilize mathematics in much of his work. In research, design, production, or even in the solution of social problems, the rapidly decreasing time lag between discoveries and applications imposes ever-increasing demands upon the mathematical preparation of the engineer. What was thought to be abstract or pure mathematics only 15 years ago is routinely used by engineers today. An engineer interested in the applications of mathematics, therefore, must have preparation in the abstract fields of modern mathe-

matics which may be applied in the future as well as in the applied mathematics of the present. This pattern combines pure mathematics, applied mathematics, and courses from a field of specialization in order that the student will be well prepared to work in engineering or to continue study at the graduate level in mathematics or engineering.

- Required courses: MA 342, 470, 474, EM 465 or MA 461,
EM 466 or MA 462; ES 441, 442, ES 444 or MA 464,
ES 49227
- Approved engineering electives from a field of specialization10

NOTE: MA 370 must be selected in the Engineering Core.

Urban Systems Engineering. Frequently civilizations are measured by their cities. For the past 100 years America has been moving toward urbanization, and forecasts indicate that this trend will likely continue for the next two decades. The problems of urbanization extend over a wide range of physical, social, and economic conditions. These problems are also affected by scale. Thus an urban area with a concentration of one million people is not always functionally the same as another area with a population of one hundred thousand. The problems of urban areas are highly interrelated and interdisciplinary. This pattern provides a fundamental education in the engineering sciences and a broad spectrum of courses in the humanities and the social sciences. From these, the engineer can move into such areas as urban engineering, transportation planning, environmental engineering, city planning, urban management and decision making, or perhaps serve the electorate directly.

- Required courses: CE 61, 472; IE 431, 473, 475;
PY 350; SO 332; ES 442, 49227
- Approved engineering electives from an area of specialization10

NOTE: ES 441 must be selected in the Engineering Core. Also, AC 100 and CE 371 must be selected as a part of the General Studies requirement.

Bio-Engineering. Bio-Engineering bridges the gap between the engineering and physical sciences on the one hand and the life sciences on the other, and draws upon each area for support. The merging of physical and engineering sciences with the life sciences began during World War II with the occasional collaboration on a new instrument between someone who had an educational background in engineering or one of the physical sciences and an associate from medicine or one of the basic biological sciences. The present multidisciplinary approach to the solving of problems in medical treatment and research has evolved from such exchanges of information. Today, engineers, physicists, and mathematicians routinely join with the biologist and physician in developing techniques, equipment, and materials. The need for advanced study beyond the bachelor degree is acute in bio-engineering since the field includes a depth of knowledge from two diverse disciplines.

- Required courses: CH 331, 332, 461; ZO 201, 202; IE 425
or 480, KE 411, KE 413 or IE 481, ES 49227
- Approved engineering electives from an area of specialization10

NOTE: CH 114 must be selected in the Engineering Core.

ENGINEERING-BASED INTERDISCIPLINARY PROGRAMS

Pre-Medical. In the past decade the interrelation between engineering and medicine has become vigorous and exciting. It seems certain that our rapidly expanding technology means that engineering will continue to become increasingly involved in all branches of medicine. As this develops, so will the need for physicians trained in the engineering sciences—medical men and women with a knowledge of computer technology, operations research, electronics and cybernetics. In preparation for this new generation, an interdisciplinary pattern has been developed within engineering science whereby a student may satisfy the requirements for entry into medical school while simultaneously fulfilling the requisites for the Bachelor of Science in Engineering degree. This preparation would be of special interest to students whose medical interests lie in research, aerospace and undersea medicine, or biophysics.

Since both engineering and medicine have as their goal the well-being of man, this program could be compatible with any field of medical endeavor.

Required courses: BO 100, CH 225 or 117 and 118, 311, 332, 335, 336; ZO 100; ES 492	23
Approved pre-medical electives	6
Approved engineering electives from a field of specialization	5

NOTE: CH 117 and 118 may replace CH 114 in the Engineering Core.

Education. Recent surveys have pointed to the acute shortage of well-qualified high school and junior college teachers of mathematics and the sciences, including engineering science. This pattern has been designed to accommodate those who wish to couple an engineering education with a career in teaching. Its content has been organized in cooperation with the College of Education and the Arizona State Department of Public Instruction. Graduates of this pattern receive a Bachelor of Science in Engineering degree and a secondary teaching certificate with a major in engineering science, and minors in mathematics and physics.

Required courses: SE 310, 311, 411, 433; EP 422; ES 492	22
Approved education elective	3
Approved engineering electives from a field of specialization	9

NOTE: PS 310 and 311 must be selected as a part of the General Studies requirement in social science.

Business and Pre-Law. This pattern has been specifically designed to accommodate those students who, after completion of their bachelor's degree in engineering, intend to earn a graduate degree in business administration or law. The success with which engineers have risen to positions of leadership in business and government is well known. It is predicted that with the rapid increase in technological advance on every hand, opportunities for engineers to enter business or legal careers will be enhanced to an even greater degree in the future. Students who complete this pattern may complete requirements for the Master of Business Administration in one calendar year.

Required courses: GB 305, AC 332, FI 325, MG 301, MK 300,
 IE 375, 473; ES 442, 49227
 Approved engineering electives from a field of specialization10

NOTE: EC 202 must be selected as a part of the General Studies requirement.

ENGINEERING MECHANICS

The undergraduate engineering mechanics curriculum emphasizes the fundamentals of the engineering sciences and mathematics. Such an education will give the engineer flexibility and understanding in the utilization of new developments and techniques as they arise. Additionally, this background will prepare him for graduate work leading to career opportunities in research and development positions in government and industrial organizations and in teaching and research positions in the universities.

The graduate engineering mechanics program offers courses in the broad areas of fluid mechanics, solid mechanics and materials science. This program also offers advanced courses for engineers in such fields as civil, mechanical, aeronautics and astronautics who find that their work demands greater depth in understanding fundamental concepts and advanced methods of analysis.

Engineering mechanics students may elect to specialize at all degree levels in one of the elective options: dynamics, aeromechanics, fluid mechanics, aerodynamics, materials science, solid mechanics, space mechanics, vibration and wave propagation, or in a general option.

ENGINEERING MECHANICS CORE

EE 341 Electromagnetic Fields	3
EM 372 Fluid Mechanics	3
EM 413 Dynamics	3
<i>or</i> EM 415 Vibration Analysis	(3)
EM 422 Mechanics of Materials	2
EM 450 Mechanical Properties of Solids	3
<i>or</i> EM 451 X-Ray Diffraction and Crystallography ..	(3)
<i>or</i> EM 452 Theory of Solids	(3)
<i>or</i> ES 346 Methods of Engineering Analysis	(3)
<i>or</i> MA 460 Applied Real Analysis	(3)
ME 488 Heat Transfer	(3)
ME 489 Statistical Thermodynamics	3
Approved Mathematics Electives	3
Approved Design Electives	(3)
Approved Technical Electives	11

INDUSTRIAL ENGINEERING

Industrial engineering provides a multi-discipline approach for analyzing, understanding, and resolving operational problems within organizations. Emphasis is on objective and analytical procedures for structuring problems to facilitate sound decision making. The IE approach to decision making is to formulate an objective and the constraints imposed on the decision maker

and then to evolve decisions that accomplish the objective while meeting the constraints. The method for accomplishing the objective can involve physical theories, management concepts, and/or mathematical and computer models.

Modern industrial engineering approaches for designing effective operational systems are universally applicable to all forms of enterprise. Students must gain competence in several areas and be capable of understanding complex systems through the integrated application of knowledge from these areas. The primary areas are computer science, human factors, industrial statistics, industrial systems and production control, operations research and systems analysis, and organizational control.

The first degree awarded in industrial engineering is the Master of Science in Engineering degree, which is fully accredited by the Engineers' Council for Professional Development (ECPD). Graduate work also is offered leading to the degrees of Master of Science and Doctor of Philosophy.

At the undergraduate level, industrial engineering course work is offered within the engineering science (ES) curriculum. Specific ES options related to industrial engineering are production systems, operations research, computer science, quality control, and bio-engineering.

MECHANICAL ENGINEERING

Mechanical engineers are employed in such a variety of work that the curriculum is broad and fundamental. Much of the work of mechanical engineers is concerned with both theoretical and applied aspects of power generation, mechanical design, manufacturing, environmental control, nuclear technology, engineering measurements and instrumentation, automatic controls, energy conversion devices, engineering materials, and the general area of aircraft, propulsion systems, and manned and unmanned space flight.

In recent years, the field of aerospace has gained substantial international importance. Engineers in this field are concerned with the flight of aircraft, guided missiles, and space vehicles in planetary atmospheres and in the regions of space adjoining those atmospheres. Manned space flight is indeed a practical reality and the engineer's knowledge of such subject areas as space mechanics, propulsion, guidance and control systems, turbomachinery, nucleonics, aerodynamics, and flight vehicle structures is necessary.

Nuclear engineers are concerned with the release, control and utilization of all types of energy from nuclear sources. This includes the design and application of nuclear reactors for electrical power generation, marine propulsion, water desalting, and advanced power systems for outer space, applications of radio isotopes in the field of medicine, biology and agriculture as well as advanced research methods using neutron activation analysis and radio isotope tracers.

Mechanical engineering students may elect to specialize at all degree levels in one of the elective options: Aerospace, nuclear, design, measure-

ment systems and controls, thermosciences, or a less specialized general option. The mechanical engineering core is required for all options.

MECHANICAL ENGINEERING CORE

EM 422 Mechanics of Materials	2
EM 372 Fluid Mechanics	3
EM 415 Vibration Analysis	3
ME 488 Heat Transfer	(3)
ES 346 Methods in Engineering Analysis	(3)
or MA 460 Applied Real Analysis	(3)
ES 361 Measurement Systems Engineering	3
ME 382 Thermodynamics	3
ME 441 Principles of Design	3
ME 445 Preliminary Design	(3)
ME 491 Experimental Mechanical Engineering	2
ME 492 Mechanical Engineering Projects	2
Approved Option Electives	10

Mechanical Engineering elective options:

Aerospace

Electives: Students may select a minimum of 10 semester hours from the following courses: ME 427, 450, 451, 453, 455; EM 414.

Design

Required: ME 321 or 322, and 442.

Electives: Students may select a minimum of four additional semester hours from the following courses: ME 321, 322, 331, 427, 465, 487; EM 351, 413, 450.

Measurement Systems and Controls

Required: ME 462 and 465.

Electives: Students may select a minimum of four additional semester hours from the following courses: ME 463; EE 302, 332.

Nuclear

Required: ES 411.

Electives: Students may select a minimum of seven additional semester hours from the following courses: ME 412, 413, 415, 465, 487.

Thermosciences

Electives: Students may select a minimum of 10 semester hours from the following courses: ME 450, 453, 455, 483, 486, 487, 489; ES 411.

Pre-approved General Option

A minimum of 10 semester hours is required. The sequence of courses selected must have continuity and approval of the student's faculty adviser prior to enrollment in any of the selected courses. Normally courses should be selected from the above option groups, or from 300 and 400-level courses in engineering, the physical sciences, or mathematics. At least two of these courses must be 400-level courses.

Division of Agriculture

DANIEL O. ROBINSON, Ph.D., Director

PURPOSE

The purpose of the program in agriculture is to prepare students to serve the agricultural industry at home and abroad. The curriculum and courses offered are planned to meet the particular needs of the following students: (1) Those who are interested in preparing for careers in farm and ranch management, animal husbandry, crop production or horticulture; (2) Those desiring to prepare for a career in agricultural business; (3) Those desiring to prepare for a career in agricultural science; (4) Those desiring to prepare for foreign agricultural service; (5) Those who wish to take certain electives in agriculture while pursuing another curriculum; (6) Those who desire pre-forestry or pre-veterinary training, or preparatory courses for agricultural education.

ORGANIZATION

The Division of Agriculture is organized into three principal areas: agricultural economics, animal science, and plant science. Students will be assigned to faculty advisers in one of these areas depending on their field of interest.

DEGREES

BACHELOR OF SCIENCE CURRICULUMS IN AGRICULTURE

A student may select a curriculum according to his particular career objective. Fields of specialization may be chosen in agricultural science (agricultural economics, animal science, plant science), agricultural production and management, and agricultural business. A four-year program of 126 semester hours of credit, including general studies requirements and a field of specialization, leads to the Bachelor of Science degree. Special programs of study are available for students who wish to prepare for foreign agricultural service, agricultural education, pre-veterinary or pre-forestry. General requirements for the various fields of specialization and special programs are given below.

MASTER OF SCIENCE PROGRAMS

Programs leading to the Master of Science degree are offered in Agricultural Economics, Animal Science and Plant Science. Requirements for these programs are given in the *Graduate Catalog*.

FIELDS OF SPECIALIZATION

Agricultural Science. Specialization in agricultural science places emphasis on basic physical and biological sciences, economics, and mathematics. It is designed to prepare students for skilled professional work and to prepare them for advanced studies in their field of interest. Areas of emphasis include agricultural economics, animal science, and plant science. Specialization requirements including General Studies requirements are listed below.

Specific courses will be selected by the student under the direction of his adviser.

AGRICULTURAL ECONOMICS

Courses in agriculture	30
Courses in economics, business, physical sciences and mathematics	52
Elective and general studies courses	44
	126

ANIMAL SCIENCE AND PLANT SCIENCE

Courses in agriculture	30
Courses in physical sciences, biological sciences, and mathematics	52
Elective and general studies courses	44
	126

Agricultural Production and Management. Specialization in agricultural production and management places emphasis on the technology of production and management and is designed to prepare students to become farmers, ranchers, farm managers, foremen, herdsmen, and for work with government agencies and the technical phases of industry. Areas of emphasis include farm and ranch management, animal husbandry, crop production, and horticulture. Specialization requirements in addition to General Studies requirements are listed below. Specific courses will be selected by the student under the direction of his adviser.

Courses in agriculture	48
Supporting courses in economics, physical sciences, biological sciences and mathematics	34
Elective and general studies courses	44
	126

In addition to the academic requirements outlined above, students are required to demonstrate ability in the practical phases of production and husbandry related to their areas of emphasis. Students without adequate farm background can gain experience in farm practices at the University Farm, or on any farm that meets the approval of the adviser.

Agricultural Business. This field of specialization provides the agricultural student with the opportunity to combine a program in agriculture with courses in business and management. It is designed to prepare students for work in the agricultural industries concerned with handling, processing, and marketing farm products. It also prepares students for work in agricultural credit institutions and service industries supplying equipment and materials used in agriculture. Agriculture courses may be selected for

particular emphasis in plant industry, animal industry, or agricultural economics. Specialization requirements in addition to General Studies requirements are listed below. Specific courses will be selected by a student under the direction of his adviser.

Courses in agriculture	36
Courses in economics and business	35
Courses in physical sciences, biological sciences, and mathematics	11
Elective and general studies courses	44

126

SPECIAL PROGRAMS

Foreign Agricultural Service. This program of studies is available for students desiring preparation for agricultural work in foreign industries and developing countries of the world. The objective is to give the student an opportunity to become better acquainted with the physical and cultural environment in which he plans to work. Under the guidance of his adviser, the student may select elective and general studies courses to give a unified area of study concerned with the physical and cultural geography of a region, as well as the government, history, language, religion, philosophy, and esthetic values of the people.

Whenever feasible, applied work in agriculture, business, and the social sciences will be conducted with American Indian people who have similar problems of underdeveloped resources and talents.

Area study courses should be selected from the following:

SUBJECT FIELD

Geography	6
History	6
Foreign Language	8
Sociology and Anthropology	9
Philosophy and Art	8
Political Science	3
Psychology	3

43

Agricultural Education. The first two years of the curriculum preparing students to teach vocational agriculture in the high school is offered as a special program. Students interested in agricultural education may enroll under animal science or plant science and, in consultation with their adviser, may select courses to meet requirements of the college from which they plan to obtain their agricultural education degree.

Pre-Forestry. Students interested in pre-forestry preparation will enroll in the plant science curriculum, selecting with their adviser courses that meet the specific requirements of the professional school of their choice.

Pre-Veterinary. Students interested in pre-veterinary preparation will enroll in the animal science curriculum, selecting with their adviser courses that meet the specific requirements of the professional school of their choice.

Completion of the animal science curriculum, including the pre-veterinary program, leads to the Bachelor of Science degree. This can be accomplished in the normal four-year sequence or a three-year pre-veterinary program may be combined with the first year of professional study to complete degree requirements. A pre-veterinary student having completed 94 semester hours of college credit with a minimum of 60 semester hours at ASU and having completed all general studies requirements and 30 hours in agriculture, may receive a written statement from the Dean of the College of Engineering Sciences giving senior-in-absentia privileges. The student will be eligible to receive the degree after the Registrar's office receives a recommendation from the dean of the professional school and a transcript of credit indicating the student has completed 126 semester hours with a cumulative index of 2.00 or better.

The three-year Pre-Veterinary program shown below meets the requirements for most veterinary colleges and also leads toward the Bachelor of Science degree.

FIRST YEAR

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
1 EN 101 First Year English	3	1 EN 102 First Year English	3
1 MA 117 College Algebra	3	1 MA 118 Trigonometry	2
4 AS 150 Animal Science	3	1 CH 115 General Chemistry and Qualitative Analysis	5
1 CH 113 General Chemistry	4	1 ZO 100 General Zoology	4
0 SE 100 Elements of Speech	3	4 AE 100 Agricultural Economics	3
		1 PE 101 Physical Ed. Activity	1

SECOND YEAR

1 BI 240 General Genetics	3	1 BO 100 General Botany	4
1 MA 120 Analytical Geometry and Calculus I	5	1 HI 104 History of U.S. Agriculture Electives	10
1 HI 103 History of U. S.	3		
4 AS 252 Animal Feeding	3		
4 AS 253, 271, or 291 Production Practices	2		

THIRD YEAR

0 HU 301 Humanities	4	0 HU 302 Humanities	4
1 PH 111 General Physics	4	1 PH 112 General Physics	4
1 CH 331 Organic Chemistry or CH 231 Elementary Organic Chemistry	4	1 CH 332 Organic Chemistry or CH 225 Quantitative Analysis Agriculture Electives	4 6
4 AE 300 Agrarian Heritage	3		
Agriculture Elective	3		

Division of Construction

EDWARD F. SHAIFFER, JR., B.S., Director

ORIGIN AND PURPOSE

The four-year Bachelor of Science degree in Construction became an operational program in 1957 in answer to recommendations by the American construction industry that a distinct academic discipline be established to prepare students directly for positions of leadership in the business of construction and its many related fields. The program has been developed from fundamental architectural, business, construction and engineering curricula with the counsel of advisory groups representing leading associations of builders and contractors to ensure a balanced understanding of both the philosophic and professional essentials which distinguish modern-day builders and constructors.

Scholarships. Apart from those given by the University generally, scholarships are awarded on the basis of work done in the construction program.

Testing. A construction aptitude test is given to all entering students during the registration period in the Fall. It is employed for counseling purposes rather than selection.

Honors Program. Construction students with outstanding academic records may be admitted to the Honors Program. Application may be made to the Director of Construction. This program provides an opportunity for students with exceptional ability to select an academic program to meet individual needs. Considerable opportunity is given for independent study under the direction of an Honors Adviser.

For further details regarding University Honors Program see the description on page 92.

Special Admission Requirements. Construction students who have deficiencies in subject matter entrance requirements may be required to complete additional University credit course work which may not be applied toward the Construction degree. The most common deficiencies are in mathematics. One or more of the following courses may be required depending on the applicant's prior preparation: MA 116 Intermediate Algebra, MA 117 College Algebra and MA 118 Trigonometry.

Before enrolling in upper division construction courses, students should complete AC 101, EN 102, CE 241, and all lower division construction requirements or equivalents.

BACHELOR OF SCIENCE DEGREE IN CONSTRUCTION

Students seeking the Bachelor of Science degree in Construction must satisfactorily complete a minimum curriculum of 126 semester hours. The basic general construction curriculum is arranged to develop management, leadership, and competitive qualities in the student through general education fundamentals and a broad range of theoretical and applied science subjects essential to building, heavy, and industrial construction contracting. Expository reasoning and problem-solving skills are stressed throughout the three principal divisions of the program:

GENERAL STUDIES AND COMMUNICATIONS COURSES furnish a broad base for developing understanding of the modern world and the relation of construction to it.

General Studies: (See also University requirements, page 91.)

<i>Humanities and Fine Arts:</i> Approved electives in architecture, literature, and philosophy	8-9
<i>Social and Behavioral Sciences:</i> Economics, EC 201, 202; approved management, law and urban science electives	15-18
<i>Sciences and Mathematics:</i> Physics, PH 111, 112; Chemistry, CH 113; Analytical Geometry and Calculus, MA 120; electives in statistics and computer science	22
Total	45-49
<i>Communications:</i> English 102 or 104; Speech elective, Technical Communications ES 400 (These are minimum requirements. Students who are not strong in written or verbal expression may be required to undertake additional communications courses.)	9-18

BUSINESS AND CONSTRUCTION MANAGEMENT COURSES offered in the Colleges of Architecture, Business Administration and Engineering Sciences furnish an understanding of fundamental principles of planning, organizing, controlling and directing the business affairs of contracting.

Organization, management, and administration:	
CO 101, IE 439, CO 481, 491, 496	13
Accounting and costs: AC 101, CO 381, IE 311	8
Estimating: CO 383, 484	6
Total	27

TECHNICAL COURSES offered in both the Colleges of Architecture and Engineering Sciences provide knowledge of buildings and structures, the materials of construction and the techniques, systems, and processes related to engineering, architecture and construction.

Applied sciences: CO 221, 323; TD 360; CE 380, 450	15
Methods analysis and design: ES 102; CO 243, 244, 361, 424, 463	16
Drawing and surveying: ES 104; CE 241, 344	8
Materials and equipment: CO 251; CE 310	4
Total	43
Minimum Total 4-year curriculum	126

To accommodate students who, by directed interest or background, prefer to select alternate technical course work in a defined construction field, the following options are available:

Urban and Residential Construction Option:

Delete from basic curriculum ES 102; CE 310, 344, 380; TD 360; CO 323, 424, 463, 481, 484. Add CO 471; FI 325; RE 251, 331, 401, 411, approved urbanology and ecology electives, 6 hours.

Electrical Construction Option:

Delete from basic curriculum CE 310, 344, 380, 450; TD 360; CO 323, 424, 463, 484. Add CO 386 and approved electrical power and instrumentation electives 22 hours.

Mechanical Construction Option:

Delete from basic curriculum CE 344; CO 323, 424, 463, 484.
Add CO 385; ME 432; TD 305, 340; TM 364, 460.

Division of Technology

WALTER E. BURDETTE, Ed.D., Director

PURPOSE

The Division of Technology serves several major functions, among which is the offering of a variety of four-year Bachelor of Science degree curricula designed to prepare technical support personnel who will assume roles as important members of the total technological team comprised of scientists, engineers, technologists, technicians, and other specialists.

The scope of emphasis in each curriculum prepares supporting personnel in the major areas of research, development, and manufacturing. While comprehensive and foundational understanding of scientific principles is required, the essential nature of the task to be performed is in translation of the scientific ideas or discoveries into useful products and services. Consequently, these curricula combine general foundations of scientific theory and facts with laboratory experiences which are designed to instruct in methods rather than to develop extensive skills.

Finally, it is the added purpose of these curricula to make the student keenly aware of the urgent problems of society and to develop deeper appreciation of the cultural achievements of man.

The student may select that particular area of technology which conforms to his interests or his plans with respect to the industry in which he pursues his career. For convenience, the fields of specialization are shown in the following list:

Aeronautical Technology <i>Aerospace Technology</i> <i>Air Transportation</i> <i>Technology</i> <i>Air Transportation</i> <i>Management Technology</i>	Graphics Arts Technology Industrial Technology <i>Communication Technology</i> <i>Design Technology</i> <i>Manufacturing Technology</i> Technical Education Technology
Electronic Technology	

A parallel function of the Division is the preparation of teachers of industrial education or technical subjects in the elementary and secondary schools, community colleges and universities. Many educational leadership positions exist at these levels, as well as in technical institutes and in industry. Among these are the positions of technical teachers, department heads, supervisors or directors, consultants, and industrial training directors requiring preparation beyond the undergraduate degree. It is the purpose of the Division of Technology to meet these needs through offerings leading to the completion of the Master of Arts in Education, the Education Specialist, the Doctor of Philosophy, and the Doctor of Education degrees with specialization in industrial education. (See *Graduate Catalog*).

ORGANIZATION

Fields of specialization in Technology have been organized around a core. This technology core constitutes the common base of science, mathematics, graphics and technical communications. Similarly, industrial arts teacher education is organized about a common core.

Courses of instruction offered by the Division are organized under the various technologies listed in the preceding section, and under the field of industrial arts education.

BACHELOR OF SCIENCE

Technology curricula require the satisfactory completion of a minimum of 126 semester hours, which includes general studies courses, technology core courses, required courses in the field of specialization, supporting field courses and electives. More specific details regarding purposes of these curricula, follow in the individual field of specialization materials.

TECHNOLOGY CORE

TD 111 Technical Graphics	3
TD 121 Technical Analysis and Design	3
TD 400 Technical Writing	3
TE 100 Electricity and Electronics	4
MT 101 Manufacturing Operations and Materials	3
CH 113 General Chemistry	4
EC 201 Principles of Economics	3
EE 226 Computer Programming	2
MA 120 Analytic Geometry and Calculus I	5
or MA 142 Mathematical Analysis II	3
PH 111 General Physics	4

32 or 34 credits

Beyond the requirements of general studies and the above core, the field of specialization requirements for the various technology curricula are as follows:

AERONAUTICAL TECHNOLOGY

Instruction combines thorough technical training with a general university education to prepare aeronautical technologists for employment throughout the aero-space industry. The curriculum is designed to prepare aeronautical engineering technologists with both theoretical and practical applications in the areas of structures, internal combustion engines and turbomachinery, fuels, lubricants, combustion, design, management, general and commercial aviation, and systems analysis. Three options are available in the degree program:

AEROSPACE TECHNOLOGY, AIR TRANSPORTATION TECHNOLOGY (*flight*), and AIR TRANSPORTATION MANAGEMENT TECHNOLOGY (*non-flight*).

AEROSPACE TECHNOLOGY

Required courses: TA 180, 181, 287, 288, 300, 301, 306, 307, 308, 384, 388, 390, 487, 488, 490, 498; CH 114; GB 101; ME 330, 380, 381; MT 166; PH 112. An additional 17 credits are required in specialization or supporting field.

AIR TRANSPORTATION TECHNOLOGY

Required courses: TA 180, 181, 182, 183, 185, 287, 288, 300, 302, 303, 305, 306, 308, 309, 310, 311, 382, 383, 384, 385, 386, 387, 388, 390, 391, 487, 488, 491, 492, 493, 498; CH 114; GB 101; ME 380; PH 112.

AIR TRANSPORTATION MANAGEMENT TECHNOLOGY

Required courses: TA 180, 181, 287, 288, 300, 303, 306, 307, 308, 311, 384, 388, 390, 391, 487, 488, 491, 492, 493, 498; CH 114; GB 101, 305; IE 322; ME 330, 380; MG 301; MT 166; PH 112.

ELECTRONIC TECHNOLOGY

A broad program of electronics is offered to provide men and women an opportunity to prepare for employment in many areas of modern industry. The program of studies includes practical as well as theoretical training in a broad field of electronics. The program permits specialization in computers, industrial electronics, instrumentation and control, communications, and other areas associated with electronics. Students in other curriculum areas may select course work to strengthen their particular area of concentration.

Required courses: TE 101, 200, 213, 300, 301, 315, 330, 331, 340, 400, 412, 415; IT 160; PH 112. An additional 12 credits are required in specialization or supporting field.

GRAPHIC ARTS TECHNOLOGY

This program is designed to provide broad professional education essential for a wide range of careers in the graphic arts industry. Among these are positions in administration and general management, production and quality control, sales and sales management, communications, design, estimating, and research.

Required courses: GA 135, 136, 236, 237, 238, 333, 334, 336, 337, 339, 435, 436, 438; IT 443; AR 181; MA 141; CH 114; GB 101. An additional 12 credits are required in a specialization or supporting field.

INDUSTRIAL TECHNOLOGY

The increasing complexity of industrial activity from product design and development, through manufacturing and quality control, has correspondingly established increasing demands for industrial technologists for this diversified professional field. The industrial technology program has been designed to prepare engineering technologists to generally satisfy industrial manufacturing requirements. The program provides for specialization within three distinct industrial fields: *communications technology*, *design technology*, *manufacturing technology*.

All three fields of specialization maintain a common industrial technology core, in addition to the required Division of Technology core, to insure a foundation in engineering technology.

INDUSTRIAL TECHNOLOGY CORE

TD 310 Applied Mechanics (Statics)	3
TD 315 Applied Mechanics (Strength of Materials)	3
TD 340 Fluids	3
TD 360 Mechanics of Machinery	3
TD 402 Value Analysis	3
MA 120 Analytical Geometry and Calculus	5
ME 230 Manufacturing Materials	2
ME 330 Metallurgy	3
ME 380 Thermodynamics	3
PH 112 General Physics	4

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Communications Technology. The curriculum offers students preparation encompassing the four major areas of technical communication as follows: technical library storage and retrieval science, graphics, technical writing, and technical editing and publishing.

The supporting studies in mathematics, science, business and technical work are planned to balance the preparation and provide the graduate with versatility for entrance to the very rapidly growing employment opportunities in technical communications.

Required courses: TD 160, 220, 221, 380, 381, 498; GA 135, 136; EN 313; MC 110, 211, 312, 313.

Design Technology. Design is the process involved in specifying solutions to satisfy mankind's needs. Design is a problem-solving process employing graphics, mathematics, manufacturing processes, science, and individual attitude. A designer's academic requirements are determined primarily by the nature of the problems he will solve professionally. For this reason the design program maintains two options to allow for specialized education in specific areas of design activity.

MECHANICAL DESIGN

The engineering designer's prime objective in product development is to develop, improve efficiency, reduce costs, and prepare the necessary working drawings and specifications. He is concerned primarily with how a machine he designs affects, or is affected, by other machines and processes — the machine/machine relationship. *Required courses:* TD 100, 112, 200, 201, 303, 305, 308, 350, 351, 406, 407, 410, 411, 450, 451.

INDUSTRIAL DESIGN

The industrial designer is generally involved in the entire process of product development from initial idea through development and manufacturing, planning, marketing, advertising, and distribution of that product. Human factors are of primary concern for the industrial designer; how the machine he designs affects human activities — the man/machine relationship.

Required courses: TD 100, 160, 260, 261, 301, 302, 410, 411, 450, 451; AR 114, 141; GA 135; MG 301; MK 300.

Manufacturing Technology. Increased technological complexity and sophistication have created great industrial demand for the services of men who possess working knowledge of the technical phases of production. Manufacturing technologists perform a vital function in the follow-through and completion of engineering decisions and the solving of manufacturing problems. Accordingly, this curriculum is intended to prepare students to meet the responsibilities in planning the processes of production, developing the tools and machines, and integrating the facilities of production or manufacturing.

Two options are included in the manufacturing program to permit specialization in either industrial operations or welding.

INDUSTRIAL OPERATIONS

The emphasis in this option relates to the managerial functions of manufacturing. The graduate will be prepared to enter the field of manufacturing operations, technical services, industrial sales, and other manufacturing-related professions.

Required courses: MT 161, 164, 262, 366, 461, 462, 463, 467, 468; TD 370, 371; MG 301, 331; IE 322.

WELDING

This option is designed to meet established needs in industry for men trained specifically as supervisors or consultants in welding and related fields. The option offers opportunities for students to gain both theoretical and practical knowledge of the techniques and applications of the principal welding processes. Emphasis is on design, graphics, metallurgy, and manufacturing processes in metalworking industries.

Required courses: MT 161, 164, 166, 262, 266, 364, 369, 461, 463, 464, 466, 470; CH 114.

TECHNICAL EDUCATION TECHNOLOGY

The purpose of this program is to develop competency in one of the technologies and in professional education. This four-year technology curriculum prepares personnel for positions as instructors or training directors in industry or for teaching positions in technology programs of educational institutions.

Required courses: IT 160, 342, 443, 446, 480, 498; EP 422; GA 135; PS 312; PY 100, TA 180. An additional 30 credits are required in a specialization or supporting field.

TWO-YEAR TECHNICAL CURRICULA AND UNCLASSIFIED STUDENTS

Students not desiring to pursue a four-year degree program may secure specialized preparation at the college level in industrial activities. Unclassified students are those who are not enrolled in any curriculum leading to a degree but who desire instruction in subjects of special interest to themselves. Moreover, a student may choose one of the two-year curricula

from a field of specialization. Specific courses included in the student program must have the approval of his adviser.

INDUSTRIAL ARTS EDUCATION

The specific objective of this curriculum is to prepare students for the requirements of industrial arts teaching in the secondary schools. The carefully planned pattern of course work permits students to receive a balance and sequence of study. The curriculum leads to a Bachelor of Arts in Education and certification for teaching. For the specific requirements of general and professional education, consult the "College of Education" section.

MAJOR TEACHING FIELD

The major teaching field requires the satisfactory completion of 45 semester hours of which 19 hours are required laboratory courses, 11 hours are required in professional industrial arts courses, and 15 hours are elected with adviser approval from an area of specialization.

INDUSTRIAL ARTS CORE

TD 111 Technical Graphics	3
GA 135 General Graphic Arts	3
IT 121 Industrial Wood Processes	3
IT 160 General Metals	3
IT 170 Transportation and Power	2
IT 204 Industrial Arts Design	2
IT 220 Electricity	3
IT 342 Selection of Subject Matter	3
IT 346 American Industries	2
IT 480 Teaching Industrial Subjects	3
IT Professional Elective	3
	30
Area of specialization electives	15
	45

Minor teaching areas available:

Industrial Arts	Metals
Drafting	Transportation
Electronics	and Power

Eighteen semester hours of work are required. See minor adviser for approved course sequence.

College of Architecture

James W. Elmore, M.S. in Arch.

Dean



New Architecture Building

PURPOSE

The College of Architecture seeks to provide each of its graduates with: (a) a thorough and intimate comprehension of the nature of architecture; (b) the competence necessary to acquire professional registration; (c) the high ideals necessary for responsible and creative functioning as an individual and as an architect in our changing society.

AFFILIATIONS

The program is accredited by the National Architectural Accrediting Board and provides educational qualification for registration under Arizona law as administered by the State Board of Technical Registration in conformity with the recommendations of the National Council of Architectural Registration Boards. The College is a member of the Association of Collegiate Schools of Architecture. An advisory committee of six architects practicing locally and in neighboring states give counsel in shaping policies of the College. The Architecture Foundation provides for enrichment of programs through administration of the supporting contributions of various private associations, firms and individuals. The Central Arizona Chapter of the American Institute of Architects lends support in many ways, including award of scholarships and sponsorship of the Student Chapter of the American Institute of Architects.

CONCEPT OF THE PROGRAM

Recognizing the student's need for at least one year of college level work to identify or verify his interest and aptitude for architecture, the five-year Bachelor of Architecture curriculum is divided into a one-year *pre-architecture* program and a four-year *professional* program.

The pre-architecture year includes, in addition to general studies, an introductory/theory/lecture course in architecture each semester and one or two introductory studio courses as determined by the extent of the student's preparation. It is possible for the pre-architecture year to be completed at some junior colleges and other collegiate institutions; admission to the professional program is then subject to the same limitations as those described below for students beginning at ASU.

The professional program consists of courses in architectural philosophies, technologies and design, emphasizing the latter. Each course of the eight-semester design synthesis sequence has certain emphases identified in the course descriptions and related to the content of preceding courses in architectural technologies. In these studio courses, team teaching methods are employed, through scheduled studio consultation by specially qualified instructors, to facilitate the student's assimilation and application of the theories and techniques introduced in the lecture/theory courses just completed.

The objective of the design/synthesis sequence is two-fold: first, to introduce and promote cumulative synthesis of the full spectrum of architectural problem-solving processes and, second, to assist the student in advancing his professional capabilities and focusing them in areas of significant human concern. Through the process of solving a variety of architectural and other problems, with faculty guidance and in competition with his peers, the student lays an academic foundation for those personal techniques and philosophies that he will develop through perhaps 45 years of apprenticeship and practice in a rapidly changing profession.

The College wishes to make the *pre-architecture program* available to as many students as possible and has established admission requirements with this objective in view. The College further believes that it can provide the highest quality of architectural education if it remains relatively small and limits the number of students working with each critic in each design studio. Guided by this principle, the College provides faculty, space and resources for approximately 50 students at each of the four levels of the *professional program* and regulates admission, retention and advancement through procedures described hereinafter. All certificates of admission to the University for the study of architecture carry the notation: "Admission to any program in architecture must be obtained from the Dean, College of Architecture."

ADMISSION

For fall admission, students are encouraged to complete all application requirements prior to June 1; for spring admission, prior to November 1.

Applicants should present certain secondary school units in addition to the minimum University requirements shown on pages 68-69. Mathe-

matics should include algebra, advanced algebra, geometry and trigonometry for a total of at least three units with grades of "C" or better. Laboratory sciences should include one unit of physics and one unit of chemistry. Other units should include additional math, art and social sciences.

Additional requirements for admission at each level of the five-year program are outlined below.

Admission to the pre-architecture program requires:

- a) Admission to the University in the College of Architecture as evidenced by certificate from the Director of Admissions.
- b) Submission of completed Student Qualification Record to the Dean's office.
- c) Rank in upper half of high school graduating class, *or* above the 75th percentile in test scores, *or* above 2.25 cumulative scholarship index for completed college work. The University certificate of admission for an applicant ranking lower will be marked: "Provisional. Verification of status must be obtained from the Dean, College of Architecture." Such an applicant may pursue a program of general studies and will be accommodated in architecture courses as space and resources permit. A student not qualifying for full, non-provisional admission to the pre-architecture program at the beginning of his second semester will be counseled for transfer to another curriculum.

For the fall semester, notices of admission are sent by the Dean's office on July 1 and August 1; for the spring semester on January 15 and 30.

Admission to the professional program requires:

- a) Admission to the University and completion of at least 29 semester hours of college level work, including courses AP 100 and 101, AT 141 and 142 or their equivalents, with cumulative scholarship index above 2.00 and at a sufficiently high level to accord preference to the applicant over others applying.
- b) Submission to the Dean's office of application form and portfolio of completed drawing and design work.
- c) Satisfactory score on the Architecture Aptitude Test, taken normally during the pre-architectural year.

A student not admitted or advanced to the professional program may have failed to qualify, may have found architecture not suited to his interests and talents, or may have found another goal to be more attractive. Such a student will be counseled for transfer to a degree program such as construction, engineering, business, fine arts or other area of his developing interest.

Admission to the professional program at a level higher than AD 221 requires:

- a) Admission to the University and completion of course work prerequisite to the level sought with cumulative scholarship index above 2.00 and at a sufficiently high level to accord preference to the applicant over others applying.
- b) Submission to the Dean's office of completed Student Qualification Record form and portfolio of completed drawing and design work. Examination of these by the College Admissions and Standards Committee

will determine if and what appropriate level the transfer student might enter the professional program. The applicant for advanced standing should allow at least a month for evaluation of his work and should make no assumptions concerning the Committee's findings before they are reported to him.

ADVANCEMENT AND RETENTION

Advancement from one design/synthesis course to the next requires:

- a) A grade of "C" or better and recommendation of the critic in the last completed design/synthesis course.
- b) Satisfactory completion of all prerequisite courses.
- c) Recommendation of the College Admissions and Standards Committee if cumulative index is below 2.00.

Retention in the Bachelor of Architecture program of a student not meeting the above standards for advancement in the design/synthesis sequence requires action by the College Admissions and Standards Committee. If a student's request for permission to enroll in professional courses other than design is approved, he and his adviser will be so notified. If not, he may remain and be advised in the B. Arch. program for a period of one semester while he completes transfer to another curriculum.

SCHOLARSHIPS

Apart from those given by the University generally, scholarships are awarded only on the basis of work done in the College of Architecture.

SPECIAL REQUIREMENTS

Work done in satisfaction of all degree requirements becomes the property of the College; when not required for exhibit or reference, it may be returned to the student. Two bound copies of the student's thesis research must be furnished to the architecture library.

BACHELOR OF ARCHITECTURE DEGREE CURRICULUM

A student seeking the Bachelor of Architecture degree must satisfactorily complete a curriculum of 170 semester hours, including basic military science or aerospace studies if elected. The requirements in the major categories of course work are recapitulated as follows:

Communications—The University requirement for Freshman English is on page 92.

English: EN 101, 102 (or 104) 6

General Studies provide a broadening and enrichment of the student's outlook and a preparation for the technical and professional content of the program to follow. Certain courses meeting the University requirements in general studies are specified in the B. Arch. curriculum but may be waived in favor of electives in the same areas for a student whose high school record is distinguished by grades above "B" and test scores above the 85th percentile in such subject areas. These courses are: MA 141 Mathematical Analysis, 4 hours; PH 111, 112 General Physics, 4 hours each; and HI 101, 102 Survey of Western Civilization, 3 hours each, a

total of 18 semester hours. University general studies requirements, as further described on page 91, are:

Humanities and Fine Arts	8
Social and Behavioral Sciences	8
Sciences and Mathematics	8
Electives in the above areas	12
	36

Architectural Philosophies (AP) develop understanding of architecture as both a consequence and a determinant of man's character in the past (history) and at present (theory). Required courses are:

Introduction and Fundamentals: 100, 101	4
History of Architecture: 313, 314 and electives	12
Seminar: 415	2
	18

Architectural Technologies (AT) develop knowledge of the technical determinants, resources and processes of architecture. Including the nine one-hour studio consultation courses indicated by asterisk, the required courses are:

Landscape Architecture: 237, 238*	3
Planning and Urban Design: 432, 433*	3
Architectural Communications: 141, 142, 241, 242*	7
Materials and Techniques: 254, 455, 456, 457*, 458*	11
Structures: 261, 362, 363, 365*, 366*, 464	14
Mechanical and Electrical Systems: 371, 372, 473*, 474*	8
Professional Practice: 484	3
	49

Architectural Design/Synthesis (AD): Work in architectural design demands and encourages synthesis of the knowledge and understanding the student has gained from course work and all other sources. Required courses are:

Design: 221, 222, 320, 323, 324, 425, 426, 427	29
Thesis Research and Thesis: 494, 495	11
	40

Electives enable the student to fortify weaknesses, exploit strengths and pursue special interests. Choices are made by the student with his adviser with the objective of increasing both his appreciation of the numerous areas of general studies and his depth of understanding in several of them. Elective opportunities provided beyond those in the general studies program are:

Electives	21
Total of normal ten-semester curriculum	170

College of Nursing

Loretta Hanner, M.S.
Dean



Patient Care Study

PURPOSE

The faculty of the College of Nursing acknowledges its responsibility to Arizona and the world community for providing nursing care of professional quality through teaching, research, and service. The purpose of the College of Nursing is to promote nursing care which considers emotional, physical and sociological need in the prevention and treatment of human illness. This nursing care is based upon the belief that all human life has dignity and worth, that there is potential for growth in every individual, and that every individual has the right to achieve and maintain health.

It is the belief of the College of Nursing that professional behavior is based upon a balance of liberal and special education and that the professional nurse is committed to the utilization of such knowledge and skills to help other human beings achieve and maintain maximum well-being.

REQUIREMENTS FOR ADMISSION AND RETENTION

The program is designed to meet the academic needs of students who enter as freshmen or who transfer from other programs within the University or from other educational institutions. (See pages 67-71.)

1. Freshman students must meet University standards and follow the

procedure as stated in the Admission section of this catalog. In addition, the high school program of the student wishing to register in nursing must include algebra, advanced algebra and an additional unit of mathematics for a total of 2½ units; laboratory sciences must include one unit of biology and one unit of chemistry or equivalent; an additional unit of physics is recommended. Students unable to meet the prerequisite requirements in high school mathematics and science will have an opportunity to meet the equivalency through prescribed University course work.

2. Transfer students must meet the retention standards of the University and follow the procedure for admission to the University as stated on pages 67-79 and, if transferring from another educational institution, also request the college to send a transcript to the Dean, College of Nursing. Transfer credits which are accepted by the Registrar will be evaluated by the College of Nursing Standards Committee to determine their application toward fulfilling the requirements of the nursing program.
3. Students who have completed nursing coursework in a school of nursing and/or college should request that their previous institution(s) send two transcripts of their school of nursing work and/or previous college work, one directly to the Registrar and Director of Admissions and one to the Dean, College of Nursing. After the Dean, College of Nursing, has received all transcripts the student should make an appointment for the evaluation of previous coursework. Students may earn credit through comprehensive examinations in nursing courses if they so select. A proficiency examination may be required for the validation of transfer credits in nursing courses from another university.
4. Prior to enrolling in the nursing major each nursing student must receive approval from the office of the Dean of the College of Nursing, and secure from his adviser an approved course of study for the remaining work. A minimum grade of "C" is required in all courses identified as prerequisites to nursing courses. A student must maintain a cumulative index of 2.00 ("C") and achieve a minimum grade of "C" in all nursing courses in order to remain in the nursing major.
5. All students, except those who receive a grade of "B" or better in English 102, or who passed English 104, shall, before the end of their sophomore year, take and satisfactorily achieve in a written English Proficiency Examination. Failure to take this examination at the proper time or failure to achieve will make them ineligible to take upper division courses. This ineligibility will continue until such time as they satisfactorily achieve in a subsequent examination.

BACHELOR OF SCIENCE IN NURSING

Students admitted to the nursing program prior to January, 1967, and in continuous attendance, will continue in the course of study outlined in the catalog in effect at the time of admission. Such students must complete the program by June, 1971.

Students admitted to the nursing program after January, 1967, will follow the course of study suggested in the College of Nursing *Bulletin* at the time of their admission.

The Bachelor of Science in Nursing is granted upon completion of 126 semester hours. The nursing program consists of completing the General Studies requirements of Arizona State University, selected non-nursing courses, and the major in Nursing. The Nursing major includes courses based on scientific principles and concepts from maternal and child, medical and surgical, psychiatric and public health nursing. The Nursing major begins in the junior year.

Students without previous nursing course work can usually complete the plan of study leading to the degree of Bachelor of Science in Nursing in four academic years. Many students, however, may find it advantageous or necessary to devote more than this minimum time to the undergraduate nursing program of study by pursuing fewer studies in any one semester than are regularly prescribed. In cases of inadequate secondary preparation, or financial necessity requiring time for outside work, the time for the undergraduate course should be extended. A student who so desires may devote an increased length of time to his undergraduate work and include additional instruction in the liberal arts.

The College of Nursing program prepares students for beginning professional practice in psychiatric, maternal and child, medical and surgical, and public health nursing. It also provides a foundation for further preparation and specialization in clinical nursing, supervision, administration and teaching.

ACCREDITATION

The program of the College of Nursing has been approved by the Arizona State Board of Nursing and the National League for Nursing. The College is a member of the Council of Member Agencies for the Baccalaureate and Higher Degree Programs of the National League for Nursing and the Western Council on Higher Education for Nursing. The College is approved by the Army Nurse Corps and the Navy Nurse Corps, so that qualified students may apply for the Army Student Nurse and Navy Student Nurse programs.

COLLOQUIA

Colloquia will be scheduled upon request from students who wish orientation to the nursing major.

SCHOLARSHIPS

For information regarding scholarships and loans, see page 101. Information about other loan funds for student nurses may be obtained from the Director of Financial Aids or the Dean of the College of Nursing.

STUDENT ACTIVITIES

The nursing student is a member of the general student body of the University. Students of the College of Nursing are eligible for membership in the Student Senate of ASASU, Arizona Association of Student Nurses and the National Student Nurse Association.

STUDENT HEALTH

In addition to the health policies of the University, the student enrolled in the nursing major is responsible for having an annual physical examination, an evaluation of his immunization status, and immunizations as needed. The physical examination must be completed during the summer and the reports returned to the Student Health Service by August 31. The nursing student must also have an annual X-ray and/or tuberculosis skin test.

When it is considered beneficial in program planning for the individual student, a medical statement from the student's family physician may be required.

STUDENT TRANSPORTATION

The College of Nursing is located in close proximity to federal, state, county and private health agencies used for selected clinical experiences with patients and families. Students will provide their own transportation to the health agencies and other selected experiences, such as home visits to patients and families.

REGISTERED NURSE STUDENTS

Registered nurse students fully admitted and enrolled in the nursing program by spring semester 1967 and planning to complete requirements for the Bachelor of Science in Nursing degree under a previous catalog must complete those requirements by August, 1971.

Registered nurse students admitted during spring semester 1967 or later, or completing degree requirements after August, 1971, should meet degree requirements outlined in this catalog.

GRADUATE PROGRAM

The College of Nursing offers a program leading to a Master of Science in Nursing degree with specialization in Community Mental Health-Psychiatric Nursing or in Family Health Nursing. Persons interested in applying for admission to the program should write to the Arizona State University Graduate College for a catalog and application forms.

College of Fine Arts

Henry A. Bruinsma, Ph.D.

Dean



Department of Music Section in Gammage Auditorium

PURPOSE AND ORGANIZATION

The College of Fine Arts functions within the general framework and philosophy of the University. In addition to providing services and courses in the General Studies program of the University, the College provides thorough professional training for properly qualified students, supported by a broad background of courses designed to prepare the student for responsible citizenship.

The College, through its programs in art, dance, music, speech and drama, and in the interdisciplinary humanities, reflects the wide range of challenges facing the communicative artist and scholar in the Twentieth Century. Located on a campus with strong supporting departments, the College provides each student the philosophical foundation for his art, strengthened by the other scientific, behavioral, and humanistic disciplines fundamental to the forming of the contemporary creative artist and scholar.

In addition to the curricula offered by each department of the College, close ties are maintained with the Colleges of Liberal Arts and Education through courses and curricula designed to meet the educational goals of those Colleges. The College of Fine Arts also enriches the life of the University community through its extension and laboratory offerings with an

intensive series of art exhibitions, the operation of the University Art Gallery and the several Art Collections, concerts and recitals, dramatic productions, musical theatre, lectures, and various diagnostic and clinical services.

GENERAL STUDIES PROGRAM

To meet the General Studies requirement, students in the Bachelor of Arts and the Bachelor of Science degree programs must take a minimum of 54 semester hours of credit in General Studies. Students in the Bachelor of Fine Arts and the Bachelor of Music degree programs must meet the University minimum requirement of 36 hours of credit in General Studies. At least eight credit hours of course work must be taken in each of the fields of humanities and fine arts, social and behavioral sciences, sciences and mathematics. Courses in the field of specialization may not be used to meet the General Studies requirement, but courses included in related fields normally considered as part of the major may be included. Students are reminded of the University requirement in Freshman English in addition to the above. See page 91 for complete description of the University General Studies program.

HONORS PROGRAM

The Honors Program in the College of Fine Arts is intended for the outstandingly competent student whose interests and specific curriculum indicate that definite advantages may accrue from a program emphasizing individual study. For a general description of Honors work, see page 92 of this catalog.

Degrees

BACHELOR'S DEGREES

The College of Fine Arts offers work leading to four bachelor's degrees: The Bachelor of Arts, the Bachelor of Science, the Bachelor of Fine Arts, and the Bachelor of Music. In general, the distinctions among these curricula lie in the degree of specialization permitted in the major field, with the Bachelor of Arts degree providing a broader humanistic program, and the other three placing greater emphasis upon the major field while maintaining the principle of General Studies required of all University students. In cooperation with the College of Education, each department of the College of Fine Arts also offers major and minor programs designed to provide teachers of art, music, speech, drama, and humanities for the public schools.

Bachelor's degrees are offered in the following fields:

DEGREE:	FIELDS OF SPECIALIZATION:
Bachelor of Arts	<i>Art</i> <i>Drama</i> <i>Humanities (Interdisciplinary)</i> <i>Music</i> <i>Speech Communication</i>
Bachelor of Science	<i>Art (Ceramics-Crafts, Commercial Art)</i> <i>Speech Pathology and Audiology</i>

Bachelor of Music	<i>Music Performance</i> <i>Choral Music</i> <i>Church Music</i> <i>Instrumental Music</i> <i>Theory and Composition</i>
Bachelor of Fine Arts	<i>Ceramics-Crafts</i> <i>Commercial Art</i> <i>Dance</i> <i>Design</i> <i>Environmental Design</i> <i>Painting and Drawing</i> <i>Photography</i> <i>Printmaking</i> <i>Sculpture</i>

MASTER'S DEGREES

A graduate program consisting of a minimum of 30 semester hours of approved work leads to a master's degree in the following fields:

DEGREE:	FIELDS OF SPECIALIZATION:
Master of Arts	<i>Art Education</i> <i>Art History</i> <i>Drama</i> <i>Humanities (Interdisciplinary)</i> <i>Music History and Literature</i> <i>Speech Communication</i>
Master of Fine Arts	<i>Ceramics</i> <i>Design</i> <i>Painting and Drawing</i> <i>Photography</i> <i>Printmaking</i> <i>Sculpture</i>
Master of Music	<i>Composition</i> <i>Music Theatre</i> <i>Pedagogy (Solo, Choral, Instrumental)</i> <i>Performance</i> <i>Theory</i>
Master of Science	<i>Speech Pathology</i>
Master of Arts in Education (Offered by the College of Education)	<i>Art Education, Music Education, Speech and Drama Education</i>
Doctor of Education Degree	<i>In cooperation with the College of Education, the Department of Art and the Department of Music offer special curricula leading to the Doctor of Education degree with majors in Art Education or Music Education.</i>

BACHELOR OF ARTS DEGREE

The curriculum for the degree Bachelor of Arts is designed to give the student a broad, general background in the principal fields of human knowledge and a reasonable amount of specialized training in a selected area. This degree is offered in the Departments of Art, Music, Speech and Drama, and also in the Center for the Humanities. At least 18 semester hours of credit in the major field must be in upper division courses. Of the total 126 credit hours required for graduation, at least 50 credit hours must consist of upper division courses.

Major Requirements. The major consists of approximately 45 semester hours of credit. Normally, not more than 30 semester hours will be taken in the field of specialization, and approximately 15 semester hours in one or more related fields. The exact content of the major is selected by the student in consultation with the adviser under the rules and regulations of the department concerned.

General Studies Requirements. Fifty-four semester hours of the total 126 required for graduation must be in General Studies. In the field of sciences and mathematics, the student must elect at least one course in a laboratory science.

Additional Degree Requirements.

1. Knowledge in one foreign language equivalent to the level obtained through 16 hours of instruction in elementary and intermediate courses on the college level. This requirement may be fulfilled in whole or in part through language instruction in secondary schools or by other means. If acquired in secondary school, two years of instruction in one foreign language will be considered the equivalent of one year of instruction on the college level. Students who transfer from other colleges with less than two years of credit in a foreign language will be placed in a course at the next level above the work completed.
2. A cumulative scholarship index of 2.00 is required for graduation and no credit will be granted toward fulfilling major requirements in any upper division course in the student's major unless the grade in that course is at least a "C".

BACHELOR OF SCIENCE DEGREE

The curriculum for the degree Bachelor of Science is designed to give the student a broad, general background in the principal fields of human knowledge and an opportunity to specialize in one specific selected area. This degree is offered with majors in Art and in Speech Pathology and Audiology. Of the total 126 credit hours required for graduation, at least 50 credit hours must consist of upper division courses.

Major Requirements. The major consists of from 45 to 55 semester hours of credit. The content of the major is selected by the student in consultation with the adviser under the rules and regulations of the department concerned.

General Studies Requirements. Fifty-four semester hours of the total 126 required for graduation must be in General Studies. In the field of sciences

and mathematics, the student must elect at least one course in the physical sciences, one course in the life sciences, and one course in mathematics. One of these courses must be a laboratory science.

Additional Degree Requirement. A cumulative scholarship index of 2.00 is required for graduation and no credit will be granted toward fulfilling major requirements in any upper division course in the student's major unless the grade in that course is at least a "C".

BACHELOR OF FINE ARTS DEGREE

The curriculum for the degree Bachelor of Fine Arts is designed to meet the needs of the student with specific professional interest in creative performance in a specialized field of the arts, while providing him with a broad, general background in the principal fields of human knowledge. This degree is offered in the Department of Art, and is also available with a major in Dance through the Department of Health, Physical Education and Recreation. Students enrolled in the Dance major will register in the College of Fine Arts. Of the 126 to 132 credit hours required for graduation, at least 50 credit hours must consist of upper division courses.

Major Requirements

1. A major in one of the areas of Art consists of 76 semester hours of credit, divided equally between the core curriculum and the area of specialization.

a) The level of courses in the core curriculum will be determined by the adviser in consultation with the student and will be based upon the student's aptitudes, needs, and previous level of training. The core curriculum shall include the following areas of study:

Basic Design	6 sem. hrs.
Drawing	6 sem. hrs.
Painting	3 sem. hrs.
Sculpture	3 sem. hrs.
Ceramics or Crafts	3 sem. hrs.
Photography	3 sem. hrs.
Art History	12 sem. hrs.
Aesthetics	2 sem. hrs.
Total	38 sem. hrs.

b) The area of specialization shall be determined by the student on the basis of his interests and professional intentions and, in addition to the core program above, shall consist of 38 hours of course work selected by the student in consultation with his adviser. A minimum of 12 credit hours of courses numbered 300 or 400 in one specific creative field must be included within the area of specialization. The student, in consultation with his adviser, may select applicable courses from other departments or colleges when it is felt they will make a specific contribution to his program of study. The following areas of specialization are available to the student: Painting, sculpture, printmaking, design, ceramics-crafts, commercial art, environmental design, and photography.

2. A major in Dance consists of a minimum of 70 semester hours of

course work in Dance and related fields. See pages 326-327 for detailed requirements.

General Studies Requirements. Thirty-six semester hours of the 126 to 132 required for graduation must be in General Studies. In the field of sciences and mathematics the student must take at least one course in a laboratory science.

Additional Degree Requirements. A cumulative scholarship index of 2.00 is required for graduation and no credit will be granted toward fulfilling major requirements in any upper division course in the student's major unless the grade in that course is at least a "C".

BACHELOR OF MUSIC DEGREE

The curriculum for the degree Bachelor of Music is designed to give the student a broad general background in the principal fields of knowledge, and training of a professional caliber in music performance, music theory, composition, church music, and the teaching of choral and instrumental music. Of the total 126 credit hours required for graduation, at least 50 credit hours must consist of upper division courses.

Placement tests in theory, piano, and a major performing medium are required of all freshman and transfer students.

Major Requirements. The major consists of 84 semester hours of credit in music. The content of the major is selected by the student in consultation with the adviser under the rules and regulations of the department of music.

General Studies Requirements. Thirty-six semester hours of the 126 required for graduation must be in General Studies.

Additional Degree Requirements.

1. The foreign language requirements vary with the student's major program leading to the Bachelor of Music degree.
 - a) Choral and Instrumental: no foreign language requirement.
 - b) Church Music: Eight hours of credit in one foreign language.
 - c) Music Performance:
 - Voice majors—16 hours of credit in more than one foreign language, chosen from French, German, or Italian. A student may elect one year of one language, and either one or two semesters of the other(s), chosen in conference with his adviser.
 - Instrumental majors—16 hours of credit in one or two foreign languages.
 - d) Music Theory, Composition: Eight hours of credit in one foreign language.

The requirement of knowledge in one foreign language equivalent to the level obtained through 16 hours of instruction in elementary and intermediate courses on the college level may be fulfilled in whole or in part through language instruction in secondary school. Two years of instruction in one language will be considered the equivalent of one year of instruction on the college level. Students who transfer from other colleges with less than two years of credit in a foreign language will be placed in a course at the next level above the work completed.

2. A cumulative scholarship index of 2.00 is required for graduation, and no credit will be granted toward fulfilling major requirements in any upper division course in the student's major unless the grade in that course is at least a "C".
3. All students majoring in music are required to attend the weekly studio class or recital as listed in the Time Schedule. In addition, attendance at five major University programs each semester is required.

The Department of Music is a member of the National Association of Schools of Music, and the requirements for entrance and graduation set forth in this catalog are in accordance with the published regulations of that Association.

College of Law

Willard H. Pedrick, J.D.

Dean



John S. Armstrong Law Building

PURPOSE

The prime function of the College of Law is to train young men and women for the practicing legal profession and related professional assignments. In addition, the College has the responsibility to contribute to the quality of justice administered in our society.

The College of Law offers a three-year program of professional studies at the graduate level leading to the degree of Juris Doctor and entry into the many branches of the legal profession.

ACCREDITATION

Accreditation of law schools is administered by the American Bar Association and by the Association of American Law Schools. In planning the law school, both the Council of the ABA Section on Legal Education and the Executive Director of the Association of American Law Schools have been consulted. It is believed that the College of Law, at the outset, surpasses in all respects the standards for accreditation laid down by these agencies. The College has been granted provisional accreditation by the ABA, qualifying its graduates to become applicants for admission to the Bar of any state in the Union.

JURIS DOCTOR DEGREE

On completion of the three-year graduate professional course, the Juris Doctor, as the first professional degree in law, is conferred. While the primary mission of the law school is thorough-going professional preparation for the practice of law, many career opportunities are open to law graduates. Government, business, finance, industry and education all call upon men and women with legal training.

The program of study in the College of Law is designed to provide intensive study of the basic legal processes in the first two years of the course, with opportunity in the third year for a variety of educational experiences in seminars, small group courses, clinical activities and, for some, participation in graduate programs in other colleges and departments of the University to add perspective and depth to the individual's program of legal education. Substantial research and writing assignments are features of the program.

ADMISSIONS

First-year students are admitted only for the fall semester in the College of Law.

The formal requirements for admission to the professional course of study leading to the degree of Juris Doctor are:

- (1) An undergraduate degree from an accredited four-year college or university (B.S., B.A., or equivalent);
- (2) A score on the Law School Admission Test (administered by the Educational Testing Service, Box 944, Princeton, N.J., in November, February, April and August in centers throughout the country).

The deadline for completed applications, with college transcripts on all completed course work and the LSAT score in the hands of the College of Law, is May 1.

The undergraduate academic record and the score on the Law School Admission Test will be evaluated with the object of selecting those who have a reasonable prospect of success in the rigorous and demanding professional course. Roughly equivalent weight will be given to the college grade average and to the LSAT score.

LAW BUILDING

The John S. Armstrong Law Building is part of the central campus, near other graduate schools of the University and the Hayden Library. The Law Building provides every modern facility for legal education and has been described by experts on planning law buildings as setting a new standard in functional design. From 350 to 450 law students can be accommodated comfortably in the completely air conditioned building.

LAW LIBRARY

With an "open stack" policy of accessibility to all law students and a rated seating capacity of three-fourths of the total student body, the Law

Library contains a substantial collection of law and law-related books. The ultra modern facility has shelf capacity for approximately 200,000 volumes. The goal is to make the Arizona State University Law Library one of the most outstanding in the country.

COURSE OF STUDY

The program is designed for full-time students. In the first two years of the three-year program, the course of study is prescribed and incorporates the time-proven techniques of legal education. These first two years give the student — by the “case method,” by the “problem method,” by “Moot Court” and through other techniques — an intensive exposure to the basic legal processes. The third year offers distinctive educational experiences in the nature of a “clinical year” — featuring practice-oriented professional subjects, small group seminars, publication of a “law review,” participation in the actual rendition of legal services under licensed practitioners through legal aid, public defender and other programs.

Further detailed information concerning the course of study, advice on pre-law courses, admission practices, expense and financial assistance will be found in the *Bulletin* of the College of Law. Requests for the *Bulletin* and for application forms should be addressed to the Office of the Dean, College of Law, Arizona State University, Tempe, Arizona 85281.

Graduate School of Social Service Administration

Horace W. Lundberg
Dean



College of Nursing Building

PURPOSE

The graduate program in social work education is a two-year course of study leading to the degree of Master of Social Work.

The curriculum is designed for the full-time student to enter in the fall semester. The course content emphasizes the integration of academic theory and field instruction in a sequence designed to provide experiences essential to professional practice. Part-time study in designated classes is limited to no more than 10 hours.

Social work is the profession with the second greatest manpower shortage in the United States. The School offers professional education for this field of service. The thorough preparation obtained in the Master's program affords the graduate expanding opportunities for a career in the restoration, maintenance and enhancement of social functioning of individuals, families and communities. The diverse heritage and cultures to be found in this area offer stimulating professional opportunities for meeting the social and cultural problems of the Southwest.

ADMISSION

The admissions requirements of the School are equivalent to and consistent with those of the Graduate College.

Application is made directly to the Graduate School of Social Service Administration. For information regarding its course of study, admissions procedure and for application forms, write the Office of the Dean.

Graduate College

William J. Burke, Ph.D.

Dean

The development and interpretation of new knowledge and creative work are important functions of the University and matters of specific concern to those involved in the programs available in the Graduate College. For students who have demonstrated a high level of ability and promise at the undergraduate level, graduate work offers an opportunity for further intellectual challenge in advanced and more specialized areas.

Under the supervision of the Graduate Council and the Dean of the Graduate College, programs for graduate study are offered by the various departments, schools, centers and colleges. The Graduate Council is responsible for the development and formulation of general policies and the approval of procedures essential to the organization and administration of graduate programs. The Dean of the Graduate College is directly responsible for the administration of policies and graduate programs.

GRADUATE DEGREE PROGRAMS OFFERED

Master of Arts	Master of Fine Arts
Master of Science	Master of Music
Master of Arts in Education	Master of Natural Sciences
Master of Business Administration	Master of Public Administration
Master of Counseling	Master of Social Work
Master of Science in Engineering	
Education Specialist	Doctor of Education
Juris Doctor	Doctor of Philosophy
Doctor of Business Administration	

Master of Arts and Master of Science. The master's degree is offered with a major in: Accounting, Agriculture, Anthropology, Art, Biological Sciences, Botany, Chemistry, Drama, Economics, Engineering, English, French, Geography, Geology, German, History, Home Economics, Humanities, Mathematics, Music, Nursing, Philosophy, Physical Education, Physics, Political Science, Psychology, Sociology, Spanish, Speech and Zoology.

Doctor of Philosophy. The Ph.D. degree is offered in the following fields: Anthropology, Botany, Chemistry, Education, Engineering, English, History, Mathematics, Physics, Political Science, Psychology, Spanish, and Zoology.

ADMISSION TO GRADUATE COLLEGE

A student who has earned a bachelor's degree or a graduate degree from an accredited college or university is eligible to apply for admission to the Graduate College of Arizona State University. Application forms may be obtained by writing to the Graduate College.

At least two months before the first enrollment, the Graduate College should have received the application for admission, two transcripts of all undergraduate and graduate work. The transcripts are to be sent directly to the Graduate College by the registrar of the college or university which the applicant previously attended. For that purpose the applicant should write to the registrars concerned and then allow them time to process and mail the transcripts. A qualified applicant, whose application has been filed later than the deadline, may be permitted to enroll in graduate classes as an unclassified student. He will maintain that status until all of the required forms and transcripts have been received and a decision regarding his admission to a program has been reached by the college or department concerned and by the Graduate College.

All documents received by the University in connection with such applications for admission become the property of Arizona State University. Under no circumstances will they be duplicated, returned to the applicant, or forwarded to any agency or other college or university.

Admission to the Graduate College is granted to applicants who have earned a bachelor's or graduate degree from an accredited college or university and who present convincing evidence of their ability to pursue successfully a graduate degree program at Arizona State University. Certain departments require the submission of scores received on the Graduate Record Examination or other predictive examinations. Applicants will be notified of these requirements by the departments. Reports on scores received should be sent directly to the Graduate College by the testing service or agency. In all instances the college or department in which the student wishes to study must indicate its willingness to admit the student. All applications for admission must be approved by the Dean of the Graduate College.

Applicants may be admitted to the Graduate College under three classifications:

Regular Classification. Applicants are ordinarily granted regular admission to the Graduate College if they have achieved a grade point average of "B" (3.0) or better in all work leading to the bachelor's degree and on the recommendation of the department or academic unit in which they plan to study. An applicant may also qualify for admission if his undergraduate overall grade point average is at least 2.5 and his undergraduate major average is "B" or his average in the last two years of undergraduate work is "B."

Provisional Status. An applicant may be admitted to the Graduate College with provisional status if the department or academic unit in which he plans to study requires additional evidence of his qualification for admission with regular status. No student may maintain provisional status indefinitely. The department or academic unit concerned will normally make a final determination on a student on provisional status by the time he has completed 12 hours of approved graduate study. If an applicant has extensive deficiencies requiring an additional year or more of preparatory study, he is ordinarily advised to enroll in an undergraduate program.

Unclassified Status. An applicant whose academic record indicates that he is qualified to study on the graduate level, but who is not pursuing a grad-

uate degree program, may be admitted to the Graduate College in an unclassified status. A student in this classification, who is later granted regular admission, may apply to his degree program not more than ten semester hours earned while in unclassified status. Credit for any such work must be approved by the department or academic unit concerned, after a review of the proposed program of study.

Foreign Student Admission. Applicants from foreign countries should write to the Graduate College at least one year prior to the date they plan to begin study. They will receive the necessary instructions and application blanks which are to be completed and returned to that office. Applicants should make sure that other documents are sent at about the same time, especially transcripts from colleges and universities attended, letters of recommendation, certification of proficiency in English, and a statement of financial responsibility.

Prospective foreign students should not make plans to leave their country until they have received notification of admission. Ordinarily such a statement regarding admission is required before the student can be issued a passport or visa.

Student Responsibility. It is the responsibility of the graduate student to become conversant with and observe all procedures and requirements of the Graduate College as defined in the *General Catalog*. The student should particularly inform himself about the general regulations concerning the degree he plans to take and any special requirements within his department or academic unit.

Transient Graduate Students. A graduate student in good standing at another university who wishes to earn credits for transfer to that institution may register for a limited number of credit hours either in a summer session or in a regular semester. He will be admitted as a "Transient Graduate Student," and will not be required to submit an academic transcript. A letter from the student's graduate dean, stating that the applicant is in good standing and is authorized to register for specified courses, must be received by the Dean of the Graduate College at least three months prior to registration.

Graduate Study by Arizona State University Faculty Members. A member of the University faculty holding the rank of assistant professor or higher may not earn a graduate degree at Arizona State University. He may, however, be permitted to enroll in graduate courses on a non-degree basis or to take courses for transfer to another institution.

Graduate Credit for Seniors. An Arizona State University senior who is within 12 semester hours of graduation and whose undergraduate work qualifies him for graduate study may request permission to register for approved courses for graduate credit. The combined undergraduate and graduate credit load for the semester should not exceed 16 hours. All requests must be approved by the department or academic unit concerned and by the Dean of the Graduate College. The necessary Senior Permit forms are available at the Graduate College. *This approval must be secured at least one month in advance of registration.*

Course Load. The course load is determined by the supervisory committee but is not to exceed 15 semester hours of graduate work.

Scholarship. Academic excellence is expected of students doing graduate work. A student who is not doing satisfactory work may be withdrawn from the degree program by the Dean of the Graduate College upon the recommendation of the department or academic unit concerned. To be eligible for a degree in the Graduate College, a student must achieve a grade point average of "B" (3.0) or better in all work taken for graduate credit, exclusive of deficiencies, and in all work specifically included in his program of study. Grades below "C" cannot be used to meet the requirements of a graduate degree. Grades on transfer work will not be included in computing grade point averages. Graduate course work, other than research or thesis, reported "Incomplete" must be completed within one year of the official ending of the course. If a grade of "Incomplete" ("I") is not removed within one year, it becomes part of the student's permanent record.

Graduate Credit Courses. Courses carrying graduate credit are numbered 500, 600, and 700. The 400 level courses are open to graduate students and qualified seniors at Arizona State University. The 300 and 400 level courses are eligible for graduate credit if included in an approved program of study.

Graduation. Students should apply for graduation no later than the date specified in the *Graduate Catalog* calendar. All fees are payable at this time.

MASTER'S DEGREE

Admission to the Master's Degree Program. Students wishing to enroll in a master's degree program at Arizona State University are admitted according to the procedure described on pages 201-202. Since graduate work presupposes adequate preparation in a selected field at the undergraduate level, deficiencies will be specified at the time of admission by the department or academic unit involved.

Credit Requirements. A minimum of 30 semester hours of course work approved by the student's supervisory committee and the Graduate College is required. More than 30 semester hours may be required in certain programs.

Supervisory Committee. Upon admission of the applicant with regular or provisional status, a supervisory committee, consisting of a chairman and other members, will be appointed by the Dean of the Graduate College to establish with the student a program of study, to direct his thesis or graduate project, and to administer his final examination(s). Appointments are made by the Dean of the Graduate College on the recommendation of the head of the student's department or academic unit.

Whenever a minor field is involved, one of the members of the committee shall be from the minor field. In the Master of Arts in Education degree programs involving an academic field, the chairman of the supervisory committee shall be from the College of Education and a co-chairman shall be from the academic field. Other members may be from either field.

The designated chairman shall direct the student's thesis study, and the committee shall serve both as a supervisory committee and as an examining committee.

Programs of study for master's degree students shall be filed with the department concerned, and should be used by the supervisory committee and the student in planning future work. Prior to admission to candidacy, programs of study may be modified as required.

Residence Requirements. A minimum of 20 semester hours of approved graduate work taken on the University campus is required.

Foreign Language Requirement. Language requirements are determined by the department concerned. If a foreign language is required, the student must demonstrate that he possesses a reading knowledge of one of the following languages: French, German, Russian, Spanish. Languages other than these must have the recommendation of the student's supervisory committee and the Dean of the Graduate College.

Foreign language examinations in French and German (ETS examinations) are administered by the University Testing Service. Examinations in Russian and Spanish are administered in the Department of Foreign Languages. Dates for these examinations are listed in the calendar of the *Graduate Catalog*. Students planning to take a foreign language examination must register at the University Testing Service for examinations in French or German, or at the office of the Department of Foreign Languages for examinations in Russian or Spanish, at least three weeks prior to the examination date. No further examinations may be taken after the second repeated examination.

The language requirement in French, German, or Russian may be fulfilled by special reading courses for graduate students given by the Department of Foreign Languages. Students are certified as having a reading knowledge in a particular language upon completion of the two-semester course, providing a grade of "A" or "B" has been achieved in the second semester of the course.

Thesis Requirements. The requirement of a thesis is determined by the department or academic unit concerned. The final copy of the thesis must be reviewed by the student's supervisory committee and submitted to the Dean of the Graduate College at least six weeks before commencement. Copies of *Guide to Thesis Preparation* are available in the Graduate College office.

Candidacy. A student should apply for admission to candidacy and graduation as soon as he has completed 12 hours of graduate work with a grade point average of at least 3.0 in an approved graduate program of study, has removed all listed deficiencies, and has met any required foreign language requirements. Changes in the planned program after admission to candidacy must be recommended in writing by the student's supervisory committee and be approved by the Dean of the Graduate College. Application forms for admission to candidacy are available in the graduation section of the Office of the Registrar, 137 Moeur Administration Building.

Final Examinations. A final examination, written, oral, or both, administered by the department or academic unit, is required. The dates for these examinations are set by the Graduate College once each semester and once each summer session, as listed in the *Graduate Catalog* calendar. A student

is not eligible to apply for the comprehensive or any final examination until he has been admitted to candidacy.

Failure in the comprehensive or any final examination will be considered final unless the supervisory committee recommends, and the Dean of the Graduate College approves, a re-examination. Only one re-examination is permitted. At least three months must elapse before a re-examination may be scheduled.

The final examination in defense of the thesis must be conducted at least three weeks before commencement. On a final oral examination in defense of a thesis, a fourth member, who may be from outside the department or college, will be appointed by the Graduate Dean. Applications for the final comprehensive examinations are available in the Graduate College office.

Transfer of Credits. A maximum of six semester hours of graduate credit taken in other institutions may be transferred for credit toward a master's degree, provided the courses are an acceptable part of the program of study planned by the student's supervisory committee. Such courses must have been taken in an accredited college or university and must be acceptable toward graduate degrees at that institution. Only courses with a "A" or "B" grade may be transferred. Grades on transferred credit cannot be included in the grade point average.

Extension Courses. Up to ten semester hours of credit toward a master's degree may be earned in extension courses offered by Arizona State University. Extension courses offered by other universities may not be included in an approved program of study.

Maximum Time Limit. All of the work offered toward a master's degree program must be completed within six consecutive years.

EDUCATION SPECIALIST DEGREE

The Education Specialist degree program is designed to provide opportunity for professional persons in the field of education to develop skills as highly competent practitioners in the various areas of education.

Programs of study for the Education Specialist degree are offered in:

Adult Education	Elementary Education
Counseling and Student Personnel	Reading
Curriculum and Instruction	Secondary Education
Educational Administration and Supervision	Social and Philosophical Foundations of Education
	Teaching Specialist

Admission to the Education Specialist Degree Program. To be eligible for admission, the student must have a bachelor's degree from an accredited institution and have at least one year of successful teaching experience. Normally the student will have a master's degree when he enters.

Supervisory Committee. The Dean of the Graduate College upon recommendation of the department chairman appoints the supervisory committee. Each area of study included in the degree program will be represented on the committee. The supervisory committee shall approve the program of study, prepare and administer qualifying and comprehensive examinations,

approve the applied project, and serve on the final oral examining committee.

Program of Study. Sixty semester hours are required beyond the bachelor's degree. This may include no more than 30 semester hours in a master's degree program. At least 48 hours of course work in the program must be earned in courses at the 500 level or above.

Credits may be transferred from other accredited institutions. The number of credits accepted for transfer will depend upon the objectives approved by the supervisory committee. Grades on transferred credit cannot be included in the grade point average. A minimum of 24 semester hours in the approved program of study shall be taken at Arizona State University, following admission to the program.

Residence. Normally the candidate must expect to spend the equivalent of two full academic years in graduate study, which may include one year spent in attaining the master's degree. One academic semester or a ten-week summer session must be spent in full-time residence at the University before admission to candidacy for the Education Specialist degree. Additional residence may be required by certain departments in order to meet special needs. At least 30 semester hours of approved graduate work must be completed at Arizona State University.

Comprehensive Examinations. When the student has essentially completed the program of study, he will apply to the Graduate College through his supervisory committee for permission to take his oral and written comprehensive examinations. Failure in the comprehensive examinations will be considered final unless the supervisory committee recommends, and the Dean of the Graduate College approves, a re-examination. Only one re-examination is permitted. At least three months must elapse before a re-examination may be scheduled.

Admission to Candidacy. A student should apply for admission to candidacy and graduation promptly after he has completed 45 hours of course work, passed the written and oral comprehensive examinations, and has had the problem and title of his applied project approved by his supervisory committee.

Applied Project. Upon recommendation of the supervisory committee, a student may enroll for the applied project after completion of 12 hours of approved course work in the degree program.

Final Examination. The final oral examination for the Education Specialist degree program in defense of the applied project report is administered by the supervisory committee and others appointed by the Dean of the Graduate College. This examination is scheduled through the Graduate College and must be held at least three weeks before the commencement date as listed on the *Graduate Catalog* calendar.

Graduation. After the final oral examination has been passed and the applied project report filed in the office of the Graduate College, the student is eligible for graduation.

Maximum Time Limit. The Education Specialist degree requirements must be completed within three years after the comprehensive examinations have been passed.

DOCTOR OF PHILOSOPHY

The Doctor of Philosophy degree is granted upon evidence of high attainment in a special field and demonstration of independent scholarship. Such attainment must be demonstrated by original research or creative work presented in a dissertation. The degree is never conferred solely on the basis of courses completed or formal study extending over a prescribed period of time.

Admission to the Ph.D. Degree Program. The general requirements for admission to the Graduate College are given on pages 201-202. Graduate students in regular classification may apply for admission to the Ph.D. degree program by filing a written application with the Office of Admissions.

Supervisory Committee. Upon recommendation of the department chairman or head of the academic unit, the Dean of the Graduate College appoints the student's supervisory committee, consisting of a chairman and four other members.

Program of Study. The program of study should be completed as early as possible and must have the approval of the student's supervisory committee and his department chairman before submittal to the Dean of the Graduate College. The courses may be taken entirely within one department or they may be taken in a combination of departments. Credits from other recognized institutions may be transferred provided the courses meet the objectives of the program as defined by the supervisory committee and are approved by the Graduate Council.

Residence. In general, the Ph.D. degree student should expect to devote to his program of study the equivalent of at least three academic years (84 semester hours) beyond the bachelor's degree. At least two semesters subsequent to the first year of graduate work must be spent in continuous full-time residence at Arizona State University, and at least 30 hours of approved graduate work must be completed at this institution.

Foreign Language Requirement for the Ph.D. Degree. Prior to applying for permission to take the Comprehensive Examination, and as a condition of admission to candidacy, the student must have demonstrated that he possesses reading knowledge of one of the following languages: French, German, Russian, Spanish. The individual department determines which of these four languages meet this requirement. Languages other than these must have the recommendation of the student's supervisory committee and the approval of the Graduate Council. A reading knowledge of two or more foreign languages may be required by the individual department.

Foreign language examinations in French and German (ETC examinations) are administered by the University Testing Service. Examinations in Russian and Spanish are administered by the Department of Foreign Languages. Dates for these examinations are listed in the calendar of the *Graduate Catalog*. Students planning to take a foreign language examination must register at the University Testing Service for examinations in French or German or at the office of the Department of Foreign Languages for examinations in Russian or Spanish at least three weeks prior to the examination date. No further examinations may be taken after the second repeated examination.

The language requirement in French, German, or Russian may be fulfilled by special reading courses for graduate students given by the Department of Foreign Languages. Students are certified as having a reading knowledge in a particular language upon completion of the two-semester course, providing a grade of "A" or "B" has been achieved in the second semester of the course.

Comprehensive Examinations. When a student has essentially completed the course work in an approved program of study and has satisfied the foreign language requirements, he should request permission from the Graduate College to take his comprehensive examinations. These written and oral examinations are designed to test the student's mastery of his field of specialization. Failure in the comprehensive examinations will be considered final unless the supervisory committee recommends, and the Dean of the Graduate College approves, a re-examination. At least three months must elapse before a re-examination may be scheduled. Only one re-examination is permissible.

Admission to Candidacy. The student should apply promptly for admission to candidacy and for graduation after he has passed the comprehensive examinations and has had the subject problem and title of his dissertation approved by his supervisory committee.

Research and Dissertation. Each candidate will register for a minimum of 24 semester hours credit for research and dissertation. The final copy of the dissertation must be reviewed by the supervisory committee and the Dean of the Graduate College at least six weeks before commencement. Copies of *Guide to Thesis Preparation* are available in the Graduate College office.

Final Examination. The final oral examination in defense of the dissertation will be scheduled by the Dean of the Graduate College. This examination may not be scheduled earlier than three weeks after the completed dissertation has been reviewed by the supervisory committee and the Dean of the Graduate College. The examination will be conducted by the supervisory committee and others appointed by the Dean of the Graduate College. All final oral examinations must be conducted at least three weeks before commencement.

Graduation. After the final oral examination has been passed and the dissertation has been accepted and filed in the Graduate College, the student is eligible for graduation.

Maximum Time Limit. The candidate must take the final oral examination in defense of the dissertation within five years after passing the comprehensive examinations. Any exception must be approved by the supervisory committee and the Graduate Council and ordinarily will involve repetition of the comprehensive examinations.

DOCTOR OF EDUCATION

The basic purpose of the Doctor of Education degree program is to provide opportunity for those interested in the field of education to do advanced scholarly study and research. A dissertation based upon this re-

search is required. The degree is never conferred solely as a result of study extending over any prescribed period of time or the completion of a given number of courses. The program for the Doctor of Education degree requires at least the equivalent of three academic years of full-time study beyond the bachelor's degree or two academic years of full-time study beyond the master's degree.

The Doctor of Education degree is offered in the following areas:

Adult Education	Industrial Arts Education
Art Education	Mathematics Education
Business Education	Music Education
Curriculum and Instruction	Physics Education
Educational Administration and Supervision	Science Education
Elementary Education	Secondary Education
Counseling and Student Personnel	Social and Philosophical Foundations of Education
Health and Physical Education	

Admission to the Doctor of Education Degree Program. A student who seeks admission will normally be expected to have a master's degree. An applicant may be required to take special qualifying examinations prepared and evaluated by the graduate committee of the department to which he applies. The general requirements for admission to the Graduate College are given on pages 201-202.

Supervisory Committee. The Dean of the Graduate College upon recommendation of the department chairman appoints the supervisory committee. Each area of study included in the degree program will be represented on the committee.

Program of Study. A minimum of 90 semester hours of work taken beyond the bachelor's degree is required. At least 28 semester hours of course work must be taken in Education, exclusive of the dissertation.

Upon approval of the supervisory committee, the student may start research activity in connection with the dissertation after he has completed 15 hours of work in the program beyond the master's level.

Credit may be granted for courses taken at other recognized institutions. The number of credits accepted on transfer depends upon the recommendation of the supervisory committee and approval of the Graduate Council.

Residence. The candidate should expect to spend the equivalent of three full academic years in graduate study, which may include one year spent in attaining the master's degree. The amount of time a student must spend in official residence on the campus depends to some extent on his individual program of studies. However, he must satisfy a minimum residence requirement of 30 semester hours within a period of 18 consecutive months, of which no more than 18 semester hours for research and dissertation credit may be included. Additional residence may be required by certain departments in order to meet special needs.

Comprehensive Examinations. When the student has essentially completed the program of study and has passed his foreign language examinations, if

required, he will apply to the Graduate College through his supervisory committee for permission to take his written and oral comprehensive examinations. These examinations are prepared, administered and evaluated by the supervisory committee. Failure in the comprehensive examinations will be considered final unless the supervisory committee recommends, and the Dean of the Graduate College approves, a re-examination. Only one re-examination is permissible. At least three months must elapse before a re-examination may be scheduled.

Admission to Candidacy. The student should apply for admission to candidacy promptly after he has passed the written and oral comprehensive examinations and after the subject of his dissertation has been approved by his supervisory committee.

Research and Dissertation. Each candidate will register for a minimum of 24 semester hours credit for research and dissertation. The final copy of the dissertation must be reviewed by the supervisory committee and the Dean of the Graduate College at least six weeks before commencement. Copies of *Guide to Thesis Preparation* are available in the Graduate College office.

DOCTOR OF BUSINESS ADMINISTRATION DEGREE

The primary objectives of the Doctor of Business Administration degree are to prepare persons for teaching and research in institutions of higher learning, and to develop proficiency for effective service in a leadership capacity in either private business or government. The degree is granted upon the completion of high academic attainment in graduate study, an original research project presented in a dissertation, and comprehensive oral and written examinations.

The D.B.A. degree program is designed to provide a broad study of the interrelated areas of business administration and a high degree of professional competence in three fields of specialization.

Admission to the D.B.A. Degree Program. A student applies for admission to the D.B.A. degree program by filing a written application with the Graduate Admissions Office. The application is considered by the Graduate Committee of the College of Business Administration in consultation with the academic department of the applicant's major field and a recommendation is then made to the Dean of the Graduate College. Admission is based upon the applicant's entire record. The Admission Test for Graduate Study in Business is required, together with three letters of recommendation.

A student normally completes a master's degree or equivalent before entering the D.B.A. degree program. In an exceptional case, a candidate with a bachelor's degree may be admitted, in which case he shall complete the requirements of the master's degree program before pursuing the doctoral core and specialized fields.

A student who applies for admission to the program without all of the business core courses required by the American Association of Collegiate Schools of Business for admission to graduate study in business may be admitted provisionally until all business core courses are satisfactorily completed. Currently core courses include basic work in each of the following

seven areas: accounting, economics, finance, management, marketing, statistics, and business law.

Supervisory Committee. The Dean of the Graduate College, upon recommendation of the Dean of the College of Business Administration, appoints a supervisory committee of five faculty members. The chairman is selected from the student's field of concentration, two members are selected at large from the faculty of the College of Business Administration. The supervisory committee approves the program of study, guides the student through his entire period of study, and serves on his examining committee for the general oral examination.

Program of Study. The program is planned to fit the student's background and objectives. *The degree is granted upon evidence of demonstrated competency and scholarly achievement, rather than upon the accumulation of hours in a series of prescribed courses.* A minimum of 30 semester hours of credit beyond the master's degree is required of all doctoral students, exclusive of the dissertation and the prerequisite business courses generally required by the American Association of Collegiate Schools of Business for admission to graduate study in business. For most students the program will consist of 36 to 54 semester hours, depending on the student's academic background and the fields selected.

Reading knowledge of a foreign language is not required for the D.B.A. degree.

Residence. The entire program, including course work and dissertation, normally requires the equivalent of two academic years of work beyond a master's degree. Students must spend at least one academic year of the last two years (summer sessions excluded) in full-time course work in residence. The dissertation may be completed *in absentia* with permission of the student's supervisory committee and the Dean of the College of Business Administration.

Comprehensive Examinations. During the final semester of course work, the student must apply to the Graduate College through the supervisory committee for permission to take his comprehensive written examinations. *Examinations are required in the field of concentration and each supplementary field and are designed to test the student's comprehensive knowledge of the fields rather than the subject matter of specific courses taken.* Comprehensive written examinations must be taken in two consecutive sittings. A student may repeat a written examination only one time. He is normally required to complete additional course work and to obtain the approval of his supervisory committee before permission for a second examination will be granted.

Upon satisfactory completion of all course work and comprehensive written examinations, the student must complete a general oral examination which covers the entire doctoral program, except the dissertation.

Admission to Candidacy. A student applies for candidacy when he has completed his general oral examination and has submitted a proposed dissertation subject. If a candidate fails to complete his dissertation oral examination within five years after completing his comprehensive examinations, it will be necessary for him to be readmitted to candidacy.

Dissertation. The dissertation requires major research of an original and creative nature. The final copy of the dissertation must be reviewed by the committee appointed to direct the dissertation research and also by the Dean of the Graduate College at least six weeks before commencement. General rules of the Graduate College for dissertation procedures, format, and microfilming will be followed. Copies of *Guide to Thesis Preparation* are available in the Graduate College office.

Dissertation Oral Examination. The final oral examination in defense of the dissertation will be scheduled by the Dean of the Graduate College. All final oral examinations must be conducted at least three weeks before commencement. The candidate will present and defend his dissertation before members of his dissertation committee and others appointed by the Dean of the Graduate College at a meeting open to all faculty members.

Graduation. After the dissertation is officially accepted and the final oral examination passed, the candidate may apply for graduation through the Graduate College office prior to the required date listed in the *Graduate Catalog* calendar.

General Regulations. In all matters not specified above, the standard procedures established by the Graduate College for the Ph.D. degree will apply.

University Extension and Summer Sessions

Joseph C. Schabacker, Ph.D.

Dean



University Mall offers pleasant atmosphere

Summer Sessions

DENIS J. KIGIN, Director

The opportunities for credit and non-credit study during Summer Sessions are much the same as those of the regular academic year, with the exception that the number of classes offered is not as extensive. A broad selection of courses is available for both graduate and undergraduate students, as well as for those seeking to enhance or to refresh their subject matter interests. Professional conferences, institutes, workshops and seminars are also offered during the Summer Sessions in air-conditioned classrooms and laboratories. These programs are available to residents of the State of Arizona, as well as for those from out-of-state.

Terms. The Summer Sessions consist of a pre-session, two terms of five weeks each, and a post-session.

Credit and Residence Requirements. Students are permitted to earn a maximum of six semester hours of credit each five-week session. For those students who seek to graduate in less than the normal four-year period, Summer Sessions provide a flexible alternative. Under certain circumstances it is possible for a student to satisfy the University residence requirement

by attending Summer Sessions. Students entering as freshmen from high school are invited to begin their university work in the summer.

Enrollment. In general, applicants for admission are expected to present evidence of graduation from an approved four-year high school, or evidence of good standing in an accredited college. Mature students, over 21 years of age, are admitted without the above qualifications, but with the understanding that all admission requirements must be satisfied before they can become candidates for the bachelor's degree.

Graduate Study. Summer Sessions offers an excellent opportunity for those who have already acquired a bachelor's degree to do graduate work for personal edification or to work for advanced degrees.

Fees and Expenses. The Summer Sessions fee is \$16.00 per semester hour. Textbooks and supplies may be purchased at the University Bookstore on the campus. Board and room for the summer are available on campus at the prevailing rates.

Information. Requests for the *Summer Sessions Bulletin* or for other information should be addressed to the Director of Summer Sessions.

University Extension

Many people who desire to continue their studies while actively engaged in their business or professional activities find it impossible to attend the regular sessions of the University. In response to this demand, University Extension offers three special types of service: extension classes offered at various locations, correspondence study, and community services.

EXTENSION CLASSES

Extension classes are organized where there is sufficient demand, when approved instructors are available, and when library or laboratory facilities are adequate to provide university-level instruction. Two types of programs are available: (1) University *credit courses* that serve in part to meet degree requirements at the undergraduate and graduate level, and (2) *Informal educational experiences* for personal growth, general cultural advancement, refresher training and the acquisition of new interests without reference to university credit.

Extension courses may be counted as residence credit toward bachelor's or advanced degree requirements within certain limits. For example, up to ten (10) semester hours of credit toward a master's degree may be earned in extension courses offered by Arizona State University.

The fee for extension courses is \$16.00 per semester hour, and is payable at the time of registration. For further information, write the Dean of University Extension.

CORRESPONDENCE STUDY

The services of some teaching faculty and departments are extended through the mails to the student whose daily occupation prevents enrollment in regular sessions.

Persons desiring to enroll in correspondence study should write to University Extension for an enrollment form and a brochure listing the

courses offered. Upon the receipt of an application, accompanied by remittance to cover the fee, the first lesson assignments will be mailed to the student.

The fee for correspondence courses is \$10.00 per semester hour of credit. Credit earned in correspondence courses may be applied toward the bachelor's degree; however, not more than 30 hours of credit in correspondence courses and/or by comprehensive examination will be accepted toward the degree. Correspondence courses are not applicable as graduate credit toward advanced degrees.

Students who fail a course on campus, or at a residence center, are not permitted to take the same course by correspondence study.

No student doing work in residence may register for a course by correspondence without first obtaining approval of the Standards Committee of the College in which the student is enrolled. All inquiries concerning correspondence study should be addressed to University Extension.

COMMUNITY SERVICE

In addition to credit classes and correspondence study offered by University Extension, Arizona State University sponsors hundreds of community services each year through conferences, workshops, seminars and other specialized consultative services.

Teaching, research and public service activities are offered as an outreach of over 50 academic departments and through numerous professional and continuing education centers. The following list suggests the kinds of functions which serve various clientele on- and off-campus:

Audiovisual Services	Continuing Education to the Bar
Bureau of Broadcasting	Engineering Research Center
Bureau of Business and Economic Research	Gammage Center for the Performing Arts
Bureau of Educational Research and Services	Indian Education Center
Center for American Studies	Institute of Police Science
Center for Asian Studies	Institute of Public Administration
Center for Executive Development	Phoenix Extension Center
Center for Family Life Studies	Rocky Mountain Forest and Range Experimental Station
Center for Higher Education	University Art Collections
Center for Latin American Studies	University Testing Center
Center for Urban Studies	



Addition to Life Sciences Building

**New additions to
ASU Campus:
Just completed or
under planning
and construction**



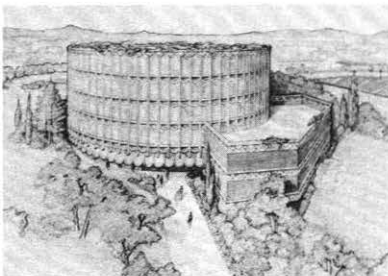
College of Education Lecture Hall



Student Health Service



Art and Architecture Complex



Proposed Music Building



Ira D. Payne Education Building

Description of Courses

Description of Courses

CLASSIFICATION OF COURSES

The course numbering system has been designed to facilitate sorting and tabulating by machine methods.

Each College and School has a code number to which departmental offerings and subject fields are related.

A complete list of code letters, subject fields and departments or divisions in which the courses are offered appears in each issue of the Schedule of Classes.

The University course numbering system is as follows:

100-299 are freshman and sophomore level courses and are designed primarily for these students. Certain courses are closed to freshmen unless they have had the designated prerequisites. This fact may be obtained from the Catalog or from curriculum adviser prior to registration.

300-499 are junior and senior level courses and are designed primarily for these students and other advanced students. When approved for inclusion in an individual program of graduate study by a supervisory committee appointed by the Dean of the Graduate College, selected 300-499 courses may serve the needs of individual graduate students.

500-799 are the graduate level courses open only to graduate students under the conditions posed by their respective programs of study. However, eligible seniors, with the approval of the Dean of the Graduate College, may enroll in certain courses at the 500 level. Ordinarily, 700-level courses are reserved for doctoral students.

PRO-SEMINAR 498

Small group study and research for advanced students within their major area. Prerequisite: Major in the department or approval of instructor. Credit, 1-3 hours.

INDEPENDENT STUDY 499

The course numbered 499 has been reserved for Independent Study courses in each of the instructional departments or divisions of the colleges at the undergraduate level. Independent Study courses are honor courses and may be taken only by outstanding senior students who have completed at least one semester in residence. Graduate students may also enroll in Independent Study as part of the program of study approved by their supervisory committee and the Dean of the Graduate College. To be

eligible for an Independent Study course a student must have a cumulative scholarship index of 3.00 or better in his major or field of specialization.

An Independent Study course is designed to provide an opportunity for the superior senior student or for the graduate student to do an original study or investigation in his major or field of specialization on an individual basis with a minimum of supervision or direction. An Independent Study course is not to be regarded as a substitute for a catalog course, nor as a means of taking a catalog course on an individual basis. Courses listed in the catalog may not be taken as Independent Study courses.

Application for Independent Study courses must be made well in advance of regular registration period with the student's adviser. The application must be signed by the adviser, and approved by the instructor under whom the student will work, and by the chairman of the department or head of the division in which the course is taken. A course fee may be required. Credit, 1-3 hours.

HONORS COURSES

The courses listed in the schedule as 298 and 492 (Honors Individual Study), 493 (Honors Thesis) and 497 (Honors Colloquium) are reserved for students in the Honors Programs in each of the Colleges. Credit, 2-6 hours.

SPECIAL GRADUATE COURSES

Special Graduate courses for Research Methods (500), Practicum (580), Internship (584), Reading and Conference (590), Seminar (591), Research (592), Thesis (593), Conference and Workshop (594), Research Methods (600), Applied Project (601), Practicum (680), Field Work (683), Internship (684), Reading and Conference (690), Seminar (691), Research (692), Research Methods (700), Practicum (780), Field Work (783), Internship (784), Reading and Conference (790), Seminar (791), Research (792), Dissertation (799), are set forth in announcements of the Graduate College and are also listed in the respective departments, where offered.

PREREQUISITES

A student registering for a course must meet the prerequisites listed for it or otherwise satisfy the instructor that he had had the equivalent preparation.

WITHDRAWAL OF COURSES

The University does not offer each year all of the courses listed in the catalog. The Schedule of Classes should be consulted for those courses offered each semester and during the summer terms.

AEROSPACE STUDIES (Air Force ROTC)

PROFESSOR:

REDDRICK (ROTC Bldg.)

ASSISTANT PROFESSORS:

BOWERSOCK, CAPPS, HERNANDEZ, LEE, SUKUT

AS 101 Aerospace Studies. Explains how the defense machinery of the United States, and particularly that of the Air Force, serves the nation. Explores the meaning and causes of war, national power, the Department of Defense and the Air Force's strategic offensive and defensive forces. Two lectures, one hour leadership laboratory. Credit, 3 hours.

102 Aerospace Studies. One hour leadership laboratory. Initial military experiences in customs and courtesies, environment of an Air Force officer, Air Force as a career and drill and ceremonies. Credit, 1 hour.

201 Aerospace Studies. Engaging in military customs and courtesies, giving military commands and the correcting and evaluating of such skills. Learning the considerations in becoming an Air Force officer. Prerequisites: AS 101 and 102, or equivalent. One hour leadership laboratory. Credit, 1 hour.

202 Aerospace Studies. Analysis of the military General Purpose Forces, Aerospace Support Forces, the conflict between democracy and communism, alliances and collective security and the struggle for peace. Prerequisite: AS 101 and 102 or equivalent. Two lectures, one hour leadership laboratory. Credit, 3 hours.

301 Aerospace Studies. Principles and techniques of communicative skills, growth and development of the United States Aerospace power and the future of manned aircraft. Prerequisite: AS 201, 202 or equivalent. Two lectures, one hour leadership laboratory. Credit, 3 hours.

302 Aerospace Studies. History of space program, space operations, future development in space and career specialty orientation. Prerequisites: AS 201, 202 or equivalent. Two lectures, one hour leadership laboratory. Credit, 3 hours.

401 Aerospace Studies. Studies in depth the need for Air Force leadership, discipline, and variables effecting leadership. Prerequisites: AS 301, 302. Two lectures, one hour leadership laboratory. Credit, 3 hours.

402 Aerospace Studies. The professional officer, military management and preparation for commissioning. Prerequisites: AS 301, 302. Two lectures, one hour leadership laboratory. Credit, 3 hours.

403 Flight Instruction. Flight Instruction — 36½ hours of both dual and solo instruction; 36 hours of ground school. Prerequisites: AS 301, 302. Students receive FAA private pilot's licenses. No credit.

AGRICULTURE

PROFESSORS:

ROBINSON (Agric. 232), BARRETT, BECKER, JUDD, MILLER,
MOODY, L. M. PARKER, RICHARDSON, TAYSOM

ASSOCIATE PROFESSOR:

MONTY

ASSISTANT PROFESSOR:

RASMUSSEN

AGRICULTURAL ECONOMICS

AE 100 Agricultural Economics. Introduction to the economic aspects of the agricultural industry. Credit, 3 hours.

206 Accounting for Farm Managers. Theory and practice in using accounting in farm management. Use of electronic data processing. Credit, 3 hours.

300 The Agrarian Heritage. Evolution of agriculture and impact of man's quest for food and fiber on civilization, development of nations, world exploration and conquest from antiquity to the present. Credit, 3 hours.

306 Intermediate Agricultural Economics. Management principles; economic theory and analysis in agriculture production and marketing. Prerequisite: AE 206. Credit, 3 hours.

308 Agricultural Finance. Capital requirements of agriculture, methods of acquiring capital, including credit use; lenders; legal aspects of working agreements and ownership arrangements; insurance; property appraisal; retirement financing; estate settlement. Credit, 3 hours.

310 Agricultural Marketing. Market principles in the economy throughout the agribusiness; arrangements for marketing power for the producer; merchandising techniques for producers, retailers; consumers' economic interest in agriculture. Credit, 3 hours.

315 Agricultural Statistics. Application of statistical techniques to data in agricultural science and economics. Interpretation of information, probability, tests of hypotheses, correlation, regression. Prerequisites: MA 116. Credit, 3 hours.

402 Land Economics. Analysis of requirements of society, and development of optimum uses of resources, with particular attention to land, water, and rural-urban relationships. Prerequisite: Nine hours credit in agricultural economics or equivalent. Credit, 3 hours.

406 Farm and Ranch Organization. Use of linear programming to develop profit maximizing or cost minimizing plans for farm, ranch, or other agricultural enterprise. Prerequisite: AE 306. Three lectures, 3 hours laboratory. Credit, 4 hours.

408 Rural Appraisal. Application of professional techniques to evaluation of rural properties, for buyer and/or seller, to determine their suitability to operating purposes and/or financial requirements and abilities. Prerequisites: AE 308, or approval of instructor. Credit, 3 hours.

410 Farm Labor Management. History of concepts and institutional development for labor; legal requirements of employers; methods for improving labor efficiency, including time and motion study, arrowpath analysis, layout, materials handling, personnel management. Credit, 3 hours.

412 Agricultural Policy. Public and institutional interest in agriculture, agricultural price policies and programs. Prerequisite: Nine hours credit in Agricultural Economics or equivalent. Credit, 3 hours.

414 Farm Cooperatives. Organization, operation and management of agricultural cooperatives. Prerequisite: Nine hours credit in Agricultural Economics or equivalent. Credit, 3 hours.

495 Current Topics. Topics chosen from the following: concept and use of contract, agricultural policy, economic theory, international trade in farm products, other country agricultural economics, development. Prerequisites: EC 201, 202; AE 406. Credit, 3 hours.

502 Advanced Land Economics. Nature and development of the rural-urban interface, with attention to appraisal, finance, and economic development; place of the rural setting with poverty in the affluent society; application of operations research techniques. Prerequisites: EC 202; AE 308, 402. Credit, 3 hours.

506 Advanced Farm Management. Application of economic theory and operations research techniques to farm-firm operations, including substitution ratios, size effects, time of consideration, tenure, and capital management. Prerequisites: EC 202; AE 406. Credit, 3 hours.

510 Advanced Agricultural Marketing. Principles of economics and marketing as evidenced in Arizona agri-businesses, including vertical integration trends and the development of bargaining power for farming. Prerequisites: EC 202; AE 310. Credit, 3 hours.

512 Agricultural Economic Development. Primary role of agriculture in the economic development process. Review of theories; exploration of cause and effect, and agricultural aspects, in economic development. Prerequisites: Suitable economics and agricultural economics. Credit, 3 hours.

ANIMAL SCIENCE

AS 150 Animal Science. Production of farm animals. Two lectures, 3 hours laboratory. Credit, 3 hours.

151 Breeds of Livestock. History, development and characteristics of breeds of farm animals. Credit, 2 hours.

252 Animal Feeding. Feeds and feeding methods, digestion, and balancing rations. Prerequisites: AS 150 and CH 113. Credit, 3 hours.

253 Livestock Production Practices. Supervised farm experience in feeding, breeding and management of livestock. Prerequisite: AS 150 or approval of instructor. One discussion period, 6 hours laboratory. Credit, 2 hours.

254 Livestock Production Practices. Continuation of AS 253. Credit, 2 hours.

262 Equitation. Care, handling and training of horses. One lecture, 3 hours laboratory. Credit, 2 hours.

271 Dairy Production Practices. Supervised farm experience, attainment of proficiency in skills associated with a dairy enterprise. Prerequisite: AS 150 or approval of instructor. One discussion period, 6 hours laboratory. Credit, 2 hours.

292 Poultry Production Practices. Supervised farm experience in poultry feeding, handling eggs, poultry raising for meat production, sanitation practices, and disease prevention. Prerequisite: AS 150 or approval of instructor. Six hours laboratory. Credit, 2 hours.

350 Livestock Judging. Breed characteristics and comparative judging. Prerequisite: AS 150. Two lectures, 3 hours laboratory. Credit, 3 hours.

351 Advanced Livestock Judging. Advanced course in judging livestock. Prerequisite: AS 350. One lecture, 3 hours laboratory. Credit, 2 hours.

359 Swine Production. Production, breeding, feeding and management of swine. Prerequisites: AS 150, 252. Credit, 2 hours.

360 Beef Production. Production, breeding, feeding and management of beef cattle. Prerequisites: AS 150, 252. Credit, 2 hours.

361 Sheep Production. Production, breeding, feeding and management of sheep. Prerequisites: AS 150, 252. Credit, 2 hours.

362 Horse Production. Production, feeding, breeding and management of horses. Prerequisite: AS 150 or approval of instructor. Credit, 2 hours.

371 Dairy Production. Technology of feeding, breeding and management of animals and of facilities for quality milk production. Prerequisites: AS 150, 252. Two lectures, 3 hours laboratory. Credit, 3 hours.

374 Animal Food Technology. Properties, processing and sanitation of meat, dairy and poultry products. Prerequisites: AS 150; MI 201. Two lectures, 3 hours laboratory. Credit, 3 hours.

390 Poultry Production and Management. Technology of feeding, breeding and management of birds for production of eggs and meat. Prerequisites: AS 150, 252. Credit, 3 hours.

453 Animal Nutrition. Use of proteins, carbohydrates, fats, minerals, and vitamins by farm animals. Prerequisites: AS 252; CH 231. Credit, 3 hours.

456 Animal Breeding. Genetics applied to animal breeding. Prerequisites: ZO 100; BI 240. Credit, 3 hours.

457 Animal Anatomy—Physiology. Form and functioning of body systems of farm animals. Prerequisites: AS 150; CH 113; ZO 100. Three lectures, 3 hours laboratory. Credit, 4 hours.

458 Livestock Diseases and Sanitation. Hygiene and management in disease control. Prerequisites: AS 457; MI 201. Credit, 3 hours.

459 Livestock Parasitology. Recognition, habitat, life history, control and treatment of the parasites of farm animals. Prerequisites: AS 150, ZO 100; MI 201. Two lectures, 3 hours laboratory. Credit, 3 hours.

460 Endocrinology. Physiology of the glands of internal secretion. Prerequisite: AS 457. Credit, 3 hours.

464 Livestock Production and Management. Methods of production, livestock enterprises, economics, loss prevention, and marketing. Prerequisite: AS 252. Credit, 3 hours.

473 Animal Reproduction and Artificial Breeding. Structure and function of the genital system in natural and artificial breeding of farm animals. Prerequisite: ZO 100. Two lectures, 3 hours laboratory. Credit, 3 hours.

474 Dairy Production and Management. Integration of the principles of feeding, breeding and management in dairy operation. Prerequisite: AS 371. Three lectures or equivalent in field trips. Credit, 3 hours.

491 Advanced Poultry Production and Management. Economics of production factors; marketing of poultry products; profit calculations. Prerequisite: AS 390. Three lectures with field trips. Credit, 3 hours.

493 Poultry Diseases and Sanitation. Health problems of poultry. Description and classification of poultry diseases, their diagnosis, control and prevention. Prerequisite: AS 390. One lecture, 3 hours laboratory. Credit, 2 hours.

495 Recent Advances in Animal Science. Current developments and literature in animal science and management. Prerequisite: Ten hours in animal science or equivalent. Credit, 2 hours.

554 Ruminant Nutrition. Metabolism of rations and fermentation products. Prerequisites: AS 453; CH 361. Credit, 3 hours.

556 Advanced Animal Breeding. Population genetics in the selection and breeding of farm animals. Prerequisites: AS 456; BI 415. Credit, 3 hours.

PLANT SCIENCE

PS 130 Crop Science. Principles of plant growth and development as applied to field crops, horticultural crops, forest and range plants. Two lectures, 3 hours laboratory. Credit, 3 hours.

222 Agricultural Mechanics. Mechanical skills important to agriculture. One lecture, 3 hours laboratory. Credit, 2 hours.

232 Soils. Properties of soils and their relation to crop production. Prerequisite: CH 113 or equivalent. Two lectures, 3 hours laboratory. Credit, 3 hours.

236 Crop Production Practices. Recommended methods and supervised farm experience in field crop production and harvesting. Prerequisite: PS 130 or approval of instructor. One lecture, 6 hours laboratory. Credit, 3 hours.

- 237 Crop Production Practices.** Continuation of PS 236. Credit, 3 hours.
- 289 Horticultural Production Practices.** Practical experience in horticultural production problems. Prerequisite: PS 130. Six hours laboratory. Credit, 2 hours.
- 325 Farm Mechanization.** Mechanical solutions to agricultural production problems in the U.S. and abroad, together with selection, evaluation, field operation and servicing of tillage, seeding, cultivating, harvesting, and pest control equipment. Two lectures, 3 hours laboratory. Credit, 3 hours.
- 326 Farm Power.** Selection and use of power sources for farm jobs including evaluation, adjustment and servicing of farm tractors and other power units. Two lectures, 3 hours laboratory. Credit, 3 hours.
- 330 Soil Fertility.** Use of fertilizers, crop rotations, and water in the management of soils. Prerequisite: PS 232. Two lectures, 3 hours laboratory. Credit, 3 hours.
- 332 Commercial Fertilizers.** Composition, properties, availability and economic use of commercial fertilizers and related materials. Prerequisite: PS 232. Credit, 3 hours.
- 334 Irrigation.** Water measurement, conveyance and conservation with emphasis on crop production and soil-plant water relations. Prerequisite: PS 232. Credit, 3 hours.
- 338 Range Management.** Improvement and utilization of range land. Prerequisites: AS 150; BO 100; or approval of instructor. Credit, 3 hours.
- 340 Weeds and Weed Control.** Identification of weeds and methods of control. Prerequisite: BO 100. Two lectures, 3 hours laboratory. Credit, 3 hours.
- 342 Grain Crops.** Production, harvesting, and utilization of grain crops. Prerequisite: BO 100. Two lectures, 3 hours laboratory. Credit, 3 hours.
- 344 Alfalfa and Forage Production.** Production and storage of forage crops, pasture management and the place of forage crops in rotations and soil conservation. Prerequisite: BO 100. Two lectures, 3 hours laboratory. Credit, 3 hours.
- 345 Cotton.** Production, harvesting, and utilization of cotton and its by-products. Prerequisite: BO 100. Two lectures, 3 hours laboratory. Credit, 3 hours.
- 346 Conservation of Agricultural Resources.** Developing an understanding of the relationships of agricultural resources. Credit, 3 hours.
- 380 Environmental Horticulture.** Plants used about the home, their culture and arrangement in the landscape. Prerequisite: PS 130 or permission of instructor. Three lectures. A laboratory will be arranged for those lacking essential skills or desiring practical experiences. Credit, 3 hours.
- 381 Plant Propagation.** Principles and skills in propagation of plants using seeds, cuttings, and grafting. Prerequisite: BO 100. Two lectures, 3 hours laboratory. Credit, 3 hours.
- 382 Lawns and Greens.** Selection, establishment, and maintenance of turf grasses for lawn, park, and sports areas. One lecture, 3 hours laboratory. Credit, 2 hours.
- 385 Tree-Fruit Production.** Production of citrus and deciduous tree fruits. Propagation, pruning, fertilizing, irrigating, pest control, and harvesting. Prerequisites: PS 130; BO 100. Two lectures, 3 hours laboratory. Credit, 3 hours.
- 386 Small Fruits.** Production of grapes, brambles, and strawberries. Planting, pruning, irrigating, pest control, fertilizing, and harvesting. Prerequisites: PS 130; BO 100. One lecture, 3 hours laboratory. Credit, 2 hours.
- 387 Commercial Vegetable Crops.** Production of truck and processing crops. Mechanical and chemical cultural practices, pest control and harvesting. Prerequisite: PS 130. Credit, 3 hours.
- 438 Advanced Range Management.** Specialized problems in scientific range administration and management. Prerequisites: PS 338; BI 415. Credit, 3 hours.
- 441 Plant Breeding.** Principles and methods used in improving farm crops. Prerequisites: BO 100; BI 340. Credit, 3 hours.
- 444 Crop Physiology.** Physiology of crops as influenced by cultural practices and environmental factors. Prerequisite: BO 360. Credit, 3 hours.
- 445 Crop Production and Management.** Crop production factors and their application to farm management. Farm plans are prepared for crop production enterprises. Prerequisite: PS 334. Credit, 3 hours.
- 446 Soil Conservation.** Soil conservation and its application to farm situations. Prerequisite: PS 232. Credit, 3 hours.

448 Soil Classification. Fundamental principles of the genesis, morphology and classification of soils; describing soil properties of significance in mapping and interpreting soil survey information. Prerequisite: PS 232. Three lectures, 3 hours laboratory. Credit, 4 hours.

450 Soil Chemistry. Chemical and mineralogical properties of soil colloids; weathering, ion exchange, soil solution reactions, and problems of acid and alkaline soils. Prerequisites: PS 232, CH 225. Three lectures; 3 hours laboratory. Credit, 4 hours.

452 Soil Physics. Physical condition of soils; water relationships, aeration, structure, and effects of tillage. Prerequisite: PS 334. Three lectures, 3 hours laboratory. Credit, 4 hours.

454 Soil Microbiology. Nature of soil microorganisms and their biochemical reactions related to soil fertility. Prerequisites: MI 201, 202. Three lectures, 3 hours laboratory. Credit, 4 hours.

495 Recent Advances in Plant Science. Current literature and recent developments in plant science. Prerequisite: Twenty hours in plant science or approval of instructor. Two lectures and discussion. Credit, 2 hours.

ANTHROPOLOGY

PROFESSORS:

RUPPÉ (SS 100E), DITTERT, JONES, STEWART

ASSOCIATE PROFESSORS:

MORRIS, TURNER

ASSISTANT PROFESSORS:

ALPHER, BAHR, FIRESTONE, MARTIN, SCHOENWETTER

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Arts Degree Curriculum

ANTHROPOLOGY — Consists of 45 semester hours of credit, of which 30 must be in anthropology and 15 in related fields to be approved by the adviser in consultation with the student. Courses AN 101, 102, 331, 341, 411, and 412 are required. An additional 12 hours in anthropology will be approved by the adviser in consultation with the student. At least 18 semester hours must be in upper division courses.

Bachelor of Science Degree Curriculum

ANTHROPOLOGY — Consists of 53 semester hours credit, of which 30 must be in anthropology and 23 hours in one of three curriculum options to be approved by the adviser in consultation with the student. Eight semester hours credit are required in a foreign language. Required courses in anthropology are AN 101, 102, 331, 341, 411, and 412. Options are: (1) archaeology, (2) physical anthropology, and (3) social-cultural anthropology. At least 18 semester hours must be in upper division courses.

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS (Secondary Education)

ANTHROPOLOGY — Consists of 18 semester hours of credit in anthropology. Courses AN 101 or 102, and 331, 341, 364, 411 and 412 are required. One other course may be taken in lieu of AN 364, dependent upon the interest of the student.

DEPARTMENTAL GRADUATE PROGRAM

The Department of Anthropology offers programs leading to the degrees of Master of Arts and Doctor of Philosophy. Consult the *Graduate Catalog* for requirements.

ANTHROPOLOGY

AN 101 Origin and Development of Man and Culture. Physical anthropology and archaeology. Evidence and processes of human evolution and of culture change. Primates. Fossil men and their tools. Race, variation and heredity. Man and his environment. Prehistoric culture and society. Credit, 3 hours.

102 Introduction to Cultural and Social Anthropology. Basic principles of cultural and social anthropology, with illustrative materials from a variety of cultures. The nature of culture. Material culture and technology. Social, political, and economic systems, religion, aesthetics, and language. Culture growth and social change. The effect of culture upon the development of personality. Credit, 3 hours.

221 Indians of the Southwest. Cultures of living Indian tribes — Navajo, Hopi, Pima, Papago, Apache, Mohave, and others. Credit, 3 hours.

231 Archaeological Field Methods. The excavation of archaeological sites and the recording and interpretation of data. Includes field experience in this locality. Two lectures, 3 hours laboratory. Credit, 3 hours.

232 Anthropological Field Session. Basic anthropological field techniques; guidance in solving representative problems. Prerequisite: Approval of instructor. May be repeated for credit. Credit, 1-5 hours.

311 Principles of Social Anthropology. Variations in man's social institutions, culturally conditioned behavior, and mechanisms of social organization and control throughout the world. Credit, 3 hours.

314 Primitive Religion. Origins, elements, forms, and symbolism of religion; a comparative survey of primitive religious beliefs and ceremonies; the place of religion in the total culture. Prerequisite: AN 102 or approval of instructor. Credit, 3 hours.

315 Primitive Arts and Technology. Comparative survey of the material culture of peoples of the world with an emphasis on the production and use of artifacts. Prerequisite: AN 102 or approval of instructor. Credit, 3 hours.

322 Peoples of Africa. Races and cultures of the peoples of Africa, past and present, with special emphasis on the Negroid peoples. Prerequisite: AN 102 or approval of instructor. Credit, 3 hours.

323 Peoples of Asia. Races and cultures of Asia, including the more complex cultures of India, China, Japan, and related areas. Prerequisite: AN 102 or approval of instructor. Credit, 3 hours.

330 Principles of Archaeology. Prehistoric man. Survey of dating methods, field techniques, and artifactual inventories. Geographic, climatic, and geological relationships. Credit, 3 hours.

331 Prehistory. Development of Old World cultures from the Old Stone Age through the Iron Age. Credit, 3 hours.

334 Arctic Anthropology. An areal survey of past and present Aleut-Eskimo prehistory, origins, physical features, adaptations, variation and culture with comparisons of Asian Arctic populations. Prerequisite: AN 101 or approval of instructor. Credit, 3 hours.

335 Southwestern Archaeology: Hohokam and Mogollon. Prehistoric cultures of the desert and mountain regions of the Southwest. Southern Palaeo-Indian, Hohokam, and Mogollon sequences are analyzed and compared. Prerequisite: AN 101 or approval of instructor. One weekend field trip. Credit, 3 hours.

336 Southwestern Archaeology: Basket Maker and Pueblo. Prehistoric Basket Maker and Pueblo cultures of the Southwest. Cultural sequences leading to the modern pueblos are analyzed. Prerequisite: AN 101 or approval of instructor. Credit, 3 hours.

- 341 Physical Anthropology.** Osteology, fossil men, anthropometry, description and analysis of archaeological and contemporary human populations. Prerequisite: AN 101 or approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.
- 342 Physical Anthropology.** Gene frequencies, clines, polymorphisms, population dynamics; description and analysis of human populations. Prerequisite: AN 101 or approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.
- 346 Human Origins.** Man's place in nature, fossil men, historic and recent concepts of human races, influence of culture on human evolution. Credit, 3 hours.
- 351 Culture and Personality.** Survey of approaches to the interrelations between the personality system and the socio-cultural environment. Prerequisite: AN 102 or approval of instructor. Credit, 3 hours.
- 364 Museum Techniques.** Laboratory techniques in restoration of artifacts. Museum display practices to present anthropological material. Prerequisite: AN 101 or approval of instructor. Credit, 3 hours.
- 365 Laboratory Methods in Archaeology.** Techniques of artifact analysis. Basic archaeological research techniques, methods of report writing. Prerequisite: AN 101 or approval of instructor. May be repeated for credit. Credit, 3 hours.
- 381 Introduction to Linguistics.** Descriptive and historical linguistics. An elementary survey of theories of human language, with emphasis on synchronic linguistics. Prerequisite: AN 102 or approval of instructor. Credit, 3 hours.
- 382 Linguistic Theory: Syntax.** Contemporary theories of the grammatical structure of languages. Prerequisite: AN 381 or FL 400 or approval of instructor. Credit, 3 hours.
- 383 Linguistic Theory: Phonology.** Contemporary theories of the sound systems of languages. Prerequisite: AN 381 or FL 400 or approval of instructor. Credit, 3 hours.
- 411 Cultural Anthropology.** Social organization and cultural processes. Survey of anthropological theory and practice. Prerequisite: AN 102 or approval of instructor. Credit, 3 hours.
- 412 Peoples of the World.** Ethnographic survey of the peoples and cultures of Eurasia, Africa, Oceania, and the Americas. Intensive analysis of selected cultures from representative culture areas. Prerequisite: AN 102 or approval of instructor. Credit, 3 hours.
- 414 Cultural Systems.** Basic concepts and concept systems in cultural research: signs, symbols, meanings, values, cognitive systems; language; expressive symbols, art, myth, and ritual. Prerequisite: AN 102 or approval of instructor. Credit, 3 hours.
- 415 Primitive Art.** Descriptive survey of the art forms of primitive people in relationship to their cultural setting. Prerequisite: AN 102 or approval of instructor. Credit, 3 hours.
- 416 Economic Anthropology.** The meaning of economic behavior and the economy; description and classification of exchange systems; the relations between production, exchange systems and other societal subsystems; problems in economic change and growth with the focus on primitive and peasant societies. Prerequisite: AN 102 or approval of instructor. Credit, 3 hours.
- 417 Cultural Dynamics and Processes.** Analysis of cultural evolution with emphasis on the relation of mechanisms of social control to technology and cultural ecology. Prerequisite: AN 102 or approval of instructor. Credit, 3 hours.
- 421 The North American Indian.** Archaeology, ethnology and linguistic relationships of the Indians of North America. Does not include Middle America. Prerequisite: AN 102 or approval of instructor. Credit, 3 hours.
- 422 Archaeology of North America.** The origin, spread, and development of the prehistoric Indians of North America up to the historic tribes. Does not include the Southwest. Prerequisite: AN 101 or approval of instructor. Credit, 3 hours.
- 423 Archaeology of Middle America.** Pre-Conquest cultures and civilizations of Mexico and Central America. The Aztecs, Maya and their predecessors. Prerequisite: AN 101 or approval of instructor. Credit, 3 hours.
- 424 Indians of Middle America.** Post-Conquest tribes and folk cultures. Prerequisite: AN 102 or approval of instructor. Credit, 3 hours.

432 Advanced Anthropological Field Session. Advanced training in anthropological field techniques, analysis of data, and preparation of field reports. Prerequisite: AN 232 or approval of instructor. May be repeated for credit. Credit, 1-5 hours.

441 Acculturation and Applied Anthropology. Dynamic processes of culture contact. Impact of Western civilization upon native societies; anthropological problems in colonial and native administration; applied anthropology in the modern world. Prerequisite: AN 102 or SO 101 or approval of instructor. Credit, 3 hours.

451 Primatology. Non-human primates: structure, taxonomy, dispersion, fossil evidence, and social behavior. Prerequisite: AN 101 or 341 or approval of instructor. Credit, 3 hours.

452 Dental Anthropology. Human and primate dental morphology, growth, evolution and genetics. Within- and between-group variation. Dental pathology and behavior-cultural-dietary factors. Prerequisite: Approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.

453 Fossil Man. Detailed review and analysis of ancient African, Asian, and European human and primate skeletal, dental, and cultural remains. Human biological, behavioral, and cultural evolution. Prerequisite: An introductory course in anthropology or zoology or approval of instructor. Credit, 3 hours.

472 Archaeological Ceramics. Analysis and identification of pottery wares, types, and varieties. Systems for ceramic classification and cultural interpretation. Prerequisite: Approval of instructor. Two hours of lecture and two hours laboratory. Credit, 3 hours.

475 Method and Theory of Archaeology. Development of archaeology and the theoretical basis of the discipline. Rationale and methods of reconstruction of past human behavior from archaeological data. Prerequisite: AN 101 or approval of instructor. Credit, 3 hours.

479 The Anthropology of Peasant Peoples. Description, comparison and theories pertaining to the social and community structure and world views of peasant peoples. Prerequisite: AN 102. Credit, 3 hours.

481 Language and Culture. The application of linguistic theories and findings to nonlinguistic aspects of culture; language change; psycho-linguistics. Prerequisite: AN 102 or approval of instructor. Credit, 3 hours.

482 Linguistic Practice. Study of a non-Indo-European language with an informant. Prerequisite: AN 381 or FL 400 or approval of instructor. Credit, 3 hours.

483 Ethnographic Practice. Working with a native speaker of a non-Indo-European language to elicit and analyze the concepts of his culture. Prerequisite: AN 381. Credit, 3 hours.

511 Kinship and Social Organization. Investigation of the meanings and uses of concepts referring to kinship, consanguinity, affinity, descent, alliance and residence in the context of a survey of the varieties of social groups, marriage rules and kinship terminological systems. Prerequisite: Approval of instructor. Credit, 3 hours.

513 Social Systems. A survey of basic concepts and concept systems in social research: social structure and social functions; structure, status, role and organization; social systems, economy and polity; problems in taxonomy and description. Prerequisite: Approval of instructor. Credit, 3 hours.

532 Graduate Field Anthropology. Independent research on a specific anthropological problem to be selected by the student in consultation with the staff. Prerequisites: AN 432 or equivalent and approval of instructor. May be repeated for credit. Credit, 2-6 hours.

541 Archaeological Pollen Analysis. Theory, methodology and practice of pollen analytic techniques. Compares uses in botany, geology, and archaeology. Field trips and laboratory. Prerequisite: Approval of instructor. Two hours lecture and two hours laboratory. Credit, 3 hours.

544 Settlement Patterns. Analysis of spatial arrangement of residences, distribution and density over the landscape, and utilization of a given environment for habitation. Prerequisite: Approval of instructor. Credit, 3 hours.

553 New World Physical Anthropology. Human biology and variation of skeletal and living populations of Aleut-Eskimos and Indians. American Indian biological

origins and microevolution. Adaptation and human population biology problems. Field trip. Prerequisites: AN 341 and 342. Credit, 3 hours.

554 Southwestern Physical Anthropology. Human biology of skeletal and living populations of Indians of the Greater Southwest. Intensive review of within- and between-group variation. Field trip. Prerequisites: AN 341, 342, and one of the following: AN 221, 335, or 336. Credit, 3 hours.

591 Seminar. Credit, 2-3 hours. Topics may be selected from the following:

- | | |
|---|---|
| (a) <i>Physical Anthropology</i> | (i) <i>Early Man in the New World</i> |
| (b) <i>Fossil Man</i> | (j) <i>Taxonomy in Archaeology</i> |
| (c) <i>Microevolution of Human Populations</i> | (k) <i>Cultural Anthropology</i> |
| (d) <i>Primates and Behavior</i> | (l) <i>Social Anthropology</i> |
| (e) <i>Evolution and Culture</i> | (m) <i>Problems in Southwestern Ethnology</i> |
| (f) <i>Dental Anthropology</i> | (n) <i>Culture and Personality</i> |
| (g) <i>Problems in Southwestern Archaeology</i> | (o) <i>Monographic Analysis</i> |
| (h) <i>Synthesis in Archaeology</i> | (p) <i>Linguistics</i> |
| | (q) <i>Museology</i> |

643 Archaeological Cultural Ecology. Analysis of practice, method, theory and history of this form of archaeological interpretation. Comparison with ecological research in other social and natural science disciplines. Prerequisites: AN 475, passage of qualifying examination, and approval of instructor. Credit, 3 hours.

Special Graduate Courses: 500, 590, 591, 592, 593, 600, 690, 691, 692, 700, 791, 792, 799. (See page 219.)

ARCHITECTURE

PROFESSORS:

ELMORE (PT1B), STRAUB, ELLNER, WHIFFEN

ASSOCIATE PROFESSORS:

COOK, FLYNN, HERSHBERGER, JAKOB, OLIVER, PETERSON, RAPP

ASSISTANT PROFESSORS:

BALLEW, BERG, BERTELSEN, DIETHELM, HINSHAW,
MOFFITT, WOOLDRIDGE

LECTURERS:

SOLERI, YELLOTT

ARCHITECTURAL PHILOSOPHIES

(Unless otherwise indicated, these courses are open to any student meeting the stated prerequisites and are recognized in the University's program of General Studies.)

AP 100 Introduction to Architecture. Understanding of our physical environment through the forms, functions and determinants of today's architecture, its continuity with the past and its relation to the developing present. Brief examination of architecture as a profession. Credit, 2 hours.

101 Fundamentals of Architecture. Interaction of forces shaping the modern architectural environment. Architecture students only. Prerequisite: AP 100. Credit, 2 hours.

300 The Man-made Environment. Social, economic, political and other factors shaping the architecture of the Twentieth Century. Selected references to architectural expression in earlier centuries. Credit, 3 hours.

- 301 American Architecture.** Influences and achievements in the U.S. from earliest colonial times to the present. Credit, 3 hours.
- 303 Discussion Leadership.** Experience of leading small groups in discussion of architectural subjects. Architecture students only. Prerequisites: AP 101, AD 324 and approval of instructor in AP 101. Credit, 1 hour. May be repeated for maximum of 3 credit hours.
- 305 Arid Region Architecture.** Problems and solutions arising from architecture's participation in a desert ecology. Prerequisite: Junior standing. Credit, 3 hours.
- 313, 314 History of Architecture.** Past achievements as the realization of changing aesthetic and cultural ideals and the expression of changing forms of society. Ancient through Renaissance in 313, Seventeenth Century to the present in 314. Credit, 3 hours each semester.
- 317 Oriental Architecture.** Middle East, India, Southeast Asia, China and Japan from ancient times to the present. Credit, 3 hours.
- 319 Topics in Architectural Philosophies.** Developments, theories or achievements of current or special interest. Prerequisite: Junior standing and approval of instructor. Credit, 1-3 hours.
- 401 Ancient Architecture.** Egypt, Greece and Rome. Prerequisite: AP 313. Credit, 3 hours.
- 402 Early Christian and Medieval Architecture.** Europe and the Near East from the reign of Constantine to the end of the Middle Ages. Prerequisite: AP 313. Credit, 3 hours.
- 403 Renaissance Architecture.** Europe and America in the Fifteenth and Sixteenth Centuries. Prerequisite: AP 313 or 314. Credit, 3 hours.
- 404 Seventeenth and Eighteenth Century Architecture.** Europe and America from the Early Baroque to Romantic Classicism. Prerequisite: AP 314. Credit, 3 hours.
- 405 Nineteenth Century Architecture.** Europe and America from Romantic Classicism to the Art Nouveau. Prerequisite: AP 314. Credit, 3 hours.
- 406 Twentieth Century Architecture.** Achievements world-wide from the Art Nouveau to the present. Prerequisite: AP 314. Credit, 3 hours.
- 410 History of Landscape Architecture.** Physical record of man's attitude toward the land. Ancient through contemporary land design for human use and enjoyment. Prerequisite: AD 324. Credit, 3 hours.
- 415 Seminar.** Discussion and reports on aspects of contemporary architecture: theory, practice, criticism, relevance. Architecture students only. Prerequisite: 16 hours of architectural philosophies. Credit, 2 hours.
- 416 Seminar.** Extension of prerequisite course: AP 415. Credit, 2 hours.

ARCHITECTURAL TECHNOLOGIES

- AT 141 Architectural Communications.** Techniques for presentation of ideas in graphic, photographic, verbal, electronic, other and combined media. Prerequisite: Admission to the pre-architecture program (see pages 181-182) or special permission of the Dean's office. One half-day in studio. Credit, 2 hours.
- 142 Architectural Communications.** Basic drawing; descriptive geometry; orthographic projection; shades and shadows; perspective drawing. Prerequisite: Admission to the pre-architecture program (see pages 181-182) or special permission of the Dean's office. One half-day in studio. Credit, 2 hours.
- 237 Landscape Architecture.** Land and site planning; ecology as the basis of outdoor design; theory, techniques, history and material vocabulary. Prerequisite: AD 221. Credit, 2 hours.
- 241 Architectural Communications.** Techniques of sketching and rendering. Prerequisite: AT 141, 142. One half-day in studio. Credit, 2 hours.
- 242 Communications Studio.** Amplification and application of prerequisite AT 241. Scheduled during studio time of corequisite: AD 222. Credit, 1 hour.
- 243 Watercolor for Architects.** Composition, color and techniques of painting architectural subjects. Prerequisite: AD 222 or equivalent. Three hours of lecture and studio. Credit, 2 hours.

254 Construction Materials and Products. Origin, nature, capabilities, limitations. Construction standards. Prerequisites: MA 141, PH 111, 112, AT 261. One half-day in studio. Credit, 3 hours.

261 Structures. Statics and strength of materials. Prerequisites: MA 141, PH 111. Credit, 3 hours.

280 Computers in Architecture. Use and potential in such areas as programming, calculations, control, design and graphics. Prerequisite: Admission to professional program. Credit, 2 hours.

331 Industrial Design. History, theory and processes of design and production of objects associated with architecture. Prerequisite: AD 324. Credit, 2 hours.

338 Landscape Studio. Amplification and application of prerequisite: AT 237. Scheduled during studio time of corequisite: AD 323. Credit, 1 hour.

362 Structures. Basic determinate structural systems with emphasis on wood and steel. Prerequisites: AT 254, 261. Credit, 3 hours.

363 Structures. Basic indeterminate structural systems, emphasizing steel and concrete. Introduction to lateral analysis and to soil mechanics. Prerequisites: AT 362, 371. Credit, 3 hours.

365, 366 Structures Studio. Amplification and application of prerequisites AT 261 and 362, respectively. Scheduled during studio time of corequisites: AD 323 and 324, respectively. Credit, 1 hour each.

371, 372 Mechanical and Electrical Systems. Technical problems of climate control, acoustics, lighting, communications and other mechanical and electrical systems. Prerequisites: PH 112, AT 254, 261. Credit, 3 hours each semester.

432 Planning and Urban Design. History, principles and techniques of planning; contemporary urban problems; redevelopment programs; new communities; urban aesthetics; factors affecting urban design. Prerequisite: AD 425 or special permission of the Dean's office. Credit, 2 hours.

433 Urban Design Studio. Amplification and application of prerequisite: AT 432. Scheduled during studio time of corequisite: AD 427. Credit, 1 hour.

455 Construction Systems. Selection and employment of materials and systems according to their nature and the techniques of their use. Prerequisites: AT 254, 363, 372. One half-day in studio. Credit, 3 hours.

456 Contract Documents. Preparation of contract drawings, specifications and documents. Use of building codes. Integration of content of prerequisites: AT 363, 372 and 455. One half-day in studio. Credit, 3 hours.

457, 458 Building Systems Studio. Amplification and application of prerequisite: AT 464. Scheduled during studio time of corequisites: AD 427 and 495, respectively. Credit, 1 hour each.

464 Structures. Unique structural systems. Lateral analysis. Structural systems research and experimentation. Prerequisites: AT 363, 372, 455. Credit, 3 hours.

473, 474 Mechanical and Electrical Systems Studio. Amplification and application of prerequisite: AT 372. Scheduled during studio time of corequisites: AD 425 and 495, respectively. Credit, 1 hour each.

481 Design and Construction Processes. Functions, problems and joint operating processes of the architect, structural engineer, mechanical engineer, electrical engineer, contractor and others involved in the creation of buildings. For other than architectural students. Prerequisite: Senior standing. Credit, 3 hours.

484 Professional Practice. Legal and ethical constraints; office management; field operations and control; financing and organization of building operations. Prerequisites: AT 372, 456, 464. Credit, 3 hours.

ARCHITECTURAL DESIGN/SYNTHESIS

AD 221 Design/Synthesis—Second Year. Basic design principles—color, texture, space, form. Graphics. Visual expression as response to human need and aspiration. Prerequisite: Admission to professional program (see page 182). Five afternoons in studio. Credit, 4 hours.

222 Design/Synthesis—Second Year. Extension of AD 121. Visual and architectural expression as response to environmental determinants. Prerequisite: AD 221. Co-requisite: AT 242. Five afternoons in studio. Credit, 4 hours.

320 Field Study. Organized study of architecture in an out-of-state setting. Co-requisite: AD 324. Credit, 1 hour.

323 Design/Synthesis—Third Year. Function and interrelationship of spaces, interior and exterior. Prerequisite: AD 222. Corequisite: AT 338, 365. Five afternoons in studio. Credit, 4 hours.

324 Design/Synthesis—Third Year. Movement, circulation, flow dynamics. Structure, materials, techniques. Prerequisite: AD 323. Corequisite: AD 320, AT 366. Five afternoons in studio. Credit, 4 hours.

425 Design/Synthesis—Fourth Year. Interior environment: air conditioning, lighting, acoustics, furnishings. Structure, materials, techniques. Prerequisite: AD 324. Co-requisite: AT 473. Five afternoons in studio. Credit, 4 hours.

426 Design/Synthesis—Fourth Year. Controls: social, political, economic. Programming. Problem solving. Prerequisite: AD 425. Five afternoons in studio. Credit, 4 hours.

427 Design/Synthesis—Fifth Year. Research. Community problems, community planning, community design. Prerequisite: AD 426. Corequisite: AT 433, 467. Five afternoons in studio. Credit, 4 hours.

435, 436 Architectural Workshop. Concentrated study of practical and theoretical aspects of architecture carried on as a full-time summer experience. Prerequisite: AD 324 and faculty approval. Credit, 4-6 hours each five-week session.

494 Thesis Research. Development of data and program for thesis. Prerequisite: AD 426 and faculty approval of topic. Credit, 3 hours.

495 Thesis. Terminal project in architecture demonstrating the student's qualification for the professional degree, Bachelor of Architecture. Prerequisites: AD 427, 494. Corequisites: AT 468, 474. Credit, 8 hours.

ART

PROFESSORS:

LINDERMAN (Arts 207), GOO, HARTER, JACOBSON, SCHAUMBURG, WOOD

ASSOCIATE PROFESSORS:

BRECKENRIDGE, FINK, GRIGSBY, HALE, TAYLOR, TURK, WAGNER

ASSISTANT PROFESSORS:

HAHN, HAYDEN, KENNEDY, SCHRIEBER, STULER, WOODS

INSTRUCTORS:

BROUCH, SCHMIDT, SHIPP

DEPARTMENTAL MAJOR REQUIREMENTS

For advisement purposes, all students registering in an art major program will enroll through the College of Fine Arts.

Bachelor of Art Degree Curriculum

ART—Consists of 45 semester hours of credit, not more than 30 hours in courses offered by the Department, with a concentration in one area of specialization, and at least 15 hours in closely related fields to be approved by the adviser in consultation with the student. Courses AR 111, 114, 141, 142, 223; AH 111, 212, 313 are required. At least 18 semester hours must be in upper division courses.

Bachelor of Science Degree Curriculum

ART—Consists of 50 semester hours of credit, with a concentration in one area of specialization to be approved by the adviser in consultation with the student. Courses AR 111, 114, 141, 223; AH 111, 212, 313 are required. At least 20 semester hours must be in upper division courses.

Bachelor of Fine Arts Degree Curriculum

ART—Consists of 76 semester hours of credit, with a concentration in one area of specialization to be approved by the adviser in consultation with the student. Courses AR 111, 114, 223, 131, 141, 142, 161 or 271, 191; AH 211, 212, 313, 441 are required. At least 30 semester hours must be in upper division courses.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS

Bachelor of Arts in Education Degree Curriculum

ART—Consists of 45 semester hours of credit in art and related fields. Courses AR 111, 114, 141, 142, 223; AH 111, 212, 313; AE 301, 412, 480 are required. Additional hours to complete the major will be approved by the adviser in consultation with the student. At least 18 semester hours must be in upper division courses. AR 111 is required of all art majors. This requirement may be waived upon demonstration by examination as the Art Department may require. Before registration, approved by the adviser in consultation with the student. At least 18

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS

ELEMENTARY EDUCATION MAJOR: Consists of 18 semester hours including AR 141, AE 301, AE 420 which are required. The remaining nine semester hours may be selected in consultation with an art education adviser.

SECONDARY EDUCATION MAJOR: Consists of 18 semester hours including AR 141, AE 480 which are required. The remaining 12 semester hours may be selected in consultation with an art adviser.

SECONDARY EDUCATION MAJOR, MINOR IN PHOTOGRAPHY: Consists of 18 semester hours including AR 191, 291, 391, 491 (black/white), 491 (color), 499 which constitute the minor.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Art offers programs leading to the degrees of Master of Arts, Master of Fine Arts, Master of Education with major in Art Education, Doctor of Education in Art Education. Consult the *Graduate Catalog* for requirements.

ART

Advertising Design

AR 181 Advertising Design. Practical problems in six major graphic media used in commercial art. Six hours a week. Credit, 3 hours.

281 Fundamentals of Graphic Design. Exercises in technique; systematic intellectual approach to graphic design. Practical study of the elements involved in the effective use of typography. Emphasis on the sequential nature of graphic design: problems of rhythm, interval, pattern, texture and shape. Prerequisites: AR 141, 181 or approval of instructor. Six hours a week. Credit, 3 hours.

282 Lettering. Basic letter forms and their relation to type design and typographic practice. Sensitivity to letter design developed through writing and broad-nib pens leading to built-up letters. Problems in page design. Prerequisites: AR 141, 142, 181 or approval of instructor. Six hours a week. Credit, 3 hours.

283 Beginning Fashion Illustration. Development of skill and expressiveness in drawing the fashion figure with emphasis on form, construction and gesture from the human figure. Prerequisite: Approval of instructor. Six hours a week. Credit, 3 hours.

381 Graphic Design. Further exploration of the communicative potential of visual images. Use of various media and techniques in their development as related to technological limitations of production. Emphasis on typography. Prerequisites: AR 281, 282. Six hours a week. Credit, 3 hours.

382 Advanced Lettering. Concentrated problems in the use of letters as positive elements in design. Study and practice of the written italic form. Prerequisite: AR 282. Six hours a week. Credit, 3 hours.

383 Advanced Fashion Illustration. Emphasizes preparation of layout and finished illustrations for fashion advertisement. Includes training in professional methods and techniques used in the professional field. Prerequisite: AR 283 or approval of the instructor. Six hours a week. Credit, 3 hours.

481 Techniques of Advertising Production. Preparation of finished art and mechanicals for reproduction by offset lithography or letterpress printing. Preparation of a professional portfolio. Six hours a week. Credit, 3 hours.

Ceramics

AR 161 Ceramics. The nature of clay and glazes, hand-forming methods, throwing on the wheel, decorative processes, glaze application, and firing. Prerequisite for art majors: AR 141. Six hours a week. Credit, 3 hours.

261 Ceramics. Concentration on potter's wheel techniques and further development of decorative processes and glaze applications. Prerequisite: AR 161. Six hours a week. Credit, 3 hours.

361 Advanced Ceramics. Advanced production methods, glaze formula interpretation, some experimental work in clays and glazes. Emphasis on development of individual style. Prerequisites: AR 141, 261. Six hours a week. Credit, 3 hours.

362 Advanced Ceramics. Emphasis on glaze formulation with experimentation in use of ceramic glaze materials and colorants. Prerequisite: AR 361. Six hours a week. Credit, 3 hours.

461 Advanced Ceramics. Studio problems adapted to meet individual needs. Curriculum problems, procedures, and techniques for teachers. Advanced research for the individual potter. Prerequisite: AR 361 or equivalent. Six hours a week. Credit, 3 hours.

Crafts

AR 271 Crafts. Contemporary design employing materials such as metal, wood, textiles, mosaics, copper enameling, glass, fabrics, etc. Six hours a week. Credit, 3 hours.

272 Fabrics. Includes weaving, stitchery, textile printing and cloth collage. Six hours a week. Credit, 3 hours.

371 Metal. Covers jewelry and the hand working of non-ferrous craft metals and associated materials. Six hours a week. Credit, 3 hours.

372 Wood. Wood carving, making of bowls, tableware, furniture, carved reliefs. Six hours a week. Credit, 3 hours.

471 Advanced Crafts. Includes creative work in all craft media. Six hours a week. Credit, 3 hours.

Design

AR 141 Basic Design. Workshop exercises leading to a sophisticated use of the fundamental principles involved in organizing two- and three-dimensional space.

A working vocabulary of structure and form is developed through problems in spatial dynamics, line, light and contrast, shape, value, pattern and texture. Six hours a week. Credit, 3 hours.

142 Basic Design. Continuation of AR 141. Problems in color. Further experimentation with images and their expressive manipulation. Prerequisite: AR 141. Six hours a week. Credit, 3 hours.

143 Interior Design. Design principles that have application to interior environments. An awareness of both the functional and aesthetic properties of new materials and methods is gained through the experimental solution of problems in contemporary design. Six hours a week. Credit, 3 hours.

241 Space Design. Articulation and analysis of volume and space relationship. Visionary constructions using a variety of methods and materials. Prerequisite: AR 141. Six hours a week. Credit, 3 hours.

341 Intermediate Space Design. Exploration of structural forms. Observation of building construction. Experimentation in structural systems. Detail drawing and photomontage of interior spaces. Developing original solutions. Prerequisite: AR 241. Six hours a week. Credit, 3 hours.

343 Advanced Interior Design. Practical problems in drafting and graphic presentations. Theory of color and lighting effects. Knowledge and practical experience in assembly and installation of interior components. Prerequisites: AR 143, 241. Six hours a week. Credit, 3 hours.

344 Environmental Design. Experiments in acoustic, optical, tactile and color illusions. Development of total atmospheres. Two- and three-dimensional constructions, six hours a week. Credit, 3 hours.

441 Advanced Space Design. Design of interior components. Working drawings. Model construction and full scale pieces of furniture. Prerequisite: AR 341. Six hours a week. Credit, 3 hours.

444 Advanced Environmental Design. Comprehensive projects in interior and exterior environments. Emphasis will be on the integration of research, presentation, plan, elevation, perspectives, model construction and analysis. Prerequisites: AR 341, 344. Six hours a week. Credit, 3 hours.

489 Professional Workshop. Analysis of professional problems and practices with internship and work experience in interior design firms. Portfolio preparation. Prerequisites: AR 441, 444. Six hours a week. Credit, 3 hours.

Drawing

AR 111 Beginning Drawing. The study and practice of common drawing media and their application to current systems of pictorial organization. Directed toward the student with no previous college level art experience. Six hours a week. Credit, 3 hours.

114 Beginning Life Drawing. Development of skill and expressiveness in drawing the basic form, construction, and gesture from the human figure. Prerequisite: AR 111. Six hours a week. Credit, 3 hours.

211 Advanced Drawing. Emphasis on composition; exploration of drawing media. Prerequisite: AR 111. Six hours a week. Credit, 3 hours.

214 Intermediate Life Drawing. Continuation of objectives of AR 114. Six hours a week. Credit, 3 hours.

311 Advanced Drawing. Continuation of AR 211. Prerequisite: AR 211. Six hours a week. Credit, 3 hours.

314 Advanced Life Drawing. Emphasizes various media and techniques on an advanced level, with additional outside requirements such as analysis of style, and anatomical structure. Prerequisites: AR 114, 214. Six hours laboratory, 2 hours outside preparation. Credit, 3 hours.

411 Drawing Techniques of the Old Masters. Historical techniques of drawing from early Renaissance to the present. The making and use of materials and tools including silver point, listre ink, quill pen, pastels and chiaroscuro drawings, as used

by Michelangelo, Rembrandt, Tiepolo, and other masters. Prerequisites: AR 211, 214. Six hours a week. Credit, 3 hours.

414 Advanced Life Drawing. Continuation of objectives of AR 314. Prerequisite: AR 314. Six hours a week. Credit, 3 hours.

Painting

AR 223 Beginning Painting. Composition, color and technical mastery of painting media. Prerequisites: AR 111, 114. Six hours a week. Credit, 3 hours.

323 Advanced Painting. Advanced problems in painting. Prerequisite: AR 223. Six hours a week. Credit, 3 hours.

421 Painting Mediums and Techniques. Designed to acquaint the student with materials and all varieties of painting. Experimental problems in traditional as well as modern synthetic media. Six hours a week. Credit, 3 hours. (Section M) A combination studio and lecture course emphasizing the unique character of mural painting in its essential relation to architecture. Two hours lecture, 4 hours laboratory. Credit, 3 hours.

423 Advanced Painting. Problems for those with a serious interest in easel painting or murals. Prerequisites: AR 314, 323. Six hours a week. Credit, 3 hours.

425 Figure Painting. Portrait and figure painting from model. Prerequisite: AR 423. Six hours a week. Credit, 3 hours.

Photography

AR 191 Photographic Art. Photography as an art medium. Two lectures, 3 hours laboratory. Credit, 3 hours.

291 Intermediate Photographic Art. Development of the disciplines and attitudes of the creative artist-photographer. Prerequisite: AR 191. One lecture, 6 hours laboratory. Credit, 3 hours.

391 Advanced Photography. The interpretation and manipulation of light as a tool in the performance of expressive photography. Prerequisite: AR 291. One lecture, 6 hours laboratory. Credit, 3 hours.

491 Advanced Photography. (Section B) Black and white. Advanced exploration of experimental, interpretive, and straight photography. (Section C) Color. The study and application of color photography and printing processes to photographic art. Both sections may be repeated for credit. Prerequisite: AR 391. One lecture, 6 hours laboratory. Credit, 3 hours.

Printmaking

AR 351 Printmaking. Printmaking processes using serigraph, lucite, glue, woodcut, lithography, etching. (Section I) Intaglio, etching, engraving, collograph, and other intaglio techniques. (Section L) Lithography. (Section R) Relief. Prerequisites: AR 111, 211, 214. Six hours a week. Credit, 3 hours.

451 Advanced Printmaking. Advanced printmaking processes. (Section I) Intaglio. (Section R) Relief. (Section L) Lithograph. (Section S) Serigraphy. Prerequisite: Approval of instructor. Six hours a week. Credit, 3 hours.

Sculpture

AR 131 Sculpture. Exploration of sculptural form and expression through direct plaster, terra cotta, wood, and stone. (Section E) Experimental. Experimentation in non-traditional approach, fabrication, structure, and with materials (synthetic and natural) in sculpture. Emphasis is placed on the nature of the exploratory process in the search for a personal expression. Six hours a week. Credit, 3 hours.

231 Advanced Sculpture. Continuation of AR 131 with emphasis on design and individual instruction. Introduction of welding and brazing techniques and casting in aluminum and bronze. (Section E) Experimental. Prerequisites: AR 131, 141. Six hours a week. Credit, 3 hours.

331 Advanced Sculpture. Introduction of sculptural problems related to architecture and man's environment. Exploration in all traditional media with emphasis on

the use of color in sculpture. (Section E) Experimental. Prerequisite: AR 231. Six hours a week. Credit, 3 hours.

431 Advanced Sculpture. Introduction to professional practices and presentation. Prerequisite: AR 331. Six hours a week. Credit, 3 hours.

432 Experimental Sculpture. Analysis in non-traditional approach, fabrication and structure, through synthetic and natural materials in sculpture. Emphasis is placed on the nature of the exploratory process in the search for a personal expression. Prerequisite: AR 231 or approval of instructor. Six hours a week. Credit, 3 hours.

Watercolor

AR 222 Watercolor. Painting in all water-soluble media. Emphasis on techniques, composition and color. Prerequisite: AR 111. Six hours a week. Credit, 3 hours.

322 Advanced Watercolor. Explorations using a variety of surfaces, a combination of media and materials in a continued search for creative form. Prerequisite: AR 222. Six hours a week. Credit, 3 hours.

422 Advanced Watercolor. Experimentation toward a more personal expression. Prerequisite: AR 322. Six hours a week. Credit, 3 hours.

Special Courses

AR 521 Studio Problems and Techniques. Advanced study in the fields of painting, sculpture, design, crafts, graphics and ceramics. Six hours a week. May be repeated for credit. Credit, 3 hours.

580 Creative Terminal Project. Must be done in one of the six major areas of concentration in the MFA degree program. Must be approved by the student's committee before undertaken, and before completion, the student must submit a complete written and documented report. A public exhibition approved by the student's committee must precede the final examination. Selected materials from the exhibit may be retained by the University on indefinite loan. Credit, 10-15 hours.

Art Education

AE 301, 302 Art in the Elementary School. Emphasis on self-understanding through the use of art, concurrent with the study of the artwork of children of all ages from early childhood to mid-adolescence. One lecture, 4 hours laboratory. Credit, 3 hours each semester.

412 Art Curriculum and Supervision. Exploration of theory, materials, organization, methods, and curriculum for the art educator or consultant; the art educator's responsibility in human relations and communications. Required of all art education majors. Prerequisite: AE 480 or concurrently. Credit, 3 hours.

420 Crafts for the Elementary School Teacher. Practical laboratory experiences stressing inexpensive and salvage materials that children can use. Combinations of materials and specific knowledges in mosaic, *papier-mache*, clay, wood, wire, etc. One lecture, 4 hours laboratory. Credit, 3 hours.

480 Methods of Teaching Art. Methods of instruction, theory organization and presentation of appropriate content in art. Required of all art education majors. Prerequisites: AE 301, SE 311 or concurrently. One lecture, 4 hours laboratory. Credit, 3 hours.

511 History and Theory of the Teaching of Art. Historical and theoretical analysis of contemporary trends in American art education. Credit, 3 hours.

515 Foundations of Art Education. Analysis of behavioral foundations of education as related to art education. Emphasis on psychological and philosophical frame-of-reference. Credit, 3 hours.

520 Creativity in Art Education. Research into the nature of creative behavior especially as it applies to the visual arts. Information about creativity and its relation to student growth and performance for contemporary teaching. Credit, 3 hours.

525 Art and Society. The inter-relationship of art and society and the significance of art education in social change. Emphasis on art as a cultural communication system and its relationship to urban renewal, the socially deprived, increased leisure, effects of automation. Credit, 3 hours.

530 Research in Art Education. An overview of recent research in art education. A critical examination of research methodology and implications for practice. Credit, 3 hours.

610 Issues and Trends in Art Education. Recent problems and directions in contemporary art education. Credit, 3 hours.

611 Curriculum Development in Art Education. The development of curriculum in terms of philosophical, psychological and sociological foundations. The relationship of objectives to practice. Credit, 3 hours.

Special Graduate Courses: 590, 591, 592, 690, 691, 692, 790, 791, 792.

Art History

AH 102 Introduction to Art. Development of understanding and enjoyment of art and its relationship to everyday life through the study of painting, sculpture, architecture, and design. Credit, 3 hours.

103 Introduction to Oriental Art. A survey of sculpture, painting, and architecture of Asia. Credit, 3 hours.

111 Survey: Western Art to the Renaissance. Prehistoric, Egyptian, Greek, Roman and Medieval European art to the Renaissance. Credit, 3 hours.

212 Survey: Renaissance Art Through Rococo. Western art from the Renaissance to the Neoclassic. Credit, 3 hours.

312 Ancient Art. The history of painting, sculpture, and architecture from the paleolithic period through the Roman Empire. Prerequisite: AH 111 or approval of the instructor. Credit, 3 hours.

313 Survey: Neo-Classic Art Through Contemporary. Western art from the Neoclassic to the present time. Credit, 3 hours.

314 Early Christian Art. Early Christian art with emphasis on Graeco-Roman background and development of Christian iconography in manuscripts, wall painting, mosaics, and architecture. Prerequisites: AH 111, 212. Credit, 3 hours.

315 Byzantine Art. Byzantine painting, mosaic, and architecture from the early Christian period to the fall of the Eastern Roman Empire in 1453. Prerequisites: AH 111, 212. Credit, 3 hours.

316 Early Medieval and Romanesque Art. The development of Western painting, sculpture and architecture from the Carolingian period through the Romanesque period, from the Eighth Century through the Twelfth Century. Prerequisites: AH 111, 212. Credit, 3 hours.

317 Gothic Art. Gothic painting, sculpture, and architecture from its earliest architectural development in the Twelfth Century in France through its climax in the International Style in the Fifteenth Century. Prerequisites: AH 111, 212. Credit, 3 hours.

321 American Art. The cultural unfolding of America as reflected in the significant trends in American painting, sculpture, and architecture. Credit, 3 hours.

326 African Art. A survey of art forms produced in West and Central Africa from prehistoric times to the present. Sculpture, architecture and crafts will be studied in relation to societies which produced them, and their influence on other cultures. Credit, 3 hours.

327 Southwestern Indian Art. The unique arts and crafts of the Southwestern American Indians from prehistoric times as related to their historical background and social customs. Credit, 3 hours.

400 Early Renaissance Art in Italy. The history of painting, sculpture, and architecture in Italy during the Early Renaissance. Prerequisites: AH 111, 212, or approval of instructor. Credit, 3 hours.

401 Renaissance Art in Northern Europe. The history of painting, sculpture, and architecture north of the Alps in the Fifteenth and early Sixteenth Centuries. Prerequisite: AH 111 or approval of instructor. Credit, 3 hours.

402 High Renaissance Art in Italy. The history of painting, sculpture, and architecture in Italy during the High Renaissance. Prerequisite: Approval of instructor. Credit, 3 hours.

403 Baroque Art. The historical development of Baroque art from its beginnings in Mannerism to the Eighteenth Century. Prerequisite: AH 212 or approval of instructor. Credit, 3 hours.

404 Rococo Art. The history of painting, sculpture, and architecture during the Eighteenth Century with emphasis on the Rococo. Prerequisite: AH 212 or approval of instructor. Credit, 3 hours.

413 Primitive Art. Relation of early art forms from prehistoric and neolithic to Oceanic, African, and pre-Columbian to contemporary art expression. Credit, 3 hours.

416 Mexican Art. The art of Mexico and related Central American cultures from the prehistoric to the contemporary schools. Prerequisites: AH 212, 313 or their equivalents. Credit, 3 hours.

417 Oriental Art. The art of India. Credit, 3 hours.

418 Oriental Art. The art of China, Korea, and Japan. Prerequisite: AH 417 or AC 317, or equivalent. Credit, 3 hours.

419 Nineteenth Century Art. The art of Europe and America of the Nineteenth Century. Prerequisite: AH 212 or equivalent. Credit, 3 hours.

420 Twentieth Century Art. The art of the Twentieth Century. Prerequisite: AH 313, 419, or equivalent. Credit, 3 hours.

421 Museology. Art museum organization, procedures and methods, including practical experience in registrarial and exhibition activity. Prerequisites: AH 111, 212, or approval of instructor. Credit, 3 hours.

441, 442 Aesthetics. The mature appreciation and understanding of the arts emphasizing the relationships of art, music, philosophy, and literature. Intended to integrate and give meaning to studio skills for majors in art or music, and to teachers and all who wish to increase understanding of modern arts. Prerequisite: Approval of instructor. Credit, 2 hours each semester.

501 Pre-Cortesian Art. The art of Mexican and related Meso-American cultures from the beginnings to the Conquest. Prerequisite: AH 413 or equivalent. Credit, 2 hours.

502 Mexican Colonial Art. The art of Mexico from the Conquest until the Twentieth Century. Prerequisite: AH 212 or equivalent. Credit, 2 hours.

503 Mexican Contemporary Art. The art of Mexico from the end of the colonial art period until the present. Prerequisite: AH 313 or equivalent. Credit, 2 hours.

504 Far Eastern Art. History and concepts of East Indian, Chinese, and Japanese thought pertaining to the fine arts. Prerequisite: 417 or 418, or approval of instructor. Credit, 3 hours.

505 The Rococo in France. The aesthetic theories, the French Academy, and the art of the Rococo in France. Prerequisites: AH 403, 404 or equivalent. Credit, 3 hours.

506 Cezanne and Van Gogh. Analysis of the structure, techniques, symbolism, and influence on Twentieth Century art movements of the drawings and paintings of two forerunners of modern art. Credit, 3 hours.

507 Jan Van Eyck, to Rubens, Van Dyck, Hals and Rembrandt. Jan Van Eyck and his school are contrasted with the paintings and drawings of four leading figures of the Flemish-Dutch Baroque. Credit, 3 hours.

Special Graduate Courses: 590, 591, 592, 593. (See page 219.)

BIOLOGICAL SCIENCES

BACHELOR OF SCIENCE DEGREE CURRICULUM

BIOLOGY—A combined offering by the faculties of the Departments of Botany and Zoology. This Liberal Arts major in biology is designed to serve students desiring a broader program in the biological sciences than that provided by the more specialized majors in the degree programs of the Botany and Zoology Departments. The major consists of a minimum of 45 semester hours of credit, of which 18 must be in upper division courses. Required courses are BO 100; ZO 100; BI 340; MI 201, 202. The additional 30 hours in the major must reflect a balanced distribution of courses from both departments and include courses in physiology, ecology, morphology, and systematics. Supporting courses required are CH 113, 115, 231 or 331, 332, 335, 336; PH 101 or 111, 112; MA 141; one year of an approved foreign language.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS

Bachelor of Arts in Education Degree Curriculum

BIOLOGICAL SCIENCES—A combined offering by the faculties of the Departments of Botany and Zoology. The major consists of a minimum of 45 semester hours of credit, of which 18 must be in upper division courses. Required courses are BO 100, 270; MI 201, 202; ZO 100; BI 340, 480; BO 360 or ZO 360; BO 320 or ZO 425, 427; ZO 250 or ET 300. The total program must reflect a balanced distribution of courses from both departments. Supporting courses: one year of general chemistry is required and organic chemistry is strongly recommended.

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS (Secondary Education)

BIOLOGICAL SCIENCES—Consists of 18 semester hours as follows: BO 100, ZO 100, MI 201-202, BI 340 and 3 additional hours in courses listed under Botany, Biology and Zoology, with the exception of the following: BI 100, 218, 318, 480; ZO 201-202, and ZO 300.

Faculty and courses listed below and on page 404.

BOTANY AND MICROBIOLOGY

PROFESSORS:

CANRIGHT (LSC 344), JOHNSON, REEVES

ASSOCIATE PROFESSORS:

ARONSON, DYCUS, LEATHERS, NORTHEY, PATTEN

ASSISTANT PROFESSORS:

PINKAVA, SCHMIDT, SOMMERFELD

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Science Degree Curriculum

BOTANY — Consists of a minimum of 45 semester hours of credit in botany and approved related fields, of which 18 must be in upper division

courses. Required courses are BO 100, 270, 320, 350, 360; ZO 100; BI 340; MI 201, 202. Organic chemistry and one year of an approved foreign language are also required.

MICROBIOLOGY — Consists of 45 semester hours of credit, of which 18 must be in upper division courses. Required courses are MI 201, 202, 310; ZO 100; BI 340, 420; BO 100; CH 332; PH 111, 112; MA 117, 118. In addition, one year of an approved foreign language is required.

MEDICAL TECHNOLOGY — Consists of 55 hours of approved courses in the pre-internship program selected by the adviser in consultation with the student and one year of internship in an A.S.C.P. approved hospital program.

X-RAY TECHNOLOGY — Consists of 55 hours of approved courses in the pre-internship program selected by the adviser in consultation with the student and 24 months internship in an approved hospital program.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Botany offers programs leading to the degrees of Master of Science and Doctor of Philosophy. Consult the *Graduate Catalog* for requirements.

BIOLOGY

BI 100 The Living World. Major biological principles as illustrated by the areas of behavior, biogeography, ecology, evolution, morphology, hygiene, physiology, reproduction and development, and taxonomy. Does not meet science requirement in pre-professional curriculum. Not open to majors in the biological sciences. Three lectures, 2 hours laboratory. Credit, 4 hours.

218 History of Medicine. From Babylonian times through present day medicine. For pre-medical and pre-dental students. Credit, 1 hour.

310 Special Techniques in Biology. Approval of instructor and chairman of department required. May be repeated for credit. Credit, 3 hours.

318 The History of Biology. Development of biological concepts from about 2000 B.C. through the present day. Prerequisite: 12 hours of biological sciences. Credit, 2 hours.

330 Ecology and Conservation. Ecological and biological concepts of conservation; the use of basic and applied ecology to understand man-made ecological problems and the purpose of conservation. Three lectures and two field trips. Credit, 3 hours.

340 General Genetics. Science and heredity and variation. Prerequisite: BI 100 or BO 100 or ZO 100 or equivalent. Three lectures. Credit, 3 hours.

412 Biological Electron Microscopy. Methods of preparation of biological materials for electron microscopic examination. Basic theory and use of the electron microscope. Two lectures, 3 hours laboratory. Credit, 3 hours.

415 Biometry. Statistical methods applied to biological problems, including design of experiments, estimation, tests of significance, analysis of variance, regression, correlation, chi square, and bioassay. Prerequisite: MA 116 or equivalent. Two lectures, 6 hours laboratory. Credit, 4 hours.

420 Immunology. Principles of immunity and their application to diagnosis, systematics and allergies. Prerequisites: MI 202; CH 231 or equivalent. Two lectures, 6 hours laboratory. Credit, 4 hours.

426 Limnology. Dynamics of inland waters, stressing the interrelations of climatic, geological, topographical, physical, and chemical factors with special reference to aquatic life. Prerequisites: BO 100; CH 113; ZO 250. Two lectures, 3 hours laboratory. Credit, 3 hours.

429 Advanced Limnology. Recent literature, developments, methods and limnological theory; field and laboratory application to some particular topic in limnology. Prerequisite: BI 426. Credit, 3 hours.

441 Cytogenetics. Chromosomal basis of inheritance. Prerequisite: BI 340. Three lectures. Credit, 3 hours.

442 Cytogenetics Laboratory. Microscopic analyses of meiosis, mitosis, and aberrant cell division. Prerequisite or concurrently: BI 441 and graduate status. Four hours laboratory. Credit, 2 hours.

443 Physiological Genetics. Nature and function of the gene. Prerequisites: BI 340; organic chemistry. Three lectures. Credit, 3 hours.

445 Organic Evolution. Principles and processes of evolution. Prerequisites: 12 hours of biological sciences, including BI 340 and a course in systematics. Three lectures. Credit, 3 hours.

480 Methods of Teaching Biology. Methods of instruction, experimentation, organization, and presentation of appropriate content in biology. Prerequisites: SE 311 or concurrently and 20 hours in the biological sciences. Two lectures, 2 hours laboratory. Credit, 3 hours.

518 Immunochemistry. Chemistry of antigens and antibodies; the chemical basis of immunity and resistance to disease. Prerequisites: BI 420; CH 464. Two lectures, 6 hours laboratory. Credit, 4 hours.

520 Biology of the Desert. Factors affecting plant and animal life in the desert regions and adaptations of the organisms to these factors. Field trips will be taken to various desert areas. Prerequisite: Ten hours of biological sciences and/or approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.

567 Radiation Biology. Effects of ionizing radiations upon living cells and organisms; techniques of isotopic tracers in biology. Prerequisites: CH 225 and approval of instructor. Two lectures, 6 hours laboratory. Credit, 4 hours.

BOTANY

BO 100 General Botany. Fundamental principles of biology as illustrated by plants, including a brief survey of the plant kingdom. Three lectures, 3 hours laboratory. Credit, 4 hours.

270 The Flora of Arizona. Principles of taxonomy, identification of Arizona plants. Two lectures, 6 hours laboratory. Credit, 4 hours.

280 General Plant Pathology. Principles and agents of disease, including field observations and methods of control. Prerequisite: BO 100. Two lectures, 6 hours laboratory. Credit, 4 hours.

301 Economic Botany. Plants used by man throughout the world, with particular emphasis on the origin, history, and distribution of food plants. Prerequisite: BI 100 or BO 100. Credit, 3 hours.

320 Plant Ecology. Plants in relation to environments. Prerequisite: BO 100 or approval of instructor. Three lectures, 3 hours laboratory or field trip. One weekend field trip. Credit, 4 hours.

350 Plant Anatomy. Development and mature structure of the principal tissues of vascular plants, and the basic patterns and modifications of leaf, stem, root, and flower. Prerequisite: BO 100. Two lectures, 6 hours laboratory. Credit, 4 hours.

360 Plant Physiology. Plant growth, nutrition, food synthesis, respiration, and reproduction. Prerequisite: BO 100. Two lectures, 6 hours laboratory. Credit, 4 hours.

425 Plant Geography. Plant communities of the world and their interpretation, with emphasis on North American plant associations. Prerequisite: BO 100 or approval of instructor. Credit, 3 hours.

434 General Mycology. Morphology, taxonomy, and economic aspects of fungi with primary emphasis on the lower fungi, ascomycetes, and medical mycology. Prerequisites: BO 100 and/or MI 201, 202. Two lectures. 6 hours laboratory. Credit, 4 hours.

440 Morphology of the Non-Vascular Plants. The morphology, life history, and economic importance of the autotrophic cryptogams (algae and bryophytes). Prerequisite: BO 100. Three lectures, 3 hours laboratory. Credit, 4 hours.

445 Morphology of the Vascular Plants. The comparative structure and evolutionary trends in the *Tracheophyta*. Prerequisites: BO 100, 350 or approval of instructor. Three lectures, 3 hours laboratory. Credit, 4 hours.

450 Algae and Bryophytes. A survey of the autotrophic cryptogams (algae, liverworts and mosses) with special emphasis on field collection and identification of local representatives. Prerequisites: BO 100, BI 100 or approval of instructor. Two lectures, 6 hours laboratory. Credit, 4 hours.

455 Experimental Phycology. Techniques employed in the isolation, identification, purification and culturing of freshwater and marine algae, with emphasis on their use as experimental systems. Prerequisites: Approval of instructor. Two lectures, 6 hours laboratory. Credit, 4 hours.

460 Growth and Reproduction. Interaction of environmental, metabolic and hormonal factors in vegetative and reproductive phases of plant behavior. Prerequisite: CH 231. Two lectures, 4 hours laboratory. Credit, 3 hours.

461 Physiology of Lower Plants. Cellular physiology and biochemistry of algae and fungi; the responses of these organisms to chemical and physical stimuli and their processes of morphogenesis. Prerequisites: BO 100 or BI 100; CH 231; or approval of instructor. Three lectures, 3 hours.

462 Physiology of Lower Plants Laboratory. Techniques of cultivation and experimentation with selected algae and fungi. Prerequisites or corequisites: BO 461 and approval of instructor. Six hours laboratory. Credit, 2 hours.

470 Taxonomy of Southwestern Vascular Plants. Survey and identification of the vascular plants of the American Southwest and the principles underlying their classification. Not open to students who have had BO 270. Three lectures and two field trips. Credit, 4 hours.

475 Angiosperm Taxonomy. Basic principles underlying angiosperm phylogeny. Prerequisite: BO 270 or approval of instructor. Two lectures, 2 hours laboratory. Credit, 3 hours.

490 Paleobotany. Plant life of the past, including types of plant fossils, kinds of fossilization, their geologic history, and past geographic distribution. Methods of preparation of plant fossils for study; identification and interpretation of fossilized plant organs. Prerequisites: BO 100; GL 102 or approval of instructor. Three lectures, 3 hours laboratory or field trip. Credit, 4 hours.

522 Plant Ecological Methods. Collection and interpretation of vegetational and environmental data. Prerequisite: BO 320. Two lectures, 3 hours laboratory or field trip. Credit, 3 hours.

550 Palynology. Consideration of the importance of spores and pollen (both fossil and modern) to systematics, evolution, ecology and stratigraphy. Prerequisite: Approval of instructor. Credit, 2 hours.

564 Plant Metabolism. Phenomena common to a wide range of plants: enzyme systems, energy transformations, responses involving light, plant growth reactions. Prerequisites: CH 231; BO 360. Three lectures. Credit, 3 hours.

565 Plant Metabolism Laboratory. Analytical procedures and instrumentation in the study of plant metabolic processes. Prerequisites or corequisites: BO 564 and approval of instructor. Six hours laboratory. Credit, 2 hours.

575 Experimental Plant Systematics. Interpretation of taxa, utilizing cytological, genetic, ecological, morphological, and anatomical techniques and data. Prerequisite: BO 475. Two lectures, 3 hours laboratory. Credit, 3 hours.

591 Seminar. Credit, 1-3 hours. Topics may be selected from the following:

- | | |
|-----------------------------|---------------------------------|
| (a) <i>Ecology</i> | (e) <i>Mycology</i> |
| (b) <i>Biosystematics</i> | (f) <i>Molecular Biology</i> |
| (c) <i>Morphology</i> | (g) <i>Cacti and Succulents</i> |
| (d) <i>Plant Physiology</i> | |

Special Graduate Courses: 590, 592, 593, 790, 792, 799. (See page 219).

MICROBIOLOGY

MI 201 Microbiology. Bacteria, molds, and other micro-organisms, and their application in industrial, agricultural, hygienic and domestic problems. Prerequisites: CH 113; BI 100 or equivalent. Credit, 3 hours.

202 Microbiology Laboratory. Principles and laboratory techniques used in identifying and handling of micro-organisms. Prerequisite: MI 201 or concurrently. Three hours laboratory. Credit, 1 hour.

310 Advanced Microbiology. Comparative study of the systematic and pathogenic relationships of micro-organisms with a consideration of physiological activities of the micro-organisms involved. Prerequisites: MI 202; CH 231 and approval of instructor. Three lectures, 6 hours laboratory. Credit, 5 hours.

370 Instrumentation. Basic electronics, basic instrumentation, and application. Two lectures, 4 hours laboratory. Credit, 3 hours.

460 Bacterial Physiology. Fermentation, respiration and other metabolic processes of bacteria. Prerequisites: Eight hours of microbiology and CH 331 or equivalent. Two lectures, 3 hours laboratory. Credit, 3 hours.

470 Systematic Bacteriology. Classification and identification of bacteria. Prerequisites: MI 202; eight hours of microbiology. One lecture, 6 hours laboratory. Credit, 3 hours.

485 Virology. Fundamental nature of viruses and rickettsiae, their mechanisms of infection and principles of cultivation and diagnosis. Prerequisite: MI 202. Two lectures, 6 hours laboratory. Credit, 4 hours.

540 Bacterial Genetics. Development of molecular transfer concepts of hereditary material in bacteria and their significance to modern genetics and microbiology. Prerequisites: Eight hours of microbiology and BI 340. Credit, 3 hours.

580 Pathogenic Bacteriology. Etiology of bacterial disease. The pathology, diagnosis and epidemiology of human pathogenic bacteria. Prerequisites: MI 202; CH 231. Two lectures, 3 hours laboratory. Credit, 3 hours.

Business Administration

ACCOUNTING

PROFESSORS:

BURTON, HUIZINGH

ASSOCIATE PROFESSORS:

HELMKAMP (BA 223A), HUNTINGTON, IMDIEKE, KRUEGER,
NIELSEN, SANDERS, WILKINSON

ASSISTANT PROFESSOR:

HARIED

LECTURER:

PYLE

ACCOUNTING

AC 101 Elementary Accounting. Introduction to the theory and practice of accounting applicable to the accounting cycle. Journals and ledgers, transactional documents, departmental procedures, and voucher system. Three lectures, 1 hour laboratory. Credit, 3 hours.

102 Elementary Accounting. Continuation of AC 101. Accounting theory and practice applicable to partnerships, corporations, cash, receivables, inventories, fixed assets, liabilities, and manufacturing accounts. Three lectures, 1 hour laboratory. Credit, 3 hours.

201 Intermediate Accounting. Accounting theory and practice applicable to current assets, fixed assets, liabilities, and sources and applications of funds. Prerequisite: AC 102. Credit, 3 hours.

202 Intermediate Accounting. Accounting theory and practice applicable to corporate net worth accounts, investments, reserves, and income. Prerequisite: AC 201. Credit, 3 hours.

301 Management Uses of Accounting. Development and analysis of accounting data in making managerial decisions. Designed primarily for nonaccounting majors. Prerequisite: AC 102. Credit, 3 hours.

331 Cost Accounting. Accounting procedures applicable to job order and process cost manufacturing operations. Prerequisite: AC 102. Credit, 3 hours.

332 Survey of Accounting. Introduction to financial and managerial accounting with emphasis on the uses of accounting information. Not open to students in the College of Business Administration. Credit, 3 hours.

383 Advanced Accounting. Accounting theory applicable to partnerships, branches, installment sales, consignments, receiverships, estates and trusts, and governmental units. Prerequisite: AC 202. Credit, 3 hours.

415 Financial Statement Analysis. Analytical methods applied to financial statements for the guidance of management and investors. Prerequisite: AC 102. Credit, 3 hours.

432 Advanced Cost Accounting. Extension of cost accounting methods and procedures to standard, estimated, and distribution cost systems. Prerequisite: AC 331. Credit, 3 hours.

447 Accounting Information Systems. Modern system building, with appropriate emphasis on data processing and internal control. Prerequisite: AC 301 or 331 or 501. Credit, 3 hours.

451 Income Tax Accounting. Concept of taxable income; tax accounting problems of individuals, partnerships, and corporate entities. Prerequisite: AC 202. Credit, 3 hours.

452 Income, Estate and Gift Taxation. Complex problems of income taxation; estate, trust, fiduciary and gift taxes; tax planning. Emphasis on tax research. Prerequisite: AC 451. Credit, 3 hours.

472 Consolidations and Mergers. Theory and practice applicable to the consolidation of parent and subsidiary financial statements and the merging of corporate interests. Prerequisite: AC 383. Credit, 3 hours.

481 Auditing Theory and Practice. Auditing standards, procedures, programs, and working papers; internal control; ethical and legal responsibilities of the Certified Public Accountant. Prerequisite: AC 383. Credit, 3 hours.

500 Accounting Survey and Analysis. Basic accounting concepts and procedures. The determination of periodic income. Preparation and interpretation of financial statements. Open only to students without previous credit in accounting. Credit, 3 hours.

501 Managerial Accounting. Use of accounting data in the managerial decision-making process and in the analysis and control of business operations. Prerequisite: AC 500 or equivalent. Credit, 3 hours.

505 Law in Professional Accounting. Law applicable to the various forms of business organizations and the transactions conducted by these business entities. Prerequisite: GB 305. Credit, 2 hours.

509 Governmental and Institutional Accounting. Accounting methods and procedures applicable to federal, state, and municipal governmental units, and religious, charitable and nonprofit organizations. Prerequisite: AC 202. Credit, 3 hours.

521 Tax Problems. Income, estate, and gift tax problems arising in the planning and review of business and investment transactions. Prerequisite: AC 451. Credit, 2 hours.

522 Tax Practice Management. Economics of tax practice management and methodology of tax research, including a survey of conference and court procedures. Prerequisite: AC 451. Credit, 2 hours.

541 Budgetary Control. Installation and administration of a budgetary control system, analysis of results, and the use and interpretation of such results by management. Prerequisite: AC 331 or 501. Credit, 3 hours.

542 Controllership. Functions of the controller and the organization of his department. Prerequisite: AC 331 or 501. Credit, 3 hours.

551 Advanced Accounting Theory. Critical analysis of generally accepted accounting theories and principles. Credit, 2 hours.

552 Problems in Income Determination. Analysis of problems in the calculation and disclosure of the periodic income of business enterprises. Credit, 2 hours.

582 Auditing Theory and Practice. Practical application of auditing standards and practices to an audit case with practice in the writing of an audit report. Prerequisite: AC 481. Credit, 3 hours.

585 Problems in Managerial Accounting. Application of accounting analysis and quantitative techniques in the solution of problems concerning internal planning and control. Credit, 2 hours.

586 Problems in Financial Accounting. Analysis of problems in controversial areas. External reporting requirements for selected industries. Influence of government regulation. Credit, 2 hours.

ECONOMICS

PROFESSORS:

FARRIS, COCHRAN, PLANTZ

ASSOCIATE PROFESSORS:

KNOX, LARSON, TAYLOR

ASSISTANT PROFESSORS:

BEACH, BOND, GOODING, JACKSON, LADMAN, LOFGREEN, O'CONNOR,
OLSON, WINKELMAN, YATES

ECONOMICS

EC 100 Development of the American Economic System. Analytical treatment of the evolution of the American economy. Introduction to economic institutions in the United States. Credit, 3 hours.

201 Principles of Economics. Descriptive analysis of the structure and functioning of the American economy. Emphasizes basic economic institutions and the factors determining income and employment levels. Credit, 3 hours.

202 Principles of Economics. Price determination and income distribution in a capitalistic economy. Current economic issues with emphasis on labor-management rela-

tions, agriculture, international trade, and government regulation of business. Prerequisite: EC 201. Credit, 3 hours.

301 Money and Banking. Functions of money, monetary systems, credit functions, banking practices and policies. Prerequisite: EC 202. Credit, 3 hours.

303 Economic Analysis and Public Policy. Application of analytical methods to economic aspects of national and international policy problems. Critical evaluation of conflicting theories and proposals. Prerequisite: EC 202. Credit, 3 hours.

311 Economic Development. Theories of economic growth and development. Role of capital formation, technological innovation, population and resource development in economic growth. Prerequisite: EC 202. Credit, 3 hours.

321 Labor Economics. Historical and theoretical analysis of labor problems and labor relations. Labor force wage theories and practices. Employment and unemployment. Government regulations. Prerequisite: EC 202. Credit, 3 hours.

331 Comparative Economic Systems. Economic theories and practices of capitalism, socialism, communism, and fascism. Prerequisite: EC 201. Credit, 3 hours.

336 International Economics. Principles and practices of international finance. Techniques of international payments. Exchange rates and their determination. Economic aspects of major international organizations. Prerequisite: EC 202. Credit, 3 hours.

341 Public Finance. Principles and practices of taxation, public expenditures, budget formulation, debt management, and fiscal policy with emphasis on federal government finance. Prerequisite: EC 202. Credit, 3 hours.

361 The Soviet Economy. Soviet economic development. Evaluation of Soviet statistics and accounting. Organization and management, planning techniques, distribution, finance, labor, agriculture and transportation. Prerequisite: EC 202 or 331. Credit, 3 hours.

371 Latin American Economics. Economic practices of Latin American economies with emphasis on special problems of economic development in the major Latin American countries. Prerequisite: EC 202. Credit, 3 hours.

401 Intermediate Price Analysis. Value and distribution theory. Price and output decisions of business firms under conditions of competition, monopolistic competition, oligopoly, and monopoly. Prerequisite: EC 202. Credit, 3 hours.

402 Economics of Income and Employment. Analysis of determinants of aggregate level of employment, output and income of an economy. Prerequisite: EC 202. Credit, 3 hours.

408 Mathematical Economics. Integration of economic analysis, mathematical methods, and quantitative procedures into a comprehensive body of knowledge within contemporary economic theory. Prerequisite: EC 202. Credit, 3 hours.

412 Business Fluctuations and Forecasting. Comparisons of leading business cycle theories. Identification, measurement, and analysis of economic fluctuations. Methods of forecasting. Prerequisite: GB 221. Credit, 3 hours.

421 State and Local Finance. Principles and practices of financing state and local governments with emphasis on budgeting, factors affecting expenditures, tax structures and fiscal capacity, and intergovernmental financial relations. Prerequisite: EC 202. Credit, 3 hours.

441 History of Economic Thought. Development of economic doctrines, theories of mercantilism, physiocracy, classicism, neoclassicism, Marxism, and contemporary economics. Prerequisite: Twelve hours of economics or approval of instructor. Credit, 3 hours.

451 Economics of Public Utilities. Economic, legislative and administrative problems in the regulation of public utility rates and service standards. Public utility costs, pricing policies, rates, plant utilization, and competition. Prerequisite: EC 202. Credit, 3 hours.

453 Government and Business. Development of public policies toward business. Antitrust activity. Economic effects of government policies. Prerequisite: EC 202. Credit, 3 hours.

461 Current Economic Problems. Discussion of current economic issues. Oral and written reports on assigned topics. Prerequisite: Twelve hours of economics or approval of instructor. Credit, 3 hours.

481 Methods of Teaching Basic Business and Economics. Methods of instruction, organization and presentation of the subject matter of basic business, economic education, and closely allied fields. Credit, 3 hours.

500 Business Economics. Fundamentals of micro- and macro-economic analysis. Price and output determination in various market structures. Functional distribution of income. Theory of income and employment. Open only to students without previous credit in economics. Credit, 3 hours.

501 Managerial Economics. Management problems from an economic point of view. Includes the application of economic analysis to decision-making in various areas of business policy development. Credit, 3 hours.

503 International Economic Theory. Problems of balance-of-payments, commercial policies of the major nations, international economic organizations in theory and practice. Credit, 3 hours.

504 Fiscal Policy. Fiscal theory and its appropriate role in determining the economic policies of government. Credit, 3 hours.

505 Monetary Policy. Determinants of the money supply and the level of interest rates. Federal Reserve policy and the effectiveness of central banking policy. Credit, 3 hours.

511 Macroeconomic Analysis. Analysis of the nation's income, output, employment, and general price level. Examination of current theoretical and empirical research and policy problems. Credit, 3 hours.

512 Microeconomic Analysis. Theory of firm, industry, and market structure emphasizing demand, cost, price and profit within the framework of a modified private enterprise system. Credit, 3 hours.

521 Manpower Economics. Analysis of variables affecting manpower resources. Availability and behavior of labor supply under changing economic conditions. Credit, 3 hours.

531 Economic Systems and Organizations. Analysis of philosophical foundations of major economic systems and of properties of principal system models. Comparison of alternative institutions and system components of contemporary economies. Credit, 3 hours.

537 American Economic Growth. Analysis of the growth of the American economy within the framework of economic theory. Development and interactions of institutions and technology to meet the changing needs of the economy. Credit, 3 hours.

553 Industrial Organization and Public Policy. Application of market theory to contemporary industrial organization, emphasizing oligopoly. Structure, conduct, and performance in industrial markets. Recent developments in antitrust policies. Credit, 3 hours.

570 Economics of Developing Nations. Analysis of economic problems, issues and policy decisions facing the lesser developed nations of the world. Prerequisites: EC 401 and 402, or approval of instructor. Credit, 3 hours.

580 Econometrics. Application of mathematical and statistical techniques to problems of economic theory, emphasizing application of multiple regression analysis to time-series and cross-sectional data. Principles, rather than computational methods or mathematical rigor, are stressed. Prerequisites: MA 142 and QS 422, or equivalent. Credit, 3 hours.

GENERAL BUSINESS ADMINISTRATION

PROFESSORS:

DAUTEN (BA 267A), BATY, OVERMAN, STEVENSON

ASSOCIATE PROFESSORS:

ANDERSON, BECKER, D. COCHRAN, A. SMITH, C. SMITH, TOOTLE, WILT

ASSISTANT PROFESSORS:

APILADO, BOHLMAN, G. DAVIS, FAHLGREEN, HEATHCOTTE,
MONROE, MYLER, NEUHEISEL, OLNEY, TENNEY, WILSON

LECTURER:

TUBEROSE

FINANCE

FI 300 Fundamentals of Finance. Management capital budgeting problems of acquiring, allocating and managing funds within the business enterprise. Serves as introduction for further study of the capital markets and financial institution and of securities investments. Prerequisite: AC 102, EC 202. Credit, 3 hours.

305 Credit Management. Principles and current practices in the field of commercial credit. Evaluation and use of credit reports, analysis of credit risk; credit limits and control. Prerequisite: FI 300. Credit, 3 hours.

403 Personal Finance. Financial problems and institutions affecting individuals: borrowing, saving, insurance, investment, financial agencies. Not open to students in the College of Business Administration. Credit, 3 hours.

421 Investments. Introduction to the appraisal of securities and the management of investment funds. Stresses principles of value determination; risks associated with investment in the various types of securities; and the concepts of asset and portfolio management. Prerequisite: FI 300. Credit, 3 hours.

431 Financial Markets. Analysis of the major financial markets and their interrelationships through interest rates and prices. Flow of funds and price behavior of the market as a whole; specific types of trading on over-the-counter and national exchanges. Prerequisite: FI 300. Credit, 3 hours.

436 Financial Institution Management. Management problems encountered in savings institutions, commercial banks, credit and mortgage institutions. Industry problems, regulations, credit appraisal and loan types. Presentations by industry representatives, cases and lectures. Prerequisite: FI 300. Credit, 3 hours.

461 Financial Management Cases. Financial management problems of business firms studied through case materials and readings. Emphasizes capital budgeting, cost of capital, short- and long-term funds, valuation situations. Prerequisite: FI 300. Credit, 3 hours.

498 Pro-Seminar. Advanced treatment of one of the three areas of finance: (a) financial management; (b) capital markets and institutions; (c) investments; particularly through student projects and through review of the literature. Prerequisites: FI 300, approval of instructor. Credit, 3 hours.

500 Finance Fundamentals. Acquisition, allocation and management of funds within the business enterprise. Financial goals, fund flows, capital budgeting, financing strategies. (Open only to students without recent course work in Finance.) Prerequisite: AC 102 or 500 or equivalent. Credit, 3 hours.

521 Investments. Intensive investigation into appraisal of equity and debt securities. Individual and institutional portfolio management. Not open to students who have had FI 421. Prerequisite: FI 300 or 500. Credit, 3 hours.

526 Investment Analysis and Management. Selected topics within the areas of the

valuation and management of securities portfolios. Prerequisite: FI 421 or 521. Credit, 3 hours.

531 Capital Markets and Institutions. Factors affecting interest rates and prices in the money and capital markets, fund flows in the new issue and secondary markets. Prerequisite: FI 300 or 500. Credit, 3 hours.

561 Financial Management. Financial management decision-making situations studied through case materials and readings. Emphasis on capital budgeting, fund-raising financing strategies. Prerequisite: FI 300 or 500. Credit, 3 hours.

571 Problems in Finance. Advanced treatment of one of the three areas of finance (financial management, capital markets and institutions, investments), particularly through student projects and through review of the literature. Prerequisite: FI 300 or 500 and one other graduate Finance course. Credit, 3 hours.

591 Seminar. Selected topics in finance. Prerequisite: Approval of instructor. Credit, 3 hours.

GENERAL BUSINESS ADMINISTRATION

GB 101 Elements of Business Enterprise. Organization, functions, activities, and role of business in the American economic system. Orientation to business terminology, practices, problems, and career opportunities. Not open to students who have received credit in EC 202 and MG 301. Credit, 3 hours.

233 Business Communication. Development of psychologically sound business communications in correct and forceful English. All outside assignments must be in typewritten form. Prerequisite: EN 102. Credit, 3 hours.

305 Business Law. Introduction to the law as it applies to business. History of legal development and judicial procedures. Case studies of contracts, their operation and discharge, and the law of agency. Credit, 3 hours.

306 Business Law. Legal aspects of corporations, partnerships, sales, negotiable instruments, real property, secured transactions, bankruptcy, and insurance. Prerequisite: GB 305. Credit, 3 hours.

307 Business and the Legal Environment. Statutory laws versus judge-made laws. Legal aspects of governmental regulation of commerce and competition and legal problems affecting business in the modern world. Credit, 3 hours.

341 Transportation. Analysis of economic principles and legislative practices in the regulation of rates and services of rail, motor, air and pipeline transportation. Theory of rates, discrimination, reasonableness, economic costs, and public policy toward transportation agencies. Prerequisite: EC 202. Credit, 3 hours.

345 Industrial Traffic Management. Analysis of the business relationships between shipper and carriers with respect to rates and services in the transportation of goods by rail, highway, water, and air. Role and organization of traffic management as a function in business enterprise. Prerequisite: EC 202. Credit, 3 hours.

371 Principles of Hotel Administration. Development and organization of the hospitality industry. Survey and evaluation of hotel and motel services. Responsibilities and procedures of the departments of food, maintenance, engineering, and the front office. Career opportunities in hotel administration. Credit, 2 hours.

431 Business Report Writing. Organization and preparation of reports of the types used in business. Techniques of collecting, interpreting, and presenting information useful to management. Prerequisite: GB 233. Credit, 3 hours.

451 Business Research Methods. Nature and purposes of research. Problem of acquiring knowledge. Validation and minimization of error. Definition of meaningful questions. Relevant data. Prerequisite: QS 221. Credit, 3 hours.

460 Commercial Motor Transportation. Highway systems of the U. S., motor carrier operations, and regulation of motor transportation. Costs, rates, services, taxes, weights and sizes, coordination and consolidation. Relationships with competitive modes of transportation. Prerequisite: GB 341. Credit, 3 hours.

461 Air Transportation. Economic and business aspects of commercial air transportation. Economics of the airline industry, rate-making, government control and assistance to airline operations. Routes and services, equipment and operations, inter-relationships with competing modes of transportation. Prerequisite: GB 341. Credit, 3 hours.

462 Problems in Transportation and Traffic. Case problems in transportation operations and traffic management of transportation firms. Selection of equipment, pricing, control, finance, labor relations, organization, and location of transportation operations. Prerequisite: GB 341. Credit, 3 hours.

463 International Transportation. Analysis of the movement of goods between foreign countries in international business; routes, rates, costs, operation, administration, and regulation of international air and maritime transportation agencies. Prerequisite: GB 341. Credit, 3 hours.

541 National Transportation Policy. Public policy alternatives and problems in the transportation industry; interrelationships of competing transportation modes; relationships of public investment to private operation. Credit, 3 hours.

591 Seminar (Business Policy). Integration of the various functional and other policy areas of the firm. Emphasis on case studies. (Last semester of MBA course work) Credit, 3 hours.

INSURANCE

IN 251 Principles of Insurance. Coverages available, buying methods, procedures in settling claims, insurance companies, and vocational opportunities. Prerequisite: GB 101. Credit, 3 hours.

321 Life Insurance. Fundamentals of life insurance including types of contracts, functions of various contracts, company organization, rate making, selection of risks and other home office operations. Governmental supervision of life insurance companies. Prerequisite: IN 251. Credit, 3 hours.

331 Property Insurance Principles and Coverage. Policies and principles of fire and casualty insurance. For students planning to make careers in agency or home office work as well as those needing a fundamental knowledge of insurance for business. Prerequisite: IN 251. Credit, 3 hours.

425 Current Problems in Insurance. Analysis of major problems and issues in the insurance industry. Prerequisite: Nine hours of insurance. Credit, 3 hours.

432 Property Insurance Administration. Rate making, reserves, financial statements, investments, underwriting, claims, prevention, and surveys. For students planning careers in agency or home office work. Prerequisite: IN 331. Credit, 3 hours.

451 Social Insurance. Insurance coverages provided by state and federal governments: social security, unemployment insurance, workmen's compensation, and other social or governmental insurance plans. Prerequisite: IN 321. Credit, 3 hours.

REAL ESTATE

RE 251 Real Estate Principles. Regulations, practices, legal aspects, and professional ethics of the real estate business. Prerequisite: EC 202. Credit, 3 hours.

302 Real Estate Management. Management of residences, apartments, and commercial properties. Consideration of professional standards, methods of business promotion, leasing, insuring, and maintaining properties as an agent of the owners. Prerequisite: RE 251. Credit, 3 hours.

331 Real Estate Finance. Sources and availability of funds. Management, servicing, and repayment of loans. Prerequisite: RE 251. Credit, 3 hours.

401 Real Estate Appraisal. Factors affecting the value of real estate. Theory and practice of appraising and preparation of the appraisal report. Techniques in appraisals. Prerequisite: RE 251. Credit, 3 hours.

411 Real Estate Law. Legal practices as they apply to the real estate field in general and to the field of titles, mortgages, lending, and trust work in particular. Prerequisite: RE 251. Credit, 3 hours.

441 Real Estate Land Development. Neighborhood and city growth. Municipal planning and zoning. Development of subdivisions. Agricultural land utilization. Prerequisite: RE 251. Credit, 3 hours.

461 Current Real Estate Problems. Recent developments in the field of real estate, finance, taxation, zoning, planning, government regulations, and government assistance programs. Prerequisite: RE 251. Credit, 3 hours.

MANAGEMENT

PROFESSORS:

FEARON (BA 367E), DAVIS, SCHABACKER

ASSOCIATE PROFESSORS:

HEIER, REUTER, TINGEY, WHITE, WRIGHT

ASSISTANT PROFESSORS:

BOYNTON, MENDLESON, RUCH

MANAGEMENT

MG 301 Principles of Management. Fundamentals of organization and administration. Planning, organizing, directing, coordinating and controlling business activity. Credit, 3 hours.

311 Personnel Administration. Personnel selection, placement, training, promotion, wage incentives, absenteeism, and counseling. Prerequisite: MG 301. Credit, 3 hours.

331 Production and Operations Management. Principal functions, departmental activities, and policies of manufacturing firms. Organization for production and analysis of production methods. Prerequisite: MG 301. Credit, 3 hours.

335 Methods Management. Role of management in methods improvement. Productivity concept as it relates to business efficiency. Development of employee attitudes supporting productivity. Process charts. Methods improvement in the work environment. Class practice in methods analysis. Prerequisite: MG 331. Credit, 3 hours.

355 Purchasing. Practices and problems confronting the purchasing agent, including sources of supply, market information, material specification and inspection, control records, inventories, stores, and purchase budgets. Prerequisites: MK 300, MG 301. Credit, 3 hours.

368 Management Systems. Systems theory and management functions; basic tools for systems analysis; organizational systems design; systems application in recent business practices; systems simulation. Prerequisite: MG 301. Credit, 3 hours.

413 Wage and Salary Management. Installation and administration of a complete wage and salary program, including objectives, policies, organization, control, job evaluation, wage surveys, and winning acceptance for an integrated program. Prerequisite: MG 311. Credit, 3 hours.

422 Employee Training and Supervision. Principles of supervision, techniques of leadership, adjustment of grievances, policy interpretation, group attitude and morale, training and learning processes, and counseling techniques. Prerequisite: MG 311. Credit, 3 hours.

423 Industrial Relations and Collective Bargaining. Processes and procedures of collective bargaining. Scope and negotiation of union contracts. Prerequisite: EC 321. Credit, 3 hours.

432 Materials Management. Analysis and managerial integration of the material flow process within an organization, including materials research and standards, purchasing, production and inventory control, warehousing and materials movement. Prerequisite: MG 331. Credit, 3 hours.

433 Managerial Decision-Making. Role of probability and desirability in management decision-making. Decision theory and models. The decision process. Communication networks and input-outputs in decision-making. Class performance of business games. Prerequisite: MG 301. Credit, 3 hours.

434 Management Responsibility in Society. Developments arising from separation of ownership and management and the growth of professional management. Limits of management authority. Relation of profit and service objectives to a business society. Prerequisite: MG 301. Credit, 3 hours.

451 Human Relations in Business. Human aspects of business, as distinguished from economic and technical aspects, and how they influence efficiency, morale, and management practice. Prerequisite: MG 301. Credit, 3 hours.

459 International Management. Problems and policies for multinational corporations; planning international objectives and strategies; developing multinational structures and executives; adapting domestic policies to overseas environments. Comparative analysis of firms operating in various foreign countries. Prerequisite: MG 301. Credit, 3 hours.

463 Business Policies. Analysis of problems encountered by management in its daily operations. Investigation of sound business principles and practices. Integration of functional and other policy areas of the firm. Prerequisite: Completion of 90 hours, including all other Business Administration core requirements. Credit, 3 hours.

501 Managerial Concepts. Analysis of current administrative philosophy and practices, and their historical foundations. Integration of an organization from the point of view of an administrator. Prerequisite: MG 301. Credit, 3 hours.

503 Organizational Behavior. Development of effective work groups in business. Analysis of cases in organizational relationships. Group dynamics, effects of change, and informal organization. Credit, 3 hours.

520 Problems in Personnel Management. Selecting, developing, maintaining, and utilizing a competent labor force. Case studies of personnel problems. Preparation of a written personnel program. Prerequisite: MG 501. Credit, 3 hours.

522 Labor Relations and Public Policy. Development of state and federal legislation. Analysis of recent decisions of courts and labor boards. The legal rights and duties of employers, unions, and the public. Credit, 3 hours.

581 Management of Production. Analysis of the production function from a managerial point of view. Conceptual foundations, analysis of major problems and decision processes. Prerequisite: MG 501. Credit, 3 hours.

591 Seminar. Credit, 3 hours. Topics may be selected from the following:

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| (a) <i>Managerial Planning and Control</i> | (e) <i>International Management</i> |
| (b) <i>Business and Society</i> | (f) <i>History of Management Thought</i> |
| (c) <i>The Management Audit</i> | (g) <i>Hospital Administration</i> |
| (d) <i>Research and Development Management</i> | (h) <i>Comparative Administration</i> |
| | (i) <i>Business Simulation</i> |

MARKETING

PROFESSORS:

DOWNING, HARRIS, NIELANDER, SCHMIDT, ZACHER

ASSOCIATE PROFESSORS:

BESSOM, CAMPBELL, GROSSMAN

ASSISTANT PROFESSORS:

GOURLEY, SCANNELL, SCHLACTER

ADVERTISING

AD 301 Advertising Principles. Advertising as a communications tool in marketing and business management. Consideration of creative methods, survey of media, measurements of effectiveness, and coordination with other aspects of the sales and promotional program. Prerequisite: MK 300 or MC 110. Credit, 3 hours.

311 Advertising Campaigns. Planning and preparation of advertising for the printed media, including newspapers, magazines and direct mail. Development of creative strategy. Practice in layout and copy writing. Prerequisite: AD 301. One hour lecture, 2 hours laboratory. Credit, 2 hours.

312 Advertising Campaigns II. Continuation of AD 311. Advertising production, typography and printing. Development and execution of the complete advertising campaign. Prerequisite: AD 311. One hour lecture, 2 hours laboratory. Credit, 2 hours.

371 Radio and Television Advertising. Use of the broadcast media in the advertising program. Preparation and production of commercial continuity. Audience measurement, station selection, and time-buying. Coordination with other media. Prerequisite: AD 301. Credit, 3 hours.

453 Advertising Campaign Problems. Problems in the planning and preparation of advertising for various media. Includes layout, copy, and the complete production process. Prerequisite: AD 311. One hour lecture, 2 hours laboratory. Credit, 2 hours.

461 Advertising Management. Administration of the complete advertising program. Advertising in the marketing mix, budgeting, media strategy, measurement of advertising effectiveness and coordination of advertising with other promotional activities. Use of the advertising agency. Prerequisite: AD 301. Credit, 3 hours.

See related courses: MC 110 *Mass Communications*; MC 401 *Public Relations Techniques*.

MARKETING

MK 300 Principles of Marketing. Role of marketing in the society and economy. The business firm as a marketing system. Management of the firm's marketing effort, including competitive strategy. Prerequisite: EC 202 or approval of instructor. Credit, 3 hours.

302 Marketing Environments. Analysis of the firm's external environments, forces of change within them, and their influence on the firm's strategies and actions. Emphasis on buyer behavior, and on changes in the social, economic, technological, political-legal, and competitive environments of the firm. Prerequisite: MK 300. Credit, 3 hours.

310 Principles of Selling. Basic principles underlying the sales process and their practical application to sales situations. Economic, sociological, and psychological relationships in the market place, applied to sales of industrial and consumer goods and intangibles. Credit, 3 hours.

321 Principles of Retailing. Role of retailing in marketing. Location, buying, promotion, organization, personnel, and control in a retail enterprise. Prerequisite: MK 300. Credit, 3 hours.

335 Foreign Trade. Principles and practices of international trade. Import-export procedures. Distribution and financing practices in foreign markets. Prerequisite: MK 300. Credit, 3 hours.

401 Public Relations in Business. Role of public relations in business, government, and social institutions, emphasizing policy formulation. Credit, 3 hours.

411 Sales Management. Application of management concepts to the administration of the sales operation. Prerequisite: MK 300. Credit, 3 hours.

424 Retailing Management. Problems of retailing management including functions within various institutions (department stores, supermarkets, etc.) and retailing of commodities (food, automobiles, clothing, home furnishings, etc.) Prerequisite: MK 321. Credit, 3 hours.

434 Industrial Marketing. Analysis of the marketing structure for industrial products. Product lines, channels of distribution, selling, pricing, warehousing, and wholesaling problems. Prerequisite: MK 300. Credit, 3 hours.

451 Marketing Intelligence. Integrated treatment of the traditional and decision-theory approaches to marketing research, and analysis of environmental factors affecting marketing decisions in the firm. Prerequisite: QS 221 or approval of instructor. Credit, 3 hours.

460 Marketing Decision-Making. Decision-making by the marketing executive. Integration of all elements of the marketing program. Prerequisite: MK 302. Credit, 3 hours.

501 Marketing Management. Analysis of marketing problems from the management point of view. Credit, 3 hours.

502 Public Relations Policies. Case analysis of problems encountered in maintenance of favorable relationships between business organizations and the public. Development of sound public relations policies. Prerequisite: MK 401, or approval of instructor. Credit, 3 hours.

522 Market Analysis. Analytical examination of the firm's environment, market intelligence, trend forecasting. Sales analysis as inputs to the firm. Application of quantitative methods. Credit, 3 hours.

563 Market Planning and Programming. Solution of marketing management problems through case analysis. Credit, 3 hours.

591 Seminar. Credit, 3 hours. Topics may be selected from the following:

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| (a) <i>Consumer Behavior</i> | (e) <i>Marketing and the Changing Society</i> |
| (b) <i>Product and Channel Strategy</i> | (f) <i>Promotion Policies</i> |
| (c) <i>History of Marketing Thought</i> | (g) <i>Foreign Trade</i> |
| (d) <i>Marketing and the Behavioral Sciences</i> | |

691 Doctoral Core Seminar in Marketing. Credit, 3 hours.

791 Marketing Theory. Credit, 3 hours.

OFFICE ADMINISTRATION AND BUSINESS EDUCATION

PROFESSORS:

TATE (NBA 352B), BOGGS

ASSOCIATE PROFESSORS:

GRYDER, JACKS

ASSISTANT PROFESSORS:

FRAME, ROWE

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS

Bachelor of Arts in Education Degree Curriculum

BUSINESS — Consists of 45 semester hours of credit including the Business Administration core curriculum; OA 201, 312, 344; BE 480.

DISTRIBUTIVE EDUCATION — Consists of 45 semester hours of credit including the Business Administration core curriculum; MK 321; OA 201; BE 401, 490.

BUSINESS EDUCATION

BE 401 Vocational Education in American Schools. Basic principles and philosophies of vocational education. Relationship of vocational education to general education, history and legislation. Credit, 3 hours.

480 Methods of Teaching Business Subjects. Methods of instruction, organization, and presentation of appropriate content in typewriting, shorthand, bookkeeping, business machines, and basic business courses. Prerequisite: SE 311 or concurrent registration. Credit, 3 hours.

481 Methods of Teaching Basic Business and Economics. Methods of instruction, organization and presentation of the subject matter of basic business, economic education, and closely allied fields. Credit, 3 hours.

490 Methods of Teaching Distributive Education. Instruction, organization and content for distributive education in high schools and in junior colleges. Credit, 3 hours.

491 Organization and Management of Cooperative Programs. Work-study programs for business occupations in high schools and junior colleges. Developing and coordinating such programs. Instructional materials. Credit, 3 hours.

501 Foundations of Business Education. History, philosophy, principles and objectives of business education. Problems of curriculum and curriculum evaluation. Contribution of business education to general education. Registration subject to approval of instructor. Credit, 3 hours.

502 Administration and Supervision of Business Education. Departmental and classroom problems related to curriculums, equipment, guidance, in-service training and personnel. Regulation of vocational business education programs by state and federal agencies. Credit, 3 hours.

503 Tests and Measurements in Business Education. Constructing, administering, and evaluating tests in secretarial and general business subjects. Diagnostic testing for remedial teaching in these subjects. Credit, 3 hours.

504 Guidance for Business and Distributive Education. Occupational surveys and job analysis to determine community opportunities and requirements for employment. Placement, follow-up, and counseling for problems encountered by student workers. Legislation affecting business occupations. Credit, 3 hours.

511 Improving Instruction in Secretarial Subjects. Modern methodology in teaching typewriting, shorthand, and office practice courses. Psychology of skill building and techniques of office production. Credit, 3 hours.

513 Improving Instruction in Bookkeeping and General Business Subjects. Evaluation of methodology and materials used in teaching bookkeeping, general business, and related subjects. Place of basic business education in general education. Credit, 3 hours.

521 Education for Business in the Junior College. Curriculum and instruction for vocational and general business subjects. Articulation with secondary schools and collegiate institutions. Credit, 3 hours.

591 Seminar. Credit 2 or 3 hours. Topics may be selected from the following:

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| (a) <i>Office Practice and Machines</i> | (e) <i>Organization and Management of Adult Programs</i> |
| (b) <i>Current Literature</i> | (f) <i>Individualized Instruction</i> |
| (c) <i>Data Processing for Teachers</i> | (g) <i>Consumer Education</i> |
| (d) <i>Analysis of Research in Business Education</i> | |

594 Study Conference or Workshop. Conducted by outstanding leaders. Individual conferences, reports, group work, and work on individual problems. Credit, 1 to 6 hours.

See page 219 for listing of special graduate courses available.

OFFICE ADMINISTRATION

OA 101 Basic Typewriting. Mastery of the keyboard. Development of speed and accuracy. Tabulation, centering, and business letters. One lecture, 2 hours laboratory. Credit, 2 hours.

113 Shorthand. Basic principles of reading and writing shorthand. Dictation of practiced material. Two lectures, 2 hours laboratory. Credit, 3 hours.

201 Advanced Typewriting. Proficiency in production of office problem material. Prerequisite: OA 101. Two lectures, 2 hours laboratory. Credit, 3 hours.

214 Shorthand. Building dictation speed with unpracticed material, and a review of shorthand principles. Prerequisite: OA 113. Two lectures, 2 hours laboratory. Credit, 3 hours.

312 Transcription. Increased speed in sustained dictation and the transcription of available business correspondence. Prerequisite: OA 214. Two lectures, 2 hours laboratory. Credit, 3 hours.

331 Secretarial Administration. Role of the professional secretary in facilitating managerial functions. Demonstration of basic secretarial competencies required for credit in this course. Credit, 3 hours.

344 Administrative Services. Voice-writing, duplicating, copying, and calculating machines. Alphabetic filing. Proportional spacing typewriters. Services as related to office systems. Prerequisite: OA 201. Two lectures, 1 hour laboratory. Credit, 3 hours.

351 Principles of Office Management. Relationship of the office function to the business enterprise including office location and layout, selection of office equipment and supplies, principles of office organization, supervision of office personnel, employee training programs, office services, and control of office output. Credit, 3 hours.

432 Records Management. Organization and management of records systems. Credit, 3 hours.

501 Office Systems and Procedures. Methods of establishing, analyzing, standardizing, and controlling administrative systems and procedures including: work simplification, forms analysis, work-flow charting, layout and space analysis, office manuals. Prerequisite: OA 351. Credit, 3 hours.

502 Advanced Office Management. Analytical and philosophical approach to the office, the administrative manager, and office services. Cases, problems, and discussions. Credit, 3 hours.

See page 219 for listing of special graduate courses available.

QUANTITATIVE SYSTEMS

PROFESSORS:

KAZMIER (NBA 297B), McCREADY

ASSOCIATE PROFESSORS:

LOWE, NIELSEN

ASSISTANT PROFESSORS:

HERSHAUER, HUSTON, PHILIPPAKIS

QUANTITATIVE SYSTEMS

QS 161 Quantitative Analysis and Statistics I. Application of mathematical concepts and methods in business. Quantitative techniques in financial analysis. Introduction to mathematical models and the use of the computer in business. Prerequisite: MA 141 or equivalent. Credit, 3 hours.

221 Quantitative Analysis and Statistics II. Methods of statistical description. Application of probability theory and statistical inference in business. Prerequisite: QS 161 or concurrent registration. Credit, 3 hours.

302 Information Systems. Introduction to systems concepts and theory, systems analysis and design. Fundamentals of data processing equipment including both punched card equipment and electronic computers. Computer programming in FORTRAN or other suitable language. Credit, 3 hours.

322 Managerial Statistics. Applications of probability and statistical inference to business decisions. Decision theory and Bayesian inference. Prerequisite: QS 221. Credit, 3 hours.

391 Operations Research. Application of quantitative techniques in business organizations, such as the simplex method of linear programming, inventory models, games and strategies, and simulation. Prerequisite: QS 221. Credit, 3 hours.

402 Programming Systems. Concepts underlying the design and operation of computer software. Elements of machine language programming. Higher-level languages, including COBOL and simulation languages. Time-sharing systems. Prerequisite: QS 302. Credit, 3 hours.

407 Systems Analysis. Sources, cost, and value of information. Analysis and design of computer-based information systems. Analysis of information requirements, processing methods, and control of operations. Prerequisite: QS 302. Credit, 3 hours.

422 Advanced Business and Economic Statistics. Application of multivariate analysis, including regression and correlation techniques, to business and economic problems. Time series analysis. Prerequisite: QS 221 or equivalent. Credit, 3 hours.

501 Fundamentals of Quantitative Analysis. Basic mathematical concepts and methods underlying quantitative analysis. Emphasis on interpretation and application rather than theorems and mathematical proofs. Model building, set theory, functional relationships, matrix algebra, differentiation, and integration. Credit, 3 hours.

502 Integrated Information Systems. Capabilities, types and applications of integrated electronic data processing systems for business applications. Fundamentals of operating systems, programming systems, and FORTRAN and COBOL programming languages. Computer applications to quantitative models for managerial decision-making. Credit, 3 hours.

522 Statistical Decision-Making. Role of sampling and statistical control procedures in managerial decision-making under conditions of risk and uncertainty. Fundamental probability distributions and their use in classical and Bayesian inference. Prerequisite: QS 221 or equivalent. Credit, 3 hours.

523 Quantitative Models in Decision-Making. Application of basic mathematical concepts to quantitative models, such as linear programming, stochastic processes, simulation, and game theory. Prerequisite: QS 522. Credit, 3 hours.

525 Advanced Statistical Methods. Multivariate analysis, including multiple regression and correlation. Curvilinear regression analysis of business and economic data. Analysis of variance and experimental design. Prerequisite: QS 522. Credit, 3 hours.

(End of Business Administration course listings.)

CHEMISTRY

PROFESSORS:

D. BROWN, BURGOYNE, BURKE, EYRING,
FUCHS, LIU, LUCHSINGER, MUNK, PETTIT, SANDERSON, THOMSON, ZASLOW

ASSOCIATE PROFESSORS:

BIEBER, T. BROWN, BUSECK, LIN, MOORE, O'KEEFFE, STUTSMAN,
WHITEHURST, YUEN

ASSISTANT PROFESSORS:

P. BROWN, CRONIN, PARSONS

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Arts Degree Curriculum

CHEMISTRY — Consists of 45 semester hours of credit, of which 30 must be in chemistry and 15 in closely related fields. Courses CH 113, 115, 225, 226 (or 113, 115, 327, 328, or 117, 118), 331, 332, 335, 336, 341, 443 and 451 are required. In addition, PH 111, 112 and MA 141, 241 (or 117, 118) must be completed. The remaining courses to complete the major will be determined by the adviser in consultation with the student. At least 18 semester hours must be in upper division courses.

Bachelor of Science Degree Curriculum

CHEMISTRY — Consists of 45 semester hours of credit in chemistry. Courses CH 113, 115, 327, 328 (or 117, 118), 331, 332, 335, 338, 421, 422, 441, 442, 444, and 453 are required. In addition, PH 111, 112 (or 115, 116); MA 120, 121 and 212; and one year of German or Russian must be completed. The remaining chemistry courses to complete the major will be determined by the adviser in consultation with the student. At least 18 semester hours must be in upper division courses.

American Chemical Society Certification. A student who satisfactorily completes the Bachelor of Science degree program will be certified by the Department of Chemistry to the American Chemical Society as having met the specific requirements for undergraduate professional training in chemistry.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS

Bachelor of Arts in Education Degree Curriculum

CHEMISTRY — Consists of 45 semester hours of credit in chemistry and related fields. CH 113, 115, 225, 226, 331, 332, 335, 336 (or 231), 341 (or 441, 442), 451, 480 (or PL 480); PH 111, 112; and MA 117, 118 are required. The remaining courses to complete the major will be determined by the adviser in consultation with the student.

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS (Secondary Education)

CHEMISTRY — Consists of 18 semester hours of credit in chemistry. CH 113, 115 and 231 (or 331, 332, 335, 336) are required. The remaining courses to complete the minor may be selected from the following: CH 225, 226, 341, 361, 451.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Chemistry offers programs leading to the degrees of Master of Science and Doctor of Philosophy. Consult the *Graduate Catalog* for requirements.

CHEMISTRY

CH 101* Introductory Chemistry. Elements of general chemistry. Adapted to the needs of students in nursing, home economics, agriculture and physical education. Normally followed by CH 231. Three lectures, 1 quiz, 2 hours laboratory. Credit, 4 hours.

113* General Chemistry. Fundamental principles of chemistry. Prerequisite: MA 116 or high school mathematics equivalent. Three lectures, 1 quiz, 2 hours laboratory. Credit, 4 hours.

114* General Chemistry. Chemistry of metals, nonmetals, and carbon. Prerequisite: CH 113. Three lectures, 1 quiz, 2 hours laboratory. Credit, 4 hours.

115* General Chemistry with Qualitative Analysis. Chemistry of metals and nonmetals, and qualitative inorganic analysis. Prerequisite: CH 113. Three lectures, 2 quizzes, 4 hours laboratory. Credit, 5 hours.

117*, 118* General Chemistry with Qualitative and Quantitative Analysis. Fundamental principles of general and analytical chemistry. Prerequisites: One or more years each of high school chemistry and physics, 2½ years of high school mathematics, and approval of instructor. Three lectures, 2 quizzes, 4 hours laboratory. Credit, 5 hours each semester.

121* Qualitative Analysis. Qualitative separation and identification of common cations and anions. Prerequisite: CH 114. Two quizzes, 4 hours laboratory. Credit, 2 hours.

225* Analytical Chemistry. Principles and methods of chemical analysis. Primarily for students in agriculture, pre-medicine, pre-dentistry, and medical technology. Prerequisite: CH 114 or 115. Two lectures, 1 quiz. Credit, 2½ hours.

226* Analytical Chemistry Laboratory. Experiments in chemical analysis. Prerequisite: CH 225 or concurrently. Six hours laboratory. Credit, 1½ hours.

231* Elementary Organic Chemistry. Representative groups of organic compounds with emphasis on biological applications. Adapted to the needs of students in nursing, home economics, agriculture and physical education. Prerequisite: CH 101 or 113. Three lectures, 1 quiz, 2 hours laboratory. Credit, 4 hours.

292 Introduction to Research Techniques. Instrumental methods, and philosophy of research by actual participation in chemical research projects. Prerequisite: Approval of adviser and research supervisor. Credit, 1 to 3 hours each semester; total may not exceed 6 hours.

300 Glass Blowing. Laboratory techniques in glass blowing. Prerequisite: Approval of instructor. Four hours laboratory. Credit, 1 hour.

327* Analytical Chemistry. Principles and methods of chemical analysis. Required of B.S. chemistry majors. Prerequisite: CH 114 or 115. Two lectures, 1 quiz. Credit, 2½ hours.

328* Analytical Chemistry Laboratory. Experiments in chemical analysis. Required of B.S. chemistry majors. Prerequisite: CH 327 or concurrently. Nine hours laboratory. Credit, 2½ hours.

331*, 332 General Organic Chemistry. Chemistry of organic compounds. Prerequisite: CH 114, 115, or 118. Credit, 3 hours each semester.

335, 336* General Organic Chemistry Laboratory. Organic chemical experiments in separation techniques, synthesis, analysis and identification, and relative reactivity. Corequisites: CH 331 for CH 335, CH 332 for CH 336. Four hours laboratory. Credit, 1 hour each semester.

338* Organic Chemistry Laboratory. Organic chemical experiments in identification, synthesis and rates of reaction. Required of B.S. chemistry majors. Prerequisite: CH 335. Corequisite: CH 332. Eight hours laboratory. Credit, 2 hours.

341* Elementary Physical Chemistry. Properties of solids, liquids, gases, solutions, equilibrium, colloidal state. For pre-medical, biology, agriculture, etc., students. Prerequisites: CH 118 or 225 and 231 or 331. Credit, 3 hours.

361* Elementary Biochemistry. Chemistry of animal and plant life including biological compounds, tissues, foods and digestion, enzymes, etc. Prerequisites: CH 231 or 332. Credit, 3 hours.

421 Instrumental Analysis. Principles of instrumental methods in chemical analysis. Electroanalytical and optical techniques. Prerequisites: CH 225 and 226 or CH 327 and 328; CH 442 or concurrently. Credit, 3 hours.

422 Instrumental Analysis Laboratory. Experiments in chemical analysis by electro-analytical and optical techniques. Prerequisite: CH 421 or concurrently. Three hours laboratory. Credit, 1 hour.

431 Qualitative Organic Analysis. Systematic identification of organic compounds. Prerequisites: CH 118 or 226 or 328, and 336 or 338 or approval of instructor. One lecture, 6 hours laboratory. Credit, 3 hours.

435 Organic Laboratory Methods. Methods of organic synthesis. General types of organic reactions and laboratory techniques employed in preparation, isolation and purification of complex organic products. Prerequisite: CH 431 or approval of instructor. One lecture, 1 conference, 5 hours laboratory. Credit, 3 hours.

441*, 442 General Physical Chemistry. Gases, liquids, solids, solutions, equilibrium, phase rule, electrochemistry, thermodynamics, atomic structure, radioactivity, and colloids. Prerequisites: PH 112 or 116 or ES 231; MA 212. Credit, 3 hours each semester.

443* Physical Chemistry Laboratory. Physical chemical experiments. Prerequisite: CH 341 or 441 or concurrently. Three hours laboratory. Credit, 1 hour.

444* General Physical Chemistry Laboratory. Physical chemical experiments. Required of B.S. chemistry majors. Prerequisite: CH 441. One conference, 5 hours laboratory. Credit, 2 hours.

446* Radioisotope Techniques. Radioactivity and detection of nuclear radiations. Quantitative measurements, tracer techniques and study of methods used in agriculture, medicine, industrial radiochemistry and related fields. Especially adapted to meet the needs of persons majoring in fields other than chemistry. Prerequisite: CH 118 or 225. Two lectures, 3 hours laboratory. Credit, 3 hours.

447* Radiochemistry. Radioactivity, natural and artificial radioisotopes, nuclear reactions, isolation of isotopes, nuclear energetics, measurement of radioactivity, tracer techniques and other applications. Prerequisite: CH 441 or concurrently. Credit, 2 hours.

- 448* Radiochemistry Laboratory.** Radiation measurements, tracer methods, quantitative identification of isotopes, and other procedures applicable to chemical, physical, engineering and biological problems. Prerequisite: CH 447 or concurrently. One conference, 4 hours laboratory. Credit, 2 hours.
- 451* Inorganic Chemistry.** Atomic structure, periodic relationships, chemical bonding, nomenclature, aqueous and non-aqueous chemistry. Prerequisite: CH 118 or 225 or 327. Credit, 3 hours.
- 452 Inorganic Chemistry Laboratory.** Preparation and purification of typical inorganic substances with emphasis on methods and techniques. Prerequisite: Approval of instructor. One lecture, 3 hours laboratory. Credit, 2 hours.
- 453* Inorganic Chemistry.** Principles and applications of inorganic chemistry. Required of B.S. chemistry majors. Prerequisite: CH 442 or concurrently. Credit, 3 hours.
- 461*, 462 General Biochemistry.** Fundamental chemistry and metabolism of major biological materials and their role in the biochemical processes of living organisms. Prerequisites: CH 332 and 341 or 441. Credit, 3 hours each semester.
- 467, 468 General Biochemistry Laboratory.** Chemistry of biological compounds, with emphasis on metabolic transformations of proteins, carbohydrates, and fats. Corequisites: CH 461 with 467; 462 with 468. One conference, 5 hours laboratory. Credit, 2 hours each semester.
- 480 Methods of Teaching Chemistry.** Organization and presentation of appropriate content of chemistry; preparation of reagents, experiments, demonstrations; organization of stock rooms, laboratories; experience in problem solving. Prerequisite: Approval of instructor. Credit, 3 hours.
- 481 Geochemistry.** Origin and distribution of the chemical elements. Geochemical cycles operating in the earth's atmosphere, hydrosphere and lithosphere. Prerequisite: CH 341 or 441 or GL 321. Credit, 3 hours. (Same as GL 481).
- 482 Physical Geochemistry.** Applications of thermodynamic and kinetic principles to geochemical processes. Prerequisite: CH 341 or CH 441 or GL 481. Credit, 3 hours.
- 485 Meteorites and Cosmochemistry.** Chemistry and mineralogy of meteorites and their relationship to the origin of the earth, solar system and universe. Prerequisite: CH 481 or 482. Credit, 3 hours.
- 501 Current Topics in Chemistry.** Prerequisite: Approval of instructor. May be repeated for credit. Credit, 1 hour.
- 511, 512 Chemistry for In-service Teachers.** An integrated approach to the concepts and principles of chemistry. Prerequisite: Approval of instructor. Credit, 3 hours each semester.
- 523 Advanced Analytical Chemistry.** Theoretical principles of analytical chemistry. Prerequisites: CH 327 and 442 or their equivalents. Credit, 3 hours.
- 525 Spectrochemical Methods of Analysis.** Theoretical and practical considerations involving the use of optical instruments for chemical analysis with special emphasis on emission and absorption spectroscopy. Prerequisite: CH 442. Three lectures, 3 hours laboratory. Credit, 4 hours.
- 526 X-Ray Methods of Analysis.** Theoretical and practical considerations involving the use of X-ray diffraction and spectroscopy for chemical and structural analyses. Prerequisite: CH 442. Three lectures, 3 hours laboratory. Credit, 4 hours.
- 527 Electrical Methods of Chemical Analysis.** Theoretical and practical considerations of polarography, potentiometric, amperometric, and conductometric titrations. Prerequisite: CH 442. Two lectures, 6 hours laboratory. Credit, 4 hours.
- 528 Topics in Analytical Chemistry.** Prerequisites: CH 523 and approval of instructor. May be repeated for credit. Credit, 3 hours.
- 531 Theoretical Organic Chemistry.** Reaction mechanisms, structure elucidation, stereoisomerism, conformational analysis. Prerequisites: CH 332, 442. Credit, 3 hours.
- 532 Theoretical Organic Chemistry.** Prerequisite: CH 531. Credit, 2 hours.

534 Heterocyclic Compounds. Chemistry of organic heterocyclic compounds containing nitrogen, sulfur, and other hetero atoms. Prerequisites: CH 532, 537. Credit, 2 hours.

535 Carbohydrates. Prerequisites: CH 532, 537, or approval of instructor. Credit, 2 hours.

536 Natural Products. Organic chemistry of such natural products as alkaloids, steroids, terpenes, organic medicinals, and antibiotics. Prerequisites: CH 532, 537 and approval of instructor. May be repeated for credit. Credit, 2 hours.

537 Organic Reactions. Important synthetic reactions of organic chemistry with emphasis on recently discovered reactions of preparative value. Prerequisite: CH 531. Credit, 2 hours.

538 Polymers. Chemistry and properties of natural and synthetic polymers. Prerequisite: CH 332. Credit, 2 hours.

541 Chemical Thermodynamics. Classical approach. Prerequisite: CH 442. Credit, 3 hours.

542, 543 Statistical Thermodynamics. Statistical mechanics applied to chemical problems. Prerequisite: CH 541. Credit, 3 hours each semester.

545 Nature of the Chemical Bond. Principles of quantum theory applied qualitatively to chemical bonding and molecular structure. Prerequisite: CH 442. Credit, 3 hours.

546, 547 Quantum Chemistry. Principles of quantum mechanics applied quantitatively to problems of chemical interest. Prerequisite: Approval of instructor. Credit, 3 hours each semester.

548 Chemical Kinetics. Kinetic theory and rate processes. Prerequisite: Approval of instructor. Credit, 3 hours.

549 Topics in Physical Chemistry. Prerequisite: Approval of instructor. May be repeated for credit. Credit, 3 hours.

553 Inorganic Chemistry. Principles of modern inorganic chemistry and their applications over the entire periodic system. Prerequisites: CH 442, 453 or their equivalents. Credit, 3 hours.

554 Advanced Inorganic Chemistry. Elaboration and extension of the more important topics of CH 553. Prerequisite: CH 553. Credit, 3 hours.

556 Topics in Inorganic Chemistry. Prerequisites: CH 553 and approval of instructor. May be repeated for credit. Credit, 3 hours.

563 Biochemistry. Proteins with special reference to the enzymes and their mechanism of action. Prerequisite: CH 462. Credit, 3 hours.

565 Biochemical Techniques. Application of recent techniques of isolation and analysis to biochemical materials and processes. Prerequisites: CH 118 or 225 and 461. One lecture, 1 quiz, 5 hours laboratory. Credit, 3 hours.

581 Isotope Geochemistry. Geochemistry and cosmochemistry of stable and radioactive isotopes; geochronology; isotope equilibria. Prerequisite: Approval of instructor. Credit, 3 hours.

582 Topics in Geochemistry and Cosmochemistry. Topics of current interest for students in chemistry and other fields. A broad sampling of data and thought concerning phase equilibria, element distribution, meteorites, the earth, and other planets. Prerequisite: Approval of instructor. May be repeated for credit. Credit, 3 hours.

583 Phase Equilibria and Geochemical Systems. Study of natural reactions at high temperatures and pressures; silicate, sulfide and oxide equilibria. Prerequisite: CH 482. Credit, 3 hours.

Special Graduate Courses: 590, 591, 592, 593, 790, 792, 799. (See page 219.)

*In each of the following groups, credit is allowed for one course only: CH 101, 113 or 117; CH 114 or 115; CH 115 or 121; CH 118, 225 or 327; CH 118, 226 or 328; CH 231 or 331; CH 336 or 338; CH 341 or 441; CH 361 or 461; CH 443 or 444; CH 446 or 447; CH 446 or 448; CH 451 or 453.

CONSTRUCTION

ASSOCIATE PROFESSORS:

SHAIFER (EC A-302), MICHELS, PETERMAN, WARD

ASSISTANT PROFESSOR:

H. THOMPSON

LECTURERS:

LAW, VAN REUSEN

CO 101 Construction Principles. Organization, functions, processes, and economics of construction. Related elements of leadership and human direction. Credit, 2 hours.

221 Static Mechanics. Study of force systems acting on structural members. Centroids, equilibrium, friction, section properties. Prerequisite: Calculus. Credit, 3 hours.

243 Building Materials and Systems. Incorporation of construction materials into building systems. Component specifications and standards. Graphic analysis and representation. Six hours lecture and laboratory. Prerequisite: Architectural or engineering drafting. Credit, 3 hours.

244 Mechanical and Electrical Systems. Acoustics, lighting, sanitation, transportation, and climate control systems for buildings. Utility and industrial piping. Instrumentation and control. Six hours lecture and laboratory. Prerequisites: PH 111, 112 or equivalent. Credit, 3 hours.

251 Construction Equipment. Characteristics, capabilities, limitations, and employment of builders' equipment and heavy construction machinery. Fleet operations, maintenance programs. Credit, 2 hours.

323 Strength of Materials. Analysis of strength and rigidity of structural members in resisting applied forces. Stress, strain, shear, moment, deflections, combined stresses, connections. Prerequisite: CO 221 or equivalent. Credit, 3 hours.

331 Construction Safety. Accident prevention in construction; safety methods, techniques, practices; protective equipment and devices; identification of hazards; safety planning and organization; worker education; occupational diseases; public laws and codes; accident and insurance procedures. Credit, 2 hours.

361 Methods Analysis and Design. Engineering analysis of construction work and production systems. Design of materials handling equipment, rigging, and erection gear. Concrete formwork. Plant organization and layout. Corequisite: Course in dynamics. Credit, 3 hours.

362 Field Study. Investigation, photographic chronicling, analysis, and report of actual construction field methods. Credit, 1 hour.

381 Construction Accounting. Application of basic accounting principles to construction operations. Theory and mechanics of cost accounting. Equipment economics, fiscal procedures and financial controls. Prerequisite: CO 383. Credit, 3 hours.

383 General Construction Estimating. Principles, theories and systems of building estimating. Quantity survey techniques, standard formats, classification of work, organization of detail, unit cost determinations, simulated bids. Prerequisites: AC 101, ES 102, CO 243. Credit, 3 hours.

385 Mechanical Construction. Estimating and construction methods for plumbing, pipefitting, heating and air conditioning in building construction. Credit, 3 hours.

386 Electrical Construction. Estimating for electrical construction in industrial, commercial and residential buildings. Credit, 3 hours.

387 Building Construction Estimating. Estimating essentials for commercial and residential building construction. Not open to Construction majors. Credit, 3 hours.

391 Externship. Directed work experience with participating construction firms. Credit, 1 hour for each 500 hours of certified, paid work. May be repeated for maximum credit of 3 hours.

424 Applied Structural Design. Economic use of timber, reinforced concrete, and steel in building and engineering structures. Foundations, plastic and ultimate strength design, prestressed concrete. Prerequisite: CO 323 or equivalent. Credit, 3 hours.

463 Foundation Construction Methods. Subsurface construction theory and practice for foundations of buildings and engineered structures. Underpinning, piling, dry and wet excavating, de-watering, cofferdams, caissons, soil stabilization, underwater pipelaying. Corequisite: CE 450. Credit, 2 hours.

471 Residential Construction. Administrative and management processes for urban building and development. Economic, fiscal, production, design, and marketing requirements of homebuilding. Consumer needs and trends. Credit, 3 hours.

481 Capital Project Construction. Functions of the constructor during the research, finance, design, and construction phases of complex projects. Analytic and conceptual estimating procedures for process plant construction. Risk and contingency evaluation. Competitive bidding factors. Credit, 3 hours.

484 Heavy Construction Estimating. Principles, methods, and techniques of estimating construction costs for highways, pipelines, bridges, tunnels, dams and other engineering works. Prerequisites: CE 344; CO 383, or approval of instructor. Credit, 3 hours.

491 Construction Management Engineering. Systems applications for construction. Analytical and quantitative methods for solving complex management and production problems. Decision-making theory and techniques. Linear programming, CPM, PERT, etc. Prerequisite: Approval of instructor. Credit, 3 hours.

494 Special Construction Problems. Guided individual student projects applying academic theory to solution of practical problems in the construction industry. Credit, 1 to 3 hours. May be repeated for a maximum credit of 6 hours.

496 Construction Administration. Ethical practice, social responsibility, licensing, codes, and public regulation of contracting. Specification writing and interpretation. Functions of the architect-engineer. Construction contracts. Bonding, insurance, indemnification. Labor agreements and jurisdictional procedures. Joint venture and subcontract relationships. Seminar. Credit, 3 hours.

ECONOMICS

LIBERAL ARTS CURRICULUMS

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Arts Degree Curriculum

ECONOMICS—Consists of 45 semester hours of credit, of which 30 must be in economics and 15 in closely related fields to be approved by the adviser in consultation with the student. EC 201, 202, 401, 402, GB 221 or MA 226, and MA 141 and 142, or equivalent courses, are required.

Bachelor of Science Degree Curriculum

ECONOMICS—Consists of 45-55 semester hours of credit, of which 30 must be in economics and the remainder in closely related fields to be approved by the adviser in consultation with the student. All courses required for the Bachelor of Arts degree major are also required for the Bachelor of Science degree major.

BUSINESS ADMINISTRATION CURRICULUM**Bachelor of Science in Business Administration Degree**

See pages 126-127 for information.

EDUCATION CURRICULUMS**DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS****Bachelor of Arts in Education Degree Curriculum**

ECONOMICS—Consists of 45 semester hours of credit, including at least 30 semester hours in economics and one course on methods of teaching economics. Remaining courses will be in closely related fields as approved by the adviser in consultation with the student. EC 100, 201, 202, 401, 402, MA 226, 141 and 142, or equivalent courses, are required.

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS**(Secondary Education)**

ECONOMICS—Consists of 18 semester hours of credit. EC 100, 201 and 202 are required. The remaining hours are to be selected in consultation with the adviser.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Economics offers a program leading to the degree of Master Science. Consult the *Graduate Catalog* for requirements.

Faculty and courses are listed on page 246.

Education

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS**Bachelor of Arts in Education Degree Curriculum**

Major teaching fields required under the secondary curriculum offered by the College of Education, leading to the degree of Bachelor of Arts in Education, are offered in the departments of the College of Liberal Arts, the College of Business Administration, the College of Engineering Sciences or the College of Fine Arts. Consult the appropriate departments for statements of these requirements.

DEPARTMENTAL GRADUATE PROGRAMS

The departments of the College of Education offer programs leading to the degrees of Master of Arts in Education, Education Specialist, Doctor of Education and Doctor of Philosophy.

ELEMENTARY EDUCATION

PROFESSORS:

STROM (Ed 302), BOYD, DOYLE, EZER, JONES, LEWIS, MANNING,
O'BEIRNE, PODLICH, STOUT, VEATCH

ASSOCIATE PROFESSORS:

BYERS, EDWARDS, MALONE, OLMSTED, RAY, SILVAROLI

ASSISTANT PROFESSORS:

CHRISTINE, CROUCH, DUDEK, HOWLAND, LEE, MEASEL,
MULLER-WILLIS, O'BRIEN, SCHALL, STEERE, TALBERT

INSTRUCTOR:

JOHNSON

LECTURER:

VERNER

ELEMENTARY EDUCATION

EE 310 Creative Activities for the Young Child. Concepts of creativity in current research. Approaches to creative teaching and learning through motivation, environmental changes, and experimentation. Credit, 3 hours.

311 Social Studies in Early Childhood Education. Development of democratic living in all areas of the curriculum. Considers objectives, unit planning, problem solving, selection of content, scope and sequence, construction of instructional material, and resources. Provides for experiences with children. Credit, 3 hours.

312 Nursery-Kindergarten Education. Considers all aspects of curriculum. Philosophy, principles, practices, problems, and evaluation in the integrated experience program. Credit, 3 hours.

313 Child Development. Major principles underlying the total development of the child during the pre-school and elementary school years with observations in school settings. Enhancement and understanding of the child in the physical, intellectual, social and emotional areas of development. Credit, 3 hours.

314 The Teaching of Reading. Reading for the classroom teacher, involving the application of expanding resources in the solving of reading problems. Designed primarily for classroom teachers in terms of reading techniques, procedures and organizational plans. Prerequisite: Admission to the elementary teacher education curriculum. Credit, 3 hours.

322 Language Arts in Early Childhood Education. Factors affecting growth in language arts areas; instructional methods and materials in teaching reading, speech, listening, and writing. Proficiency in handwriting required. Credit, 3 hours.

333 Language Arts in Early Childhood Education. Factors affecting language development. Instructional methods and materials for teaching of listening, speaking, and writing with emphasis upon the middle and upper elementary grades. Proficiency in handwriting required. Credit, 3 hours.

344 Elementary Curriculum. Program of the emerging elementary school. Principles, practices, and problems. Interrelationships and synthesis. Credit, 3 hours.

355 Social Studies in the Elementary School. The core function of social studies.

scope and sequence, unit organization, methods of instruction, materials and resources for learning. Credit, 3 hours.

366 Observation and Participation. Provides an opportunity for students to observe and work directly with elementary children in a classroom situation. Includes a critical evaluation of the student's experiences. Credit, 3 hours. Y grade only.

411 Early Childhood Education. Practical consideration of basic principles, experiments, research studies, and recent trends as factors related to the education of children through seven years of age. Prerequisite: EE 312. Credit, 3 hours.

415 Current Reading Practices. Special consideration given to the implementation of selected factors for classroom practices. Credit, 3 hours.

478 Directed Teaching in the Elementary School. The relationship of theory and methods of teaching, the practice of teaching; practice in guidance, measurement, extra-curricular activities, and classroom management procedures. Prerequisite: Admission to the elementary teacher education curriculum. Credit 1-12 hours. Y grade only.

479 Problems of Teachers in the Elementary School. Individual problems encountered by students in their observations and practice teaching experiences; appraisal of teacher-education backgrounds; bridging of gaps in teacher-education backgrounds. Prerequisite or corequisite: EE 478. Credit, 3 hours.

498 Seminar in Student Teaching. A series of seminars connected directly with the sequential experiences in the classroom. Required of students enrolled for nine hours or more of student teaching credit and is to be taken concurrently with EE 478. Credit, 3 hours.

511 Elementary Curriculum Development. Criteria of appraisal, typical curriculum problems, curriculum construction and improvement. Prerequisite: EE 344, or equivalent. Credit, 3 hours.

513 Child Development. A continuation and more thorough analysis of the major principles, theories and research concerning the elementary school child and his development. An integrated approach to the study and facilitation of wholesome educational and psychological development. Credit, 3 hours.

522 Developmental Social Experiences in Early Childhood Education. Materials, techniques, aesthetic expression, creative activities and values in the integrated curriculum. Prerequisite: EE 311 or equivalent. Credit, 3 hours.

525 Language Arts in Early Childhood Education. Significant problems and trends of current programs. Development of a balanced and articulated program of language arts. Prerequisite: EE 322 or equivalent. Credit, 3 hours.

526 Language Arts in the Elementary School. Significant problems and trends of current programs. Development of a balanced and articulated program of language arts. Prerequisite: EE 333 or equivalent. Credit, 3 hours.

527 Mathematics in Early Childhood Education. Contemporary mathematics programs in terms of content, materials and approaches to instruction. Focuses upon the lower elementary school. Prerequisite: MA 380 or equivalent. Credit, 3 hours.

528 Social Studies in the Elementary School. Significant problems and trends of current programs. Development of a balanced and articulated program of social studies. Prerequisite: EE 355 or equivalent. Credit, 3 hours.

529 Science in the Elementary School. Significant problems and trends of current programs. Development of a balanced and articulated science program. Prerequisite: PL 320 or equivalent. Credit, 3 hours.

537 Mathematics in the Elementary School. Contemporary mathematics programs or elementary school mathematics in terms of content, materials and approaches to instruction. Focuses upon the middle and upper school. Prerequisite: MA 380 or equivalent. Credit, 3 hours.

544 Play Education. Conflicting theories of play and the educational implications of each in a curriculum. A practical application in the lower levels of the elementary school. Credit, 3 hours.

555 Modern Practices in Early Childhood Education. Trends and practices, instructional and resource material, methods and techniques in early childhood education. Prerequisite: EE 312 or equivalent. Credit, 3 hours.

711 History of Curriculum Development in the Elementary School. Elementary school curriculum from colonial times to the present with concomitant attention to the philosophical assumptions and theories of learning which influenced the selection of content. Prerequisite: EE 511 or equivalent. Credit, 4 hours.

722 Issues in Elementary Education. Problems, trends, issues and research in elementary education, and their relationship in modern educational practices. Credit, 4 hours.

READING EDUCATION

RE 433 Reading: Elementary School. A reading program for teachers-in-training, aimed at improving skills in word recognition (specifically phonics) and comprehension. Classroom practices in reading and testing are included. Credit, 3 hours.

466 Reading: Upper Grades. Acquaints the teacher-in-training with procedures and practices, in reading, which are related to various subject matter fields. Specific skill development and evaluation techniques for upper graders. Credit, 3 hours.

481 Reading Clinic. Teachers-in-training work directly with students who are disabled in reading. Techniques employed in treating disabilities. Prerequisite: EE 314, RE 433 or 466. Credit, 3 hours.

505 Elementary Reading. Phonics for classroom teachers, designed to improve reading programs for developmental and corrective readers. Teacher skills, evaluation and approaches used for teaching reading. Prerequisite: Teaching Certificate. Credit, 3 hours.

507 Reading in the Junior-Senior High School. Acquaints the classroom teacher, at these levels, with reading in content fields. Techniques involved in readability, vocabulary and efficient reading. Prerequisite: Teaching Certificate. Credit, 3 hours.

544 Special Reading Programs: Secondary. Recommended procedures for working with corrective reading cases at the secondary school level. The role of the junior and senior high school special reading teacher. Prerequisite: RE 507 or approval of instructor. Credit, 3 hours.

550 Directed Experiences in Reading. Affords the opportunity to employ visual-auditory-kinesthetic treatment techniques acquired in previous reading courses. Teachers work directly with corrective reading problems. Prerequisite: RE 505 or 507. Credit, 3 hours.

556 Diagnostic and Treatment Procedures in Reading. Experience in administering and interpreting diagnostic tests in reading and related areas. Treatment of specific reading disabilities and preparation of materials are emphasized. Prerequisite: RE 505 or 507. Credit, 3 hours.

557 Reading Clinic Experience. The special reading teacher develops advanced clinical reading programs for disabled readers. Use of remedial materials and techniques. Prerequisite: RE 556. Credit, 3 hours.

581 Psychological Aspects of Reading. Designed to acquaint experienced teachers with individualized reading programs. Discussions and demonstrations should enable the teacher to understand and practice these unique approaches to reading. Prerequisites: RE 505, 507 or 556. Credit, 3 hours.

Special Graduate Courses: 500, 580, 584, 590, 591, 592, 593, 594, 600, 601, 680, 683, 684, 690, 691, 692, 700, 780, 783, 784, 790, 791, 792, 799. (See page 219.)

SECONDARY EDUCATION

PROFESSORS:

HAGGERSON, (Ed 406C), FRASIER, FULLERTON, GRIFFITH, JELINEK,
MCGRATH, PERRIL, RICE, ROVER, SHOFSTALL

ASSOCIATE PROFESSORS:

JAMES W. BELL, JOHN E. BELL, CHASEY, COOK, EDWARDS,
FETTERHOFF, KIESOW

ASSISTANT PROFESSORS:

ARMSTRONG, COHEN, PARRISH, PIERCEY, SJOSTROM

SECONDARY EDUCATION

SE 310 The Secondary School. Development of American secondary education. Controversial viewpoints regarding American secondary schools. Challenges confronting secondary school teachers. Observations may be required. Credit, 3 hours.

311 Principles and Curricula of Secondary Schools. Principles, purposes, organization and curricula of secondary schools, emphasizing current curricula materials, trends, and issues. Prerequisites: EF 322 or equivalent, EF 333 or SE 310, and admission to a secondary teacher education curriculum. Credit, 3 hours.

410 Observation and Participation in the Secondary School. Students observe and work directly with secondary school pupils in a classroom situation. Credit, 1 - 3 hours.

411 Teaching and Evaluating in Secondary Schools. Methods, procedures, techniques, and instruments of teaching and evaluating in secondary schools. Prerequisite: EF 322 or equivalent, SE 311, and admission to a secondary teacher education curriculum. Credit, 4 hours.

433 Directed Teaching in the Secondary School. Relationship of theory and practice in methods of teaching, practice of teaching; practice in guidance, measurement, extra-curricular activities, and classroom management procedures. Prerequisites: SE 311, 411, and admission to a secondary teacher education curriculum. Credit, 1 - 9 hours.

444 The Junior High School. Development, purposes, organization, curricula, and students of the junior high school, with a major emphasis on curriculum. Prerequisite: EF 322 or equivalent, and EF 333 or SE 310. Credit, 3 hours.

455 Core Curriculum Methods and Materials. Foundations, organization, and present status of the core curriculum. The development and utilization of core materials for classroom instruction. Prerequisite: EF 322 or equivalent, EF 333 or SE 310. Credit, 3 hours.

522 Secondary School Curriculum Development. Social processes, issues, principles, patterns, and procedures in curriculum development. Prerequisites: SE 311, 411, 433. Credit, 3 hours.

533 Improving Instruction in Secondary Schools. Analytical appraisal of procedures, methods, techniques, and experimental approaches to teaching in secondary schools. Prerequisite: SE 433 or equivalent. Credit, 3 hours.

555 Student Activities in the Secondary School. Development, purposes, and principles of student activities as they are related to the educational program of the secondary school. Prerequisites: SE 311, 411, 433. Credit, 3 hours.

566 Evaluating Secondary School Programs. Development of evaluative criteria. Group and individual work in evaluation, using schools and classes of those enrolled as the source of problems for discussion and analysis. Prerequisite: SE 433. Credit, 3 hours.

577 Recent Issues and Trends in Secondary Education. Recent committee reports,

problems facing American secondary schools, and recent issues. Prerequisite: SE 433. Credit, 3 hours.

588 Human Relations in the Secondary Schools. Human relations problems in the school resulting from the interaction of teachers, pupils, administrators, laymen and non-professional staff. Prerequisite: SE 433. Credit, 3 hours.

711 Secondary Curriculum Development. Factors bearing upon the development of a qualitative learning environment in the secondary school, the evaluation of research and the individual study of fundamental problems in secondary curriculum development. Prerequisites: SE 433, 522. Credit, 4 hours.

722 Improvement of Instruction in the Secondary School. Factors bearing upon the improvement of instruction in the secondary school, the evaluation of research and the individual study of fundamental problems in the improvement of instruction in the secondary school. Prerequisite: SE 433, 533. Credit, 4 hours.

SAFETY EDUCATION

ST 466 Safety Education. Various phases of safety education: home, school, and on-the-job. Emphasis on special interests of class members. Credit, 3 hours.

477 Driver and Traffic Safety Education. Critical analysis of traffic accidents and attitude factors involved. Development of a broad background of automobile operation, traffic laws and high level driving skills. Prerequisite: Valid operator's license and ST 466. Credit, 3 hours.

478 Driver and Traffic Safety Education. Preparation of candidates for secondary school instruction in driver education. Classroom and in-car techniques of teaching beginning drivers. Range and simulator operation. Prerequisite: A good driving record and ST 477. Lecture and laboratory. Credit, 3 hours.

488 Organization and Administration of Driver and Safety Education. Procedures and planning for the curriculum, organization, and administration of safety education programs. Prerequisite: ST 477. Credit, 3 hours.

ADULT EDUCATION

AE 433 Family Education in the Schools. Development, content, and considerations of teaching marriage and family courses in the public schools. Prerequisites: Approval of instructor. Credit, 3 hours.

455 Education of Migrants. Special problems and considerations in educating migrant families. Prerequisite: Approval of instructor. Credit, 3 hours.

511 Adult Education. Historical development, objectives, scope, trends, and significance of adult education. Philosophy and trends of adult education in relation to desirable present and future local public school programs. Credit, 3 hours.

512 Curriculum Development and Program Planning in Adult Education. Factors considered in establishing and developing an adult education program in secondary schools, colleges and universities. Prerequisite: AE 511. Credit, 3 hours.

522 Educating the Middle Age and Older Person. Educational considerations and methods utilized in each of the principal age groupings of adults. Prerequisite: Approval of instructor. Credit, 3 hours.

555 Inter-Cultural Education. Administration and organization of inter-cultural education for interchanges and technical assistance of higher education in other countries. Credit, 3 hours.

566 International Education. Education in the world community with special reference to cross-cultural problems of foreign students preparing for teaching abroad. Credit, 3 hours.

711 Adult Education. Types, methods, and administration of adult programs. Ways and means of implementing adult activity and to the use of adult activity in the study and improvement of educational services provided in local communities. Each student will participate in a research study of some area of adult education. Credit, 4 hours.

Special Graduate Courses: 500, 580, 584, 590, 591, 592, 593, 594, 600, 601, 680, 684, 690, 691, 692, 700, 780, 783, 784, 790, 791, 792, 799. (See page 219.)

COUNSELING AND EDUCATIONAL PSYCHOLOGY

PROFESSORS:

DAVIS, (Ed 415C), BLACKHAM, BLAESSER, DAANE, GAFFNEY,
HEIMANN, HELMSTADTER, NICHOLS, RICHARDSON, STAFFORD

ASSOCIATE PROFESSORS:

COMBS, CHRISTIANSEN, GUINOARD, HAMM, KERR, KIMLER,
MAES, MCGREEVY, VAN WAGENEN

ASSISTANT PROFESSORS:

ANDERSON, CABIANCA, CHURCHILL, FRY, GROSS, MILLER,
RIPLEY, SATTLER, SHELL, SLETTEDAHL, SNYDER

VISITING PROFESSOR:

WRENN

COUNSELOR EDUCATION

CE 512 Principles of Counseling and Student Personnel Work. Areas of student personnel work with consideration of the interrelation of the various school services and community agencies. Credit, 3 hours.

522 Personality Development. Interaction of emotional and cognitive factors in personality development at different age levels in personal life, and in school situations. Various personality theories examined. Credit, 3 hours.

523 Psychological Tests. Standardized tests in the study of the individual with emphasis on test score interpretation in counseling. Prerequisites or corequisites: CE 512, 522. Credit, 3 hours.

534 Occupations and Careers. The world of work, value climates and job classification systems, educational and training criteria regarding occupational entry and vertical mobility. Prerequisites or corequisites: CE 512 and 522. Credit, 3 hours.

545 Analysis of the Individual. Theory and methods commonly employed in studying the individual. Observational methods, diagnostic interview, study and semi-structured methods for studying personality. Prerequisites or corequisites: CE 512, 522, 523. Credit, 3 hours.

567 Group Procedures. Principles and techniques of group procedures other than counseling as used in the school program. Prerequisites: CE 523, 534, 545. Credit, 3 hours.

577 Counseling. Principles and application of counseling with particular emphasis on the counseling interview. Prerequisites: CE 523, 545. Credit, 3 hours.

612 Child Counseling. Counseling theory, methods, and experiences in working with elementary school children individually and in small groups. Prerequisite: CE 577. Credit, 4 hours.

622 Group Counseling. Principles and application of group counseling techniques. Prerequisite: CE 577. Credit, 3 hours.

633 Organization and Administration of Student Personnel Programs. Organizational procedures and patterns, and administrative relationships in student personnel programs. Prerequisites: CE 577 and 622. Credit, 2 hours.

634 Organizational Theory and Change. Conceptual models useful to the counselor in understanding how organizational structures emerge, develop and decline. Organizational goals, theories of organization, authority-subordinate roles, communication within and between organizations. Prerequisite: CE 577. Credit, 3 hours.

644 Psychology of Careers. Structural and developmental theories regarding patterns of occupational choice. The role of counseling in the career planning function. Prerequisite: CE 577. Credit, 3 hours.

655 Student Personnel Work in College and University. Historical development and present status in relation to changing concepts and functions in higher education

—junior college, college and university. Observation on college campuses. Prerequisite or corequisite: Experience or course-work in higher education. Credit, 3 hours.

666 Comparative Theories of Personality. Comparative analysis of personality theories in relation to school counseling practices. Prerequisite: CE 577. Credit, 3 hours.

667 Patterns of Behavior Disorders. Common personality and/or emotional disturbances in children, adolescents, and adults. Etiology and dynamics of primary behavior disorders, neurotic coping styles, personality disorders and various types of psychosomatic illness. Prerequisite: CE 666. Credit, 3 hours.

668 Personality Assessment. Advanced study and interpretation of semistructured personality instruments. Theoretical rationale, administration, and use of projective drawings and thematic apperception devices. Prerequisite: CE 577. Credit, 3 hours.

677 Advanced Counseling. Applied technique and tape analysis. Procedures and structure of counseling-pacing, communication, empathy, and the helping relationship. Prerequisite: CE 577. Credit, 3 hours.

681 Supervised Practice. Assignment in a school or community agency for supervised experiences in personnel work. Prerequisite: Approval of instructor. Credit, 2-6 hours.

722 Philosophies and Theories of Counseling. Philosophical and psychological assumptions of various counseling approaches and various vocational development theories. Implications for school and college counseling situations of each major counseling approach. Prerequisite: CE 677. Credit, 3 hours.

Special Graduate Courses: 500, 580, 584, 590, 591, 592, 593, 594, 600, 601, 680, 683, 684, 690, 691, 692, 700, 780, 783, 784, 790, 791, 792, 799. (See page 219.)

EDUCATIONAL PSYCHOLOGY

EP 410 Laboratory in Test Construction and Interpretation. Principles of educational measurement and evaluation. Construction of classroom examinations, the assignment of grades and the interpretation of widely used group measures of school ability and achievement. Credit, 2 hours.

411 Principles of Educational Measurement and Evaluation. Major concepts and basic logic involved in the assessment of human abilities and school accomplishment. Nature of tests, the use of test information in making educational decisions, systems of grading, the process of test standardization and the concepts of test reliability and validity. Credit, 3 hours.

422 Educational Psychology. Psychological facts and laws particularly relevant to the problems of education. Prerequisite: PY 112 or equivalent. Credit, 3 hours.

433 Educational Statistics. A conceptual approach to statistical procedures used in the description and analysis of educational data. Descriptive statistics, probability and theoretical frequency distributions, introduction to the logic of testing hypothesis, basic parametric and nonparametric procedures. Credit, 3 hours.

444 Mental Health and Educational Practice. Social and emotional adjustment with emphasis on the influence of educational practice on personality development. The role of the teacher in the identification of pupil adjustment mechanisms and methods for handling behavior disorders. Prerequisites: PY 112, EP 422. Credit, 3 hours.

511 Educational Psychology. Empirical approaches to the development of learning and motivation: acquisition and forgetting, transfer of training, and the control of incentive conditions presented on an experimental basis and related to educational processes. Prerequisite: EP 422 or equivalent. Credit, 3 hours.

513 Psychology of the Elementary School Child. Mental, physical, social, and emotional development of children during early, middle and late childhood with emphasis on the application of psychological theory to problems of teaching in the elementary school. Prerequisites: PY 112, EP 422. Credit, 3 hours.

514 Psychology of the Adolescent. Mental, physical, social and emotional development in adolescence and emphasis on the influence of various aspects and activities of the secondary school on adolescent development. Prerequisites: PY 112, EP 422. Credit, 3 hours.

515 Psychology of Teaching Adults. Psycho-educational problems in teaching the adult learner emphasizing individual differences, remedial procedures and adjustment problems of the adult. Prerequisites: PY 112, EP 422, 511. Credit, 3 hours.

522 Theoretical Views of Learning in Education. Critical review of classical theories of learning; contemporary learning orientations and their experimental foundations with implications for education. Prerequisites: EP 511 and approval of instructor. Credit, 3 hours.

523 Automated Instructional Techniques. Application of psychological principles to the automatization of certain instructional processes. Principles of self-instructional programming, the development, revision, and testing of programmed learning sequences and a study of the available devices and systems are emphasized. Prerequisites: PY 112, EP 511, and approval of instructor. Credit, 3 hours.

525 Individual Measurements in Education. Individual test administration and experience in interpreting the results of the test to school personnel. Prerequisites: EP 411, 511, and approval of instructor. Credit, 3 hours.

528 Diagnosis of Learning Disabilities. Clinical diagnosis of learning disabilities emphasizing specific academic problems. Use and interpretation of diagnostic instruments in practical school situations. Prerequisites: EP 411, 511, and 525. Credit, 3 hours.

533 Statistical Methods in Education. Basic multivariate procedures for analyzing educational data, including analysis of variance and covariance, multiple regression and discriminant function. Introduction to sampling techniques and experimental design. Prerequisite: EP 433 or equivalent. Credit, 3 hours.

541 Measurement Techniques in School Personnel Selection and Placement. Development of test procedures in the operation of a school personnel selection and placement testing program. Job description and analysis, test selection and development, construction and analysis of new tests, methods of estimating validity and methods of including nontest variables in the prediction of job success are emphasized. Prerequisites: EP 411, 433, and approval of instructor. Credit, 3 hours.

543 Theoretical Issues in Educational Measurement. Different theoretical approaches to educational measurement and the implication of these theories for educational practice. Current major issues in measurement examined through a review of research literature. Prerequisites: EP 411, 412, 433. Credit, 3 hours.

544 Appraisal and Evaluation Techniques. Factors involved in the construction of tests — formal and informal, old and new types. Practice in discovering and formulating objectives and in constructing techniques for ascertaining the extent of achievement of these objectives. Prerequisites: EP 411, 433, 543. Credit, 3 hours.

555 Factor Analysis and Techniques of Data Processing. Theory and methods of computation in factor analysis, application of modern data processing methods to large sample researches, group testing programs, and pupil accounting. The coding and analysis of the mass data collected in such studies, using punch card procedures. Prerequisites: EP 411, 433, or equivalents. Credit, 3 hours.

562 Psychology of Exceptionality. General psychological theory and experimental research relevant to exceptionality with emphasis on implications for educational programs which take cognizance of unique learner characteristics. Prerequisite: EP 511. Credit, 3 hours.

564 Psychology of Reading. A behavioral analysis of the reading process and application of experimentally derived principles of learning and behavior in reading instruction and research. Prerequisite: EP 511. Credit, 3 hours.

566 Recent Studies in Educational Psychology. A critical psychological analysis of school activities emphasizing what the literature has to say about application of current personality theory to the educative process. Prerequisite: Six hours of Educational Psychology. Credit, 3 hours.

711 Educational Psychology. Theory and research in educational psychology, and their implications for educational practice. Credit, 4 hours.

Special Graduate Courses: 500, 580, 584, 590, 591, 592, 593, 594, 600, 601, 680, 683, 684, 690, 691, 692, 700, 780, 783, 784, 790, 791, 792, 799. (See page 219.)

EDUCATIONAL ADMINISTRATION AND SUPERVISION

PROFESSORS:

WOCHNER (Ed 404 B), ASHE, DEEVER, MENKE, H. MOORE,
NEWBURN, M. STOUT, WOOTTON

ASSOCIATE PROFESSORS:

BRIDGMAN, DEMEKE, HUNNICUTT, LEVAN, METOS

ASSISTANT PROFESSOR:

MAYHEW

EDUCATIONAL ADMINISTRATION AND SUPERVISION

EA 503 School-Community Relationships. Principles, philosophy, and techniques for improving the educational program through school-community action. The role of all school personnel in coordinating school-community experiences. Credit, 2 hours.

511 School Law. Constitutional, statutory, and case law that relates to all school personnel, pupils, the school district and other governmental units. Contracts, dismissals, tenure, retirement, pupil injuries, liability of personnel and district, school district boundary changes, and bonding. Credit, 3 hours.

522 Public School Administration. History and development of public school administration in the United States, current organizational patterns for public education at local, county, state and national levels, the administrator's responsibilities in all phases of education. Credit, 4 hours.

533 Instructional Leadership in the Elementary School. Curricular practices and the processes used by administrative and supervisory leaders who plan, organize, and coordinate the professional activities of elementary school teachers in improving pupil-learning experiences. Prerequisite: EE 511. Credit, 3 hours.

535 Instructional Leadership in the Secondary School. Curricular practices and the processes used by administrative and supervisory leaders who plan, organize, and coordinate the professional activities of secondary school teachers in improving pupil-learning experiences. Prerequisite: SE 522. Credit, 3 hours.

537 Evaluation of Teaching Effectiveness. Cooperative development of methods of evaluating teaching effectiveness by teachers and administrative personnel; emphasizes instructional improvement as the objective and outcome of the cooperative process; systematic training in observation. Prerequisite: Approval of instructor. Credit, 3 hours.

538 Administration of the Community School. Philosophy, history, organization and operation of the community-centered school. Introduction of the community education concept into a school system and upon making it operational. Credit, 3 hours.

544 Public School Finance. School budget procedures, accounting, revenues, state and county finance, and problems relating to financing public education. Prerequisite: Admission to Educational Administration program. Credit, 3 hours.

555 School Plant Planning and Maintenance. School building needs, educational planning for facilities, responsibilities of architects, duties of contractors, equipping and furnishing of school buildings. Prerequisite: Admission to Educational Administration program. Credit, 3 hours.

566 Human Relationships in Educational Administration. The administrator's professional relationships with teachers, parents, pupils and other educational leaders within the district. Factors in human relationships including communication skills, morale, authority, and perception through the case approach. Credit, 3 hours.

568 Role and Responsibility of Supervising Teacher. Experiences and content for those planning to become supervisors of student teaching in teacher education pro-

grams. Also serves as in-service training for those already working in student teaching. Credit, 3 hours.

571 School Business Management. Purchasing, budgeting, accounting, payroll management, auditing, financial reporting, insurance, and administration of non-teaching personnel and services. Prerequisite: EA 544. Credit, 3 hours.

573 School Personnel Administration. Organization for personnel services; development of policy to govern selection, orientation, placement, remuneration, transfers, separations; and development of morale among instructional and non-instructional personnel. Prerequisite: Admission to Educational Administration program. Credit, 3 hours.

577 Elementary School Principalship. Problem and laboratory approaches used to provide application of administrative principles and procedures to the administrative activities of elementary school principals. Prerequisites: Admission to Educational Administration program and EA 533. Credit, 3 hours.

578 Secondary School Principalship. Problem and laboratory approaches used to provide application of administrative principles and procedures to the administrative activities of secondary school principals. Prerequisites: Admission to Educational Administrative program and EA 535. Credit, 3 hours.

611 Interdisciplinary Forces Affecting Educational Administration. Interrelated nature of educational administration and the behavioral sciences. Prerequisites: 15 semester hours in Educational Administration. Credit, 3 hours.

622 Public School Surveys. History and development of public school surveys, with a critical study of current practices, trends, and objectives. Practical experience provided in collecting and preparing survey data. Prerequisites: EA 522 and six additional hours in school administration. Credit, 2 hours.

673 School Personnel Administration: Issues and Problems. Major current issues and pertinent research in school personnel administration. Conceptual framework for school personnel administration, role relationships of the school personnel administrator, processes and strategies of staff participation in policy making, strategies for allocating human resources in the school system, and the legal status of collective action. Prerequisite: EA 573. Credit, 3 hours.

675 Federal, State, and County Education Programs. Function and responsibilities of school administrators relating to federal financial aid to schools; function and responsibilities of state departments of education and county or other intermediate districts in educational programs. Prerequisite: Admission to Educational Administration program. Credit, 3 hours.

679 Administration of Special Programs in Education. Designed for personnel responsible for administering special educational services; emphasizes responsibilities of superintendents, principals, supervisors, and directors for special education, student personnel, audiovisual, library science and others. Credit, 3 hours.

711 Administrative Leadership. Emphasis on research in leadership; application of research findings to administrative and supervisory functions in educational endeavors. Prerequisite: 30 semester hours in Educational Administration, or approval of instructor. Credit, 4 hours.

722 Administration of Instructional Improvement. Recent research relating to administrative and supervisory responsibilities for the improvement of the educational program. Emphasis on effective processes by administrators, supervisors, consultants, and coordinators. Prerequisite: 30 semester hours in Educational Administration, or approval of instructor. Credit, 4 hours.

733 Administrative Management. Recent research relating to school management. Emphasis in areas of school finance, law, buildings, transportation, food services, and supply management. Prerequisite: 30 semester hours in Educational Administration, or approval of instructor. Credit, 4 hours.

HIGHER EDUCATION

HE 522 Introduction to Higher Education. General introduction and orientation to the broad field of higher education. Credit, 3 hours.

533 The Junior-Community College. General introduction and orientation to the junior college as an educational institution and its role in American higher education. Credit, 3 hours.

611 Curriculum and Instruction in the Junior-Community College. Issues, principles, patterns and procedures in the development of the instructional program of the junior college; factors relating to the improvement of instruction in the junior college. Prerequisite: HE 522 or HE 533. Credit, 3 hours.

622 Curriculum and Instruction in Higher Education. Current issues and trends in curriculum and instruction in the field of higher education. Prerequisite: HE 522 or 533. Credit, 3 hours.

679 Administration of the Junior-Community College. Organization and administration of the junior-community college with emphasis on problems and practices encountered in the operation of such units. Prerequisite: HE 522 or 533. Credit, 3 hours.

689 Administration of Higher Education. Intensive study of the theory and practice of administrative leadership in institutions of higher education. Prerequisite: HE 522. Credit, 3 hours.

711 Financing Higher Education. Income and expenditures for higher education and an analysis of trends in the support of the program, particularly public higher education. Prerequisite: HE 522. Credit, 3 hours.

Special Graduate Courses: 594, 601, 683, 684, 690, 691, 692, 700, 790, 791, 792, 799. (See page 219.)

EDUCATIONAL FOUNDATIONS

PROFESSORS:

RALSTON (Ed 414 D), HOOVER

ASSOCIATE PROFESSORS:

ABBOTT, BAUMANN, BELOK, HARDT, KINGSBURY, MITCHELL,
MOULTON, SHAFER, SKELTON, THOMAS

ASSISTANT PROFESSORS:

BROOK, MORRIS

EDUCATIONAL FOUNDATIONS

EF 111 Exploration of Education. Education as an instrument in the development of the individual and society; its significance as an American institution. Credit, 3 hours.

322 Psychological Foundations of Education. Childhood and youth; physical, motor, intellectual, social, emotional and moral development of students, and the observing, recording, and interpreting of human behavior; functional concepts of learning, modern theories of education. Credit, 3 hours.

333 Basic Issues in Education. Educationally significant historical, philosophical, psychological, and sociological issues through the methods of science. Credit, 3 hours.

411 General Semantics in Education. Demonstrations, research, intensive reading in original documents and applications in general semantics. Prerequisites: EF 111, 322, 333; PL 101, and/or approval of instructor. Credit, 3 hours.

422 Group Dynamics and the Educational Process. Leadership potential by understanding and using group processes in education and human relations. Formation of groups, development of group leadership, communications within groups and rela-

tions between group and individual members. The use of problems and expectations of group work as an educational instrument. Credit, 3 hours.

611 Psychological Foundations of Education. Educational psychological theory applied to problems involved in the educative process. Credit, 3 hours.

622 Contemporary Education. Critical, student-centered research into the dominant movements in contemporary education in America; the semantic-cultural-ideological bases of these movements. Prerequisites: SF 433 or 522, or 544 and approval of instructor. Credit, 3 hours.

SOCIAL AND PHILOSOPHICAL FOUNDATIONS

SF 411 History of American Education. The social life, ideas, and institutions that have given direction to education in the United States. A background for understanding and evaluating present educational problems. Credit, 3 hours.

422 Educational Sociology. Education in relation to social institutions. Considers methods of gathering data in social research, the family, problems of educational reconstruction, social relationships, and social measurements. Credit, 3 hours.

433 Philosophy of Education. Philosophical foundations of contemporary educational ideas. Introductory considerations for the development of a philosophy of education. Credit, 3 hours.

505 Education and National Goals. Case studies in comparative and international education. Interrelationship of education with political ideologies, economic conditions, social organization, and values existing in certain selected cultures. Credit, 3 hours.

511 School and Society. Interrelationship of school and society and the place of education in social change. Prerequisite: EF 333 or SF 433. Credit, 3 hours.

522 Education and Democratic Values. Education as a moral enterprise in which the school seeks to cultivate school values by the subject matter and methods it employs in its program. Prerequisite: EF 333 or SF 433. Credit, 3 hours.

533 Comparative Education in the Western World. Educational systems, ideas, and traditions of the leading nations of Europe including the Soviet Union. Credit, 3 hours.

534 Education and Change. Role of education in producing change in economic and socio-political conditions in the developing nations of Africa, Asia, and Latin America. Credit, 3 hours.

544 Philosophic Foundations of Education. Major points of view in contemporary educational thought, emphasizing the basic issues in general philosophy which are foundational to education. Prerequisite: EF 333 or SF 433. Credit, 3 hours.

555 Education Classics. Selected documents from the past for the purpose of finding useful suggestions for dealing with present educational problems. Prerequisite: EF 333 or SF 433. Credit, 3 hours.

566 History of Education. Development of educational institutions and ideas in the Western World, from ancient times to the Twentieth Century. Prerequisite: EF 333 or SF 433. Credit, 3 hours.

711 Social and Historical Foundations of Education. Critical examination of the characteristics and problems of modern American education and the social and historical context from which they have emerged. Prerequisite: SF 544. Credit, 4 hours.

722 Recent Developments in Philosophy of Education. Trends in contemporary educational thought. Prerequisite: SF 544. Credit, 4 hours.

735 Education, Politics and Power. Educational systems as agencies of political socialization. Forces which shape educational policy; allocation of resources to education; locus of power and influence groups, decision-making in the schools. Credit, 4 hours.

Special Graduate Courses: 500, 584, 590, 591, 592, 593, 594, 601, 691, 692, 700, 784, 790, 791, 792, 799, (See page 219.)

SPECIAL EDUCATION

PROFESSORS:

ABRAHAM (Ed 402C), SUNDWALL

ASSOCIATE PROFESSORS:

B. MOORE, WARREN

ASSISTANT PROFESSORS:

BROWN, FAAS, GILL, NELSON, NEWMAN

INDIAN EDUCATION

IE 411 Indian Education. Foundations and history of Indian education and present day implications. Credit, 3 hours.

422 Methods of Teaching Indian Children. Materials and methods particularly suited to the education of Indian students. Effective use of local and tribal materials in the classroom. Experimentation with new ideas provided. Credit, 3 hours.

424 Curriculum and Practices for Indian Education. Curriculum problems and recommended practices of Indian education. Review of past and present Bureau of Indian Affairs and public school curriculums. Specific techniques examined for curriculum improvement in Indian education. Credit, 3 hours.

425 Educational Applications in Anthropology. Education and its relation to anthropology. Values and implicit cultural assumptions with their impact on education. Use of case study approach in understanding the influence of social and cultural factors in the educative process. Credit, 3 hours.

433 Guidance for the Indian Student. Problems faced in providing adequate guidance services of Indian students and the necessity for cultural understanding in guidance. Consideration given to the effect of tribal values and their relationship to effective guidance. Credit, 3 hours.

490 Problems of Teachers of Indian Children. Current issues, trends and general problems encountered by teachers of Indian children. Oral English, written English, and reading receive special emphasis. Current research reviewed and evaluated. Credit, 3 hours.

511 School-Community Relations in Indian Education. Specific techniques and methods utilized in realizing harmonious and effective relations between the school with Indian children and the community in which these children live. Credit, 3 hours.

522 Education of Indian Adults. Methods used to establish Indian adult education, principles involved in determining course selection and course content; successful Indian adult education programs and their essential ingredients. Credit, 3 hours.

544 Community Development in Indian Education. Methods and techniques for initiating community development programs in Indian communities; the role and responsibilities of school personnel, community leaders, and individuals. Credit, 3 hours.

SPECIAL EDUCATION

SP 311 Orientation to Education of Exceptional Children. Exceptional child categories, including gifted, mentally retarded, sight, hearing, speech, emotionally disturbed and others. This orientation will include observation of exceptional children in classroom situations. Credit, 3 hours.

312 Mental Retardation. Nature and characteristics of mental retardation in children and adults. Appropriate techniques of instruction, training, and therapy. Credit, 3 hours.

320 Participation with Mentally Retarded Children. Clinical and laboratory experience with the mentally retarded in cooperating clinics, institutions, schools, and agencies. Prerequisite: SP 312 or approval of instructor; SP 321 to be taken concurrently. Credit, 3 hours.

321 Methods of Teaching the Mentally Retarded. Methods, materials, and curricula suitable for the mentally retarded. Procedures currently useful at elementary and secondary levels. Prerequisites: SP 311, 312. SP 320 to be taken concurrently. Credit, 3 hours.

404 Psychological, Social, and Health Aspects of Mental Retardation. Multidisciplinary approach to the problem of mental retardation in children. Contributions provided by well-qualified persons in the fields of pediatrics, psychology, social work and public health nursing. Credit, 2 hours.

436 The Emotionally Disturbed Child. Emotional difficulties during childhood. The meaning and development of the most common maladaptive patterns will be considered and methods by which the teacher can assist the child and his family will be emphasized. Credit, 3 hours.

446 The Disadvantaged Child. The deprived child in terms of his physical, social, economic, psychological and educational needs. Material from all the major disciplines will be used to help understand the child and his problems. Credit, 3 hours.

447 Methods of Teaching the Disadvantaged. Techniques for organizing and providing special educational experiences for students who are from deprived or culturally different backgrounds. Prerequisite: SP 446. Credit, 3 hours.

455 Education of the Hearing-Handicapped. Curriculum and techniques in pre-schools, primary and intermediate levels. Consideration of the psychological correlates of hearing handicaps and their effect upon the child, the family, and the community. Philosophy and methods of language and speech development. Credit, 3 hours.

456 Education of the Hearing-Handicapped. Language and speech development, reading techniques and the teaching of elementary subjects to the hearing-handicapped. Prerequisite: SP 455. Credit, 3 hours.

471 Art, Music and Crafts for the Handicapped. Use of art, music and crafts in the motivation and development of the sensory motor skills of the handicapped. Prerequisite: SP 321 or equivalent. Credit, 3 hours.

474 Educational Evaluation of the Handicapped. Educational evaluation techniques appropriate for use by teachers of children who are mentally retarded or who have learning difficulties. Prerequisites: SP 321 or equivalent; EF 322 or EP 422. Credit, 3 hours.

511 The Exceptional Child. Educational needs of handicapped and gifted children. (Not available to students who have completed SP 311 or the summer "Workshop in Exceptional Children.") Credit, 3 hours.

522 Experience in Exceptional Child Clinics. Provides experience with exceptional children in cooperating clinics, organizations, and institutions in Arizona which work with mentally retarded, orthopedic, sight, speech, hearing, bilingual, and other areas in special education. Preregistration necessary. Prerequisites: SP 594 (Summer Workshop in Exceptional Children), and teaching experience. Credit, 6 hours.

523 Participation with Gifted Children. Intensified study and participation with gifted children in either a campus or community setting. Organized around both a college class for background study and research and a special class of gifted children. Prerequisites: SP 594 (Summer Workshop in Exceptional Children), or experience in working with exceptional children in this category, and teaching experience. Credit, 6 hours.

524 Participation with Cerebral Palsy Children. Intensified study and participation with cerebral palsy children in either a campus or community setting. Organized around both a college class for background study and research and a special class of cerebral palsy children. Prerequisites: SP 594 (Summer Workshop in Exceptional Children), or experience in working with exceptional children in this category, and teaching experience. Credit, 6 hours.

533 The Bilingual Child. Spanish-American and Indian children, including their educational needs, materials and methods appropriate to their backgrounds and language problems. Credit, 3 hours.

537 Methods of Teaching the Emotionally Disturbed. Use of special methods and techniques in the development of a therapeutic educational atmosphere for socially maladjusted and emotionally disturbed children. Prerequisite: SP 436. Credit, 3 hours.

544 The Orthopedically Handicapped Child. Orthopedically handicapped children, their needs and characteristics, appropriate materials and teaching methods, teacher qualifications, educability, definitions, and terminology. Children with orthopedic, cardiac, tubercular, and glandular handicaps. Credit, 3 hours.

555 The Child with Hearing Problems. Children with hearing disabilities of either a partial or complete nature, including their needs and characteristics, appropriate materials and teaching methods, teacher qualifications, educability, definitions, and terminology. The hearing-handicapped child in the regular classroom situation and in special classes. Credit, 3 hours.

561 Learning Disabilities I: Survey. Education of students with severe learning disabilities. Emphasis upon incidence, causes and diagnosis. Credit, 3 hours.

562 Learning Disabilities II: Methods. Methods and materials for teaching students who have learning disabilities due to conceptual and perceptual disfunctions. Prerequisite: SP 561. Credit, 3 hours.

566 The Visually Handicapped Child. Visually handicapped children, their needs and characteristics, appropriate materials and teaching methods, teacher qualifications, definitions, and terminology. Credit, 3 hours.

577 The Mentally Retarded Child. Mentally retarded children, appropriate materials and methods, teacher qualifications, educability, and special problems. Credit, 3 hours.

578 Educational Procedures in Mental Retardation (Curriculum, Materials and Methods). Teaching the mentally retarded child, with emphasis on specific methods, materials of instruction, and curriculum development. Meets state requirement for Special Education methods. Prerequisite: SP 577 or approval of instructor. Credit, 3 hours.

579 Vocational Programs for the Mentally Retarded. Curriculum planning and methods of teaching in secondary school and post-school programs for the mentally retarded. Work evaluation, work-study, sheltered employment, and other aspects of vocational programs. Prerequisites: SP 312 or 577. Credit, 3 hours.

581 Methods of Teaching the Trainable Mentally Retarded. Development of materials, procedures and programs for the trainable mentally retarded, pre-school through adulthood. Prerequisites: SP 312 or 577. Credit, 3 hours.

588 The Gifted Child. Gifted children, their needs and characteristics, appropriate materials and methods, and teacher qualifications. Techniques and values related to acceleration, enrichment, special classes, and the research of Terman, Hollingworth, Witty, and others. Credit, 3 hours.

LIBRARY SCIENCE

PROFESSORS:

GERLACH (Ed 109C), BATCHELOR, BENEDICT, ALAN COVEY, VERGIS

ASSOCIATE PROFESSOR:

SATTERTHWAITE

ASSISTANT PROFESSORS:

BOETTO, HIGGINS, MOFFIT

INSTRUCTOR:

ALMA COVEY

LIBRARY SCIENCE

LS 313 Library Skills for Teachers. A classroom teacher's introduction to school library materials, organization and services. Most frequently used ready-reference materials and procedures for using the library in teaching. No credit on Library Science minor. Credit, 3 hours.

323 Books, Libraries, and Society. History of books and libraries as related to society, and a study of librarianship as a profession. Credit, 3 hours.

441 Dewey Decimal Classification. Principles and applications of subject classification, assigning of Cutter numbers and subject tracings, and compiling of the shelf list. Credit, 2 hours.

442 Descriptive Cataloging. Purpose and principles of cataloging library materials with emphasis upon the use of both printed and typewritten cards. Credit, 2 hours.

461 Selection of Library Materials. Criteria, problems, and policies in the selection of materials for the school and public library. Attention given to guides and aids, publishers, dealers, and reading interests. Credit, 2 hours.

463 Library Materials for Children. Books and related materials for children's libraries and for the elementary school program. Criteria for selection and procedures for integrating vital materials into the school curriculum and/or free-reading program in both the school and public library. Prerequisite: LS 461 or approval of instructor. Credit, 3 hours.

464 Library Materials for Adolescents. Books and related materials for youth libraries and for the secondary school program. Criteria for selection and procedures for integrating vital materials into the school curriculum and/or free-reading program in both the school and public library. Prerequisite: LS 461 or approval of instructor. Credit, 3 hours.

471 Basic Reference Resources. Content and use of the basic types of ready-reference works such as dictionaries, encyclopedias, yearbooks, biographical dictionaries, geographical sources, directories of agencies, hand-books, manuals, serials, indexes, bibliographies, government publications and audiovisual sources. Credit, 3 hours.

481 Library Administration. Organization and management of the school and public libraries; their backgrounds, services, functions, personnel, materials and equipment. Prerequisites: LS 323, 441, 442, 461, and 471. Credit, 3 hours.

493 Library Science Workshop. Selected library problems, directed by the regular staff and/or visiting specialists, for in-service librarians with no fewer than 15 credits in Library Science. Others by approval of the instructor. Credit, 3 - 6 hours.

511 Cataloging Administration. Problems related to contemporary cataloging, its structure and purpose as a function of bibliographical control. Prerequisites: LS 441 and 442. Credit, 2 hours.

522 Bibliography in Subject Fields. Critical evaluation of the most frequently used reference materials in the humanities, the sciences, and the social sciences. Prerequisite: LS 471. Credit, 3 hours.

531 Instructional Materials Centers. Organization and management of the library as an integral part of an instructional materials center. Prerequisite: Library science minor. Credit, 3 hours.

533 Current Library Problems. Professional reading and discussion on current issues in librarianship as related particularly to supervision in school districts and/or public library systems. Prerequisite: LS 481 or approval of instructor. Credit, 2 hours.

544 Reading and Communication. Principles and techniques of individual and group guidance, including the improvement and encouragement of reading interests and habits as related to the use of library materials and resources. Prerequisites: LS 461, 463 and/or 464. Credit, 2 hours.

AUDIOVISUAL EDUCATION

AV 411 Audiovisual Materials and Procedures in Education. Role of learning and communication principles in the selection and/or preparation, evaluation and utilization of materials and equipment in instructional contexts. Emphasis on a variety of practical instructional technological developments in education. Two lectures, 2 hours laboratory. Credit, 2 hours.

412 Audiovisual Practices. Exploration in depth of selected areas emphasized in AV 411. One lecture, 2 hours laboratory. Prerequisite: AV 411. Credit, 2 hours.

413 Audio Recording in Education. Techniques of tape and disc recording. Editing, mixing, and other technical aspects. Utilization of sound recordings in instructional situations. Prerequisite: AV 411. One lecture, 2 hours laboratory. Credit, 2 hours.

422 Radio and Television in Education: Utilization. For students and teachers interested in making more effective use of radio and television in education. Designed to acquaint teachers with the possibilities available and the means of adapting materials for learning experiences. Credit, 2 hours.

433 New Instructional Media in Special Education. Selecting and utilizing audiovisual equipment and materials as instructional aids in teaching exceptional children. Aspects of instructional media pertaining to problems not ordinarily encountered in regular classrooms. Two lectures, 2 hours laboratory. Credit, 3 hours.

501 Audiovisual Methods of Teaching for In-Service Teachers. Newer media for instruction. Selection and evaluation of materials and procedures. Operation of equipment and production of materials. (This course may not be used for credit in a graduate major.) Credit, 3 hours.

502 Production of AV Materials for In-Service Teachers. Production of projected and non-projected audiovisual materials, including transparencies, slides, recordings, etc. Utilization of AV materials in individual, small group, and large group instructional settings. (This course may not be used for credit in a graduate major.) Credit, 3 hours.

511 Photography in Education. Laboratory course in the fundamentals of photography and darkroom procedure. For the teacher who wishes to use photography in preparing instructional materials. One lecture, 2 hours laboratory. Credit, 2 hours.

512 Cinematography in Education. Fundamentals of production of educational motion pictures. Techniques of planning, scriptwriting, directing, filming, editing, and sound recording. Prerequisite: AV 511 or equivalent. One lecture, 2 hours laboratory. Credit, 2 hours.

522 Production of Audiovisual Materials. Making of photographs, slides, filmstrips, motion pictures, and recordings. Preparation of scripts. Technical problems of production. Prerequisite: AV 511. One lecture, 2 hours laboratory. Credit, 2 hours.

533 Administration of Audiovisual Programs. Qualifications and duties of the director, preparing the budget, buying equipment, handling materials, in-service training, and evaluation of the program. Credit, 3 hours.

544 Graphic Arts in Education. Perception and learning theory as they apply to communication in educational situations involving graphic material selection, evaluation, application and preparation. Layout, planning, mechanical lettering, transparency making, photo copying and allied methods of graphic duplicating processes. Prerequisite: AV 411 or equivalent. One lecture, 2 hours laboratory. Credit, 2 hours.

555 Educational Television: Production. Designed to acquaint teachers with methods of teaching via television. Planning, preparation, and production of tele-courses. Credit, 2 hours.

INSTRUCTIONAL MATERIALS

IM 311 Children's Literature. Survey of modern and folk literature for elementary school children; elements that can make a good book for children; techniques for promoting appreciation of literature. Provides background for supplementary materials in all areas of the school curriculum. Credit, 3 hours.

533 Evaluation of Children's Literature. Social and educational concepts expressed in literature and changes in values and principles that are needed. Prerequisite: At least one course in literature. Credit, 3 hours.

EDUCATIONAL TECHNOLOGY

ET 501 Foundations of Educational Technology. Educational and psychological research findings in the development of technology. Application of philosophical

tenets and empirically-derived principles to problems of curriculum and instruction. Prerequisite: Admission to the program or approval of the Department Chairman. Credit, 3 hours.

502 Designing Educational Environments and Materials. Procedures in formulation and development of materials and environments. Translation of instructional specifications into prototype environments and materials. Prerequisite: ET 501 or concurrent enrollment in ET 501. Credit, 3 hours.

503 Quality Verification. Theory and practice of determining quality of materials and environments in all phases of the product-development cycle. Credit, 3 hours.

504 Installation of Innovations in Instructional Systems. Operations and procedures required for introduction of new instructional materials, environments, strategies. Development of director manuals. Staff training procedures. Credit, 3 hours.

521 Programmed Instruction. Constructing, testing, and revising a programmed learning sequence. Application of principles of programmed instruction to both printed and non-printed media. Prerequisite: Admission to the program or approval of Department Chairman. Credit, 3 hours.

522 Computers in Education. Computer technology in the instructional process. General orientation to capabilities of computers. Preparation of instructional materials: managing instruction; technological support of other school functions. Prerequisite: ET 501. Credit, 3 hours.

Special Graduate Courses: 580, 590, 591, 592, 593, 594.

Special course numbers are available in subject fields in the College of Education, as appropriate. These are further identified by title as: Research Methods (500, 600, 700), Reading and Conference (590, 690, 790), Thesis (593), Practicum (580, 680, 780), Seminar (591, 691, 791), Research (592, 692, 792), Internship (484, 584, 684, 784), Conference and Workshop (494, 594), Applied Project (601), Field Work (683, 783), Pro-Seminar (498), Independent Study (499), Dissertation (799).

(End of College of Education course listings.)

Engineering Sciences

ENGINEERING SCIENCE

(Core Courses)

ES 102 Engineering Analysis and Design. Role of the engineer; systematic analysis of elementary engineering problems; methods of engineering design, and design project. Lecture, recitation and laboratory. Corequisite: MA 120. Credit, 3 hours.

103 Computer Programming. Application of digital programming to the numerical solution of elementary engineering problems. Corequisite: MA 120. Credit, 2 hours.

104 Engineering Graphics. Graphics as a fundamental means of communication in engineering analysis and design; development of spatial visualization; descriptive geometry, and modern engineering drawing practice. Six hours lecture-laboratory. Credit, 2 hours.

- 118 Chemical Foundations of Engineering.** Atomic and molecular structure, states of matter and their energies, chemical equilibria and reaction rates, organic compounds, and industrial processes. Prerequisite: Superior performance in one year of high school physics and chemistry. Lecture, demonstrations and recitation. Credit, 4 hours.
- 211 Engineering Mechanics, Statics.** Force systems, resultants, equilibrium, distributed forces. First and second moments of areas and masses. Friction. Virtual work. Corequisite: MA 121. Credit, 3 hours.
- 231 Electrical Science.** Basic concepts of electricity and magnetism. Development of fundamental laws and their engineering application. Prerequisite: ES 102. Corequisite: MA 212 and ES 312. Lecture, demonstrations and laboratory. Credit, 4 hours.
- 312 Engineering Mechanics, Dynamics.** Kinematics and kinetics of particles, translating and rotating coordinate systems. Rigid body kinematics. Dynamics of systems of particles and rigid bodies. Energy and momentum methods. Prerequisite: ES 211. Corequisite: MA 212. Credit, 3 hours.
- 321 Mechanics of Materials.** Concepts of stress and strain, Hooke's Law; strength and deflection of axial force members, shafts in torsion and beams in flexure; combined stress; stability of columns. Prerequisite: ES 312. Lecture, demonstrations and laboratory. Credit, 4 hours.
- 330 Electrical Networks.** Mathematical analysis of networks and linear systems. Prerequisite: ES 231. Corequisite: MA 212 or ES 345. Lecture, demonstrations and laboratory. Credit, 4 hours.
- 331 Electronic Engineering.** Electronic circuits. Prerequisite: ES 330. Lecture, demonstrations and laboratory. Credit, 4 hours.
- 345 Methods in Engineering Analysis.** Exact and numerical solutions of ordinary differential equations with applications to the problems that frequently appear in engineering. Prerequisite: MA 121. Credit, 3 hours.
- 346 Methods in Engineering Analysis.** Topics from advanced calculus; differentiation and integration of functions of several variables, vector differential and integral calculus. Fourier Series and orthogonal functions, infinite series; application to engineering problems. Prerequisite: MA 212. Credit, 3 hours.
- 348 Applied Mathematical Analysis.** Treatment and interpretation of engineering data, mathematical models of engineering problems, linear algebra and introduction to optimization techniques, and computational techniques for solving non-linear equations. Prerequisite: MA 212. Credit, 3 hours.
- 350 Structure and Properties of Materials.** Quantum mechanical introduction to atomic bonding. Classification of solids. Crystal structures and diffraction of X-rays by crystals. Effects of imperfections on physical properties, electronic conduction in solids, mechanical properties of solids. Prerequisite: ES 231. Corequisite: PH 361. Credit, 3 hours.
- 361 Measurement Systems Engineering.** Application of system design concepts to measurements. Fundamental theory of static and dynamic measurements. Behavior of transducers individually and in open-loop systems. Validation of experimental data. Measurements are considered as information transfer accompanied by energy transfer. Prerequisites: ES 345 or MA 212; ES 321, 330. Two lectures, 1 laboratory lecture, 2 hours laboratory bi-weekly. Credit, 3 hours.
- 364 Chemical Process Instrumentation.** Theory and applications of analytical and control instrumentation used in the chemical process industries. Prerequisite: ES 330. Two lectures, 2 hours laboratory. Credit, 3 hours.
- 371 Fluid Mechanics.** Basic principles of continuum fluid mechanics. Prerequisite: ES 381. Lecture, demonstration and laboratory. Credit, 4 hours.
- 381 Thermodynamics.** Work, heat and energy transformations. Relation of properties. Laws, concepts and modes of analysis common to all applications of thermodynamics in engineering. Corequisite: ES 312. Credit, 3 hours.
- 400 Engineering Communications.** Composition for technical papers, reports and scientific articles suitable for publication. Oral and written presentations. Credit, 3 hours.
- 411 Nuclear Engineering.** Elements of nuclear chain reactions; utilization of energy released from fission; reactor systems and their control; nuclear materials; health

physics principles; radiation shielding, and applications of nuclear energy. Credit, 3 hours.

441 Probability for Engineers. Combinatorial analysis, sample space, events, probability, discrete and continuous random variables, probability distributions with applications in engineering. Prerequisite: MA 212. Credit, 3 hours.

442 Engineering Statistics. Significance tests and confidence intervals, tests of hypotheses, simple and multiple regression and correlation with applications in engineering. Prerequisite: MA 212. Credit, 3 hours.

444 Numerical Analysis in Engineering. Application of numerical procedures to the solution of complex engineering problems. Analysis and organization of practical programs for numerical solution of initial, boundary, and eigenvalue problems. Prerequisite: MA 212. Credit, 3 hours.

492 Project in Design and Development. Individual project in creative design and synthesis. Credit, 2 or 3 hours.

512, 513 Mathematical Methods in System Engineering, I and II. Probability and Stochastic processes, operational mathematics, transform methods and state space variables, control theory. Part of graduate integrated system engineering program. Integrates with ES 514, 515. Credit, 3 hours each semester.

514, 515 Mathematical Analysis of System Operations, I and II. Linear algebra and linear programming, inventory models, queueing theory, sequencing, dynamic programming, numerical analysis and computational methods. Part of graduate integrated system engineering program. Integrates with ES 512, 513. Credit, 3 hours each semester.

Special Graduate Courses: 500, 590, 591, 592, 593, 594, 799 (see page 219.)

CHEMICAL ENGINEERING

PROFESSORS:

REISER (EC G-136B), CRAIG

ASSOCIATE PROFESSORS:

BERMAN, DORSON, SATER

CHEMICAL ENGINEERING

KE 211 Chemical Process Calculations. Principles of physics and chemistry applied to the formulation of material and energy balances for process industries. Prerequisite: CH 114. Corequisite: MA 121. Credit, 2 hours.

331 Transport Processes. Development and application of the principles of momentum, energy, and mass transfer. Corequisites: ES 348, 381. Credit, 4 hours.

332 Chemical Engineering Operations. Process operations including distillation, extraction, absorption, drying, crystallization, filtration, materials handling and preparation. Prerequisite: KE 331. Credit, 4 hours.

333 Transport Phenomena Laboratory. Physicochemical measurements and determination of transport properties. Prerequisite: KE 331. Three hours laboratory. Credit, 1 hour.

382 Applied Chemical Thermodynamics. Chemical potentials and equilibria, non-ideal behavior. Prerequisite: ES 381. Credit, 2 hours.

411 Biomedical Engineering. Transport, metabolic, and autoregulatory processes in the human body using engineering terminology and analysis, current survey of human system simulation, prosthetic devices, diagnostic methods, engineering criteria, and properties of biological fluids. Prerequisite: ES 371. Credit, 3 hours.

413 Physiological Instrumentation. Problems, concepts, and techniques of biomedical

instrumentation in static and dynamic environments; physiological, diagnostic, prosthetic, and psychological systems; interdisciplinary communications in bioengineering. Lecture and laboratory assignments (offered jointly as KE 413 or IE 481). Prerequisite: Approval of instructor. Credit, 3 hours.

423 Materials Processing. Phase transformations, crystallography, growth processes, kinetics of solid state transformations; technology of high and low temperatures, vacuum systems, high pressure, and clean environments. Prerequisite: ES 381. Credit, 3 hours.

442 Chemical Reactor Design. Application of kinetics to chemical reactor design. Prerequisite: KE 382. Credit, 3 hours.

451, 452 Chemical Engineering Laboratory. Operation, control and design of experimental and industrial process equipment; independent research projects. Corequisite: KE 332. Six hours laboratory. Credit, 2 hours each semester.

453 Materials Processing Laboratory. Selected experiments in solid state materials processing and evaluation. Three hours laboratory. Credit, 1 hour.

461 Process Control. Process dynamics, instrumentation, and feedback applied to automatic process control. Prerequisites: MA 212; ES 371. Two lectures, 3 hours laboratory. Credit, 3 hours.

462 Process Design. Application of economic principles to optimize equipment selection and design; development and design of process systems. Prerequisite: KE 332. Credit, 4 hours.

482 Statistical Applications in Chemical Engineering. Interpretation and correlation of data; experimental design; scale-up for design and operation of process plants. Credit, 3 hours.

513 Rheology of Fluids. Physical and mathematical foundation of the constitutive fluid equations and their application, including biological fluids, uses and limitations of experimental viscometry, development of multi-dimensional flow equation for a general fluid. Prerequisite: ES 371. Credit, 3 hours.

515 Physiological Transport Processes. Engineering analysis of heat, mass, momentum and electrical energy transfer in mammals, derivation of both microscopic and macroscopic models based on current research. Credit, 3 hours.

517 Prosthetic and Diagnostic Engineering. Engineering criteria for mechanical replacement or assistance of organ functions and diagnostic methods, equipment and usage; existing methodology and future requirements including several specific detailed designs. Credit, 3 hours.

523 Materials Processing. Solid state theory; control of morphology, purity, growth and defects; formation, structure and properties of thin films; micro-crystals, whiskers, and organic crystals. Credit, 3 hours.

524 Surface Phenomena. Structure and thermodynamics of surfaces, grain boundary mobility and migration; friction, adhesion, and lubrication; electronic surface properties, interaction of surfaces with gases; corrosion; forms. Credit, 3 hours.

533, 534 Transport Processes. Momentum transfer including turbulent and viscous flow. Newtonian and non-Newtonian fluids, compressible flow, packed and fluidized beds; energy and mass transfer in static and dynamic systems. Prerequisite: KE 332. Credit, 3 hours each semester.

535 Unit Operations. Transport principles applied to modern separation techniques. Credit, 3 hours.

543 Thermodynamics of Chemical Systems. Application of classical and statistical thermodynamics of non-ideal physicochemical systems and processes; prediction of optimum operating conditions. Credit, 3 hours.

544 Chemical Process Kinetics. Reaction rates, thermodynamics, and transport principles applied to the design and operation of chemical reactors. Prerequisite: KE 543. Credit, 3 hours.

562 Chemical Systems Engineering. Process dynamics, systems analysis, computer applications, process control. Credit, 3 hours.

563, 564 Chemical Engineering Design. Computational methods; the design of chemical plants and processes. Credit, 3 hours each semester.

571 Electrochemical Engineering. Principles of electrochemical reactions applied to

selected topics such as chemical production, electroplating, electro dialysis, and fuel cells. Prerequisite: CH 442. Credit, 3 hours.

581 Multistage Optimization Principles. Unified theory of optimization including differential, variational and search techniques applied to the design of optimum multi-stage systems. Credit, 3 hours.

Special Graduate Courses: 498, 500, 591, 592, 593, 594, 692, 799. (See page 219.)

CIVIL ENGINEERING

PROFESSORS:

NEWLIN (EC G-136A), BETZ, KLOCK, PIAN, SCHOELLER, WILSON

ASSOCIATE PROFESSORS:

HILL, LUNDGREN, RUFF

ASSISTANT PROFESSORS:

MATTHIAS, O'BANNON

INSTRUCTOR:

BORGIO

CIVIL ENGINEERING

CE 241 Surveying. Theory and field work in construction and land surveys. Prerequisite: MA 118. Two lectures, 3 hours laboratory. Credit, 3 hours.

310 Materials for Construction. Structural and behavioral characteristics, engineering properties, measurements and applications of construction materials. Not open to engineering students. Prerequisite: CO 322 or equivalent. One lecture, 3 hours laboratory. Credit, 2 hours.

312 Engineering Materials. Structure and behavior of civil engineering materials. Laboratory investigations and test criteria. Prerequisite: ES 350. One lecture, 3 hours laboratory. Credit, 2 hours.

321 Structural Mechanics. Determinant and indeterminate analysis of beams, trusses, frames including influence diagrams. Prerequisite: ES 321. Three lectures, 2 hours laboratory. Credit, 4 hours.

322 Fundamentals of Structures. Analysis and design of steel and reinforced concrete structural members. Prerequisite: CE 321. Three lectures, 2 hours laboratory. Credit, 4 hours.

342 Surveying. Precise traverse triangulation, azimuth determination, and leveling; errors and correction; plane coordinate systems. Elements of photogrammetry, topographic mapping, hydrographic, mine, and special surveys. Prerequisite: CE 241. One lecture, 6 hours laboratory. Credit, 3 hours.

343 Surveying and Geodesy. Methods of geodetic surveying. Adjustment of observations. Geodetic positions. Map projections. Prerequisite: CE 342. One lecture, 6 hours laboratory. Credit, 3 hours.

344 Route Surveying. Simple, compound and transition curves, reconnaissance, preliminary, and location survey. Calculation of earthwork. Prerequisite: CE 241. Two lectures, 3 hours laboratory. Credit, 3 hours.

371 Selected Urban Problems. Problems of the modern urban environment. Concepts of comprehensive planning. History of urban development, transportation, public service, zoning, land division, urban renewal, neighborhood planning, etc. Credit, 3 hours.

380 Construction Hydraulics and Hydrology. Applied hydraulics and hydrology for river, marine, and utility construction. Elements of climatology, drainage, flood control, and dynamics of water bodies. Irrigation, navigation, water and sewage treatment systems. Pipelines, pumps, conduits, channels, and hydraulic structures. Not open to engineering students. Prerequisite: Approval of instructor. Credit, 3 hours.

381 Applied Fluid Mechanics. Detailed analysis of fluid-flow concepts and basic equations. Application of fluid mechanics to pressure conduit and free surface flow, unsteady flow and turbomachinery. Laboratory investigations and analysis of basic flow phenomena. Prerequisite: ES 371. Credit, 3 hours.

423 Structural Design. Analysis and design of structural systems. Prerequisite: CE 322. Two lectures, 3 hours laboratory. Credit, 3 hours.

431 Theory of Structures. Elastic curvature, real work, virtual work, Castigliano's theorems, consistent deformation, three moment equation, slope deflection, moment distribution, elastic centers, and influence lines. Prerequisite: CE 321. Credit, 3 hours.

432 Stress Analysis. Unsymmetrical bending, shear center, torsion of non-circular sections; beam columns, curved beams, beams on elastic foundation; contact stresses, stress concentration, fatigue. Prerequisite: ES 321. Credit, 3 hours.

438 Structural Models. Analysis of structures by means of physical models. Corequisite: CE 431. Credit, 3 hours.

441 Photogrammetry. Mapping and surveying using aerial photographs and stereoscopic plotters. Prerequisite: CE 342. One lecture, 6 hours laboratory. Credit, 3 hours.

450 Soil Mechanics in Construction. Soil mechanics as applied to the construction field. The fundamental properties of soils with application to foundations, highways, retaining walls and slope stability. The relationship between soil characteristics and geologic formations. Prerequisite: Senior standing, or approval of instructor. Not open to engineering students. Two lectures, 3 hours laboratory. Credit, 3 hours.

451 Soil Mechanics. Index properties and engineering characteristics of soils. Compaction, shear, compressibility, and permeability. Prerequisites: ES 321, 371. Two lectures, 3 hours laboratory. Credit, 3 hours.

452 Soil Mechanics. Applications of soil mechanics to retaining walls, slope stability, highways, earth dams, and foundations. Prerequisite: CE 451. Two lectures, 3 hours laboratory. Credit, 3 hours.

453 Site Foundation Engineering. Geological investigations for engineering purposes, case histories, major aspects of geologic structure, weathering, river mechanics, glacial deposits, eolian deposits in the site location for an engineering structure. Prerequisite: GL 311 or approval of instructor. Credit, 3 hours.

461 Environmental Engineering. Man's environment, water resources, hydrologic cycle, chemistry of natural waters, quality requirements and water treatment, water distribution system. Credit, 3 hours.

462 Environmental Engineering. Man's environment, the carbon cycle and biochemistry of wastes, principles of waste treatment, drainage systems. Credit, 2 hours.

463 Sanitary Chemistry Laboratory. Analyses of water, domestic and industrial wastes, laboratory procedures for control of water and waste treatment processes. Prerequisite: CE 461 or 462. Two lectures, 3 hours laboratory. Credit, 3 hours.

464, 465 Industrial Hygiene. Selected topics in industrial hygiene including survey methods, legal and physiological aspects of occupational health hazards. Introduction to methods of measurement and analysis and physiological actions of such contaminants as toxic gases, mineral dusts, metals and their compounds, and industrial solvents. Prerequisite: Approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours each semester.

466 Sanitary Systems Design. Capacity, planning and design of water distribution and domestic and storm drainage systems. Prerequisite: Approval of instructor. Credit, 2 hours.

471 City Planning. Municipal organization and administration; public health, public utilities, services, zoning, replanning, critical studies. Prerequisite: Approval of instructor. Credit, 3 hours.

472 Transportation Engineering. Elementary investigation of all forms of transport-

highway, rail, water, air. Similarities and differences in construction, operation, planning and administration. Prerequisite: Senior standing. Three lectures. Credit, 3 hours.

473 Engineering Interpretation of Land Forms. Study of North America by geographic regions and the engineering problems and characteristics of each area. Prerequisite: Approval of instructor. Credit, 3 hours.

474 Traffic Engineering. Study of operator and vehicle characteristics, street capacity, signals, signs and markings, etc. All phases of traffic engineering as applied to urban areas. Prerequisite: Approval of instructor. Credit, 3 hours.

475 Highway Geometric Design. Design of the visible elements of the roadway. Study of fundamental design controls with application to rural roads, at-grade intersections, freeways, and interchanges. Prerequisites: CE 344, 472. Two lectures and 3 hours laboratory. Credit, 3 hours.

481 Water Resources Engineering. Water resources systems for various types of water utilization, including: irrigation, hydroelectric power, navigation and flood control. Presentation of physical hydrology. Economic analysis. Case studies. Prerequisite: CE 381. Credit, 3 hours.

482 Free Surface Flow. Steady and unsteady flow in open channels, surface curves, transitions and controls, hydraulic jump, surges and waves. Secondary flows. Prerequisite: CE 381. Credit, 3 hours.

495 Topics in Civil Engineering. Selection and evaluation of the significant variables in civil engineering problems. Application of concepts acquired in undergraduate curriculum to the development of a rational and feasible problem solution. Prerequisite: Senior standing and approval of instructor. Credit, 1 hour.

525 Bridge Design. Computer-aided design of bridges and bridge components. Superstructure design of continuous girder, continuous truss, arch, and suspension bridges. Complete design of a continuous plate girder bridge. Prerequisite: CE 431. Two hours lecture, 2 hours laboratory. Credit, 3 hours.

526 Building Design. Structural design (elastic and plastic) of buildings and frames. Methods of framing, wind and earthquake forces; special systems. Prerequisite: CE 423. Corequisite: CE 431. Credit, 3 hours.

527 Concrete Structures. Elastic, ultimate strength and yield line theory. Deflection, torsion, shrinkage and plastic flow. Prestressed concrete; special systems. Prerequisite: Approval of instructor. Credit, 3 hours.

528 Stability of Structures. Elastic and inelastic buckling of rolled and sheet metal beam columns. Stability of plates and continuous frames. Prerequisite: Approval of instructor. Credit, 3 hours.

529 Aerospace Structures. Analysis and design of aerospace structures and components. Consideration of loads, types of structural systems, and system configurations. Prerequisites: CE 432 and 532. Credit, 3 hours.

532 Matrix Methods in Structural Analysis. Matrix methods applied to structural engineering and structural mechanics. Stiffness and flexure methods, finite elements, finite differences. Prerequisite: CE 431 and computer programming background. Credit, 3 hours.

533 Optimization of Design. Linear and non-linear mathematical techniques leading to optimum weight and optimum cost design. Application to civil and aerospace structures and civil systems. Prerequisite: Approval of instructor. Credit, 3 hours.

534, 535 Plate and Shell Structures. Development of equations and applications of theory to the analysis of plates and shells with emphasis on numerical solutions. Membrane and bending stresses in steel and concrete structures. Prerequisite: Approval of instructor. Credit, 3 hours each semester.

536 Dynamics of Structures. Analysis of structures and structural members subjected to dynamic loadings; response spectra theory with emphasis on earthquake applications; investigations of the response of multi-degree of freedom structures; matrix methods of analysis. Prerequisite: Approval of instructor. Credit, 3 hours.

553 Theoretical Soil Mechanics. Fundamental structure and properties in soils. Formation of soils, clay mineralogy, and soil structure. Stress distribution, theory of consolidation, and compaction. Prerequisite: CE 451. Two lectures, 3 hours laboratory. Credit, 3 hours.

554 Theoretical Soil Mechanics. Shear strength of soils and shear test techniques. Soil rheology and soil dynamics. Prerequisite: CE 451. Two lectures, 3 hours laboratory. Credit, 3 hours.

555 Applied Soil Mechanics. Application of theoretical soil mechanics to engineering problems. Earth retaining structures, earth dams, footings, pile foundations, site investigation and sampling techniques. Prerequisite: Approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.

556 Seepage and Earth Dams. Flow of water through soils. Pore water pressure. Emphasis on flow nets and the design of earth dams. Prerequisite: CE 451. Two lectures, 3 hours laboratory. Credit, 3 hours.

561 Theory and Design of Water Treatment Facilities. Theory and design of processes used in the supply and treatment of water. Prerequisite: CE 461 or equivalent. Credit, 3 hours.

562 Theory and Design of Waste Treatment Facilities. Theory and design of waste treatment and disposal systems. Prerequisite: CE 462 or equivalent. Credit, 3 hours.

563 Sanitary Engineering Processes Laboratory. Laboratory study of unit processes involved in water and waste treatment. Prerequisite: Approval of instructor. One lecture, 6 hours laboratory. Credit, 3 hours.

564 Industrial Waste Treatment. Types of industrial wastes and effects on the natural environment. Pollution control concepts and regulatory agencies. Waste treatment. Prerequisite: Approval of instructor. Credit, 2 hours.

567 Atmospheric Pollution. Selected topics including atmospheric composition and dynamics, origins and chemistry of contamination, biological significance, analytical measurement, engineering control methods and air pollution legislation. Prerequisite: Approval of instructor. Credit, 1 - 3 hours.

568 Epidemiology and Public Health Engineering. Biology and transmission of diseases, mathematical theory of epidemics, sanitation and public health administration. Prerequisite: Approval of instructor. Credit, 1 - 3 hours.

571 Airport Engineering. The planning and design of airport facilities, financing, air traffic control, aircraft characteristics, demand, site selection, runway configuration, and terminal areas. Prerequisite: CE 472. Credit, 3 hours.

572 Design of Highway and Airport Pavements. Design practices, materials, and testing of flexible and rigid pavements. Prerequisites: CE 451, 472. Two lectures, 3 hours laboratory. Credit, 3 hours.

573 Urban Transportation Planning. Application of land use parameters, traffic generation theory, traffic distribution and assignment models, transit analysis and economic factors to the solution of the urban transportation problem. Prerequisite: Approval of instructor. Credit, 3 hours.

574 Highway Engineering, Planning and Economics. Highway transportation including design, construction, operation, planning, economic feasibility and financing. Stress will be applied to highways as a regional system. Prerequisite: Approval of instructor. Credit, 3 hours.

581 Hydrology. Advanced hydrologic principles. Hydrologic measurements, statistical analysis of data; design storms, flood routing; ground water theory. Prerequisite: CE 381. Credit, 2 - 3 hours.

582 Experimental Hydromechanics. Theory of dynamic similarity and dimensional analysis. Modeling of hydraulic structures, free surface flows, flow through porous media, rotating fluid systems, hydraulic machinery, and ships. Correlation of experimental data. Instrumentation. Prerequisite: CE 381. Credit, 2 hours.

583 Hydromechanics Laboratory. Experimental studies of fundamental flow phenomena such as diffusion, boundary layers, fluid vibrations, wave motion, sediment movement, and density currents. Verification of dynamic similitude theory. Experiments selected in accordance with student interests. Prerequisite: CE 381. Credit, 2 hours.

584 Hydromechanics. Theoretical consideration of water waves, jets, wakes, cavities, stratified flows, diffusion phenomena, unsteady flow in pipes and surge problems, potential flow concepts, and turbulence. Prerequisite: CE 482 or approval of instructor. Credit, 3 hours.

585 Applied Hydromechanics. Advanced topics selected in accordance with student interests: sedimentation phenomena, water waves, coastal processes, flow in porous media, cavitation, density currents, transport phenomena, and fluid mixing. Prerequisite: CE 584 or approval of instructor. Credit, 3 hours.

586 Water Resources Systems. Consideration of engineering, economic, legal, political, administrative, and social factors affecting decisions in resource allocation and water resources systems. Prerequisite: CE 481 or approval of instructor. Credit, 2 - 3 hours.

587 Water Resources Systems. Water resources project formulation, economic analysis, cost allocation, and evaluation of performance. Case studies. Prerequisite: CE 481 or approval of instructor. Credit, 2 - 3 hours.

588 Hydraulic Design. Analytical and experimental investigation of hydraulic problems. Prerequisite: Approval of instructor. Credit, 1 - 3 hours.

Special Graduate Courses: 498, 590, 591, 592, 593, 594, 799.

ELECTRICAL ENGINEERING

PROFESSORS:

TICE (EC A-209A), BARKSON, DONNELLY, I. KAUFMAN, RUSSELL,
SIRKIS, T. B. THOMPSON, WELCH

ASSOCIATE PROFESSORS:

AX, DEMASSA, JELSMAN, KELLY, PALAIS, PATTERSON,
ROBBINS, STEINMANN, WOODFILL, ZIMMER

ASSISTANT PROFESSORS:

CLARK, GELOPULOS, HIGGINS, SNIDER

INSTRUCTORS:

SAKIOTIS, STRAWN

ELECTRICAL ENGINEERING

EE 226 Digital Computer Programming. FORTRAN programming and the operation of a stored program digital computer. Prerequisite: MA 117. One hour lecture, 2 hours laboratory. Credit, 2 hours.

302 Electrical Networks. Analysis of networks and linear systems. Prerequisite: ES 330. Three lectures. Credit, 3 hours.

320 Introduction to Digital Systems. Introduction to the fundamentals of digital computers and systems, switching theory, and the fundamentals of logical design. Prerequisite: Junior standing. Credit, 3 hours.

325 Analog Methods. Analog techniques applied to problems in system dynamics, including simulation of electrical, mechanical, hydraulic, and other configurations as in control loops. Prerequisites: MA 212, ES 312, 330. Two lectures, 3 hours laboratory. Credit, 3 hours.

329 Programming Languages. Theory of programming language specification and its application to FORTRAN IV and ALGOL. Prerequisite: ES 103. Credit, 3 hours.

332 Electronic Engineering. Continuation of ES 331. Three lectures, 3 hours laboratory. Credit, 4 hours.

341 Electromagnetic Fields. Introduction to fields and waves. Prerequisites: ES 231, MA 362. Credit, 3 hours.

357 Semiconductor Materials and Devices. Fundamentals of physical electronics leading to a description of electrical conduction. Basic concepts of drift, diffusion, carrier generation and recombination. Physical theory for the junction diode, transistor and other semiconductor devices. Prerequisites: EE 341, ES 350. Credit, 3 hours.

362 Electromechanics. Magnetic circuits and electromechanical energy conversion;

introduction to analog computer and machinery laboratories. Prerequisite: EE 302. Three lectures, 3 hours laboratory. Credit, 4 hours.

401 Electrical Networks. Design and analysis of two and four terminal passive networks. Traveling electromagnetic waves with application to distributed parameters. Prerequisites: EE 302, 341. Three lectures, 3 hours laboratory. Credit, 4 hours.

402 Network Analysis. Analysis of electrical networks. Prerequisite: EE 302. Credit, 3 hours.

405 Network Design. Introduction to modern network synthesis. Frequency domain approximations. Theory of two-port networks. Prerequisite: EE 302. Credit, 3 hours.

406 Computer-Aided Network Design. Computer methods in AC, DC and transient analysis of linear and/or non-linear networks. Selected general purpose programs such as ECAP, CIRCUS and SCEPTRE. Active device modeling. Prerequisite: EE 302. Credit, 3 hours.

421 Logical Systems Design. Design of digital computer systems: a basic hardware set and a basic software set. Prerequisite or corequisite: EE 428. Corequisite: EE 427 (except by approval of instructor). Credit, 3 hours.

422 Digital Systems, Circuits. Components and electrical circuits for digital systems. Prerequisites: EE 320 or 428; ES 331. Corequisite: EE 423 (except by approval of instructor). Credit, 3 hours.

423 Digital Circuits Laboratory. Investigation of digital components and their incorporation into circuits for digital systems applications. Corequisite: EE 422. Laboratory, 3 hours. Credit, 1 hour.

425 Analog Computer. Theory, operation and application of analog computers. Prerequisites: EE 302, 332. Credit, 3 hours.

426 System Programming Methods. Programming techniques such as table-look-up procedures, hierarchical data-structures, macro programming and assembler specification. Prerequisites: EE 329, 429. Credit, 3 hours.

427 Digital Systems Laboratory. Investigation and on-line operation of a digital system. Corequisite: EE 421. Laboratory 3 hours. Credit, 1 hour.

428 Logical Component Design. Theory of number systems, switching theory, and design of arithmetic elements. Prerequisite: Junior standing. Credit, 3 hours.

429 Symbolic Programming. Symbolic assembly language programming techniques and applications. Prerequisite: EE 226 or 329, or ES 103. Credit, 3 hours.

431 Semiconductor Devices. Semiconductor contacts and junctions, uniformly doped diodes and transistors, introduction to drift transistors, field effect transistors, and other semiconductor devices. Prerequisite: EE 357. Credit, 3 hours.

432 Device Modeling and Applications. Small and large signal modeling, interstage coupling, symmetric circuits, flow graph analysis, oscillators, topics on integrated circuits. Prerequisite: EE 431. Two lectures, 3 hours laboratory. Credit, 3 hours.

433 Semiconductor Device Limitations. Current, voltage, temperature and speed limitations of semiconductor devices; extreme conditions of operation. Prerequisite: EE 431. Two lectures, 3 hours laboratory. Credit, 3 hours.

434 Wave Mechanics. Probability, Schrodinger equation, eigenfunctions, harmonic oscillator, hydrogen atom, periodic potential, superposition, angular momentum, scattering, tunnelling, steady state and time dependent perturbation theory. Prerequisites: MA 362; EE 341. Credit, 3 hours.

441 Relativistic Electromagnetics. Approach to the Lorentz force law and Maxwell's equations, using Coulomb's inverse square law and the transformation of special relativity. Prerequisite: EE 341 or equivalent. Credit, 3 hours.

443 Antennas. Theory and application of radiating systems. Prerequisites: EE 341, 401. Credit, 3 hours.

445 Microwaves. Microwave devices and systems. Prerequisites: EE 341, 401. Three lectures, 3 hours laboratory. Credit, 4 hours.

448 Electro-Optics. Basic coherent optical devices and systems. Laser applications. Prerequisite: EE 341. Credit, 3 hours.

452 Matrix Applications. Solution of linear, polynomial, and systems of differential equations by methods of matrix algebra and matrix calculus. Applications to networks and waves. Prerequisites: ES 103, 330. Credit, 3 hours.

- 455 Communication Theory.** Spectral analysis of signals and noise. Linear and exponential modulation. Sampling theory and pulse modulation. Comparative analysis of systems. Prerequisites: EE 302, 332. Three lectures, 3 hours laboratory. Credit, 4 hours.
- 456 Communication Systems.** Introduction to statistical methods in communication systems. Representation of random signals and statistical theory of systems. Fundamentals of detection and estimation theory. Prerequisite: EE 455. Credit, 3 hours.
- 461 Electrical Machinery.** Methods and techniques of systems analysis applied to the dynamics of electrical machinery. Prerequisite: EE 362. Two lectures, 3 hours laboratory. Credit, 3 hours.
- 471, 472 Electric Power Systems.** Elements of power-system analysis. Prerequisite: EE 461. Credit, 3 hours each semester.
- 480 Feedback Systems.** Frequency response, root locus, Nyquist criterion, compensation, signal flow, Routh Hurwitz criteria. Prerequisites: EE 302, 332, 362. Three lectures, 3 hours laboratory. Credit, 4 hours.
- 483 Theory of Systems.** System classification, convolution, Laplace and Z-transform theory, introduction to linear spaces and state variables. Not intended for EE graduate students. Prerequisite: EE 302. Credit, 3 hours.
- 484 System Engineering.** Synthesis of prerequisite course material in individual and group projects with emphasis on physical interactions and limitations on system performance, environmental and economic considerations, evaluation, criteria, and project organization. Prerequisites: EE 332, 341, 357, 362, and at least one 400 level course. Credit, 3 hours.
- 490 Electroacoustics.** Acoustical theory. Prerequisite: ES 330; MA 362 or ES 346. Credit, 2 hours.
- 495 Magnetics.** Theory and design of magnetic devices and circuits. Prerequisite: ES 330. Credit, 2 hours.
- 496 Professional Seminar.** Topics of interest to graduating electrical engineers. Open to seniors only. One lecture. Credit, none.
- 501 Passive Network Synthesis I.** Synthesis of linear two-terminal networks. The approximation of specification functions. Prerequisites: EE 302; and EE 550 or MA 461. Credit, 3 hours.
- 502 Passive Network Synthesis II.** Synthesis of linear three- and four-terminal networks. Approximation methods for filters and delay networks. Prerequisite: EE 501. Credit, 3 hours.
- 503 Active Networks.** Theory of networks containing general active elements. Prerequisites: EE 302; and EE 550 or MA 461. Credit, 3 hours.
- 504 Active Network Synthesis.** Synthesis of two-, three-, and four-terminal networks using passive and active elements. Prerequisite: EE 501. Credit, 3 hours.
- 514, 515 Applied System Science I and II.** Physical interactions in integrated systems, physical properties of materials and devices, application of field and network theory to system component design, control, communication and information theory. System maintainability, reliability, performance prediction and evaluation. Part of graduate integrated system engineering program. Credit, 3 hours each semester.
- 516, 517 Logical System Engineering I and II.** System design of digital computers, number systems and arithmetic, computer organization. Design and application of serial and parallel logical components including counters, registers, analog to digital converters, adders, subtractors; data structures; system programming; study of basic hardware and software set. Part of graduate integrated system engineering program. Credit, 3 hours each semester.
- 518 Digital System Engineering.** Design of digital systems hardware and software. Methods and techniques of translating systems requirements into "optimum" hardware designs for a wide range of applications and systems requirements, and systems design of the software component of digital systems including assemblers, interpreters, compilers, monitors and maintenance systems. Part of graduate integrated system engineering program. Credit, 3 hours.
- 520 Advanced Switching Theory.** Applications of matrices, partially ordered sets and lattices to logical design and sequential switching circuits. Prerequisite: EE 428. or approval of instructor. Credit, 3 hours.

- 521 Digital Systems Hardware.** Detailed study of the memory and input-output elements of a digital computer system. Continuation of EE 421. Prerequisite: EE 421. Credit, 3 hours.
- 522 Digital Circuit Design.** Advanced topics in digital circuit design including tunnel diodes, multi-aperture cores, thin films, and integrated circuits. Prerequisite: EE 422. Credit, 3 hours.
- 523 Control Computers.** Process control by means of computers. Prerequisites: EE 421, 480. Credit, 3 hours.
- 524 Digital Systems Software.** Details of software of a digital computer system including the design of loaders, assemblers, and utility systems. Prerequisite: EE 421. Credit, 3 hours.
- 525 Hybrid Computers.** Theory, application and design of hybrid computer systems. Prerequisites: EE 425, 428. Credit, 3 hours.
- 526 Design of Automatic Programming Systems.** Methods and techniques of designing compilers for languages such as FORTRAN and ALGOL. Prerequisite: EE 429. Credit, 3 hours.
- 529 Digital Systems Seminar.** Selected topics in digital systems theory, design or application. May be repeated for credit. Credit, 3 hours.
- 531 Semiconductor Device Theory I.** Advanced study of junction diodes and transistors including inhomogeneous impurity profiles and the effects of high injection levels. Surface effects leading to the analysis of metal oxide, semiconductor, field-effect transistors. Prerequisite: EE 431. Credit, 3 hours.
- 532 Semiconductor Device Theory II.** Metal, insulator and semiconductor combinations for additional devices. Injection lasers, microwave solid-state devices and characteristics. Prerequisite: EE 531. Credit, 3 hours.
- 533 Integrated Circuit Design.** Integrated circuit fabrication, device modeling, active and passive parasitics. Comparison of integrated and discrete circuits. Characterization and design of integrated logic and small-signal circuits. Prerequisites: EE 302 and 431, or approval of instructor. Credit, 3 hours.
- 534 Semiconductor Device Design.** Transport equations, lifetime determining processes, and surface properties. Diffusion, epitaxy, and metallization. Bipolar transistor d.c. design, rf and switching transistors, trigger devices. Radiation effects and reliability. Prerequisite: EE 531 or approval of instructor. Credit, 3 hours.
- 535 Advanced Topics in Solid State Devices.** Electrical and thermal transport properties of an electron gas. Electron scattering. Thermoelectric devices, electron-phonon interaction, hot electron effects. Acoustic amplification. Excess carrier dynamics. Equilibrium and non-equilibrium processes. Solid state plasma. Photoconductive and photoluminescent devices. Prerequisite: EE 431 and 434, or approval of instructor. Credit, 3 hours.
- 541 Electromagnetic Waves.** Guided waves, radiation, propagation, reflection and refraction of waves. Prerequisite: EE 341. Credit, 3 hours.
- 542 Electromagnetic Fields.** Continuation of EE 541. Prerequisite: EE 541. Credit, 3 hours.
- 543 Antennas.** Analysis and synthesis of various radiating structures and systems. Prerequisite: EE 443 or approval of instructor. Credit, 3 hours.
- 545 Microwave Solid State Electronics.** Ferrimagnetics; resonance, material properties, measurements, magnetic waves, devices. Semiconductors; diodes and applications, Gunn effect. Acoustic waves, piezoelectric amplification. Prerequisites: EE 357 and 541 or approval of instructor. Credit, 3 hours.
- 548 Electro-Optics.** Advanced coherent optical devices and systems. Laser applications. Prerequisite: EE 448. Credit, 3 hours.
- 549 Lasers.** Emission and absorption of radiation, spectra and lifetimes, properties of optical cavities, theory and design of lasers, nonlinear interactions of light and matter. Prerequisite: EE 434. Credit, 3 hours.
- 550 Applied Operational Mathematics.** Complex variables; analytic functions, conformal mapping, contour integration, series, residues, analytic continuation. Fourier, Laplace, and bilateral Laplace transform theory; convolution; δ -functions, Z-transforms. Credit, 3 hours.

552 Error Correcting Codes. Application of the techniques of modern algebra to the analysis of error-correcting and error-detecting codes. Prerequisite: EE 320 or 428. Credit, 3 hours.

554 Random Variables. Concepts, functions and sequences of one, two and more random variables. Prerequisite: MA 212. Credit, 3 hours.

555 Stochastic Processes. Concepts, spectra, correlation and estimation. Stationary, non-stationary, Markov and Poisson processes. Prerequisite: EE 554. Credit, 3 hours.

556 Detection and Estimation Theory. A combination of the classical techniques of statistical inference and the random process characterization of communication, radar and other modern data processing systems. Prerequisite: EE 555. Credit, 3 hours.

557 Information Theory. Definitions of information sources and channels; fundamental theorems of information theory and their significance; simple error-detecting and error-correcting codes. Prerequisite: EE 554. Credit, 3 hours.

558 Modulation Theory. Linear and nonlinear modulation, optimum processors including the development of performance bounds. Prerequisites: EE 455 and 556. Credit, 3 hours.

559 Quantum Theory of Noise. Vectors and operators in Hilbert space; Lie products and the uncertainty principle; the statistical density operator, noise in physical systems. Prerequisite: EE 555 or approval of instructor. Credit, 3 hours.

570 Symmetrical Components. Theory and application of symmetrical components to the analysis of power systems and machines. Prerequisites: EE 401, 461. Credit, 3 hours.

571 Power System Stability. Transient and steady-state stability limits of power systems. Prerequisites: EE 461, 471. Credit, 3 hours.

572 High-Voltage Engineering. High-voltage sources, breakdown, measurements, and transmission. Prerequisite: EE 471. Credit, 3 hours.

574 Unconventional Power Sources. Energy conversion devices and systems other than conventional rotating machines. Prerequisite: EE 461. Credit, 3 hours.

575 Analysis of Power Networks. Tensor and matrix methods applied to problems involving extensive complex circuits. Prerequisite: EE 471. Credit, 3 hours.

580 Sampled Data Control Systems. Sampling process, Z-transforms time and frequency responses, compensation, synthesis of sampled data systems in time and frequency domains. Prerequisites: EE 550, 582. Credit, 3 hours.

581 Random Processes in Control Systems. Random processes in linear systems, state estimation and control system design using Wiener filtering, Kalman filtering, system parameter estimation, combined estimation and control. Prerequisites: EE 550, 554, 582. Credit, 3 hours.

582 State Variables in Control Systems. System representation in state variable form. Lagrangian modeling, calculus of variations in linear optimal control. Prerequisite: EE 480. Credit, 3 hours.

583 Function Spaces and Distributed Parameter Systems. Function spaces, structure of systems, geometric methods, distributive systems. Prerequisites: EE 550, 582. Credit, 3 hours.

584 Analysis of Control Components. Transfer functions of hydraulic, pneumatic, mechanical, and electrical devices. Prerequisite: EE 480. Credit, 3 hours.

586 Nonlinear Control Systems. Analysis of nonlinear systems. Stability theory including phase-plane, describing function, Liapunov's method, frequency domain criteria for nonlinear systems. Relay systems. Prerequisites: EE 550, 582. Credit, 3 hours.

587 Optimal Control. Theory of optimal control systems. Application of calculus of variations, Pontryagin's principle, and dynamic programming to control problems. Computational techniques for solving optimal control problems. Prerequisites: EE 550, 582. Credit, 3 hours.

588 Automata. Theory of finite state machines, deterministic and probabilistic. Prerequisite: EE 520. Credit, 3 hours.

589 Artificial Intelligence. Intelligence by artificial means. Prerequisite: EE 429. Credit, 3 hours.

Special Graduate Courses: 500, 590, 591, 592, 593, 594, 799. (See page 219.)

ENGINEERING MECHANICS

PROFESSORS:

WALLACE (EC G-120B), ALLEN, AVERY, L. P. THOMPSON, TURNBOW

ASSOCIATE PROFESSORS:

BICKFORD, NELSON, STANLEY

ASSISTANT PROFESSORS:

CHEN, HENDRICKSON, MAH

ENGINEERING COMMUNICATIONS**ASSOCIATE PROFESSOR:**

WILCOX

ASSISTANT PROFESSORS:

LAWLER, STADMILLER

EM 323 Continuum Mechanics. Cartesian tensors. Stress and deformation in a continuum. Physical laws — Eulerian form; applications to solids and fluids. Prerequisite: ES 321. Credit, 3 hours.

351 Materials Engineering. Scientific and engineering principles important in the selection and design of engineering materials. Variables influencing material properties and behavior. Prerequisites: ES 350, 381. Two lectures, 3 hours laboratory. Credit, 3 hours.

353 Thermodynamics and Kinetics of Solids. Thermodynamic properties of solutions, rate theory, diffusion in solids, solid state phase transformation, and precipitation phenomena in solids. Prerequisites: ES 350, 381. Credit, 3 hours.

372 Fluid Mechanics. Continuation of gas dynamics, including shock waves, viscous flow analysis and solutions in boundary layer theory, laminar and turbulent flow concepts, similarity considerations. Prerequisite: ES 371. Credit, 3 hours.

413 Dynamics. Moving coordinate systems, systems of particles. Euler's equations, gyroscopic motion. Lagrange's equations of motion. Prerequisites: ES 312, 345 or MA 260. Credit, 3 hours.

414 Space Mechanics. Dynamics with applications to aeronautical and astronomical problems, orbits and trajectories, motion in a resisting medium, performance and optimization of multistage rockets. Prerequisites: ES 312, 345 or MA 260. Credit, 3 hours.

415 Vibration Analysis. Undamped and damped vibrations of single-degree-of-freedom systems. Forced vibration, transient response. Many degrees of freedom systems, normal modes, vibration of elastic bodies. Prerequisites: ES 321, 345 or MA 260. Credit, 3 hours.

422 Mechanics of Materials. Elastic energy and Castigliano's principle. Bending of rings and curved beams. Skew bending, shear flow, and shear center. Bending of plates. Torsion of non-circular members. Beam columns. Theories of failure. Introduction to limit analysis. Prerequisite: ES 321. Credit, 2 hours.

450 Mechanical Properties of Solids. Mechanical behavior of engineering materials from the microscopic point of view and the influence of structural defects in determining material properties. Prerequisite: ES 350. Credit, 3 hours.

451 X-Ray Diffraction and Crystallography. Fundamentals of diffraction and crystallography. Basic experimental techniques for X-ray diffraction. Fundamentals of X-ray fluorescent spectrometry. Prerequisite: ES 350. Credit, 3 hours.

452 Theory of Solids. Electronic structure of solids, electrical conduction in metals

and semiconductors; dielectric and magnetic properties of solids. Structure sensitive properties and imperfections. Prerequisites: ES 350, 381. Credit, 3 hours.

465 Analytical Methods in Engineering. Complex variables with application to problems in engineering: analytic functions, integrals, power series, conformal mapping, application of conformal mapping to problems in fluid flow, heat transfer, and electric potential. Prerequisite: MA 460 or ES 346. Credit, 3 hours.

466 Analytical Methods in Engineering. Solutions of partial differential equations with application to the initial boundary value problems of engineering. Classification: parabolic, hyperbolic and elliptic equations. Separation of variable, transform techniques, method of characteristics. Prerequisites: MA 260 or ES 345; MA 460 or ES 346. Credit, 3 hours.

492, 493 Projects in Design and Development. Individual and small-group projects employing design, analysis, and development techniques. Credit, 3 hours each semester.

513 Analytical Dynamics. Dynamics of particles, systems of particles, and rigid bodies. Generalized coordinates, D'Alembert's and Hamilton's principles, Lagrange's equations, canonical equations of motion. Hamilton and Jacobi theories. Prerequisite: MA 460 or ES 346. Credit, 3 hours.

514 Space Vehicle Dynamics. Gyrodynamics and gyroscopic instruments, missile and space vehicle motion, inertial navigation, terminal guidance, flight trajectory optimization. Prerequisite: EM 513. Credit, 3 hours.

515 Dynamics of Elastic Systems. Free vibration and forced response of discrete and continuous mass systems. Damped systems. Exact and approximate methods of analysis — differential and integral equations. Prerequisite: EM 513. Credit, 3 hours.

516 Wave Propagation in Continuous Media. Stress-wave propagation in finite and infinite elastic media. Dilational, equivoluminal and surface waves. Plane cylindrical and spherical waves. Exact and approximate theories of motion of structural elements emphasizing transient phenomena. Prerequisite: MA 463. Credit, 3 hours.

517 Nonlinear and Random Vibrations. Qualitative and quantitative methods of analyzing the free and forced response of nonlinear mechanical systems. Stability of motion. Response of linear and nonlinear mechanical systems to random excitation. Prerequisite: Approval of instructor. Credit, 3 hours.

522 Variational Principles of Mechanics. Fundamental variational principles: virtual work, minimum and complementary potential energy, Reissner's and Hamilton's principles. Application to the formulation of governing differential equations and boundary conditions. Direct methods of the calculus of variations in treating problems in stability, vibrations, elasticity. Prerequisite: Approval of instructor. Credit, 3 hours.

523 Theory of Plates and Shells. Bending of rectangular and circular plates. Plates on elastic foundation. Large deflections of plates. Membrane theory of shells. Bending theory of shells of revolution. Asymptotic integration. Special and approximate methods. Prerequisites: MA 460 or ES 346; MA 461 or EM 465. Credit, 3 hours.

524 Theory of Elasticity. Analysis of stress and strain in three dimensions, generalized Hooke's law, general theorems. Plane elastostatic problems in rectangular and polar coordinates. Bodies of revolution, general bending and torsional problems and applications. Prerequisite: MA 460 or ES 346. Credit, 3 hours.

527 Theory of Plasticity. Inelastic behavior of metallic and non-metallic structural materials. Mechanics of perfectly plastic solids and strain-hardening solids. Yield conditions and flow laws. Minimum principles. Topics selected from current research. Credit, 3 hours.

529 Theory of Elastic Stability. General stability concepts; stability of discrete systems, bars, frames, arches, and rings. Torsional and lateral buckling. Buckling of thin plates and shells. Dynamic stability. Prerequisite: MA 460 or ES 346. Credit, 3 hours.

530 Continuum Mechanics. Continuum hypotheses. Field laws: mass, momentum, energy, entropy. Constitutive relations. Applications. Credit, 3 hours.

550 Theory of Crystalline Solids. Modern theory of crystalline materials. Topics treated include crystal structure, mechanical, thermal and transport properties of solids. Band theory and free electron model of solids. Credit, 3 hours.

551 Imperfections in Solids. Topics treated include general properties of lattice imperfections, imperfections in metals and non-metallic crystals. Prerequisite: EM 550. Credit, 3 hours.

552 Dislocation Theory. Fundamental properties of dislocations in crystals. Dislocation multiplication, motion and interactions. Application of dislocation theory to behavior of solids. Prerequisite: EM 550. Credit, 3 hours.

553 X-Ray Diffraction Theory. Properties of X-rays and their interaction with matter, atomic scattering factors. Diffraction of X-rays by crystals, kinematical and dynamical theory, effect of crystal defects. Crystal structure analysis. Experimental techniques. Prerequisite: EM 451. Credit, 3 hours.

571 Fluid Mechanics. Development of basic kinematic, dynamic, and thermodynamic equations of the fluid continuum and their application to some basic models. Credit, 3 hours.

572 Mechanics of Inviscid Flow. Fluid motions described by scalar and vector potentials. Compressible and incompressible flow and wave motion. Prerequisites: EM 571; MA 461 or EM 465. Credit, 3 hours.

574 Mechanics of Viscous Flow. Laminar and turbulent flows of viscous fluids with emphasis on Newtonian fluids. Slow motion, boundary layer flow, and free surface flows. Prerequisite: EM 571. Credit, 3 hours.

575 Mechanics of Viscous Flow. Continuation of EM 574, including a treatment of non-Newtonian fluids. Prerequisite: EM 574. Credit, 3 hours.

Special Graduate Courses: 500, 590, 591, 592, 593, 594, 799. (See page 219.)

INDUSTRIAL ENGINEERING

PROFESSORS:

YOUNG (EC G-136C), BEDWORTH, DECKER, HOYT, MIZE, MOAN, NUTT

ASSOCIATE PROFESSORS:

SCHAMADAN, SMITH

ASSISTANT PROFESSORS:

LEWIS, MOOR

INDUSTRIAL ENGINEERING

IE 311 Engineering Economy. Economic evaluation of engineering alternatives. Prerequisite: MA 120. Credit, 2 hours.

335 Engineering Law. Influence of contract, property and tort law upon engineering activities; contracts, agency, partnerships, corporations, liens, and expert testimony. Credit, 3 hours.

374 Quality Control I. Organizational and statistical concepts of quality control; applications and methods applied to the control of quality manufactured product. Credit, 3 hours.

375 Computer Methods and Applications. Continuation of ES 103 with emphasis on programming logic. Prerequisite: ES 103. Credit, 3 hours.

411 Engineering Economics. Cash flow model, pricing, economic production charts, economic balance analysis, profitability models. Prerequisite: IE 311. Credit, 3 hours.

421 Human Factors Engineering. Man-machine systems utilizing space program constraints for the development of principles and concepts. Credit, 2 hours.

422 Information Acquisition. Design of systems to collect data for use in managerial decision models, job evaluation, wage payment, production standards, queueing studies, engineering evaluations and reliability predictions. Prerequisite: ES 442. Credit, 3 hours.

425 Environmental Bioengineering. The biotechnology of aerospace and undersea environments. Control and utilization of artificial environments. Credit, 3 hours.

431 Engineering Administration. Engineering organization and administration; delegation of authority and responsibility; effective utilization of resources; compensation structure, labor-management relations. Credit, 3 hours.

437 Job Evaluation and Compensation. Analysis and evaluation of work assignments; determination of compensation. Credit, 3 hours.

439 Supervision and Labor. Interrelationship of supervisory personnel and employees; organization, operation, and characteristics of labor. Credit, 2 hours.

451 Foundations for Industrial Engineering. Engineering accounting and economy, and information acquisition. Laboratory assignments. Prerequisite: Graduate standing. Credit, 3 hours.

461 Design of Industrial Operations. Planning, analyzing, controlling, and evaluating production systems, including CPM and PERT techniques for project planning. Laboratory assignments. Prerequisite: IE 311. Corequisite: IE 422. Credit, 3 hours.

462 Design of Industrial Facilities. Planning and layout of industrial facilities. Material flow systems and plant design. Laboratory assignments. Prerequisite: IE 461. Credit, 3 hours.

463 Industrial Automation. Design, analysis and evaluation of industrial control methodologies utilizing conventional control components and analog and digital computers. Two lectures, 3 hours laboratory. Prerequisite: Senior standing. Credit, 3 hours.

473 Mathematical Methods of Operations Research. Linear algebra, classical optimization techniques, difference equations, transform theory. Markov chains and stochastic processes. Prerequisite: ES 441. Credit, 3 hours.

474 Quality Control II. Continuation of the statistical concepts of IE 374; theory and application of attribute and variable acceptance including sequential analysis; life test plans and procedures. Prerequisite: IE 374 or ES 441. Credit, 3 hours.

475 Linear Programming. Assignment, transportation, and general linear programming problems: solution algorithms. The network flow problem. Prerequisite: IE 473. Credit, 3 hours.

476 Operations Research Models. Background of operations research; OR methodology; development of models and techniques for solving problems such as queueing, inventory, and replacement. Prerequisite: IE 473. Credit, 3 hours.

480 Biosystems. Analysis and explanation of muscular, cardiac, sensory, respiratory and neurological systems as they relate to engineering. Credit, 3 hours.

481 Physiological Instrumentation. Problems, concepts, and techniques of biomedical instrumentation in static and dynamic environments; physiological, diagnostic, prosthetic and psychological systems; inter-disciplinary communications in bioengineering. Lecture and laboratory assignments (offered jointly as KE 413 and IE 481). Prerequisite: Approval of instructor. Credit, 3 hours.

500 Research Methods. Acquaints students with the essential steps in the scientific method and with the techniques and skills used in research. Credit, 3 hours.

510 Engineering Economic Analysis. The engineering economic audit, breakeven point analysis, variable budget control of manufacturing costs, cost analysis, and product pricing. Prerequisite: ES 442. Credit, 3 hours.

511 Analysis of Decision Processes. Methods of making economic decisions; statistical decision theory; effects of risk, uncertainty, and strategy on managerial economic decisions. Prerequisite: IE 473. Credit, 3 hours.

518 Operational System Engineering. Operational analysis and design, system simulation, information acquisition. Methods of making economic decisions; effects of risk, uncertainty, and strategy on managerial economic decisions. Part of graduate integrated system engineering program. Credit, 3 hours.

520 Topics in Human Engineering. Analysis, design and control of human performance in man-machine environments; considerations of physiological and psychological factors as related to system performance. Laboratory assignments. Credit, 3 hours.

521 Synecology for Engineers. Ecological approach to the definition and solution of industrial problems arising from human interactions. Credit, 3 hours.

531 Topics in Engineering Administration. Consideration of qualitative and quantitative aspects. Consideration given to philosophical, psychological, political, and social implications of administrative decisions. Prerequisite: IE 431 or equivalent. Credit, 3 hours.

533 Network Analysis. Analysis of networks including GERT and maximum flow problems. Prerequisites: ES 441 and IE 475 or their equivalents. Credit, 3 hours.

561 Scheduling of Resources. Intensive analysis of scheduling procedures for optimum utilization of resources. Prerequisites: IE 461 and 475. Credit, 3 hours.

562 Discrete System Control. Application of automatic control methodology to discrete processes. Sampled data systems. Design and synthesis by digital computer; statistical analysis and optimization. Prerequisite: Control background or approval of instructor. Credit 3 hours.

563 Topics in Mechanization and Automation. Analysis of mechanization and automation procedures as applied to selected industrial processes. Specific digital computer installations will be analyzed and evaluated. Laboratory assignments. Credit, 3 hours.

566 Computer Science. Scientific analysis of computing, Turing and sequential machines, finite state grammars, heuristic programming, algorithmic approach to problem solving. Prerequisites: IE 375 and ES 441 or their equivalents. Credit, 3 hours.

567 System Simulation with Digital Computers. Methods and procedures for simulating large-scale systems with digital computers. FORTRAN and GASP programming languages are used. Laboratory assignments. Prerequisites: IE 375 and 473. Credit, 3 hours.

569 Engineering Statistics. Continuation of ES 442 with special emphasis on non-parametric statistics. Prerequisite: ES 442. Credit, 3 hours.

571 Probability for Engineers. Continuation of ES 441. Prerequisite: ES 441 or equivalent. Credit, 3 hours.

572 Design of Engineering Experiments. Statistical design and analysis of engineering and industrial experiments. Analysis of engineering and industrial experiments. Analysis of variance and covariance. Determination of optimum experimental conditions for maximum response. Prerequisite: ES 442. Credit, 3 hours.

573 Reliability Models. Advanced statistical methods for determining reliability and reliability growth curves with associated confidence limits. Prerequisite: ES 441 or equivalent. Credit, 3 hours.

574 Mathematical Programming. Theory and application of methods for determining the maximum and minimum functions of many variables subject to constraints. Methods include Lagrangian multipliers, non-linear and dynamic programming. Prerequisite: IE 475. Credit, 3 hours.

576 Queueing Theory. Analysis of queues using analytical and Monte Carlo methods. Prerequisite: IE 476. Credit, 3 hours.

577 Systems Analysis. General theories for the analysis of complex systems. Macro- and micro-analysis viewpoints will be considered. Credit, 3 hours.

578 Inventory Theory. Mathematical and statistical analysis of inventory, warehouse and logistic systems, application of theory of dynamic programming and stochastic processes. Prerequisites: IE 475, 476. Credit, 3 hours.

579 Forecasting and Scheduling. Analysis of advanced prediction techniques in forecasting and scheduling by time series and probability models, smoothing techniques, error analysis. Prerequisites: ES 442 and IE 473. Credit, 3 hours.

580 Current Trends in Industrial Engineering. Evaluation of current trends in the theory and practice of industrial engineering. Credit, 3 hours.

Special Graduate Courses: 500, 591, 592, 593, 594, 790, 792, 799. (See page 219.)

MECHANICAL ENGINEERING

PROFESSORS:

RICE (EC G-120D), BEAKLEY, LOGAN, PRICE, STAFFORD, STEIN

ASSOCIATE PROFESSORS:

BREGAR, COLLINS, DITSWORTH, EVANS, FLORSCHUETZ, FRY, JANKOWSKI,
METZGER, VERMEULEN, WOOLDRIDGE

ASSISTANT PROFESSORS:

AUTORE, BACKUS

INSTRUCTORS:

EDLIN, HAWLEY

MECHANICAL ENGINEERING

ME 201 Technology and Social Change. Review of existing theories of social change, analysis of the role of technology as related to social change, and studies of contemporary and possible future impacts of technology on society. Credit, 2 hours.

230 Materials and Industrial Processes. Modern processing techniques and equipment used in production. Properties and conversion of basic materials into consumer products. One lecture, 3 hours laboratory. Credit, 2 hours.

300 Man and Machine. How the processes of mechanical invention and technical progress affected, and were in turn affected by, the evolution of social forms and institutions. Credit, 2 hours.

301, 302 Science and Technology in History. Important developments in the sciences and technology from earliest times; reciprocal relations of science and/or technology with the socio-economic processes and institutions; development of science and technology. ME 301 is not a prerequisite for ME 302. Credit, 3 hours each semester.

321 Kinematics of Mechanisms. Motions, velocities, and accelerations of machine parts, cams, gears, flexible connectors, rolling contact, and synthesis of mechanisms. Prerequisite: ES 104. Corequisite: MA 121. Credit, 3 hours.

322 Dynamics of Machines. Interrelationships among forces, motions, and masses as related to rigid and elastic machine members, including force analysis, vibrations, impact, balancing, critical speeds, and stability. Prerequisite: ME 321. Corequisite: EM 415. Credit, 3 hours.

330 Metallurgy. Metallurgy of iron, steel and non-ferrous alloys; atomic and crystal structure; welding, brazing, and soldering. For non-engineering majors. Prerequisite: CH 114. Two lectures, 3 hours laboratory. Credit, 3 hours.

331 Principles of Metallurgy. Theory, techniques, and applications of metallurgical phenomena including atomic and microstructure of metals; equilibrium diagrams; ferrous and non-ferrous metals; cermets and plastics; powder metallurgy; metal joining techniques including electron beam and Laser welding; analysis and prevention of failure; corrosion; application of computers in metallurgical analysis and process control. Prerequisite: CH 114 or ES 118. Two lectures, 3 hours laboratory. Credit, 3 hours.

332 Manufacturing Design. Product and process design considerations essential to design for production; coordination of functional design, materials and processes. Prerequisite: ME 230 or 331. One lecture, 3 hours laboratory. Credit, 2 hours.

380, 381 Applied Thermodynamics. Applications of laws of thermodynamics to engines, turbines, and compressors. Vapor cycles, gas mixtures, and gas and vapor mixtures. Not open to engineering students. Prerequisites: MA 118; PH 112. Credit, 3 hours each semester.

382 Thermodynamics. Applied thermodynamics; gas mixtures, power cycles, and reactive systems. Prerequisite: ES 381. Credit, 3 hours.

401 Theory, Prediction and Social Effects of Invention. Invention considered as an instrument of change in civilization; evolutionary nature of inventions, cycle of growth and decline, causation and social effects; possibility, past success and art of predicting the cultural future. Credit, 3 hours.

402 Science in History. Examination of the reciprocal relations of science and society from ancient to recent times. Prerequisite: Twelve semester hours credit in science. Credit, 3 hours.

412 Nucleonics Laboratory. Experimental investigation of characteristics of nuclear radiations and their interaction with matter; operation of apparatus for detection and measurement of nuclear radiation. Two lectures, 3 hours laboratory. Credit, 3 hours.

413 Nuclear Reactor Engineering. Principles of reactor design; reactor control and instrumentation; reactor materials; power reactor economics; power reactor systems; analysis of hazards. Prerequisite: ES 411. Credit, 3 hours.

415 Nuclear System Design. Engineering design of nuclear reactors with emphasis on heat transfer and heat removal; the nuclear reactor as a heat source for power generation. Prerequisite: ES 411. Corequisite: ME 488. Credit, 3 hours.

427 Flight Vehicle Structures. Space structures; thin-walled structures; load factors; non-symmetrical bending and transverse shear; shear center and flow; semi-monocoque construction, fuselage rings; multicelled structures; sandwich panels, fatigue. Prerequisite: EM 422. Credit, 3 hours.

441 Principles of Design. Design procedures; force and motion analysis; failure modes; stress and deflection analysis; stress concentration; fatigue; selected components. Prerequisites: EM 422 and ES 350. Credit, 3 hours.

442 Intermediate Design. Application of the principles and empiricisms of engineering to the creative design of machine components and sub-systems. Prerequisite: ME 441. Credit, 3 hours.

445 Preliminary Design. Confrontation of engineering design problems at the professional level; application of principles and analytical techniques from engineering disciplines to the creative design-synthesis of selected engineering systems; concepts of formulation, simplifying assumptions, optimization techniques; consideration of performance, life, cost. Prerequisite: ME 441. Corequisite: ME 488. One lecture, 2 hours laboratory-lecture, 3 hours laboratory. Credit, 3 hours.

450 Aerodynamics. Principles of subsonic and supersonic flight; airfoils in compressible and incompressible flow; flow about a body; thin airfoil and finite airfoil theory. Prerequisite: EM 372. Credit, 3 hours.

451 Aerodynamic Control and Stability. Static and dynamic stability of aircraft; control surface theory. Prerequisite: ME 450. Credit, 3 hours.

453 Propulsion. Analysis and principles of propulsion systems. Prerequisites: EM 372 and ME 382. Credit, 3 hours.

455 Gas Turbines. Thermodynamic analysis of gas turbine plants; analysis of flow in turbines and compressors; blade losses; combustion, turbine and compressor matching; off-design performance; design consideration. Prerequisite: ME 382. Credit, 3 hours.

462 Measurement Systems. Extension of fundamental measurement principles; discussion of DC, sine wave and pulse carrier systems and of unbalance and reference-balance measuring methods; simple computing-type transducer. Prerequisite: ES 361. Two lectures, 2 hours lecture-laboratory. Credit, 3 hours.

463 Transducer Principles. Transducers for measuring systems; advantages, limitations and applications of various mechanical, electrical, magnetic, optical, thermal transducing principles. Prerequisite: ES 361. Corequisite: ME 462. Two lectures, 3 hours laboratory. Credit, 3 hours.

465 Automatic Controls. Theory of control systems including open-loop and closed-loop, with emphasis on mechanical, hydraulic, thermal, and pneumatic systems; application of the analog computer to the solution of differential equations. Prerequisite: MA 212. Credit, 3 hours.

483 Internal Combustion Engines. Application of thermodynamics, fluid mechanics, and chemistry to internal combustion engines; performance characteristics, combustion,

carburetion, cooling, and controls. Prerequisite: ME 382 or approval of instructor. Credit, 3 hours.

486 Environmental Control. Refrigeration cycles, refrigerant properties, heating, cooling loads; psychrometry; processes for heating, cooling, humidifying, dehumidifying, purifying; heat transfer principles; controls. Prerequisite: ME 382. Credit, 3 hours.

487 Direct Energy Conversion. Unconventional methods of energy conversion; particular emphasis on fuel cells, thermoelectrics, thermionics, photovoltaics, and magnetohydrodynamics. Prerequisites: PH 361, ME 382, or approval of instructor. Credit, 3 hours.

488 Heat Transfer. Steady and unsteady heat conduction, including introduction to numerical solutions; thermal boundary layer concepts and applications to free and forced convection. Introduction to thermal radiation concepts. Mass transfer analogies included where appropriate. Corequisite: EM 372. Credit, 3 hours.

489 Statistical Thermodynamics. Statistical approach to thermodynamic concepts, laws, and methods of analysis. Generalized p-v-T data. Special systems. Prerequisite: ES 381. Credit, 3 hours.

491 Experimental Mechanical Engineering. Experimental and analytical studies of phenomena and performance of fluid flow, heat transfer, thermodynamics, refrigeration and mechanical power systems. Prerequisites: ES 361, ME 382. Corequisite: ME 488. Six hours laboratory. Credit, 2 hours.

492 Mechanical Engineering Projects. Small group projects in fundamental or applied aspects of mechanical engineering; emphasis on experimental solutions to complex problems. Prerequisites: ME 441, 491. Six hours laboratory. Credit, 2 hours.

512 Reactor Theory. Neutron moderation; Fermi Age theory; diffusion theory; applications of diffusion theory; reflected reactors; multi-group diffusion equations. Prerequisite: ES 411. Credit, 3 hours.

513 Reactor Kinetics and Control. Reactor kinetic equations; Laplace transform solution of the kinetic equations and reactor transfer functions; reactor stability analysis; non-linear reactor dynamics. Credit, 3 hours.

514 Reactor Design. Heterogeneous reactor systems, perturbation theory, fuel burn-up, introduction to neutron transport theory. Prerequisite: ME 512. Credit, 3 hours.

515 Radiation Hazards and Shielding. Radiation effects on materials; biological effects of radiation, limits on radiation exposure; principles of radiation shielding; principles of radiation detection instruments. Credit, 3 hours.

517 Nuclear Engineering Laboratory. Experiments in nuclear engineering including neutron activation analysis; neutron distribution and dynamics of a sub-critical assembly; simulation of nuclear reactor kinetics using analog computer techniques. Corequisite: ME 413. Two lectures, 3 hours laboratory. Credit, 3 hours.

527 Aeroelasticity. Mutual interaction between aerodynamic and elastic forces and deflection induced in the structures, control mechanisms, and propulsion systems of flight vehicles. Prerequisites: ME 427 and EM 415. Credit, 3 hours.

544 Mechanical Design and Failure Analysis I. Modes of mechanical failure; elements of dislocation theory; application of principles of elasticity and plasticity in multiaxial state-of-stress to design synthesis; failure theories; fatigue; creep; impact. Prerequisite: ME 445 or approval of instructor. Credit, 3 hours.

545 Mechanical Design and Failure Analysis II. Principles, concepts, phenomenological theories, and techniques of analysis associated with failure prevention in mechanical design; emphasis on fatigue, creep, combined fatigue and creep, and impact. Prerequisite: ME 544. Credit, 3 hours.

548 Advanced Mechanisms. Advanced kinematics, graphical and analytical methods of analysis, dynamics and transmission of forces in mechanisms. Prerequisite: ME 321. Credit, 3 hours.

551 Aerodynamics. Slender-body theory at subsonic, supersonic, and hypersonic speeds; wing-body and wing-tail interference. Prerequisite: ME 450. Credit, 3 hours.

552 Physical Gas Dynamics. Molecular theories of gases, Boltzmann equation, Chapman-Enskog solution, applications to transport phenomena and low density flows, atomic and molecular structure, elements of statistical thermodynamics, properties of high temperature gases. Prerequisite: Approval of instructor. Credit, 3 hours.

553 Mechanics of Reacting Fluids. Molecular and continuum ideas applied to gas dynamics of reacting mixtures; chemical thermodynamics and kinetics, frozen and equilibrium flows, transport properties and flames and detonations. Prerequisite: ME 552 or approval of instructor. Credit, 3 hours.

554 Propulsion. Analysis and principles of propulsion systems. Prerequisite: ME 453. Credit, 3 hours.

555 Turbomachinery. Thermodynamics and fluid mechanics of the energy-transfer process in turbomachines. Prerequisites: EM 372 and ME 382. Credit, 3 hours.

556 Combustion Systems. Structure, propagation, aerodynamics and stability of pre-mixed and diffusion flames. Effects of forced convection and turbulence. Combustion of solid and liquid fuels and propellants. Designs of burners, furnaces, combustors, rockets. Reactant and product handling systems. Prerequisites: ME 382, 488. Credit 3 hours.

561 Control System Theory. Continuation of ME 465 with emphasis on non-linear systems and advanced methods for control system analysis and optimization. Prerequisite: ME 465. Credit, 3 hours.

562 System Control. Theory and analysis of system control. Prerequisite: ME 561. Credit, 3 hours.

564 Experimental Stress Analysis. Measurement of static and dynamic stresses in models and prototypes. Brittle analogs and coatings, photo-elastic analogs and coatings, membrane analogy, interaction methods, electrical analogy, strain gages of mechanical and electrical nature. Prerequisite: ES 361 or ME 565. Three lectures, 3 hours laboratory. Credit, 3 hours.

565 Measurement Engineering Survey. Accelerated review of measurement engineering principles presenting the unified approach. Measurement as information flow with energy flow through systems consisting of elements in structures; static and dynamic behavior; problems of reproducing and shaping information. Not open to students who have completed ES 361. Two hours lecture, 2 hours recitation, 1 hour laboratory. Credit, 3 hours.

571 Fluid Mechanics. The development of the basic kinematic, dynamic, and thermodynamic equations of the fluid continuum and their application to some basic models. Credit, 3 hours. (Same as EM 571).

572 Fluid Mechanics. A continuation of the unified treatment of ME 571 with particular emphasis on compressible and turbulent flows. Prerequisite: ME 571. Credit, 3 hours.

573 Turbulence. Development of Reynolds' and turbulence energy equations. Application to isotropic and anisotropic flow fields. Introduction to research methods and survey of current research activity. Prerequisite: ME 574. Credit, 3 hours.

574 Mechanics of Viscous Fluids. Analysis of laminar and turbulent viscous flows. Perturbation theory, similarity solutions, and numerical solutions for the various flow regimes. Prerequisite: ME 571. Credit, 3 hours. (Same as EM 574).

575 Mechanics of Viscous Fluids. Emphasis on laminar and turbulent boundary layer flows; other viscous flows having boundary layer characteristics. Prerequisite: ME 574. Credit, 3 hours.

576 Two-Phase Flow and Boiling Heat Transfer. Classification and characteristics of two-phase flows; energy transfer with emphasis on boiling heat transfer. Selected topics include: pressure drop in single and multi-component gas-fluid flows, bubble ebullition models, natural and forced convection boiling characteristics, burnout phenomena, and condensation. Prerequisite: Approval of instructor. Credit, 3 hours.

581 Thermodynamics. Laws of equilibrium thermodynamics; relations between properties and aspects of the Second Law; Maxwell relations; p-v-T relations; property calculations; thermodynamics of chemical systems. Prerequisite: ME 382. Credit, 3 hours.

582 Thermodynamics. Criteria of equilibrium. Thermodynamics of electrostatic and electromagnetic fields and ionized gases. Statistics of ensembles. Thermodynamics of irreversible processes. Prerequisite: ME 581. Credit, 3 hours.

583 Statistical Thermodynamics. Classical and quantum statistics; macroscopic thermodynamic and transport properties; application. Credit, 3 hours.

585 Heat Transfer. Basic equations and concepts of heat transfer; applications to conductive, convective, and radiative heat transfer. Prerequisite: ME 488. Credit, 3 hours.

586 Heat Transfer. A continuation of ME 585 with emphasis on convection heat transfer. Prerequisite: ME 585. Credit, 3 hours.

587 Heat Transfer. A continuation of ME 585 with emphasis on radiation heat transfer. Prerequisite: ME 585. Credit, 3 hours.

588 Thermo-Sciences Laboratory. Experimental techniques and experiments in fluid mechanics, heat transfer, and thermodynamics. Prerequisite: Approval of instructor. Credit, 2-3 hours.

591 Seminar. Credit, 2-3 hours. Topics may be offered in the areas of:

- | | | |
|---------------------------|-------------------------|----------------------|
| (a) <i>Thermosciences</i> | (c) <i>Measurements</i> | (d) <i>Nuclear</i> |
| (b) <i>Design</i> | | (e) <i>Aerospace</i> |

594 Graduate Research Conference. Topics in contemporary research. Required every semester of all Mechanical Engineering graduate students registered for nine or more semester hours. Not for degree credit. Credit, 1 hour.

Special Graduate Courses: 500, 590, 591, 592, 593, 594, 799 (See page 219.)

(End of Engineering Sciences course listings.)

ENGLISH

PROFESSORS:

ARCHER (LL 501), ERNO, FERRELL, FISHER, B. HARRIS, LAMBERTS,
LANDINI, LEVY, MYERS, O'MALLEY, OSENBURG, SHAFER, TURNER,
ZIMMERMAN

ASSOCIATE PROFESSORS:

DONELSON, ELLIS, EMERY, EVANS, HABERMAN, HERMAN, LIGHTFOOT,
POWERS, RATLIFF, SALERNO

ASSISTANT PROFESSORS:

BAROODY, BROSE. COLBY, J. GREEN, M. GREEN, GREENE, HAKAC,
HIGGINS, JANSSEN, JOHNSON, KEHL, LYLE, MORAN, MURRAY,
NEBEKER, QUIRK, RANDALL, SLATTERY, SWANSON, TAYLOR

INSTRUCTORS:

BLAKEY, BOYAR, BRIA, BROPHY, CRAWFORD, CROOKS, EERKENS, FEIL,
FULLER, HARRIES, K. HARRIS, HOLSINGER, JACKSON, KAY, MERRILL,
REDWINE, ROBERTSON, SCHIEDAT, SCHULTE, STONE,
STRICKLAND, TAUBITZ

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Arts Degree Curriculum

ENGLISH — Consists of 45 semester hours of credit, of which 30 must be in English, and 15 in no more than two related fields (drama, speech, history, psychology, etc.) to be selected by the student in consultation with the adviser. Required courses are EN 221 and 222; 421 or 422; 423 or 424; 312 or 314 or 413; two period courses (*e.g.*, 341, 415, 419); one types course (*e.g.*, 420, 446, 452). At least 18 hours must be in upper division courses.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS**Bachelor of Arts in Education Degree Curriculum**

ENGLISH — Consists of 42 semester hours of credit in English. Required courses are EN 211 or 212, 221, 222, 312 or 314 or 413, 341 or 342, 421 or 422, 471, 480, one types course, one period course, and 12 hours electives, six of which must be upper division. Upper division courses in related fields may be accepted with the approval of the adviser.

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS (Secondary Education)

ENGLISH — Consists of 18 semester hours of credit. Required courses are EN 211 or 212; 221 or 222; 341 or 342; 312 or 314; 471 or 480; and at least one of the following: SE 241 and 422, or EN 321.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of English offers programs leading to the degrees of Master of Arts and Doctor of Philosophy. Consult the *Graduate Catalog* for requirements.

ENGLISH

EN 101 First Year English. Composition; emphasis on paragraph structure, correctness in English fundamentals, exactness and concreteness of statement; dictionary and library practice; intensive and extensive reading. Credit, 3 hours.

102 First Year English. Expository writing; emphasis on organizing and unifying long papers, improvement in style, expansion of vocabulary. Introduction to word study; practice in research, including the writing of a model term paper. Intensive and extensive reading. Prerequisite: EN 101. Credit, 3 hours.

103 Introduction to Literature. Introduction to literature through literary types, selections taken mainly from modern writers. Not open to English majors. Credit, 3 hours.

104 Advanced First Year English. Composition, with emphasis on refining writing skills; intensive reading; research papers; logic. Prerequisite: Passing grade on the EN 101 exemption examination. Credit, 3 hours.

105 The Nature of Literature. A critical approach to literary types: poetry, drama, essay, short story, novel. For English majors or minors, primarily for freshmen, but open to sophomores. Credit, 3 hours.

111 English for Foreign Students. For foreign students from non-English speaking countries who have studied English in their native countries, but who require practice in the idioms of English. Intensive reading, writing, and discussion to acquaint students with the colloquial flavor of English. Satisfies the graduation requirement of EN 101. Credit, 3 hours.

112 English for Foreign Students. Reading on a broader scope and more emphasis on composition. Satisfies the graduation requirement of EN 102. Prerequisite: EN 111. Credit, 3 hours.

201 World Literature — The Classical and Medieval Periods. Selections from the great literature of the world in translation and lectures on the cultural background of the writings. Prerequisite: EN 101. Credit, 3 hours.

202 World Literature — The Renaissance and Modern Periods. Selections from the great literature of the world in translation and lectures on the cultural background of the writings. Prerequisite: EN 101. Credit, 3 hours.

204 Literature of Today. Poetry, short story, novel, and drama. Not for English majors. Not open to freshmen. Credit, 3 hours.

211 Advanced Composition. For students interested in further training in organization and expression of ideas. Primarily for non-English majors. Prerequisite: EN 102. Two lectures, conferences arranged. Credit, 3 hours.

- 212 English Prose Style.** Advanced training in various types of prose writing. Prerequisites: Grade of "B" in EN 102; English major or approval of instructor. Two lectures, conferences arranged. Credit, 3 hours.
- 221 Survey of English Literature.** Content and form of the earlier English literature, including a study of the individual and national characteristics of certain authors. Prerequisite: EN 102. Primarily for English majors and minors. Credit, 3 hours.
- 222 Survey of English Literature.** Based upon the later English literature. Prerequisite: EN 102. Primarily for English majors and minors. Credit, 3 hours.
- 300 History of Literary Criticism.** Major critical theories and methods from the Classical Period to the Twentieth Century. Prerequisite: Junior standing or approval of instructor. Credit, 3 hours.
- 311 Creative Writing.** Writing laboratory. Lectures and conferences dealing with the various forms of imaginative writing. Prerequisites: EN 211, 212, or approval of instructor. Two lectures, conferences arranged. Credit, 3 hours.
- 312 Current English Usage.** Recent changes and current trends in the language, with emphasis on American English and the factual basis of grammar. Prerequisite: Junior standing or approval of instructor. Credit, 3 hours.
- 313 Introduction to Semantics.** Nature of meaning and the function of language, designed to improve accuracy of communication and to provide a technique for analyzing false or misleading statements. Prerequisite: Junior standing or approval of instructor. Credit, 3 hours.
- 314 Modern Grammar.** Conventional, structural, and generative grammars with implications for high school English teachers. Prerequisite: Junior standing or approval of instructor. Credit, 3 hours.
- 321 Introduction to Shakespeare.** Shakespeare's major comedies, history and tragedies. Not open to English majors. Prerequisite: Junior standing or approval of instructor. Credit, 3 hours.
- 341 American Literature.** From colonial times to the Civil War, including the growth of nationalism and the rise of the New England school. Open to those specializing in other departments who have junior standing. Prerequisite: EN 102. Credit, 3 hours.
- 342 American Literature.** From Whitman to the present. Influence of westward expansion, growth of regionalism, literature of social protest. Open to those specializing in other departments who have junior standing. Prerequisite: EN 102. Credit, 3 hours.
- 352 Short Story.** Development of the short story as a literary form; analysis of its technique through study of examples from the work of representative authors. Prerequisite: Three hours of literature. Credit, 3 hours.
- 355 History of the Drama.** English drama from the Middle Ages to the present, with selective examples of foreign influences. Reading of representative plays of each period. Prerequisite: Junior standing or approval of instructor. Credit, 3 hours.
- 356 Biblical Backgrounds of Literature.** Reading of the Old and New Testaments with emphasis on types and ideas used as primary or major sources in literature. Prerequisite: Junior standing or approval of instructor. Credit, 3 hours.
- 358 Afro-American Literature.** Thematic and cultural study of the literature dealing with the Afro-American in the U.S. Prerequisite: EN 102. Credit, 3 hours.
- 400 Contemporary Literary Criticism.** Twentieth Century critical theories and methods. Practice in criticism of poetry, drama, short story, and the novel. Prerequisite: Senior or graduate standing. Credit, 3 hours.
- 411 Advanced Creative Writing.** Prerequisite: EN 311 or approval of instructor. Two lectures, conferences arranged. Credit, 3 hours.
- 412 Professional Writing.** Lectures and conferences concerning techniques of writing for publication. Prerequisite: EN 311 or approval of instructor. Two lectures, conferences arranged. Credit, 3 hours.
- 413 History of the English Language.** Development of the language from the earliest times to the modern period. Prerequisite: EN 221. Credit, 3 hours.
- 415 Medieval Literature.** Medieval English literature in translation, from Beowulf to Malory (exclusive of Chaucer) with particular emphasis on cultural and intellectual

backgrounds, and including some continental works. Prerequisite: Three hours of literature. Credit, 3 hours.

418 Tudor Literature. English prose and poetry, 1485-1603, exclusive of the drama. Prerequisite: EN 221. Credit, 3 hours.

419 The Age of Donne. English prose and poetry, 1603-1660, exclusive of Milton and the drama. Prerequisite: EN 221. Credit, 3 hours.

420 Renaissance Drama. Plays of Elizabethan, Jacobean, and Caroline dramatists, excluding Shakespeare. Prerequisite: EN 221 or DR 111. Credit, 3 hours.

421 Shakespeare: The Early Plays. Critical reading of the comedies, early tragedies, and selected history plays (1593-1602). Prerequisite: EN 221. Credit, 3 hours.

422 Shakespeare: The Later Plays. Critical reading of the mature tragedies, later comedies, and romances. Prerequisite: EN 221. Credit, 3 hours.

423 Milton. Life of Milton—his relation to the literary and social background of his period, and textual study of his chief works. Prerequisite: EN 221. Credit, 3 hours.

424 Chaucer. Chaucer's language, poetry and intellectual background. Prerequisite: EN 221. Credit, 3 hours.

425 Romantic Poetry. Poetry of Wordsworth, Coleridge, Shelley, Keats, Byron. Prerequisite: EN 222. Credit, 3 hours.

426 Victorian Poetry. Poetry of the second half of the century. Special study of Tennyson, Browning, Arnold. Prerequisite: EN 222. Credit, 3 hours.

427 Age of Johnson. Chief writers, movements, and books during Johnson's career as a dominating literary figure, together with their most important relationships to predecessors and followers. Prerequisite: EN 221. Credit, 3 hours.

428 Age of Satire. English satirists of the Restoration and early Eighteenth Century: Dryden, Pope, Swift, and others. Prerequisite: EN 221. Credit, 3 hours.

430 Nineteenth Century Prose. Romantic and Victorian prose, exclusive of the novel. Prerequisite: EN 222. Credit, 3 hours.

441 Contemporary American Drama. American drama since World War I, with special attention to experimental techniques. Prerequisite: Three hours of literature. Credit, 3 hours.

442 Contemporary British Poetry. British poetry of the Twentieth Century: techniques, aims, and significance. Prerequisite: Three hours of literature. Credit, 3 hours.

443 Contemporary American Poetry. American poetry of the Twentieth Century: techniques, aims, and significance. Prerequisite: Three hours of literature. Credit, 3 hours.

444 American Romanticism, 1830-60. Chief American transcendentalists and Romanticists. Prerequisite: EN 341 or 342. Credit, 3 hours.

445 American Realism, 1860-1900. Literary realism as expressed in the critical essay, short story, and poetry, with attention to European influences. Prerequisite: EN 341 or 342. Credit, 3 hours.

446 Twentieth Century American Novel. American novel since Dreiser. Prerequisite: Three hours of literature. Credit, 3 hours.

448 Twentieth Century British Novel. Twentieth Century British novel since 1914. Prerequisite: Three hours of literature. Credit, 3 hours.

451 The Novel to Jane Austen. From the origins of prose fiction through Scott. Prerequisite: EN 221. Credit, 3 hours.

452 The Nineteenth Century Novel. From Scott to Conrad. Prerequisite: EN 222. Credit, 3 hours.

453 The American Novel to Dreiser. Sentimental, romantic, realistic and naturalistic novels in America. Prerequisite: EN 341 or 342. Credit, 3 hours.

454 Modern Drama. Chief dramatic writers of the modern period, with special attention to experimental techniques. Prerequisite: Three hours of literature. Credit, 3 hours.

455 The Form of Verse: Theory and Practice. Types, history, criticism and schools of theory of metrical form. Analysis of lyric, narrative, and dramatic poetry. Original verse writing optional. Prerequisite: Three hours of literature. Two lectures, conferences arranged. Credit, 3 hours.

456 Classical Background of English Literature. Myths and legends of Greece and Rome and some of the works in which they appear. Prerequisite: Junior standing or approval of instructor. Credit, 2 hours.

460 Western Literature. A critical examination of the ideas and traditions of the literature of the western United States, including the novel. Prerequisite: Junior standing or approval of the instructor. Credit, 3 hours.

471 Literature for Junior and Senior High School Students. Prose and poetry which meet the interests, desires and capabilities of the high school boy and girl. Recent literature stressed. Prerequisite: EN 222. Credit, 3 hours.

480 Methods of Teaching English. Methods of instruction, organization, and presentation of appropriate content in English. Prerequisite: SE 311 or concurrently. Credit, 3 hours.

485 Teaching of English as a Second Language. Teaching of English to young persons and adults whose native language is not English. Nature of language learning, testing, analysis of differences between two languages as a basis of instruction. Problems of cultural orientation. Prerequisite: EN 312 or 314 or 413, and teaching experience or approval of the instructor. Credit, 3 hours.

491 Backgrounds of English Literature. Lectures and individual study in England, France, and Italy. Tour to be arranged. Credit, 3 hours.

500 Research Methods. Credit, 3 hours.

507 Old English. Elements of Old English grammar, with selected readings. Credit, 3 hours.

508 Beowulf. Intensive literary and linguistic study of Beowulf. Prerequisite: EN 507. Credit, 3 hours.

509 Middle English Language. A study of the language including the principal dialects, with selected readings. Credit, 3 hours.

510 The Structure of English. Analysis of the structural patterns of English from both the grammatical and linguistic points of view. Prerequisite: EN 314 or 413 or approval of instructor. Credit, 3 hours.

511 Theory and Practice of Rhetoric. Students will be required to demonstrate their grasp of stylistic theory by doing at least competent apprentice work in various assigned forms. Prerequisite: EN 510 or approval of department chairman. Credit, 3 hours.

512 The Teaching of Composition in the Secondary School. Advanced intensive study of rhetoric and linguistic materials appropriate for the teaching of composition, and their application to the development of new school programs. Prerequisite: EN 480 or equivalent or approval of instructor. Credit, 3 hours.

515 Middle English Literature. English literature from the Twelfth through the Fifteenth Century, exclusive of Chaucer. Credit, 3 hours.

520 Renaissance Literature. Poetry and prose of the English Renaissance, excluding drama. Prerequisite: EN 221. Credit, 3 hours.

522 Spenser. The poetry of Spenser with some attention to its influence on the following three centuries. Credit, 3 hours.

540 American Literature to 1815. Thought and expression from the time of the first English-speaking colonies to 1815. Prerequisite: EN 341 or approval of department chairman. Credit, 3 hours.

550 Contemporary Comparative Literature. Current trends in American and other literatures emphasizing their significance in contemporary thought. Credit, 3 hours.

571 The Teaching of Literature in the Secondary School. Advanced intensive study of methods and materials appropriate for the teaching of literature. Application of recent literary scholarship and criticism to the development of new school programs. Prerequisite: EN 471 or equivalent or approval of instructor. Credit, 3 hours.

572 The Teaching of Language in the Secondary School. Intensive study of methods and materials appropriate for teaching of the English language in the secondary school. Application of recent scholarship and research in linguistics and applied linguistics to the development of new school programs. Prerequisite: EN 312, 314 or 413, and teaching experience or permission of the instructor. Credit, 3 hours.

591 Seminar. Credit, 3 hours. Topics may be selected from the following:

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|---|---|
| (a) <i>Old English</i> | (i) <i>Techniques of the Novel</i> |
| (b) <i>Middle English</i> | (j) <i>Twentieth Century British and American Poetry</i> |
| (c) <i>Literary Criticism</i> | (k) <i>Drama</i> |
| (d) <i>Renaissance Poetry to 1600</i> | (l) <i>American Literature</i> |
| (e) <i>Seventeenth Century Literature</i> | (m) <i>American Poetry</i> |
| (f) <i>English Romanticism</i> | (n) <i>Nineteenth Century American Fictional Techniques</i> |
| (g) <i>Restoration and Eighteenth Century</i> | (o) <i>Contemporary Southern Writing</i> |
| (h) <i>Victorian Literature</i> | (p) <i>Composition for Graduate Assistants</i> |

Special Graduate Courses: 500, 590, 591, 592, 593, 600, 690, 691, 692, 700, 790, 791, 792, 799. (See page 219). Prerequisites for EN 590, 690, and 790: Approval of instructor, adviser, and department chairman. Secure forms in the Department of English Office.

FOREIGN LANGUAGES

PROFESSORS:

VAN SCOY (LL 403), BOWMAN, BUFFINGTON, ESCUDERO, GROBE,
GUERRA, LOWE, MARTINEZ, VON DER HEYDT, WIRTZ

ASSOCIATE PROFESSORS:

BININGER, CARLSON, COUCH, EKMANIS, FOSTER, LANDEIRA,
LUENOW, McINTIRE, RADKE

ASSISTANT PROFESSORS:

ACEVEDO, CARVER, CURRAN, DULLEY, HARRISON, KNOWLTON, LAETZ,
LAWYER, NIELSON, RANDOLPH, SIMMONS, VIRGILLO, WOLLAM

INSTRUCTORS:

ABDOW, ALARCON, SCHUBACK, WILSON

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Arts Degree Curriculum

CHINESE, FRENCH, GERMAN, RUSSIAN, SPANISH—Consists of 45 semester hours of credit, of which 30 must be in one language, and 15 in closely related fields to be approved by the adviser in consultation with the student. The 30 hours must be above the 102 level and include the 321, 322 courses. At least 18 semester hours must be in upper division courses.

ASIAN STUDIES EMPHASIS—Consists of the Bachelor of Arts Degree requirements in Chinese. At least 30 semester hours of the student's program must consist of Asian courses selected with approval of the department adviser. Basic Chinese and Japanese language courses may not be counted within this total.

LATIN AMERICAN STUDIES EMPHASIS—Consists of 45 semester hours of credit of which 30 must be in Spanish. The 15 hours of related fields must be in Latin American content courses in anthropology, economics, geography, history, political science, or Portuguese.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS**Bachelor of Arts in Education Degree Curriculum**

CHINESE, FRENCH, GERMAN, RUSSIAN, SPANISH—Consists of 45 semester hours of credit, of which 30 must be in one language, and 15 in closely related fields to be approved by the adviser in consultation with the student. The 30 hours must be above the 102 level and include the 321, 322 courses and FL 480.

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS (Secondary Education)

Consists of a minimum of 18 semester hours of credit in one foreign language, not including 101 and 102 courses. The minor ordinarily consists of 201-202, 311-312, and additional courses at the 300 and 400 level.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Foreign Languages offers programs leading to the degree of Master of Arts in French, German and Spanish and the Doctor of Philosophy degree in Spanish. Consult the *Graduate Catalog* for requirements.

PLACEMENT

Students who have high school credit in a foreign language and who plan to continue study here in the same language must take the departmental placement examination as a prerequisite to enrollment in such language courses. The examination should be taken immediately prior to the semester in which university study is begun. This examination will be offered during registration week before the fall and spring semesters. Those who wish to start their language study during the summer sessions are required to consult with a member of the departmental placement committee before registering for a language course.

For the purpose of pre-placement advisement, one year of high school language may be equated to one semester of university study. College transfers are not required to take the placement examination.

LANGUAGE LABORATORY REQUIREMENT

All students enrolled in 101, 102, 201, and 202 language courses must spend a minimum of one hour per week in the language laboratory in addition to the four regular class periods.

FOREIGN LANGUAGES

FL 100 Introduction to Foreign Languages. The significance of languages in society, including study of the history of language, family relationships existing among languages, word relationships, and meanings. Emphasis upon languages of Western Europe with some reference to Slavic, African and Oriental tongues. Credit, 2 hours.

400 Linguistics. Principles of descriptive and structural linguistics: phonology, morphology and syntax. Emphasis will be divided between theoretical and practical concepts. Open to sophomores and juniors with approval of instructor. Credit, 3 hours.

421 Directed Reading for Foreign Language Majors. Supervised reading with a weekly individual conference with instructor. Prerequisite: Six hours in upper division courses. Credit, 2 hours.

480 Methods of Teaching Foreign Languages. Theory and practice of teaching foreign languages and literatures at secondary and college levels. Student participation in

classroom demonstrations. Prerequisite: Twelve hours of upper division courses in one foreign language. Credit, 3 hours.

500 Research Methods. Required of all graduate students. Credit, 3 hours.

CHINESE

CN 101, 102 Elementary Chinese (Mandarin). Pronunciation, grammar, elementary conversation, development of basic reading and writing skills. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

201, 202 Intermediate Chinese (Mandarin). Systematic review of grammar. Development of vocabulary through reading, writing. Drill in aural/oral skills. Prerequisite: CN 102 or equivalent. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

311, 312 Advanced Chinese Conversation. Intensive aural/oral drills towards conversational fluency in Mandarin Chinese. Instruction is in Mandarin Chinese. Prerequisite: CN 202. Credit, 2 hours each semester.

313, 314 Advanced Chinese. Emphasis on the modern written language. Prerequisite: CN 202 or equivalent. Credit, 3 hours each semester.

321, 322 Chinese Literature in Translation. Broad view of Chinese literary development; selected representative works of the various genres and periods in translation. Credit, 3 hours each semester.

413, 414 Introduction to Literary Chinese. Readings in various genres of pre-Twentieth Century *wen-yen*, with analysis of its structural characteristics. Prerequisite: CN 314. Credit, 3 hours each semester.

FRENCH

FR 101, 102 Elementary French. Intensive aural/oral drill in class and laboratory, and a study of basic grammar supplemented by simple prose readings. Four lectures, 1 hour laboratory. Special reading knowledge sections are available for graduate students. Credit, 4 hours each semester.

201, 202 Intermediate French. Continued oral practice, grammar review, readings in modern French literature. Prerequisite: FR 102 or equivalent. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

311 French Conversation. Further practice in speaking French, emphasizing current usage and promoting facility in the expression of ideas. One hour laboratory work required. Prerequisite: FR 202 or approval of instructor. Credit, 3 hours.

312 French Composition. Further practice in writing French, emphasizing current usage and promoting facility in the expression of ideas. Prerequisite: FR 202 or approval of instructor. Credit, 3 hours.

321, 322 French Literature. Representative masterpieces and significant movements of French literature. Prerequisite: FR 202 or approval of instructor. Credit, 3 hours each semester.

410 French Phonetics and Diction. Theory and practical application. Prerequisites: FR 311, 312 or approval of instructor. Credit, 2 hours.

411 Advanced Spoken French. Improvement of spoken French. Prerequisites: FR 311, 312 or approval of instructor. Credit, 3 hours.

412 Advanced Written French. Improvement of composition skills. Prerequisites: FR 311, 312, or approval of instructor. Credit, 3 hours.

415 French Civilization. Political, intellectual, social, economic and artistic development of the French nation from its origins to the present. Prerequisite: Six hours of upper division French. Credit, 3 hours.

441 French Literature of the Seventeenth Century. From 1600 to 1660. Prerequisite: FR 322. Credit, 3 hours.

442 French Literature of the Seventeenth Century. From 1660 to 1700. Prerequisite: FR 322. Credit, 3 hours.

445 French Literature of the Eighteenth Century. Contributions of the *philosophies*, the development of the novel and drama. Prerequisite: FR 322 or approval of instructor. Credit, 3 hours.

- 451 French Literature of the Nineteenth Century.** From 1800 to 1850. Prerequisite: FR 322. Credit, 3 hours.
- 452 French Literature of the Nineteenth Century.** From 1850 to 1900. Prerequisite: FR 322. Credit, 3 hours.
- 461 Twentieth Century French Drama.** Developments in contemporary French theater, including the surrealist theater and the theater of the absurd. Prerequisite: FR 322. Credit, 3 hours.
- 462 Twentieth Century Prose Literature.** Techniques and philosophy of the contemporary novel, studies in the modern essay. Prerequisite: FR 322. Credit, 3 hours.
- 511 French Stylistics.** Art of writing literary French, comparative stylistics. Credit, 3 hours.
- 515 Intellectual Currents in France, Sixteenth—Nineteenth Centuries.** Selected works of fiction and non-fiction significant for the understanding of key problems and concerns in French thought and letters. Credit, 3 hours.
- 516 Contemporary French Thought.** Study of major social, aesthetic, philosophic and scientific ideas as presented by major contemporary writers of fiction and non-fiction. Credit, 3 hours.
- 521 History of the French Language.** Principal phonological, morphological, and semantic developments of French from its Latin origins to the present. Prerequisite: Some familiarity with Latin recommended. Credit, 3 hours.
- 523 History of the French Drama.** From its origins to Romanticism, with special emphasis on the classical period. Credit, 3 hours.
- 524 Modern French Drama.** Representative dramatists of the Nineteenth and Twentieth centuries. Credit, 3 hours.
- 525, 526 History of the French Novel.** From its beginnings to the present. Credit, 3 hours each semester.
- 527 History of French Poetry.** From the Middle Ages to 1900. Credit, 3 hours.
- 528 History of French Poetry.** From 1900 to the present. Credit, 3 hours.
- 531 Medieval French Literature.** Readings in the epic, early drama, *roman courtois* and other representative literary genres of the Middle Ages. Prerequisite: Some familiarity with Old French recommended. Credit, 3 hours.
- 535 French Literature of the Sixteenth Century.** Readings in French Renaissance literature with special attention in the humanist movement and to Rabelais, Montaigne and the Pleiade. Credit, 3 hours.
- 591 Seminar.** Credit, 3 hours. Topics may be selected from the following:
- | | |
|---|---|
| (a) <i>French Literary Criticism</i> | (f) <i>Proust</i> |
| (b) <i>Corneille, Moliere and Racine</i> | (g) <i>Realism and Naturalism</i> |
| (c) <i>Diderot, Voltaire and Rousseau</i> | (h) <i>French Existentialist Literature</i> |
| (d) <i>Balzac</i> | (i) <i>Advanced Problems in French Literature</i> |
| (e) <i>Romanticism</i> | |

GERMAN

- GR 101, 102 Elementary German.** Emphasis on pronunciation, conversation, grammar and reading. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.
- 201, 202 Intermediate German.** Intensive review of grammar, increased emphasis on conversation; readings in contemporary prose. Prerequisite: GR 102 or equivalent. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.
- 311, 312 German Conversation.** Expansion of idiom through oral practice dealing with contemporary articles, essays and stories. Prerequisite: GR 202 or equivalent. Credit, 2 hours each semester.
- 313 German Composition.** Intensive practice in writing with emphasis on style and grammar. Prerequisite: GR 202 or equivalent. Credit, 2 hours.
- 314 Introduction to German Literature.** Beginning study of German poetry, drama, the novel and the Novelle. Prerequisite: GR 313 or equivalent. Credit, 2 hours.
- 321, 322 German Literature.** Masterpieces of significant movements of German literature from the beginning to the present. Prerequisite: GR 314 or approval of instructor. Credit, 3 hours each semester.

411 Advanced German Grammar and Conversation. Improvement of diction and idiom through intense oral review. Prerequisite: GR 312. Credit, 3 hours.

412 Advanced German Composition. Improvement of writing ability. Prerequisite: GR 313. Credit, 3 hours.

445 Literary Trends of the Late Eighteenth Century. Literary trends of the Eighteenth Century with emphasis on Lessing, Wieland, Klopstock, Schiller, Goethe, and Herder. Prerequisite: GR 322. Credit, 3 hours.

451 Realism. Works of representative writers of the Nineteenth Century. Prerequisite: GR 322. Credit, 3 hours.

455 German Poetry. Major trends in German poetry with emphasis on the writers of the Eighteenth, Nineteenth and Twentieth centuries. Prerequisite: GR 322. Credit, 3 hours.

461 Contemporary German Literature. Naturalism to the present. Prerequisite: GR 322. Credit, 3 hours.

511 German Stylistics. Art of writing literary German, comparative stylistics. Credit, 3 hours.

521 History of the German Language. Linguistic development of German from the earliest records to the present. Credit, 3 hours.

523 German Drama. Drama of the Nineteenth and Twentieth centuries. Credit, 3 hours.

525 German Novel. Special studies in the German novel. Credit, 3 hours.

527 The "Novelle." Special studies in the German short story. Credit, 3 hours.

531 Middle High German Language and Literature. Reading and discussion of specimens of Middle High German epics, romances, and other literary genres. Credit, 3 hours.

535 Renaissance and Reformation. Literary, historical, and religious problems of the "Age of Luther." Credit, 3 hours.

541 Baroque. Studies in the poetry, prose, and drama of the Seventeenth and early Eighteenth centuries. Credit, 3 hours.

545 Goethe's "Faust." Background and genesis of the Faust tradition with readings and interpretation of the text. Credit, 3 hours.

551 Romanticism. Treatment of early and late Romanticism. Credit, 3 hours.

591 Seminar. Credit, 3 hours. Topics may be selected from the following:

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|--------------------|---------------------|----------------------|
| (a) <i>Lessing</i> | (c) <i>Schiller</i> | (e) <i>Hauptmann</i> |
| (b) <i>Goethe</i> | (d) <i>Mann</i> | (f) <i>Kleist</i> |
| | | (g) <i>Hebbel</i> |

GREEK

GK 101, 102 Elementary Greek. For beginning students only. Credit, 4 hours each semester.

201, 202 Intermediate Greek. Plato's *Apology* and *Crito*; selections from the speeches of *Lysias* or from Homer's *Iliad* and *Odyssey*. Prerequisite: GK 102. Credit, 4 hours each semester.

301, 302 Greek Literature. Readings in the masterpieces of classical Greek literature; advanced grammar. Authors are changed each year in accordance with needs of the class. May be repeated for credit. Prerequisite: Approval of instructor. Credit, 3 hours each semester.

ITALIAN

IT 101, 102 Elementary Italian. Aural/oral drill in class and laboratory, and basic grammar supplemented by simple prose readings. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

201, 202 Intermediate Italian. Intensive review of the fundamentals of Italian grammatical structure to increase the student's ability in composition, translation and idiomatic expression. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

311, 312 Italian Composition and Conversation. Development of writing ability and oral expression. Prerequisite: IT 202 or equivalent. Credit, 3 hours each semester.

JAPANESE

JN 101, 102 Elementary Japanese. Pronunciation, conversation and structural grammar with intensive aural/oral drill in class and laboratory. Graduated introduction of basic reading and writing skills. Credit, 4 hours each semester.

201, 202 Intermediate Japanese. Grammar review and continued oral practice. Increased emphasis on reading and writing. Prerequisite: JN 102 or equivalent. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

LATIN

LA 101, 102 Elementary Latin. For beginning students only. Credit, 4 hours each semester.

201, 202 Intermediate Latin. A selective survey of Latin literature both classical and post-classical; Virgil's *Aeneid*; advanced grammar. Prerequisite: LA 102 or approval of instructor. Credit, 4 hours each semester.

321, 322 Roman Literature. Representative masterpieces of Roman literature from the earliest extant works through the literature of the Augustan Age. Prerequisite: LA 202 or approval of instructor. Credit, 3 hours each semester.

421, 422 Roman Literature. Readings in the Latin masterpieces. The authors read change each year in accordance with the needs of the class. May be repeated for credit. Prerequisite: Approval of instructor. Credit, 3 hours each semester.

PORTUGUESE

PG 101, 102 Elementary Portuguese. Basic grammar with intensive drill in class and laboratory directed toward conversational fluency. Five lectures, 1 hour laboratory. Credit, 5 hours each semester.

211, 212 Portuguese Composition and Conversation. Practice in writing and speaking Portuguese, emphasizing current usage. Reports and compositions on current topics, history and culture of Brazil and Portugal. Prerequisite: PG 102 or equivalent. Credit, 3 hours each semester.

313, 314 Advanced Portuguese Composition and Conversation. Designed to develop skill in written Portuguese and correct oral expression. Prerequisite: Approval of the instructor. Credit, 3 hours each semester.

321, 322 Luso-Brazilian Literature. Representative masterpieces of Portuguese and Brazilian literature from the beginning to the present. Prerequisite: PG 212 or equivalent. Credit, 3 hours each semester.

441 Nineteenth Century Brazilian Prose. Prose fiction and non-fiction with emphasis on the novel. Prerequisite: PG 314 or approval of instructor. Credit, 3 hours.

449 Twentieth Century Portuguese Poetry. Major trends in both Brazilian and Lusitanian poetry. Prerequisite: PG 314 or approval of instructor. Credit, 3 hours.

450 Twentieth Century Brazilian Drama. Development of Brazilian dramatic literature from 1900 to the present. Prerequisite: PG 314 or approval of instructor. Credit, 3 hours.

451 Twentieth Century Brazilian Prose. Prose fiction and non-fiction from 1900 to the present. Prerequisite: PG 314 or approval of instructor. Credit, 3 hours.

RUSSIAN

RU 101, 102 Elementary Russian. Structural grammar and basic vocabulary. Introduction and reinforcement of aural/oral reading and writing skills. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

201, 202 Intermediate Russian. Systematic review of grammar. Development of vocabulary through reading, writing. Drill in aural/oral skills. Prerequisite: RU 102 or equivalent. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

211, 212 Basic Russian Conversation. Intensive aural/oral drill to supplement reading and grammatical skills acquired in RU 101, 102, 201 and 202. Required of Russian majors. Prerequisite: RU 102. Credit, 3 hours each semester.

303, 304 Scientific Russian. Acquisition of scientific vocabulary through reading from current Soviet scientific publications. Prerequisite: RU 102. Credit, 3 hours each semester.

311, 312 Russian Composition and Conversation. Development of writing ability and oral expression. Prerequisite: RU 202. Credit, 3 hours each semester.

321, 322 Russian Literature. The most significant works, authors, and literary movements of Russian and Soviet literature. Prerequisite: RU 202. Credit, 3 hours each semester.

411, 412 Advanced Composition and Conversation. Designed to improve aural discrimination, self-expression in oral and written skills, with special emphasis on vocabulary building. Subject materials drawn from current Soviet publications. Prerequisite: RU 312. Credit, 3 hours each semester.

417, 418 Applied Russian Phonetics. General improvement in the student's language skills through aural/oral training in Russian phonology and an analysis of Russian orthography. Prerequisite: RU 312. Credit, 2 hours each semester.

421 Pushkin. Pushkin's poetry, plays and prose fiction, including *Eugene Onegin*, the "Little Tragedies," *Tales of Belkin*, *Queen of Spades* and the *Captain's Daughter*. Prerequisite: RU 312 or approval of instructor. Credit, 3 hours.

422 History of Russian Drama and Theater. Development of Russian drama and theater from its beginning to the present. Prerequisite: RU 312 or approval of instructor. Credit, 3 hours.

423 Dostoyevsky. Dostoyevsky's major works of fiction, including *Crime and Punishment* and *Brothers Karamazov*. Prerequisite: RU 312 or approval of instructor. Credit, 3 hours.

424 Tolstoy. Tolstoy's major works, including *War and Peace* and *Anna Karenina*. Prerequisite: RU 312 or approval of instructor. Credit, 3 hours.

425 Chekhov. Chekhov's major works, representative short stories and major plays, including *Cherry Orchard* and *Three Sisters*. Prerequisite: RU 312 or approval of instructor. Credit, 3 hours.

426 Soviet Literature. Development of Soviet literature (1917 to present) through representative authors and works, including Gorky, Sholokhov, Pasternak and Yev-tushenko. Prerequisite: RU 312 or approval of instructor. Credit, 3 hours.

440 History of the Russian Language. Linguistic evolution of the Russian language from Old Church Slavonic to present. Prerequisite: RU 312 or approval of instructor. Credit, 3 hours.

441 Survey of Russian Culture. The interplay of artistic, social and political forces in the development of Russian culture from the Kievan period to the present. Exclusive use of Russian language source materials. Prerequisite: RU 312 or approval of instructor. Credit, 3 hours.

591 Seminar. Credit, 3 hours. Topics may be selected from the following:

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| (a) <i>Pre-Nineteenth Century Russian Literature</i> | (d) <i>Russian Poetry, 1890 to Present</i> |
| (b) <i>Nineteenth Century Russian Literature</i> | (e) <i>Russian Literary Criticism</i> |
| (c) <i>Russian Poetry to 1890</i> | (f) <i>Soviet Socialism Realism</i> |
| | (g) <i>Contemporary Soviet Authors</i> |

SPANISH

SP 101, 102 Elementary Spanish. Basic fundamentals of the language. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

201, 202 Intermediate Spanish. Intensive review of fundamentals plus composition, reading and conversation. Prerequisite: SP 102. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

311, 312 Spanish Conversation. Designed to promote facility in coherent and expressive diction in Spanish. Prerequisite: SP 202 or equivalent. Credit, 3 hours each semester.

313, 314 Spanish Composition. Designed to develop skill and accuracy in written Spanish. Special emphasis on structure and form. Prerequisite: SP 202 or equivalent. Credit, 3 hours each semester.

- 321, 322 Spanish Literature.** Spanish literature from its beginnings to the present with some emphasis on the evolution of Spanish thought and literary ideals. Prerequisite: SP 202 or approval of instructor. Credit, 3 hours each semester.
- 413 Advanced Spanish Grammar.** Intensive analysis of the structure of the Spanish language. Recommended for teaching majors or minors. Prerequisite: SP 312 or approval of instructor. Credit, 3 hours.
- 417 Spanish Phonetics.** Pronunciation and articulation of the Spanish language. Emphasis on problems of articulation in the Spanish-speaking Southwest. Prerequisite: Three semesters of any 300 level courses in Spanish. Credit, 3 hours.
- 427, 428 Spanish-American Literature.** Significant literature and writers from the colonial period to the present. Prerequisite: SP 322. Credit, 3 hours each semester.
- 429 Poetry of the Golden Age.** Prosody and the poetic schools and genres of the Golden Age. Prerequisite: SP 322. Credit, 3 hours.
- 430 Drama of the Golden Age.** Dramatic works of Lope de Vega, Calderon de la Barca and their contemporaries. Prerequisite: SP 322. Credit, 3 hours.
- 431 Prose of the Golden Age.** Prose fiction and non-fiction of the Golden Age, exclusive of prose drama and with special attention to the forms of the novel. Prerequisite: SP 322. Credit, 3 hours.
- 439 Nineteenth Century Poetry.** Poetic schools and prosody of the Nineteenth Century. Prerequisite: SP 322. Credit, 3 hours.
- 440 Nineteenth Century Drama.** Chief dramatists and movements of the Nineteenth Century. Prerequisite: SP 322. Credit, 3 hours.
- 441 Nineteenth Century Prose.** Prose fiction and non-fiction of the Nineteenth Century with emphasis on the novel. Prerequisite: SP 322. Credit, 3 hours.
- 443 Life and Works of Cervantes.** Life and works of Cervantes with emphasis on *Don Quixote*. Lectures, readings and a term paper. Prerequisite: Twelve hours in upper division courses. Credit, 3 hours.
- 449 Twentieth Century Poetry.** Major trends in Spanish poetry from the Generation of 1898 to the Civil War. Prerequisite: SP 322. Credit, 3 hours.
- 450 Twentieth Century Drama.** Development of Spanish dramatic literature from the Generation of 1898 to the Civil War. Prerequisite: SP 322. Credit, 3 hours.
- 451 Twentieth Century Prose.** Prose fiction and non-fiction, exclusive of the drama, from the Generation of 1898 to the Civil War. Prerequisite: SP 322. Credit, 3 hours.
- 460 The Latin-American Novel.** Nineteenth and Twentieth Century novel in Latin America, emphasizing the contemporary. Prerequisite: SP 322. Credit, 3 hours.
- 472 Spanish-American Civilization.** The people, growth of their institutions and culture, and aspirations of their great men. Credit, 3 hours.
- 473 Spanish Civilization.** Political, intellectual, social, economic and artistic development of the Spanish nation from its origins to the present. Prerequisite: SP 322. Credit, 3 hours.
- 485, 486 Spanish for Elementary Teachers.** Designed for teachers interested in introducing the teaching of Spanish in the elementary grades. Emphasizes the fundamentals of Spanish, integrating the techniques of teaching at the elementary level. Credit, 3 hours each semester.
- 511 Spanish Stylistics.** Art of writing literary Spanish, comparative stylistics. Credit, 3 hours.
- 520 Contemporary Spanish Poetry.** Major works of post-Civil War Spanish poetry. Credit, 3 hours.
- 521 Contemporary Spanish Novel.** Major works of post-Civil War Spanish fiction. Credit, 3 hours.
- 522 Contemporary Spanish Drama.** Major works of Spanish drama during the last 30 years. Credit, 3 hours.
- 530 Contemporary Spanish-American Novel.** Major works of Spanish-American fiction since the Second World War. Credit, 3 hours.
- 531 Contemporary Spanish-American Poetry.** Major works of Spanish-American poetry since the Second World War. Credit, 3 hours.

540 History of the Spanish Language. Linguistic development of the Spanish language from the epoch of Vulgar Latin to the present day. Credit, 3 hours.

545 Concepts of Literary Criticism. Aims and methods of modern literary scholarship. Discussion of major theories of literary analysis. Credit, 3 hours.

591 Seminar. Credit, 3 hours. Topics may be selected from the following:

- (a) *Medieval Spanish Literature*
- (b) *Renaissance Spanish Literature*
- (c) *Baroque Spanish Literature*
- (d) *Eighteenth Century Spanish Literature*
- (e) *Nineteenth Century Spanish Literature*
- (f) *Twentieth Century Spanish Literature*
- (g) *Colonial Spanish-American Literature*
- (h) *Nineteenth Century Spanish-American Literature*
- (i) *Twentieth Century Spanish-American Literature*
- (j) *National Spanish-American Literature*

Special Graduate Courses: 500, 590, 591, 592, 593, 600, 690, 691, 692, 700, 790, 791, 799. (See page 219.) Prerequisites for SP 590, 690, 790: Approval of instructor, adviser, and department chairman. Secure forms in the Foreign Languages Office.

GEOGRAPHY

PROFESSORS:

LOUNSBURY (OBA 209), BAKER, HARING, HOLMES, RENNER

ASSOCIATE PROFESSOR:

WAGSTAFF

ASSISTANT PROFESSORS:

ALDRICH, FROST, HENKEL, MAXWELL

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Arts Degree Curriculum

GEOGRAPHY — Consists of 45 semester hours of credit, of which 30 must be in geography, and the remainder of the 45 hours in approved related fields selected in consultation with the adviser.

The following courses must be included in the major: GC 121, GP 211, 271, 371, and 491. Work in the systematic fields should be included in the major. No more than nine hours of regional courses may count toward a major. GP 111 must be taken but will not count toward a major. At least 18 semester hours must be in upper division courses.

Bachelor of Science Degree Curriculum

GEOGRAPHY — Consists of 45 semester hours of credit, of which at least 30 must be in geography. Courses in approved closely related fields will be selected, in consultation with the adviser, to make up the rest of the work.

The following courses must be included in the major: GC 121, GP 211, 271, and 491. Work in the systematic fields should be included in the major. No more than nine hours of regional courses may count toward the minimum of 30 semester hours in the major. GP 111 must be taken

but will not count toward the major. A minimum of 18 semester hours must be in upper division courses.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS

Bachelor of Arts in Education Degree Curriculum

GEOGRAPHY — Consists of 45 semester hours of credit, of which a minimum of 24 must be in geography and 18 in a related teaching field or fields. The following courses are required: GP 111 or 411, GC 121 and 480.

Departmental minor teaching field requirements (Elementary and Secondary Education) consists of a minimum of 18 semester hours of credit. Courses GP 111 or 411 and GC 121 and 480 are required. The remaining hours are to be selected in consultation with an adviser.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Geography offers programs leading to the degree of Master of Arts. Consult the *Graduate Catalog* for requirements.

CULTURAL GEOGRAPHY

GC 121 World Geography. Description and analysis of areal variations in social, economic and political phenomena in major world regions. Credit, 4 hours.

241 Economic Geography. Production, distribution, and consumption of various types of commodities of the world and relationships to the activities of man. Credit, 3 hours.

321 Geography of Arizona. Landscape features, climate, soils, minerals, water resources, plant and animal life, and industries, and their influence on man's activities. Credit, 3 hours.

322 Geography of Anglo-America. Physical, social and economic characteristics of the geographic regions in the United States and Canada. Credit, 3 hours.

325 Geography of Europe. Spatial patterns of human and environmental phenomena, emphasizing cultural, historical, and political geography. Recommended for social studies teachers and students of European history. Credit, 3 hours.

327 Geography of Africa. Geographic study of the continent with emphasis on current political and economic developments. Credit, 3 hours.

328 Geography of the Near East. Physical and cultural analysis of the Near East with emphasis on current political and economic developments. Credit, 3 hours.

332 Geography of Australia and Oceania. Physical and cultural analysis of the islands of the Pacific, including New Zealand and Australia. Credit, 3 hours.

351 Political Geography. The relationship between the social-physical environment and the state. Credit, 3 hours.

361 Urban Geography. External spatial relations of cities, internal city structure, and spatial aspects of urban problems in various parts of the world, particularly in the United States. Credit, 3 hours.

381 Conservation of Natural Resources. Nature and distribution of natural resources and the problems and principles associated with their use. Credit, 3 hours.

390 Geographic Literature. Current publications in geography; authors, trends of research, and sources. Prerequisite: Approval of instructor. Credit, 2 hours.

401 Cultural Geography. Cultural patterns, including such phenomena as language, religion, and various aspects of material culture. Origins and diffusion and division of the world into culture areas. Prerequisites: GC 121 and nine additional hours of geography or approval of instructor. Credit, 3 hours.

402 Topics in Cultural Geography. Special topics in economic, social, historical, and political geography. Open to students qualified to pursue independent studies. Prerequisite: Approval of instructor. Credit, 1-3 hours.

423 Geography of South America. Physiographic regions, their climates, products, and human activities. Credit, 3 hours.

424 Geography of Middle America. Lands and peoples of the islands of the Caribbean, Central America, and Mexico. Credit, 3 hours.

426 Geography of the Soviet Union. Physical setting and culture groups of the U.S.S.R.; analysis of the Soviet economy; current international affairs, military potential, and comparisons with the U.S.A. Credit, 3 hours.

429 Geography of Southern and Southeast Asia. The Indic culture world, with focus on the physical and cultural geography of India, Pakistan, and Southeast Asia. Credit, 3 hours.

431 Geography of the Far East. Geographic study of China, Japan, Korea, Taiwan, and the Philippines, emphasizing culture groups and current political and economic developments. Credit, 3 hours.

441 Economic Geography. Patterns of production, exchange, and consumption of the various types of commodities of the world by man and the relationships of these patterns of economic activity phenomena. Prerequisite: GC 241. Credit, 3 hours.

442 Geography of Trade and Transportation. Geographic analysis of the world's trade routes by land, sea, and air. Prerequisite: GP 111 or GC 241. Credit, 3 hours.

451 Political Geography. Application of the principles of geography to the spatial aspects of politics and the state. Prerequisite: GC 351. Credit, 3 hours.

452 Military Geography. Geographic principles in the analysis of military power, planning, supply, and strategy. Credit, 2 hours.

455 Historical Geography of Anglo-America. Changing geography of the United States and Canada from pre-Columbian times to about 1900. Attention is concentrated on evolving economic patterns. Recommended for social studies teachers and students of American history. Credit, 3 hours.

480 Methods of Teaching Geography. Methods of organization and presentation of appropriate content in geography. Prerequisites: SE 311 or concurrently and 18 hours of geography or approval of instructor. Credit, 3 hours.

495 Quantitative Methods in Geography. Use of selected mathematical and statistical techniques in geographic problem solving. Prerequisite: General statistics course or approval of instructor. Credit, 3 hours.

496 History of Geographic Thought. Development of geographic thought from Strabo and Herodotus to Humboldt and Ritter. Credit, 2 hours.

591 Seminar. Credit, 3 hours. Topics may be selected from the following:

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| (a) <i>Political Geography</i> | (c) <i>Economic Geography</i> |
| (b) <i>Quantitative Methodology in Geography</i> | (d) <i>Urban Geography</i> |
| | (e) <i>Social Geography</i> |

PHYSICAL GEOGRAPHY

GP 111 Physical Elements of Geography. Analysis of the spatial and functional relationships among climates, land forms, soils, water, plants, and animal life. Three lectures, 3 hours laboratory. Credit, 4 hours.

211 Introduction to Landforms. Introductory analysis of the geographic characteristics of the major types of landforms, stressing areal association by the use of maps. Prerequisite: GP 111. Two lectures, 3 hours laboratory. Credit, 3 hours.

212 Meteorology. Weather elements, meteorological instruments, weather maps, forecasting and their relation to activities of man. Prerequisite: GP 111. Credit, 3 hours.

271 Maps and Map Reading. Techniques of interpretation of the many types of maps, map projections, and history of mapping. Prerequisite: GP 111. Credit, 3 hours.

312 Climatology. Principles of climate; attention to climatic regions and climate cycles. Prerequisites: GP 111 and 212. Credit, 3 hours.

333 Physical Geography of the Polar Lands. Regional study of advantages and limitations of the natural environment upon present and future problems involving resource distribution, human activities, and regional and interregional adjustments. Credit, 3 hours.

371 Cartography. Basic map drafting, grid compilation, simple design, and use of cartographic instruments. Prerequisites: GP 111, 271. Four hours laboratory. Credit, 3 hours.

372 Air Photo Interpretation. Aerial photographs as a means of determining topography, vegetation, and culture; scale, use of index, vertical and oblique photographs, and stereoscopes. Prerequisites: GP 111, 211. Credit, 3 hours.

403 Topics in Physical Geography. Special topics in physical geography. Open to students qualified to pursue independent studies. Prerequisite: Approval of instructor. Credit, 1-3 hours.

411 Physical Geography. Basic introduction to physiography and the physical elements of the environment. Open only to students who have not taken GP 111. Credit, 3 hours.

413 Oceanography. Marine relief, topography, water masses, currents, isohalines, isotherms, biotic environment, marine geochemistry, marine sedimentation as factors in the geography of the oceans. Prerequisites: GP 111; CH 111 or PH 101 or equivalent. Credit, 3 hours.

471 Cartography. Map compilation, design, scribing, color selection, and reproduction. Prerequisite: GP 371. Four hours laboratory. Credit, 3 hours.

491 Field Studies in Geography. Systematic cataloging, mapping and analysis of geographic phenomena by means of actual field work. Written report required. Prerequisite: Approval of instructor. Credit, 3-6 hours.

591 Seminar. Credit, 3 hours. Topics may be selected from the following:

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|--------------------------------------|-------------------------------------|
| (a) <i>Physical Geography</i> | (d) <i>Air Photo Interpretation</i> |
| (b) <i>Landforms</i> | (e) <i>Field Studies</i> |
| (c) <i>Meteorology - Climatology</i> | |

GEOLOGY

PROFESSORS:

PÉWÉ (Ag. 142), MILLER

ASSOCIATE PROFESSORS:

BUSECK, LUNDIN, MOORE, RAGAN

ASSISTANT PROFESSORS:

ROYSE, SHERIDAN

VISITING PROFESSOR:

FISHER

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Arts Degree Curriculum

GEOLOGY — Consists of 45 semester hours. Courses GL 100 or 111 or 311, 102, 310, 313, 321, 323, 324, and 335 or their equivalents are required. The additional courses necessary to complete the major will be approved by the student's adviser. GL 480, 483, 485 and 486 do not fulfill the requirements for a major. Supporting required courses in related fields: CH 113, 115; PH 111, 112; MA 118, 226.

Bachelor of Science Degree Curriculum

GEOLOGY — Consists of 45 semester hours plus a summer geology field course. The following general basic courses, or their equivalents, are

required: GL 100 or 111 or 311, 102, 310, 321, 323, 324, 335, and 450. An approved summer geology field course for six or more credits is also required. To complete the major, four courses, totaling 12 credits from the following list are required: GL 313, 436, 451, 461, 465, 472, 475, 481; MA 226 or equivalent, MA 212, CH 341 or 441 and CE 450. In addition, six credits must be obtained which may include any other course in geology or in an allied field (science). GL 480, 483, 485, and 486 do not fulfill the requirements of a major. Supporting courses required in related fields are: CH 113, 115; PH 111, 112 (PH 115, 116 recommended, but PH 111, 112 acceptable); MA 120, 121. One semester of approved biological science also is required (BO 100 or ZO 100, or ZO 250). One year of a foreign language is required: French, German or Russian.

Bachelor of Arts in Education Degree Curriculum Departmental Teaching Minor

Eighteen semester hours will be selected from courses below. The following courses or their equivalent are recommended for a teaching minor in Geology (Earth Science): GL 100 or 111, GL 102, 480. Any of the following courses or their equivalent may be used to complete a minor in Geology (Earth Science): GL 310, 313, 321, 323, 324, 335, 423, 450 and 451. Any substitutions for the above courses must be approved by the adviser.

Departmental Teaching Major

GEOLOGY — Consists of 45 semester hours of credit. The following courses in geology or their equivalents are required: GL 100 or 111, 102, 310, 313, 321, 323, 335, and 480. Additional courses and substitutions that are necessary to complete the major will be selected from geology and closely related fields and approved by the student's adviser. Supporting courses required in related fields are: CH 113, 114; PH 111; MA 118.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Geology offers programs leading to the degree Master of Science. Consult the *Graduate Catalog* for requirements.

GEOLOGY

GL 100 Physical Geology. Basic principles of geology. Geology, geochemistry, and geophysics in relation to materials and processes acting upon and within the earth's crust. Rocks, minerals, weathering, earthquakes, mountain building processes, volcanoes, running water, ground water, and glaciers. Aims to stimulate student's interest in the geological aspects of the environment in which he will spend his life. Three lectures, 3 hours laboratory, field trips. Credit, 4 hours.

102 Historical Geology. History of the earth from its earliest stages to the present; sequence of geologic events and processes; succession of life forms; dating methods and meaning of time. Laboratory work includes reconstruction of geologic history with geologic maps and structure sections. Plant and animal life throughout geologic time is reviewed. Prerequisite: GL 100 or 111. Three lectures, 3 hours laboratory, field trips. Credit, 4 hours.

111 General Geology. Non-laboratory introduction to physical and historical geology. The earth, its origin, processes that affect it, sequence of events in its evolution and succession of life upon it; appreciation of the development of the physical landscape. GL 100 and 111 may not both be taken for credit. Field trips. Credit, 4 hours.

300 Volcanology. Distribution of past and present volcanism, types of volcanic activity, mechanism of eruption, form and structure of volcanoes, geochemistry of

volcanic activity. Prerequisites: GL 100, CH 113. Two lectures, 3 hours laboratory, field trips. Credit 3 hours.

310 Structural Geology. Introduction to the mathematical description of finite strain and stress. Application of mechanical principles to the processes and results of rock deformation. Geometrical techniques used in describing structures and solving problems. Prerequisites: GL 100 or 311. Two lectures, 3 hours laboratory, field trips. Credit, 3 hours.

311 Geology for Engineers. Physical geology emphasizing structural geology, ground water, soil genesis, and relation of geology to engineering problems. Laboratory exercises include rock and mineral identification, and interpretation of aerial photographs and geologic and topographic maps. Prerequisite: CH 114. Two lectures, 3 hours laboratory, field trips. Credit, 3 hours.

313 Geomorphology. Land forms and processes which create and modify them. Laboratory and field study of physiographic features. Prerequisites: GL 100, 310; 324 or concurrent enrollment. Two lectures, 3 hours laboratory, field trips. Credit, 3 hours.

321 Mineralogy. Crystallography, crystal chemistry and crystal physics as applied to minerals; origin and occurrence of minerals; introduction to X-ray technique. Prerequisites: MA 118, CH 115 or concurrent enrollment. Geology majors must enroll in GL 323 concurrently. Three lectures. Credit, 3 hours.

323 Mineralogy Laboratory. Techniques in determinative mineralogy and crystallography; hand specimen study. Corequisite: GL 321. Six hours laboratory, field trips. Credit, 2 hours.

324 Petrology-Petrography. Theoretical and laboratory study of the origin and classification of igneous and metamorphic rocks. Optical mineralogy. Hand specimen and thin section study of rocks. Prerequisites: GL 321, 323; CH 113. Three lectures, 6 hours laboratory, field trips. Credit, 5 hours.

335 Invertebrate Paleontology. Structure and evolutionary development of fossil invertebrates with emphasis on morphology of skeletal parts and the application of paleontology to stratigraphic problems. Prerequisites: GL 102; ZO 100 or 250 or BO 100. Two lectures, 6 hours laboratory, field trips. Credit, 4 hours.

400 Geology Colloquium. Presentation of recent research by geology juniors, seniors, graduate students, faculty members, and invited guests. Required each semester of all junior, senior, and graduate geology majors. May be repeated for credit. Credit, 1 hour.

419 Field Geology. Field techniques, including description and measurement of stratigraphic sections, solution of geologic problems, aerial mapping, and plane table surveying. Held on Saturdays in central Arizona. Prerequisite: GL 310 or approval of instructor. Credit, 3 hours.

436 Micropaleontology. Classification, morphology, and paleoecology of microscopic organisms. Prerequisite: GL 335. Two lectures, 3 hours laboratory, field trips. Credit, 3 hours.

450 Sedimentology. Origin, transport, deposition and diagenesis of sediments and sedimentary rocks. Physical and chemical analysis and interpretation of processes affecting sedimentary environments and their products. Prerequisites: GL 102, 321, and 323. Two lectures, 3 hours laboratory, field trips. Credit, 3 hours.

451 Stratigraphy. Sources of sediments, depositional environments and the principles in delimiting, correlating, and naming of stratigraphic units. Prerequisites: GL 102, 335, 450. Three lectures, field trips. Credit, 3 hours.

460 Topics in Geology. Special topics in petrology, optical mineralogy, economic geology, geochemistry, petroleum geology, regional geology, geomorphology, paleontology, stratigraphy, and sedimentology. Open to qualified students. Prerequisite: Approval of instructor. Credit, 1-3 hours.

461 Ore Deposits. Origin, occurrence, structure, and mineralogy of ore deposits. Prerequisites: GL 321, 323 and 324. Two lectures, 3 hours laboratory, field trips. Credit, 3 hours.

465 Geophysics. A survey of solid earth geophysics; geomagnetism, gravity, seismology, heat flows. Scheme of the earth, emphasizing the crust and upper mantle. Prerequisites: GL 100 or 311, PH 112, or approval of instructor. Credit, 3 hours.

468 Ground Water Geology. Principles governing the occurrence, movement, quality, classification and recovery of underground water, with special reference to Arizona. Prerequisite: GL 450. Field trips. Credit, 3 hours.

469 Periglacial Geology. Geological and engineering importance of seasonal and perennially frozen ground (permafrost). Properties, distribution, origin of ice in the ground, and its application to engineering and land utilization problems. Fossil frost features and their use as paleoclimatic indicators. Prerequisites: GL 100, 450; PH 111. Three lectures, field trips. Credit, 3 hours.

472 Sedimentary Petrography. Microscopic, geochemical, and X-ray analysis of sedimentary components and textures of consolidated and unconsolidated sediments. Prerequisites: GL 321, 323 and 450. Two lectures, 3 hours laboratory. Credit, 3 hours.

475 Igneous Petrology. Phase equilibrium and magma crystallization. Study of selected plutonic and volcanic rock suites in thin section. Modern petrologic techniques. Prerequisites: GL 324, CH 115. Two lectures, 3 hours laboratory, field trips. Credit, 3 hours.

480 Methods of Teaching Earth Science. Organization and presentation of appropriate content in earth science; the E.S.C.P. laboratory approach; preparation of laboratory and demonstration materials. Prerequisite: Approval of instructor. Three lectures, field trips. Credit, 3 hours.

481 Geochemistry. Origin and distribution of the chemical elements. Geochemical cycles operating in the earth's atmosphere, hydrosphere and lithosphere. Prerequisites: CH 341 or 441, or GL 321. Credit, 3 hours.

482 Physical Geochemistry. Applications of thermodynamic and kinetic principles to geochemical processes. Prerequisites: GL 481 or its prerequisites. Credit, 3 hours.

483 Earth Science. Principles of earth science and their influence in forming the scenic features on the surface of the earth. GL 483 cannot be taken for credit by one who has completed GL 100 or 111 or their equivalent. Three lectures, field trips. Credit, 3 hours.

484 Meteorites and Cosmochemistry. Chemistry of meteorites and their relationship to the origin of the earth, solar system and universe. Prerequisite: GL 481 or GL 482. Credit, 3 hours.

485, 486 Earth Science for In-Service Teachers. An integrated approach to the concepts and principles of earth science. Prerequisite: Approval of instructor. Field trips. Credit, 3 hours each semester.

501 Glacial Geology. Properties, distribution, and origin of glacial deposits, including principles of their stratigraphy and correlation. Processes of glacial erosion and deposition. Prerequisite: GL 313. Two lectures, 3 hours laboratory, field trips. Credit, 3 hours.

502 Pleistocene Geology. Geology of the Pleistocene epoch in both glaciated and unglaciated areas. Stratigraphy and correlation of Pleistocene deposits. Special reference to the Southwest. Prerequisite: GL 313. Two lectures, 3 hours laboratory, field trips. Credit, 3 hours.

506 Metamorphic Petrology. Thermodynamics of metamorphic equilibrium. Theory of rock deformation and recrystallization. Study of selected metamorphic rock suites in thin section. Prerequisites: GL 324, 310; CH 115. Two lectures, 3 hours laboratory, field trips. Credit, 3 hours.

524 Geotectonics. Scheme of the earth. Origin of continents and ocean basins. Evolution of the crust in time. Drift, sea floor spreading, and other large scale movements of the earth's crust. Upper mantle processes. Emphasis on mountains and current work. Prerequisite: GL 310. Three lectures. Credit, 3 hours.

526 Advanced Structural Geology. Progressive finite strain in three dimensions as applied to problems of rock flowage. Mechanical processes of folding. Theoretical basis of granite tectonics. Processes of crystal deformation and the problem of preferred orientation. Prerequisites: GL 310, 324. Three lectures, field trips. Credit, 3 hours.

534 Advanced Paleontology. Stratigraphic distribution, and evolutionary trends of fossil invertebrates; special reference to concepts of biostratigraphy and principles of taxonomy. Prerequisite: GL 335. Two lectures, 3 hours laboratory, field trips. Credit, 3 hours.

561 Metalliferous Ore Deposits. Field and laboratory study of selected mining districts. Samples of ores and associated rocks collected in the field will be studied in the laboratory to determine type and genesis of mineralization. Prerequisite: Approval of instructor. Two lectures, 3 hours laboratory, field trips. Credit, 3 hours.

580 Laboratory Techniques in Geochemistry. Use of tools and techniques used in geochemical research. Experiments of geochemical interest are done using the emission spectrograph, spectrophotometer, X-ray spectrometer, mass spectrometer, and radioactivity counters. Sample selection and preparation, and wet chemistry. Prerequisite: Approval of instructor. One lecture, 6 hours laboratory. Credit, 3 hours.

581 Optical Crystallography. Relation of the optical indicatrix to the morphologic directions. Prerequisite: Graduate standing. Two lectures. Credit, 2 hours.

582 Structural Crystallography. Structural analysis of major rock forming minerals. Prerequisite: Graduate standing. Two lectures. Credit, 2 hours.

583 Phase Equilibria and Geochemical Systems. Natural reactions at high temperatures and pressures; silicate, sulfide and oxide equilibria. Prerequisite: GL 482. Credit, 3 hours.

591 Seminar. Credit, 2-3 hours. Topics may be selected from the following:

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|--|---|
| (a) <i>Igneous, Metamorphic, and Sedimentary Petrology</i> | (f) <i>Paleozoic, Mesozoic, and Cenozoic Stratigraphy</i> |
| (b) <i>Pleistocene Environment</i> | (g) <i>Mineralogy and Crystallography</i> |
| (c) <i>Seismology and Applied Geophysics</i> | (h) <i>Mineral Deposits</i> |
| (d) <i>Structural Geology</i> | (i) <i>Geochemistry</i> |
| (e) <i>Paleoecology</i> | (j) <i>Physical and Chemical Sedimentology</i> |
| | (k) <i>Biostratigraphy</i> |

See related courses: AN 541 *Archaeological Pollen Analysis*; CH 581 *Isotope Geochemistry*; CH 582 *Topics in Geochemistry and Cosmochemistry*; BO 490 *Paleobotany*.

HEALTH, PHYSICAL EDUCATION, AND RECREATION

PROFESSORS:

DEACH, SMITH, STEWART,
THOMSON (Vice Chairman, MPE 137), WEGNER

ASSOCIATE PROFESSORS:

BRYANT, DEZELSKY, GISOLO, KAJIKAWA, KLANN, ODENKIRK,
PITTMAN, STEVERSON, STONE, TOOHEY

ASSISTANT PROFESSORS:

GRIER, KUSH, LITTLEWOOD, PACKER, PIKE, PLUMMER,
ROBERTS, ROBINSON, WULK

INSTRUCTORS:

BAKER, BREDEHOFT, CASTILLO, GIGLIO, KENTERA, MANN, MCBRIDE,
OWENS, RANGELER, ROBISON, SENDGRAFF, THOMPSON,
WINKLES, YOUNG

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Science Degree Curriculum

BOYS' CLUB ADMINISTRATION — Consists of 45 semester hours of credit, of which 35 must be in the major subject field and 10 in closely related fields to be approved by the adviser in consultation with the student.

Courses PY 100; SE 100; RE 150, 262, 362, 372, 472; PE 430, 471 are required. At least 18 semester hours must be in upper division courses.

HEALTH EDUCATION — Consists of 45 semester hours of credit. Courses HE 100, 460, 461, 480, 481; MI 201; ZO 201, 202 are required. An additional 20 hours are to be selected from related fields by the student in consultation with the adviser. At least 18 semester hours must be in upper division courses.

PHYSICAL EDUCATION — Consists of 45 semester hours of credit of which 30 must be in the major subject field and 15 in closely related fields to be approved by the adviser in consultation with the student. Courses PE 150, 151, 161, 250, 251, 385, 386 and 472 are required. At least 18 semester hours must be in upper division courses.

RECREATION — Consists of 45 semester hours of credit of which 32 must be in recreation and 13 in closely related fields to be approved by the adviser in consultation with the student. Courses RE 120, 150, 260, 262, 362, 363, 364, 370, 470, 472, 498, and two semester hours of physical education activity courses are required. At least 18 semester hours must be in upper division courses.

SPECIAL PROGRAMS

Pre-occupational and Pre-physical Therapy

Students desiring to specialize in one of these fields should major in physical education with a pre-occupational or pre-physical therapy emphasis. The student's adviser will assist in identifying courses essential in the student's preparation to qualify for admission to the selected professional schools.

Upon completion of the bachelor's degree within either of these programs, a student is prepared to enroll in the certificate program offered in approved schools of occupational or physical therapy. Customarily, an internship of from nine to 18 months is required beyond the certificate year to complete the student's training. Many students plan to transfer to the appropriate professional schools at the end of the sophomore year.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS

Bachelor of Arts in Education Degree Curriculum

DANCE — Consists of 45 semester hours of credit of which the following are required: PE 130, 131, 160, 230, 231, 261, 263, 385, 480, 490; ZO 201, 202. At least 18 hours must be in upper division courses.

HEALTH EDUCATION — Consists of 45 semester hours of credit. Courses HE 100, 460, 461, 480, 481; MI 201; ZO 201, 202 are required. An additional 20 hours are to be selected from related fields by the student in consultation with the adviser. At least 18 semester hours must be in upper division courses.

PHYSICAL EDUCATION — Consists of 45 semester hours of credit of which the following are required: PE 150, 151, 161, 250, 251, 366, 385, 386, 400, 472, and 480. At least 18 semester hours must be in upper division courses. The entire program must be planned in consultation with the student's adviser.

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS (Secondary Education)

DANCE — Consists of 18 semester hours of credit. Courses PE 151, 251, 261, 360, and 361 are required. The remaining hours are to be selected in consultation with an adviser.

HEALTH EDUCATION — Consists of 18 semester hours of credit. Courses HE 100, 460, 461, 480 and 481 are required. The remaining hours are to be selected in consultation with an adviser.

PHYSICAL EDUCATION (MEN) — Consists of 18 semester hours of credit. Courses PE 385, 386, 462 and 472 are required; plus six hours from PE 364, 365, selected in consultation with an adviser.

PHYSICAL EDUCATION (WOMEN) — Consists of 18 semester hours of credit. Courses PE 150, 151 or 250, 366, 368, and 472 are required. The remaining hours are to be selected in consultation with an adviser.

DEPARTMENTAL MAJOR REQUIREMENTS**Bachelor of Fine Arts Degree Curriculum**

DANCE — Consists of 70 semester hours of credit in dance and related fields. Courses PE 130, 131, 160, 230, 231, 261, 262, 263, 330, 331, 332, 380, 385, 464, 490; ZO 201, 202; DR 112; MU 133 are required. At least 30 semester hours must be in upper division dance courses.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Health, Physical Education and Recreation offers programs leading to the degree Master of Science in Physical Education. In addition, the department participates in: (1) the Master of Arts in Education degree program as a subject matter field in Secondary Education, (2) the Education Specialist degree program as a major teaching field, and (3) the Doctor of Education degree program with a major in the teaching of Health and Physical Education. Consult the *Graduate Catalog* for requirements.

HEALTH EDUCATION

HE 100 Healthful Living. Knowledge, attitudes, and practices which promote and maintain personal and community health. Credit, 3 hours.

460 School-Community Health. Basic plan of the school health program—health services, health instruction, and healthful school environment. Role of the teacher in relation to school and community health programs. Credit, 3 hours.

461 School Health Problems. Community and school health problems. Designed to develop skills in the analysis and solution of selected problems. Organization and operation of school and community health councils. Prerequisite: HE 460 or teaching experience. Credit, 3 hours.

480 Methods of Teaching Health. Analysis of techniques and materials for health instruction. Credit, 3 hours.

481 Principles and Practices of Public Health. Major areas of public health and principles involved in the operation of an adequate community health program—particularly the public health programs of Arizona. Afternoon and evening field trips may be scheduled. Credit, 3 hours.

501 Contemporary World Health Problems. Recent discoveries in the fields of medicine, engineering, and life sciences, and their application to personal and community health. Malnutrition, venereal diseases, tuberculosis, malaria, leprosy, the parasitical

infestations, radiation, environmental pollution, and other current problems as they affect the United States. Credit, 3 hours.

502 Health Problems of the Southwest. Coccidioidomycosis, allergies, vector infestations, diabetes among the Pima Indians, arthritis, dysenteries, rabies, airborne viruses, histoplasmosis, sanitation, air and water pollution, pesticide contamination of food products and other current problems. Credit, 3 hours.

503 Clerkship in Community Health. The student will actively participate, under supervision, in some community health service such as the State or County Health Department, Indian Health Service, U.S. Public Health Service or a private health agency. Credit, 1-6 hours.

550 History and Philosophy of Health Education. History of health education from early civilizations to present. Major emphasis traces historical development of, and philosophical bases for, health education in the United States. Credit, 3 hours.

554 Sociological Aspects of Health Education. Medicare, Medicaid, World Health Organization, Peace Corps, the U.S. Public Health Service. The inner city and health, and community health services. Credit, 3 hours.

560 Curriculum Construction in Health Education. Problems of curriculum construction with respect to acquisition of materials, establishment of basic curriculum philosophies, application of education principles, and sequence of course content. Credit, 3 hours.

562 Evaluation in Health Education. Techniques and devices for evaluating school health programs. Credit, 3 hours.

563 Administration of School Health Programs. Principles and techniques for coordinating and administering school health programs; personnel, legal aspects, public relations, policies, health service, and instruction. Meets teacher certification requirement. Prerequisite: HE 460 or teaching experience. Credit, 3 hours.

PHYSICAL EDUCATION

PE 100 Developmental Activities. Required skills course for majors in physical education; emphasis on basic motor skills and use of research laboratory. Three times a week. Credit, 1 hour.

101 Physical Education Activity. Instruction in archery, badminton, fencing, fitness, golf, gymnastics, handball, and other activity. Three times a week. May be repeated for credit. Credit, 1 hour.

103 Adapted Activities. Limited activities for students who cannot, because of disabilities, enroll in regular physical education classes. Written recommendation of the University physician required. Twice a week. May be repeated for credit. Credit, 1 hour.

110, 111 Team Sports. Skills, strategies, knowledge, and techniques of officiating major team sports for women. Opportunities to qualify for intramural, associate, local, and national ratings. Two lectures, 2 hours laboratory. Credit, 2 hours each semester.

130 Dance. Folk, modern, social, square, tap and other dance activities. Three times a week. May be repeated for credit. Credit, 1 hour.

131 Music for Dance. Elements of music, music structures, and their relationship to dance. Emphasis on rhythmic analysis and dance accompaniment. Credit, 2 hours.

140 Aquatics. Swimming, diving and other aquatic activities. Three times a week. May be repeated for credit. Credit, 1 hour.

150, 151 Professional Activities. Skills in physical education activities for physical education majors and minors. Three activities may be taken each semester; each activity section of five weeks duration, six hours each week. Credit, 1 hour per section each semester.

160 Contemporary Dance. Orientation to the field of dance with particular reference to trends. Credit, 2 hours.

161 Introduction to Physical Education. Orientation to the field of physical education. Required of all freshmen specializing in physical education. Credit, 2 hours.

162 Occupational and Physical Therapy. Backgrounds, purposes and functions of the

professions of physical therapy and occupational therapy; their relationships to health professions and community agencies. Credit, 2 hours.

210, 211 Team Sports. Continuation of PE 110, 111. Two lectures, 2 hours laboratory. Credit, 2 hours each semester.

220 Physical Education Activity. Intermediate levels. Continuation of PE 101. Three times a week. May be repeated for credit. Credit, 1 hour.

230 Dance. Intermediate levels. Continuation of PE 130. Three times a week. May be repeated for credit. Credit, 1 hour.

232 Dance Notation—I. A study of the contemporary systems of dance notation. Experiences in recording and the interpretation of dance scores. Credit, 2 hours.

240 Aquatics. Intermediate levels. Continuation of PE 140. Three times a week. May be repeated for credit. Credit, 1 hour.

250, 251 Professional Activities. Skills in physical education activities for physical education majors and minors. Three activities may be taken each semester; each activity section of five weeks duration, six hours each week. Credit, 1 hour per section each semester.

260 First Aid Instructorship. For individuals who wish to receive certification as Red Cross First Aid Instructors. Prerequisite: Must be 18 years of age and hold current advanced certificate. Credit, 1 hour.

261 Dance Composition. Study and analysis of theme and dramatic ideas drawn from poetry, drama, music, and other art forms for use in dance composition. Prerequisite: Approval of instructor. One lecture, 2 hours laboratory. Credit, 2 hours.

262 Dance Production—I. Theory of lighting and costuming as related to dance. Credit, 2 hours.

263 Dance Production—II. Theory and practice of programing, make-up, scenery, and sound as related to dance production. One lecture, 2 hours laboratory. Prerequisite: PE 262 or approval of instructor. Credit, 2 hours.

280 History and Philosophy of Dance. Dance from ancient times to the present. Consideration of dance as an art in relation to other arts; primitive, pre-classic, and modern forms. Credit, 2 hours.

287 Physical Education for the Atypical Student. Handicapping conditions found among students, and adaptation of exercises and activities to individual needs. Open to all students. Credit, 2 hours.

320 Physical Education Activity. Advanced levels. Continuation of PE 220. Three times a week. May be repeated for credit. Credit, 1 hour.

330 Dance. Advanced levels. Continuation of PE 230. Three times a week. May be repeated for credit. Credit, 1 hour.

332 Dance Notation—II. Advanced study of the systems of dance notation. Prerequisite: PE 232. Credit, 3 hours.

340 Aquatics. Advanced skills such as Red Cross Senior Life Saving, Red Cross Water Safety Instructorship (Prerequisite: Current Senior Red Cross Life Saving Certificate), synchronized swimming and other aquatic activities. Three times a week. May be repeated for credit. Credit, 1 hour.

344 Methods and Materials in Aquatics. Methods and materials used to teach beginning, intermediate, and advanced aquatics. Credit, 2 hours.

360, 361 Theory and Practice of Teaching Dance. Creative, folk, square, social, modern, and other dance forms. Analysis and acquisition of materials suitable for school and recreational use. Separate sections offered for the various emphases. One lecture, 2 hours laboratory. Credit, 2 hours.

362 Sports Officiating. Rules and mechanics of officiating used in football, basketball, baseball, and track. Credit, 3 hours.

364 Theory of Coaching. Theory and techniques of coaching competitive sports; includes baseball, gymnastics, swimming, track and field, wrestling and other sports. Each sport presented for one-half semester. Meets four hours each week for eight weeks. Prerequisite: Professional Activity course for applicable sport or approval of instructor. Credit, 1 hour.

365 Theory of Coaching. Theory and techniques of coaching competitive basketball and football. Each sport meets four hours per week for one semester. Prerequisite:

Professional Activity course for applicable sport or approval of instructor. Credit, 2 hours.

366 Physical Education for the Elementary School. The scope and values of physical education and movement education in the elementary school. Methods, materials, and practice in teaching activities for primary, intermediate, and upper grades. Credit, 3 hours.

367 Children's Dance. Theory and practice of teaching creative, folk, square and other dance forms for children. Designed for dance majors and related curriculums. Credit, 3 hours.

368 Theory and Practice of Teaching Sports. Theory and practice in teaching and coaching in the areas of team sports, individual and dual sports. Analysis of motor skills and acquisition of suitable materials for all school levels. Credit, 3 hours.

370 Varsity Athletics. Credit may be given for participation in varsity sports. For men and women. May be repeated for credit. Time arranged. Credit, 1 hour.

380 Dance in Diverse Cultures. The influence of dance in selected cultures. Required for dance majors. Credit, 3 hours.

385 Kinesiology. Analytic and synthetic studies of body movements. Neuromuscular skills and body mechanics are emphasized. Prerequisites: ZO 201, 202. Credit, 3 hours.

386 Physiology of Exercise. Effects of the various types of exercises upon body structure and function. Prerequisites: ZO 201, 202. Credit, 3 hours.

400 Tests and Measurements in Physical Education. Analysis and construction of tests, analysis of data, and interpretation of measurement in physical education programs. Credit, 2 hours.

430 Boys' Club Field Experience. The student is assigned to a cooperating Boys' Club for a period of 12 weeks, 30 hours a week. To be taken during the fall semester of the senior year. Open only to majors in this program. Credit, 8 hours.

462 Techniques of Athletic Training. Emphasizes the screening and conditioning of athletes, prevention, care and treatment of athletic injuries; includes techniques of applying supportive materials and use of therapeutic aids. Prerequisites: ZO 201 and 202. Credit, 3 hours.

463 Advanced Dance Composition. Investigation and practice of archaic, preclassic, and contemporary styles of choreography. Prerequisite: PE 261 or approval of instructor. Credit, 3 hours.

464 Dance Accompaniment. Analysis of the function of accompaniment for dance; experience in the use of percussion, voice, records, piano, and selected instruments in relation to their use in composition. Credit, 2 hours.

471 Organization and Administration of Intramural Activities. Principles and practices of the organization of intramural programs. Credit, 2 hours.

472 Organization and Administration of Physical Education. Organization and administration of school physical education programs. Curricula, staff, facilities, budget, scheduling, and equipment analyzed. Credit, 3 hours.

480 Methods of Teaching Physical Education. Methods of instruction, organization, and presentation of appropriate content in physical education. Credit, 3 hours.

490 Senior Performance in Dance. Original choreography for solo or group performance with analysis and critique of problems encountered in production. May be repeated once for credit. Prerequisites: PE 261 and 463 or 464. Credit, 2 hours.

530 Modern Practices in Physical Education. Current practices, materials, and trends of physical education activities and their function in contemporary physical education programs are analyzed and experienced. Credit, 3 hours.

540 Physiological Bases for Physical Activity. Immediate and long range adaptations of the body to exercise. Adjustment of selected bodily systems to the stress of muscular activity. Credit, 3 hours.

545 Principles of Motor Learning. Learning theories and psychological principles underlying motor learning; motivation, kinesthetic perception, personality, reaction time, stress, and individual differences as they influence physical activity. Credit, 3 hours.

550 Historical Bases of Physical Education. Cultural-historical development of physical education beginning with the earliest known forms and continuing through the present day programs. Credit, 3 hours.

552 Philosophy of Physical Education. Philosophies of physical education and athletics and their effect upon program development. Credit, 3 hours.

554 Sociological Aspects of Physical Activity. Development of a theoretical framework and analysis of research relative to cultural-social influences upon sport and motor performance; interrelationships among societal forces and various types of physical activity and their effect upon the individual and the group. Credit, 3 hours.

558 Trends and Issues in Physical Education. Contemporary emphases and developments related to several dimensions of physical education; exploration and examination of current literature and research to enhance understanding of the profession. Credit, 3 hours.

560 Curriculum Construction in Physical Education. Application of the principles, practices, and functional philosophies of curriculum making in physical education. Prerequisite: Major in physical education or teaching experience. Credit, 3 hours.

561 Adapted Physical Education. Contemporary adapted, developmental, remedial, and corrective physical education programs; understanding and appreciation of principles, problems and recent developments in this area. Credit, 3 hours.

563 Planning Facilities in Health, Physical Education and Recreation. Principles, standards, personnel, and designs utilized in the planning, construction and maintenance of outdoor-indoor facilities. Credit, 3 hours.

564 Improving Performance in Competitive Athletics. Factors in successful motor performance in skills used in individual, dual, and team sports. Ballistic movement, balance, kinesthesia, resistive exercises, spaced activity, laws of learning, physics, kinesiology, and physiology of exercise. Credit, 3 hours.

565 Evaluation in Physical Education. Skill tests, knowledge tests, attitude tests, motor capacity tests, and classification tests. Opportunity for practical experience in administering the several types of tests. Credit, 3 hours.

570 Organization and Administration of Athletics. Managing the affairs of an athletic program. Financing, budget policies, staging and promotion of athletic contests, schedules, travel, insurance, and current athletic trends. Credit, 3 hours.

571 Supervision of School Health and Physical Education. Contemporary trends and practices in the supervision of health and physical education; emphasis on research as it is related to the supervisory functions in the improvement of instruction; its purposes, processes, and techniques. Credit, 3 hours.

575 Theory of Administration in Health, Physical Education and Recreation. Administrative philosophies; development of concepts related to processes of administration, types of administrative behavior, tasks and responsibilities of the administrator, and evaluation of the effectiveness of administration. Credit, 3 hours.

585 Movement Education. Structure, function and meaning of human movement experiences. Analysis of theories of movement education as they relate to the curriculum of physical education. Credit, 3 hours.

RECREATION

RE 120 Recreational Games and Rhythms. Games, rhythms, and play activities suitable for students majoring in recreation, physical education, and elementary education. Three times a week. Credit, 1 hour.

150 Camp Program Activities and Skills. Outdoor cookery, nature study, nature crafts, camp crafts, story telling, dramatics, songs and music, overnight trips, shelters, orienting, axemanship, firecraft, food preservation and cooking devices. May include American Camping Association national certification in campercraft skills. Credit, 3 hours.

260 Recreation in American Life. History and philosophy of the organized field of recreation. Recreation as related to the use of leisure. Credit, 3 hours.

262 Program Planning for Recreation. Principles and practices of planning and conducting recreation programs for playgrounds, community centers and other recreation-serving organizations. Credit, 3 hours.

362 Recreation Leadership. Principles, practices, ethics, and professional preparation for leadership in the field of recreation. Credit, 3 hours.

363 Directed Field Experience in Recreation. Supervised leadership assignments, or experience equivalent, in public or private agency, camp or institution with emphasis on a variety of leadership experiences common to such organizational programs. May be repeated for credit up to six hours. Recreation majors only. Credit, 2-6 hours.

364 Recreation for the Atypical. Concepts, objectives, methods, and settings for recreation for the physically, mentally, and emotionally handicapped. May include field trips. Credit, 2 hours.

370 Public School Camping and Outdoor Education. Planning and operating a school camping program. Relationship of camping and outdoor education to other educational disciplines. Credit, 3 hours.

372 Community Recreation Organizations. Principles, objectives, and practices of community organizations and agencies which provide recreation programs. Credit, 2 hours.

470 Camp Organization and Administration. Organization and administration of camps. Preparation for camp management; consideration of budget, camp site, and personnel. Credit, 2 hours.

472 Organization and Administration of Recreation. Administrative structure and organizational policies and practices on the local, state, and national level. Analysis of methods of operation, finance, personnel standards and problems, legal aspects and study of modern trends in terms of present and projected future community needs. Credit, 3 hours.

Special Graduate Courses: 500, 590, 591, 592, 593, 594, 600, 690, 691, 692, 700, 790, 791, 792, 799. (See page 219.)

HISTORY

PROFESSORS:

HUBBARD (SS 225G), ADAMS, BARLOW, DANNENFELDT, DUDLEY,
KARNES, KRENKEL, SACKS, TILDEN, YOUNG

ASSOCIATE PROFESSORS:

PAULSEN, PHILLIPS

ASSISTANT PROFESSORS:

BURG, CHIANG, FRIEDMAN, FULLINWIDER, GIFFIN, KEARNEY,
KLEINFELD, SMITH, STOWE, WEINER, WOOTTEN

LECTURER:

FIREMAN

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Arts Degree Curriculum

HISTORY — Consists of 45 semester hours of credit of which 30 must be in history and 15 in closely related fields to be approved by the adviser in consultation with the student. Courses HI 101, 102, 103, and 104 are required. An additional 18 hours in history courses will be approved by the adviser in consultation with the student. At least 12 hours in history and six hours in the related fields must be in upper division courses.

LATIN AMERICAN EMPHASIS — Consists of 45 semester hours of credit, of which 30 must be in history, including HI 101, 102, 103, 104. The 15 hours of related fields must be in Latin American content courses in anthropology, economics, geography, political science, Portuguese, or Spanish. A reading knowledge of Spanish is required. A reading knowledge of Portuguese or French is suggested.

ASIAN STUDIES EMPHASIS — Consists of the Bachelor of Arts degree requirements in History plus a minimum of two years of Chinese or Japanese language. At least 30 semester hours of the student's total program must consist of Asian courses selected with the approval of the departmental adviser. Basic Chinese and Japanese language courses may not be counted within this total.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS

Bachelor of Arts in Education Degree Curriculum

HISTORY — Consists of 45 semester hours of credit. Courses HI 101, 102, 103, and 104 are required. An additional 33 hours, at least 18 of which must be in history, will be approved by the adviser in consultation with the student. The remaining courses to complete the major may be in history or closely related fields. At least 18 hours must be in upper division courses.

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS

Bachelor of Arts in Education Degree Curriculum

HISTORY — Consists of 18 hours of credit in history courses, of which at least six must be in upper division and at least six must be in American history.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of History offers programs leading to the degrees of Master of Arts and Doctor of Philosophy. Consult the *Graduate Catalog* for requirements.

HISTORY

HI 101, 102 Western Civilization. First semester traces western civilization from its origins through the Seventeenth Century; second semester continues the survey to modern times. Credit, 3 hours each semester.

103, 104 The United States. Growth of the Republic from colonial times, with the first semester covering through the Civil War period and the second continuing to the present day. Credit, 3 hours each semester.

301, 302 Ancient Near East and the Classical World. First semester, the history and civilization of the Ancient Orient and Greece; second semester, classical history to the downfall of the Roman Empire. Credit, 3 hours each semester.

303, 304 American Cultural History. Culture in a broad connotation including ideas, ideals, the arts, and social and economic standards. First semester, the nation's colonial background and early national period; second semester, the age of industrialism and modern America. Credit, 3 hours each semester.

305, 306 Eastern Civilizations. Features, developments, and extensions of the civilizations of the Middle East, India, and the Far East analyzed to provide an understanding of this area of growing importance in the world today. First semester, to mid-Nineteenth Century; second semester, since mid-Nineteenth Century. Credit, 3 hours each semester.

321, 322 The Middle Ages. Political, socio-economic, and cultural development of Western Europe. First semester, Early Middle Ages; second semester, High Middle Ages. Prerequisite: HI 101 or approval of instructor. Credit, 3 hours each semester.

323, 324 Intellectual History of Modern Europe. Major political, social, and economic trends in European thought from the Enlightenment to the present. First semester, Enlightenment to mid-Nineteenth Century; second semester, Marxism to the present. Prerequisite: HI 102 or approval of instructor. Credit, 3 hours each semester.

325, 326 Diplomatic History of Modern Europe. First semester, Peace of Westphalia to 1848; second semester, 1848 to present. Credit, 3 hours each semester.

327, 328 Economic History of Modern Europe. Impact of industrialism upon the political, social, and cultural life of Europe. First semester, Renaissance to the Nineteenth Century; second semester, Nineteenth and Twentieth Centuries. Credit, 3 hours each semester.

329 Social History of Modern Europe. Impact of various socio-economic groups on Nineteenth and Twentieth Century European society. Credit, 3 hours.

331 American Colonial History. Political, economic, social, and cultural history of the colonial era. Concentrates on English with some consideration of Spanish, French, and other colonies. Credit, 3 hours.

335, 336 Recent American History. First semester, 1914 to 1933; second semester, 1933 to the present. Prerequisite: HI 104 or approval of instructor. Credit, 3 hours each semester.

337, 338 The West in American History. First semester, the Turner Thesis of the significance of the frontier in American history, beginning with discovery and exploration, and continuing to the period of Texas and the Mexican War; second semester, the development of the frontier thesis to 1890, with emphasis upon Arizona and the Southwest. Prerequisites: HI 103, 104 or approval of instructor. Credit, 3 hours each semester.

343, 344 Latin America. First semester, ancient civilization, explorers and conquerors, and colonial institutions; second semester, nationalistic development of the independent republics since 1825. Credit, 3 hours each semester.

351, 352 England. Political, economic, and social development of the English people. First semester, from the earliest times to the Seventeenth Century; second semester, from the Seventeenth Century to the present. Credit, 3 hours each semester.

354 British Constitutional History. Historical development of the constitutional system of Great Britain from the Middle Ages to the present with emphasis on the growth of democracy. Prerequisites: HI 101, 102 or 351, 352 or approval of instructor. Credit, 3 hours.

401 Arizona. Emergence of the state from early times to the present. Credit, 3 hours.

403, 404 Economic History of the United States. First semester, Colonial times to 1865; second semester, 1865 to the present. Credit, 3 hours each semester.

405, 406 American Diplomatic History. American relations with foreign powers. First semester, 1776-1898; second semester, 1898 to the present. Prerequisites: HI 103, 104 or approval of instructor. Credit, 3 hours each semester.

407, 408 Constitutional History of the United States. Origin and development of the American constitutional system. First semester, colonial origins through Reconstruction; second semester, Reconstruction to the present. Prerequisite: Approval of instructor. Credit 3 hours each semester.

409, 410 American Urban History. Urban development from colonial times to the

present. Considers structural aspects, location trends, distribution, and impact on the American economy. Credit, 3 hours each semester.

421 The French Revolution and the Napoleonic Era. Conditions in France before 1789, the Revolution from 1789 to 1799, the organization of France under Napoleon, and the impact of changes in France on European society. Prerequisite: Six hours of history or approval of instructor. Credit, 3 hours.

423 Renaissance and Reformation. Antecedents and developments of the Renaissance in Italy, its spread into the rest of Europe, and the subsequent changes in religious and political thought. Prerequisite: HI 101 or approval of instructor. Credit, 3 hours.

424 Age of Absolutism. Political, social, economic, and cultural changes in Europe from the Peace of Westphalia to the eve of the French Revolution. Prerequisite: HI 102 or approval of instructor. Credit, 3 hours.

425, 426 Europe in the Nineteenth Century. Political, social, economic, and intellectual currents in Europe from Napoleon through World War I. First semester, 1815-1866; second semester, 1866-1918. Prerequisite: Six hours of history or approval of instructor. Credit, 3 hours each semester.

427 Modern France. France since 1870. Prerequisite: HI 102 or approval of instructor. Credit, 3 hours.

428 Modern Germany. German political, social, and intellectual history since 1815. Prerequisite: HI 102 or approval of instructor. Credit, 3 hours.

429, 430 Twentieth Century Europe. Europe in its world setting since World War I emphasizing major political issues. First semester, 1914 to 1945; second semester, 1945 to present. Prerequisite: HI 102 or approval of instructor. Credit, 3 hours each semester.

431, 432 American Biography. Considers the noted Americans who made important contributions to United States history. First semester, the period prior to 1860; second semester, since 1860. Credit, 3 hours each semester.

435 Early National Period in American History. Political, social, and economic development of the United States from the Revolution to 1828. Prerequisite: HI 103 or approval of instructor. Credit, 3 hours.

436 Middle Period in American History. Impact of nationalism, liberalism, and sectionalism upon American life, 1828-1860. Prerequisite: HI 103 or approval of instructor. Credit, 3 hours.

437 Civil War and Reconstruction. Analysis of the causes and development of the war; political, constitutional, and social issues of reconstruction, and their effects on post-war America. Prerequisite: HI 103 or 104 or approval of instructor. Credit, 3 hours.

438 Populism and Progressivism. Political, social, economic, and intellectual trends in the United States, 1877-1918. Credit, 3 hours.

441 Diplomatic History of Latin America. The struggle for diplomatic recognition, attempts at political union, and participation in international organizations since 1810. Credit, 3 hours.

442 Brazil. Discovery, conquest, and settlement by the Portuguese; achievement of independence; rise and fall of the empire; problems and growth of the republic to the present. Credit, 3 hours.

443, 444 Spanish South America. Political, economic, and social developments of the Spanish-speaking nations of South America since independence. First semester, the Nineteenth Century; second semester, Twentieth Century developments. Credit, 3 hours each semester.

445, 446 Mexico. Political, economic, social, and cultural developments. First semester, earliest times to 1810; second semester, 1810 to the present. Credit, 3 hours each semester.

447, 448 Colonial Latin America. Political, economic, and social institutions during Hispanic rule in America. First semester, Iberian and pre-conquest backgrounds,

colonial institutions of the Sixteenth Century; second semester, Seventeenth and Eighteenth Century developments. Credit, 3 hours each semester.

449 Intellectual and Cultural History of Latin America. Main currents of thought, the outstanding thinkers and their impact on Nineteenth and Twentieth Century Latin America. Cultural and institutional basis of Latin American life. Credit, 3 hours.

451 The British Empire and the Commonwealth. Growth and development of the British Empire, with emphasis on those factors contributing to the transition to the Commonwealth of Nations. Prerequisite: HI 102 or 352 or approval of instructor. Credit, 3 hours.

452 Tudor and Stuart England. Political, social, economic, and cultural developments which contributed to the forming of the modern world. Prerequisite: HI 101 or 352 or approval of instructor. Credit, 3 hours.

453 Modern Britain. Analysis of the factors contributing to Britain's position as the world's leading power in the Nineteenth Century and its decline from that position in the Twentieth Century. Prerequisite: HI 102 or 352 or approval of instructor. Credit, 3 hours.

454 Eighteenth Century England. Major, social, economic, political, and intellectual trends during the Georgian Era. Prerequisite: HI 102 or 352 or approval of instructor. Credit, 3 hours.

461 Russia to 1917. Development of Russian political, economic, social, religious, and intellectual institutions and traditions from the Ninth Century to the Revolution of 1917. Prerequisite: HI 102 or approval of instructor. Credit, 3 hours.

462 The Soviet Union. Development of the Soviet system since the Revolution of 1917, with emphasis on its Russian, European, Asian, and global significance. Prerequisite: HI 102 or approval of instructor. Credit, 3 hours.

465 Eastern Europe and the Balkans. Development of the countries of eastern and southeastern Europe from 1900 to the present. Credit, 3 hours.

473, 474 China. Political, economic, social, and cultural history of the Chinese people. First semester, early times to the Nineteenth Century; second semester, Nineteenth Century to the present. Prerequisite: Approval of instructor. Credit, 3 hours each semester.

477, 478 Japan. Political, economic, social, and cultural history of the Japanese people. First semester, early times to the Nineteenth Century; second semester, Nineteenth Century to the present. Prerequisite: Approval of instructor. Credit, 3 hours each semester.

480 Methods of Teaching History. Methods of instruction, organization, and presentation of the subject matter of history and closely allied fields. Credit, 3 hours.

482 Modern India. India from the Mogul Empire to the present, with emphasis on the impact of British ideas on Indian life and the subsequent growth of nationalism, the development of Hindu-Muslim antagonism, and its problems after independence. Prerequisite: Approval of instructor. Credit, 3 hours.

500 Research Methods. Credit, 3 hours.

512 European Historiography. Methods and theories of writers of ancient and European history. Credit, 3 hours.

513 American Historiography. Methods and theories of writers of United States history. Credit, 3 hours.

514 Latin American Historiography. Methods and theories of writers of Latin American history. Credit, 3 hours.

591 Seminar. Credit, 3 hours. Topics may be selected from the following:

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|----------------------------------|-----------------------------------|
| (a) <i>United States History</i> | (d) <i>British History</i> |
| (b) <i>Arizona History</i> | (e) <i>Latin American History</i> |
| (c) <i>European History</i> | |

Special Graduate Courses: 500, 590, 591, 592, 593, 799. (See page 219.)

HOME ECONOMICS

PROFESSORS:

BRESINA (HEc 104), BARKLEY, ELLSWORTH, KAGY, MORGAN, RANNELLS

ASSOCIATE PROFESSORS:

ERICSON, HOOVER, STREUFERT

ASSISTANT PROFESSORS:

BATES, HOGAN, HUNTER, PETERS, WOOLDRIDGE

The Department of Home Economics offers curriculums leading to a Bachelor of Arts, Bachelor of Science, or Bachelor of Arts in Education degree with a major in home economics with six areas of emphasis: clothing, textiles and related art; family life and child development; foods and nutrition; home economics in business; home economics education; and general home economics. Students who elect the area of concentration related to business with emphasis in foods and equipment are prepared for employment in the home economics departments of food processors, equipment manufacturers, and public utilities; those in clothing and textiles, for fashion merchandising and consumer service. Both areas prepare students for advertising and publicity agencies, newspapers, and magazines.

CENTER FOR FAMILY LIFE STUDIES

The Center for Family Life Studies is an educational, research and service agency of the University within the College of Liberal Arts and administratively related to the Department of Home Economics. The purpose of the Center is to coordinate and highlight programs which develop and foster the understanding of family life from an interdisciplinary point of view. Both academic courses and special programs for the academic and professional communities as well as for the general public are developed and carried out by the Center. Policies and programs of the Center are guided by an interdepartmental advisory committee.

DEPARTMENTAL MAJOR REQUIREMENTS**Bachelor of Arts Degree Curriculum**

HOME ECONOMICS — Consists of 45 semester hours of credit of which not more than 30 may be in home economics and at least 15 in related fields to be approved by the adviser in consultation with the student. Courses MF 231, 254 are required. The remaining courses will be determined by the adviser in consultation with the student depending on the area of emphasis. At least 20 semester hours of credit must be in upper division courses.

Bachelor of Science Degree Curriculum

HOME ECONOMICS — Consists of 50 semester hours of credit of which at least 20 must be in upper division courses. MF 231, 254 are re-

quired. The remaining courses will be determined by the adviser in consultation with the student, depending on the area of emphasis.

Students who satisfactorily complete the requirements for this degree with emphasis in foods and nutrition can qualify for entrance to training centers in institution management and hospital dietetics as approved by the American Dietetics Association.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS

Bachelor of Arts in Education Degree Curriculum

HOME ECONOMICS — Consists of 45 semester hours of credit in home economics. At least 18 semester hours of credit must be in upper division courses. In addition to the home economics core (MF 231, 254), required courses are TC 122, 123, 222, 231; FN 141, 142, 341; CD 232, 337; MF 331, 454, 457; HO 153, 480; DA 171; CH 101 or 113. Chemistry requirement must be fulfilled during the first two years.

Students enrolled in this major meet requirements for vocation certification and are qualified for work in the Extension Service.

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS

Consists of at least 18 hours for a teaching minor. Required courses are TC 122, 123; FN 141, 142; CD 232; MF 254, 331. If Child Development is taken in the College of Education or Department of Psychology, DA 171 may be substituted. A minor emphasizing Family Life Studies is available through consultation with the Director of the Center for Family Life Studies.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Home Economics offers programs leading to the degree of Master of Science. Consult the *Graduate Catalog* for requirements.

CHILD DEVELOPMENT

CD 232 Child Development. Development from conception through later childhood. Significance of family membership. Recognition of individuality within the universal pattern of human development. Guided observations. Prerequisites: PY 100, SO 101 or equivalent. Credit, 3 hours.

337 Nursery School Education. Participation in the University nursery school. Discussion and application of methods for guiding children in activities related to learning experiences for young children. Prerequisite: CD 232 or course in psychology. Two lectures, 3 hours laboratory. Credit, 3 hours.

432 The Meaning of Play. Observation, analysis, and interpretation of play activities in relation to the development of the child. Prerequisite: CD 232 or EE 313 or approval of instructor. Credit, 3 hours.

433 Enrichment Activities for the Young Child. Methods of relating art, literature, music and science activities to learning experiences of the nursery school child. Involves practicum. Prerequisite: CD 232. Credit, 3 hours.

434 Organization and Administration of Preschools. Curriculum planning and evaluation of existing and proposed programs in relation to recommended standards and needs of the child, family and community. Prerequisite: CD 337 or approval of instructor. Credit, 3 hours.

456 Parent-Adolescent Relationships. Dynamics of the relationships between parents and their adolescent children in different segments of the American culture today. Developmental characteristics of adolescence and the corresponding adult stage. Prerequisites: CD 232, MF 331 or equivalent. Credit, 3 hours.

531 Advanced Child Development. Theory and research relating to the development of children in the family. Prerequisite: CD 232 or CE 522 or approval of instructor. Credit, 3 hours.

532 Behavior of Young Children. Understanding developmental problems occurring most frequently in early childhood. Survey of recent literature. Prerequisite: CD 232 or course in psychology or approval of instructor. Credit, 3 hours.

DECORATIVE ARTS

DA 171 Introduction to Decorative Arts. Accessories in environmental design. Psychological and sociological responses related to elements of design and integrity of materials. Credit, 3 hours.

371 Decorative Textiles. Evolution of design, production and performance of textile furnishings reflecting cultural influence on environmental design. Prerequisites: DA 171 or equivalent, AH 111 or 212. Credit, 3 hours.

373 Home Furnishings. Furnishings designed for the home. Coordinating human values with esthetic, functional and economic qualities. Prerequisite: DA 171 or equivalent. Credit, 3 hours.

376 Professional Practice. Experience in executing environmental design problems for clients under the direction of professional designers and advisers. Prerequisite: Approval of instructor. Credit, 3 hours.

474 History of Interior Furnishings. Focus on furnishings designed to meet cultural needs from antiquity to the present day. Prerequisite: DA 171 or equivalent. Credit, 3 hours.

475 Retail Promotion and Display. Creative experiences in visual communications emphasizing design, materials, lighting, space and color. Credit, 3 hours.

FAMILY RELATIONSHIPS

MF 231 Personal Adjustment for Family Living. Personal development and behavior as related to competency in interpersonal relationships within the family. Processes of family interaction. Prerequisites: SO 101, PY 100 or equivalent. Credit, 3 hours.

254 Management in the Family. Integrated nature of management as a means to realization of individual and family values and goals; creation, allocation and utilization of resources. Focus on decision-making. Prerequisites: SO 101, PY 100 or equivalent. Credit, 3 hours.

331 Family Relationships. Issues, challenges and opportunities relating to present day family living. Factors influencing interrelations within the family. Prerequisite: Course in psychology or sociology. Credit, 3 hours.

354 Consumer Economics. Relationship of the consumer to the economy as a determinant of the family pattern of living. Current consumer problems and sources of protection. Credit, 3 hours.

435 Advanced Family Relationships. Conceptual approaches to the study of the family. Special problems in interrelations within the family as affected by family composition, physical environment, family patterns and values. Prerequisite: MF 331. Credit, 3 hours.

454 Family Financial Management. Major family income and expenditure alternatives in attainment of family goals. Credit, 3 hours.

457 Home Management. Laboratory application of management concepts. Observation, analysis, and interpretation of management in families. Prerequisite: MF 254. Credit, 2 hours.

534 Understanding the Family Through Literature. Family relationship processes and experiences through study of literary accounts of family life. Prerequisite: MF 331 or equivalent. Credit, 2 hours.

535 Family Relationships in the Middle and Later Years. Developmental processes and generational relationships of the family in the middle and later stages of the family life cycle. Prerequisites: CD 232 and MF 331 or approval of instructor. Credit, 3 hours.

536 Family Crises and Resources. Special problems encountered in the family. Individual and community resources for approaching them. Prerequisites: MF 231, CE 522 or equivalent. Credit, 2 hours.

537 Individual Development in the Family Milieu. The family as a framework for human development. Reciprocal influences between individual and family development. Prerequisites: CD 232, MF 331. Credit, 3 hours.

538 Approaches to Marriage and Family Counseling. Methods currently used in marriage and family counseling and consideration of theoretical bases underlying the methods. Prerequisite: Approval of instructor. Credit, 3 hours.

539 Developmental Approach to Understanding Human Sexuality. Sexuality in the broader framework of human development and basic human values from an interdisciplinary point of view. Prerequisite: Approval of instructor. Credit, 3 hours.

551 Advanced Home Management. Management concepts and research findings applied to problems of modern families. Prerequisite: MF 254. Credit, 2 hours.

FOOD AND NUTRITION

FN 141 Elementary Nutrition. Principles of nutrition, diet, food in its relation to health. Credit, 2 hours.

142 Applied Food Principles. Scientific principles and nutrition related to selection, preparation and care of food. Designed for majors and non-majors. One lecture, 4 hours laboratory. Credit, 3 hours.

242 Advanced Food Principles. Scientific principles and nutrition related to advanced food preparation. Prerequisites: FN 142, CH 101, 231 or equivalent. One lecture, 6 hours laboratory. Credit, 3 hours.

341 Meal Management. Management in meal planning, preparation, and service for today's families. Social and cultural aspects of foods. Prerequisites: FN 141, 142 and HO 153. Two lectures, 3 hours laboratory. Credit, 3 hours.

343 Quantity Food Production. Standard methods of food preparation in quantity; operation of institutional equipment, menu planning for institutions. Experience in quantity food service. Prerequisite: FN 341. One lecture, 6 hours laboratory. Credit, 3 hours.

441 Advanced Nutrition. Special problems in diet and nutrition. Prerequisites: FN 141, CH 101. Credit, 3 hours.

442 Experimental Foods. Experimental study of foods: investigation of current research. Prerequisites: FN 142, CH 231. Two lectures, 3 hours laboratory. Credit, 3 hours.

443 Child Nutrition. Nutritional needs from prenatal development through adolescence; food requirements, feeding practices, and indices of good nutritional status. Prerequisites: FN 141, CD 232 or approval of instructor. Credit, 2 hours.

444 Diet Therapy. Methods of adapting, modifying, and applying normal nutrition principles to abnormalities of metabolism. Prerequisites: FN 341, 441 or approval of instructor. Credit, 3 hours.

445 Institutional Food Service. Organization, administration and management of food service in hospitals and institutions. Prerequisite: FN 343. One lecture, 4 hours laboratory. Credit, 3 hours.

446 Institutional Food Purchasing. Food purchasing for institutions; understanding of cost factors, food laws, quality standards, and basic manufacturing processes. Prerequisite: FN 343. Two lectures, 3 hours laboratory. Credit, 3 hours.

447 Classical Cuisine. Art and appreciation of international epicurean foods accompanied by preparation and appropriate service; effect of the economy, geography, history and culture on food. Prerequisite: FN 341. Three hours a week. Credit, 2 hours.

448 Community Nutrition. Survey and evaluation of current nutrition problems of population groups. Application of principles of learning to nutrition education. Prerequisites: FN 141, SO 101. Credit, 3 hours.

462 Home Economics in Business. Organization and scope of home economics departments in businesses related to foods and equipment. Field trip to Los Angeles required. Credit, 2 hours.

541 Recent Development in Nutrition. Recent research in nutrition with view of finding practical applications. Prerequisites: FN 141, CH 101. Credit, 2 hours.

542 Advanced Experimental Foods. Group and individual research in food preparation. Prerequisites: FN 442, CH 231. One lecture, 5 hours laboratory. Credit, 3 hours.

548 Recent Developments in Foods. Recent developments in the food field which affect the food supply. Prerequisites: FN 341, CH 101. Credit, 2 hours.

HOME ECONOMICS EDUCATION

HO 153 Household Equipment. Principles of construction, operation, selection and effective use of equipment in the home. Two lectures, 2 hours laboratory. Credit, 3 hours.

352 Housing. Family housing as affected by legislation, life cycle, physical and psychological needs, with application to modern housing; kitchen planning. Credit, 3 hours.

401 Vocational Education in American Schools. Basic principles and philosophies of vocational education. Relationship of vocational education to general education, history and legislation. Credit, 3 hours.

453 Advanced Household Equipment. Experimental investigations of major appliances. Focus on current trends. Prerequisite: HO 153. Two lectures, 2 hours laboratory. Credit, 3 hours.

461 Demonstration Techniques. Principles and techniques of demonstrations. Experience before audiences. Six hours a week. Credit, 3 hours.

480 Methods of Teaching Home Economics. Methods and techniques of instruction, departmental organization and professional activities. Prerequisite: SE 411 or concurrently. Credit, 3 hours.

481 Teaching Vocational Home Economics. Planning and organizing instruction designed to meet vocational requirements, including occupational, adult, and parent education classes. Prerequisite: SE 311 or 310. Credit, 3 hours.

581 Supervision of Home Economics Education. Practices and processes used by cooperating teachers working with student teachers, members of state supervising staffs, department heads, and coordinators of instructional programs in home economics. Prerequisite: Approval of instructor. Credit, 2 hours.

582 Evaluation in Home Economics. Procedures used in the broad content of evaluation applied to home economics, including the construction of evaluative devices and use of selected standardized instruments. Prerequisite: HO 480 or equivalent. Credit, 3 hours.

583 Recent Trends in Home Economics Education. Socio-economic and technological developments affecting home economics education with implications for teaching. Prerequisite: HO 480 or equivalent. Credit, 3 hours.

TEXTILES AND CLOTHING

TC 122 Clothing Selection. Appropriate clothing for individuals, emphasizing design and human behavior. Credit, 2 hours.

123 Clothing Construction. Construction processes of various fabrics and fashions, study and use of commercial patterns. One lecture, 4 hours laboratory. Credit, 3 hours.

222 Textiles. Introduction to textile fibers, structures, and finishes, emphasizing performance characteristics, end use applications, and care Prerequisite: CH 101. Two lectures, 2 hours laboratory. Credit, 3 hours.

321 Pattern Designing. Flat patterns used to develop fundamental principles in designing individualized garments. Prerequisites: TC 122, 123. Two lectures, 4 hours laboratory. Credit, 3 hours.

327 Clothing the Family. Analysis of clothing needs of men, women and children at various stages of the life cycle. Credit, 3 hours.

421 Field Study. Supervised experience with business firms in the fashion field. Placement is in accordance with prevailing employment conditions, major interests and readiness of student. Credit, 3 hours.

422 Applied Dress Design. Creative interpretation of dress design developed through the media of draping. Prerequisites: TC 122, 123. Two lectures, 4 hours laboratory. Credit, 3 hours.

423 Clothing Technique Problems. Problems involving techniques used in tailored apparel. Prerequisites: TC 123, 321. Two lectures, 4 hours laboratory. Credit, 3 hours.

426 The Clothing and Textile Industries. Organization, economics and marketing problems and practices specific to the textile and clothing industries. Prerequisite: MK 321. Credit, 3 hours.

428 Textile and Clothing Appraisal. Problems which affect the consumer in the production, distribution, and consumption of textile products. Prerequisites: TC 222, MF 354. Credit, 2 hours.

429 Advanced Textiles. Introduction to textile research and the evaluation of data. An individual problem. Prerequisites: TC 222, CH 101, or approval of instructor. One lecture, 4 hours laboratory. Credit, 3 hours.

521 Recent Developments in Textiles. Current developments in the field as reported in technical journals. Prerequisite: TC 222. Credit, 2 hours.

522 Advanced Dress Design Analysis. Use of a foundation pattern as a basis for interpreting new designs. Prerequisite: TC 321. Credit, 3 hours.

523 Socio-Psychological Aspects of Clothing. Application of social-psychological theories to the selection and use of clothing. Prerequisites: TC 122, SO 101, PY 100, EC 201. Credit, 3 hours.

HUMANITIES (CENTER FOR THE HUMANITIES)

PROFESSORS:

LAMM (North Hall 15½), PARKER

ASSOCIATE PROFESSORS:

BRECKENRIDGE, HANNA, STELLHORN

INSTRUCTOR:

HANSEN

MAJOR REQUIREMENTS

Bachelor of Arts Degree Curriculum

The Interdisciplinary Humanities program consists of 45 semester hours of credit in the four subject fields of art-architecture, literature, music, and philosophy. Three of the four fields must be chosen and semester hours accumulated in the following pattern: first subject, 20-21 hours; second subject, 15 hours; third subject, 9-12 hours. Approved courses, specific Interdisciplinary Humanities courses, and suggested elective courses are selected in consultation with the adviser.

GRADUATE PROGRAM

Consult the *Graduate Catalog* for requirements in the Interdisciplinary Humanities program leading to the degree of Master of Arts.

HUMANITIES

HU 101, 102 Ideas and Values in the Humanities. The interrelation of art-architecture, literature, music, and philosophy in the modern world. Term paper and attendance at selected cultural events are required. Credit to meet the General Studies require-

ment in the Humanities given only when both HU 101 and 102 are taken. Class registration open to freshmen only. Credit, 4 hours each semester.

301, 302 Humanities in the Western World. An integrated course designed to develop a discriminating appreciation of art-architecture, literature, music, and philosophy. The heritage of the past is presented in relation to life today. Term paper and attendance at selected cultural events are required. Credit for General Studies given only when both HU 301 and 302 are taken. Credit, 4 hours each semester.

401 Humanities in World Cultures. A humanities study program of foreign travel. Emphasis on the study of the fine arts of the various world cultures. Art galleries, museums, drama and music festivals form a basic part of the itinerary. Term paper required. May be repeated for credit. Prerequisite: Approval of instructor. Credit, 6 hours.

403, 404 Comparative Arts. Art-architecture, literature, music and the minor arts against a background of socio-economic development and philosophic thought. First semester, Greece through Renaissance; second semester, Baroque through Twentieth Century. Prerequisites: HU 301, 302 or approval of instructor. Credit, 3 hours each semester.

532 Humanities Bibliography. Investigations of the important primary and secondary sources for research in Humanities and Humanities Education. Credit, 3 hours.

601 Philosophical Foundations of Humanities Education. Basic issues in general philosophy which are foundational to philosophies of Humanities Education. Credit, 3 hours.

602 Experimentation and Recent Trends in Humanities Education. A critical analysis and evaluation of current and in-process developments in Humanities Education. Credit, 3 hours.

603 Curriculum Development in Humanities Education. Issues, patterns, and procedures in Humanities curricula. Credit, 3 hours. Additional courses are listed under Music, Philosophy, Art, Architecture, and Literature (English).

Special Graduate Courses: 500, 590, 591, 592, 594. (See page 219.)

LAW

PROFESSORS:

PEDRICK (AH 102d), CANBY, CLEARY, DAHL,
EFFLAND, HAVIGHURST, MORRIS

ASSOCIATE PROFESSORS:

MATHESON, ROSE

ASSISTANT PROFESSORS:

DIX, COHEN

Application is made to the College of Law. Copies of the *Bulletin* for the College of Law and application forms may be secured from the Office of the Dean.

LW 501 Contracts. Contract doctrines and their role in the judicial process. Judicial doctrines and, where applicable, the Uniform Commercial Code are studied in the context of contracts covering employment, personal and family arrangements, building and construction, the sale of goods, loans; assignment of wages and accounts receivable. Also examined are statutes of limitations; payment and settlement; remedies and measure of damages; problems of advocacy and counseling. Credit, 3 hours.

502 Contracts. Continuation of 501. Credit, 3 hours.

503 Torts. Protection through the judicial process of personality, property and relational interests against physical, appropriational, and defamatory harms. Doctrines of trespass, nuisance, negligence, conversion, deceit, privacy, slander, libel, seduction, alienation of affections, malicious prosecution, inducement of breach of contract and unfair competition are studied in a variety of factual settings. Credit, 4 hours.

504 Torts. Continuation of 503. Credit, 2 hours.

505 Procedure. Common procedural steps in litigation as an aid to understanding the terminology and concepts of procedure. Common law remedies, equitable relief, the extraordinary remedies and the problems arising from the abolition of the forms of action and the union of law and equity. Credit, 3 hours.

506 Legislation. Use and functions of statutes and legislative materials. Lawyer's role in the legislative process and training in legislative research, bill drafting and interpretation of statutes. Credit, 2 hours.

507 Property. Law of real and personal property, various legal and equitable estates in land, life estates, remainders, concurrent interests, executory interests, limitations on creation of future interests. Modern concepts of property and an introduction to the modern efforts to define the public interest in relationship to the use of the property. Credit, 3 hours.

508 Property. Continuation of 507. Credit, 2 hours.

509 Criminal Law and Procedure. Legislative and judicial formulations designed to deal with anti-social activity, the substantive elements of particular crimes, problems in the administration of criminal law and the penal system generally. Criminal procedures as affected by the requirement of the Federal Constitution are examined. The role and the responsibilities of the legal profession in the administration and improvement of our system of criminal justice. Credit, 4 hours.

510 Constitutional Law. Role of the courts in the federal system, distribution of powers between state and federal governments, role of procedure in litigation of constitutional questions, fundamental protection for personal, property, political and social rights. Credit, 4 hours.

550 Administrative Law. Administrative process, emphasizing nature of powers exercised by administrative agencies of government, problems of procedure, and scope of judicial review. Credit, 3 hours.

551 Antitrust Law. Legislation and its implementation to prevent monopoly and business practices in restraint of trade, including restrictive agreements involving price-fixing, trade association activities and resale price maintenance, as well as concentration of industrial and commercial control through mergers. Credit, 3 hours.

552 Commercial Law. Law of negotiable instruments, sales and secured transactions with emphasis on the Uniform Commercial Code. Legal problems arising in the distribution of goods. Credit, 4 hours.

553 Conflict of Laws. Problems arising when the operative facts of a case are connected with more than one state or nation. Choice of law, bases of jurisdiction, effect of foreign judgments, underlying federal and constitutional issues. Credit, 3 hours.

554 Corporations. The corporation as a legal tool for organizing the business enterprise in comparison with sole proprietorship and partnership. Relations of stockholders and management, varieties of stock ownership, problems of corporate finance, and government regulations to achieve investor protection. Credit, 4 hours.

555 Evidence. Principles and practice governing the competency of witnesses and presentation of evidence, including the rules of exclusion and roles of lawyer, judge and jury under the adversary system. Credit, 3 hours.

556 Federal Income Taxation. Federal income tax in relation to concepts of income, property arrangements, business activity and current tax problems, with focus upon the process of tax legislation and administration. Credit, 3 hours.

557 Procedure II. Obtaining and exchanging information in advance of trial, isolating the area of controversy, disposing of cases or issues without trial, defining the scope of litigation in terms of parties and subject matter, and the relationship between successive litigations. Credit, 2 hours.

558 Procedure III. Litigation through appeal, including jurisdiction, right to jury, selection of jury, withdrawing case from jury, instructing jury, verdicts, judgments, appellate review. Credit, 2 hours.

559 Trust and Estates. Substantive concepts involved in transmitting wealth, including intestate succession, wills and will substitutes, the modern trust as a family protective device, creation of future interests in a planned estate, social restrictions of a non-tax nature and methods of devoting property to charitable purposes. Credit, 4 hours.

Third-Year Courses and Seminars

During the third year of law study, instruction will be given in intensive, two-month segments known as "quadrants." A student will normally carry two subjects each quadrant (four subjects in a semester) in a curriculum which combines course and seminar work with clinical training and field experience. The third-year student will have a substantially free range in electing courses, seminars and other credit-carrying offerings.

Not all of the third-year law courses and seminars will be offered during every academic year. Rather, a selection of a substantial number from among the approved courses will be made annually on the basis of student interest, faculty availability and other factors. The current College of Law Bulletin and the University Schedule of Classes should be consulted.

560 Legal History. Lawyer's contribution to society, emphasizing the lives of eminent lawyers, judges, legal scholars and law-trained statesmen and lawmakers. Credit, 3 hours.

561 Jurisprudence. Philosophic problems inherent in law; relationship of law to ethics, logic and language; selected schools of legal philosophy. Credit, 3 hours.

562 Family Law. Legal and nonlegal problems which an individual may encounter because of his situation as a member of a family. Credit, 3 hours.

563 State and Local Taxation. Taxation on the state and local level, including jurisdiction over tax, taxation of multistate business, *ad valorem* property taxes, sales and use taxes, income taxes, death taxes and other excise taxes. Credit, 3 hours.

564 Corporate Finance. Application of legal materials, training and judgment to problems of small and large-scale corporate enterprises. Problems include selection of the capital structure, public offerings of corporate securities, reorganization of solvent corporate enterprises, and corporate dissolution. Credit, 3 hours.

565 Corporate Taxation. Problems in taxability of the corporation, corporate distributions, corporate reorganizations and foreign operations. Credit, 3 hours.

566 Indian Law. An inquiry into legal problems special to American Indians and tribes. Credit, 3 hours.

567 Advanced Indian Law. Advanced individual and group study in selected problems of administration of tribal justice, economic development, rights of individual Indians. Prerequisite: LW 566. Credit, 3 hours.

568 Law in a Technological Society. Impact of technology on law and society. Such developments as computer science, nuclear energy and high-speed transportation will be considered. Credit, 3 hours.

569 Law and Medicine. Problems raised by the interaction of law and medicine. Credit, 3 hours.

570 Natural Resources Development. Legal problems relating to the acquisition, distribution, development and conservation of natural resources, federal-state and interstate problems; environmental control; public lands. Credit, 3 hours.

571 Insurance. Current trends in the business of insurance. Role of government in the insurance field will be considered. Credit, 3 hours.

572 Creditor-Debtor Relations. Remedies available to creditors and the protection and relief accorded to debtors. Credit, 3 hours.

573 Legislative Problems. Research methods and the drafting of legislation; lawyer's role as a legislative advocate. Credit, 3 hours.

574 Constitutional Litigation. Selected constitutional cases from inception through judicial decision. Emphasis on special problems of framing constitutional issues and overcoming obstacles peculiar to constitutional adjudication. Credit, 3 hours.

575 Securities Regulation. Selected problems arising under the major federal statutes concerned with regulating the securities market. Credit, 3 hours.

576 Professional Sports. Unique legal problems relating to professional sports, including their relationship to anti-trust laws, the nature of the player contracts and associated tax problems. Credit, 3 hours.

577 Social Legislation and the Social Sciences. A particular social problem with legislative implications such as divorce, abortion or organ transplantation will be studied in some detail, with consideration given to information available from psychology, sociology and related fields, and the use of legal skills in drafting legislative solutions. Credit, 3 hours.

601 Organization and Responsibilities of the Profession I. Organized bar, distribution of legal services in modern society, economics of the profession, professional canons of ethics for the bar, and judiciary and problems in policing the profession. Credit, 3 hours.

602 Organization and Responsibilities of the Profession II. Advanced work on selected problems. Credit, 3 hours.

603 Professional Skills: Interviewing and Counseling. Skills and techniques involved in interviewing and counseling, including interdisciplinary materials from other fields such as psychology and psychiatry. Credit, 3 hours.

604 Professional Skills: Negotiation and Drafting of Legal Instruments. Skills of negotiation in licensing a variety of situations and drafting of typical legal instruments. Credit, 3 hours.

605 Lawyers and Leadership in Society. Research techniques in the social sciences, skills in the use of mass media and techniques of political action as related to the needs of the modern lawyer. Credit, 3 hours.

611 Estate Planning I. Tax laws relating to transfer of wealth both at death and during lifetime, including federal estate tax, gift tax, and income taxation of estates and trusts. Credit, 3 hours.

612 Estate Planning II. Preparation of actual estate plans, and implementing legal documents for a variety of typical private clients. Both tax and nontax elements in preparation of the plans will be considered. Prerequisite: LW 611. Credit, 3 hours.

613 Planning for the Business Client. Planning a business organization for maximum efficiency and to achieve personal objectives of the business owners presented in a variety of situations. Student will prepare typical legal documents for business organization and transfer of ownership. Credit, 3 hours.

614 Planning Private Real Estate Developments. Legal aspects of real estate development, including negotiation, legal devices for financing, promotion of sales, leasing problems and compliance with legal controls, as well as creation of private controls over land use. Credit, 3 hours.

621 Practice Court. Students act as lawyers in conducting a case through all stages of trial, from commencement of the action to final judgment. Credit, 3 hours.

622 Techniques of Advocacy. Designed to familiarize students with the skills of the advocate by observation, instruction and participation. Credit, 3 hours.

623 Current Problems of Litigation. Current developments in the field of procedure, such as rules of evidence, rules of procedure, or systems of jury instruction. Credit, 3 hours.

624 Federal Courts. Federal judicial system; relationship of federal and state law; jurisdiction of federal courts and their relation to state courts. Credit, 3 hours.

631 Freedom of Speech. Freedom of speech and its association in competition with a number of governmental and individual interests, including those of preserving order, morality, fair trial and privacy. Credit, 3 hours.

632 Equality in Modern Society. Discrimination, its social and legal effects and remedies. Focus on constitutional, statutory and private organizational attacks upon racial, religious or national discrimination. Credit, 3 hours.

633 Freedom of Religion. Problems arising under the establishment and free exercise clauses of the First Amendment, including the separation of church and state. Theoretical and practical bases of current federal, state and local governmental policy toward religious institutions. Credit, 3 hours.

634 Protections from Bureaucracy. Proposed and existing mechanisms for protection of individuals from governmental action or inaction. Case studies of the operation of the ombudsman, police civilian review boards and other such institutions. Credit, 3 hours.

635 Current Constitutional Issues. Intensive examination of selected current constitutional decisions of the U. S. Supreme Court. Credit, 3 hours.

641 Legal Aspects of Community Renewal. Basic social structure in a community and possibilities of changing the structure to achieve a renewal of the community; legal devices to make more effective the participation of minorities in urban affairs; organization and distribution of legal services in urban areas. Credit, 3 hours.

642 Federal and Local Participation in Urban Problems. Federal programs designed to aid urban areas in solving the problems of an urban society. Relationship of these programs to local governments, individuals and groups within the community. Credit, 3 hours.

643 Local Government. Legal problems involved in the organization and administration of local governmental units including the city, county, town, village, school district, and special district. Credit, 3 hours.

644 Area Planning. Selected legal problems relating to the economic development of a region; intergovernmental relationships; role of private and public planning and the means through which planning is given operative effect. Credit, 3 hours.

651 Labor Relations. Collective bargaining, including the right of employees to organize and to engage in concerted activities; resolution of questions concerning the representation of employees; duty of employers and unions to bargain; administration and enforcement of collective bargaining agreements. Credit, 3 hours.

652 Labor Arbitration and Mediation. Role of the arbitrator and mediator in the settlement of labor-management disputes. Enforceability of awards, procedure and the operation of arbitration associations. Credit, 3 hours.

653 Selected Problems in Labor Law. Advanced questions in the collective bargaining area. Credit, 3 hours.

654 Modern Social Legislation. Significant legislative programs of social insurance and governmental responses to such problems as unemployment and disability. Credit, 3 hours.

661 Criminal Behavior and Criminal Law. Legal problems raised by the various systems of social control. Objectives of the criminal justice system; theories as to the dynamics of criminal behavior and specific questions raised by the behavior of classes of offenders. Credit, 3 hours.

662 Administration of Criminal Justice. Administration of the adult criminal justice system, including issues arising in the initial police stage of the system, the trial process and the sentencing and correctional stages. Credit, 3 hours.

663 Juvenile Justice System. Special problems in the juvenile system. Credit, 3 hours.

664 Mental Health, Psychiatry and the Law. Mental health system as a companion to the adult criminal system and the juvenile justice system in controlling antisocial behavior. Credit, 3 hours.

665 Selected Problems in Criminology. A research course drawing on local sources such as courts and correctional facilities. Papers will be prepared using material gathered in empirical research combining legal analysis with criminology techniques. Credit, 3 hours.

671 Regulated Industries. The nature and extent of regulation imposed on selected industries and of the techniques adopted by administrative agencies in seeking to achieve the varied objectives of public control. Credit, 3 hours.

672 The Legal Monopolies: Patent, Copyright and Labor. Legally created and sanctioned monopolies will be examined and compared on the basis of their justifications, objectives and limitations. Credit, 3 hours.

673 The Competitive Economy. Legal and economic characteristics of selected prob-

lems of the industrial organization in the modern economy. Prerequisite: LW 551. Credit, 3 hours.

674 Advanced Regulated Industries. Intensive and detailed examination of one or more of the regulated industries. Prerequisites: LW 551, 671. Credit, 3 hours.

681 Public International Law. Role of law in international disputes. Drafting and interpretation of treaties and multilateral conventions will be considered. Credit, 3 hours.

682 Regional Organizations. Role of economic and political multinational organizations and associations. Credit, 3 hours.

683 Selected Problems in International Law. Advanced consideration of selected problems. Credit, 3 hours.

684 Comparative Law. Techniques of analyzing legal institutions in different cultures. Credit, 3 hours.

685 Selected Problems in Comparative Law. Advanced studies on subjects to be decided. Credit, 3 hours.

686 Latin American Legal Institutions. Legal systems of the western hemisphere nations; the activities of American nationals in these nations. Credit, 3 hours.

687 Selected Problems in Developing Nations. Role of the lawyer in encouraging economic development abroad, emphasizing tasks of protecting investment and securing progress. Credit, 3 hours.

688 International Business Transactions. Special problems facing the investor abroad in dealing with nationals and governments. International conflicts of law considered. Credit, 3 hours.

700 Internship in Law. Supervised, practical experience with such agencies as Legal Aid, the Public Defender Office, the District Attorney's Office and other state and local governmental departments. Credit, 3 or 6 hours.

701 Field Work. Specialized study outside the law school in a particular area where law has an impact. The work must be approved and supervised by a member of the faculty. Credit, 1 to 6 hours.

702 Individual Study. With the approval of a faculty member, a student may research a legal subject of special interest and prepare a paper suitable for publication. Credit, 1 to 3 hours.

MASS COMMUNICATIONS

PROFESSORS:

BROWN (Old BA 304), ZACHER

ASSOCIATE PROFESSORS:

ELLIS, MILNER

ASSISTANT PROFESSORS:

BURGESS, LANCE

INSTRUCTOR:

MORRIS

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Arts Degree Curriculum

JOURNALISM, RADIO-TELEVISION — Consists of 45 semester hours of credit, including 30 in mass communications and 15 in related fields approved by the adviser in consultation with the student. Courses MC 110, 211, and 312 are required. At least 18 semester hours must be in upper division courses.

Bachelor of Science Degree Curriculum

JOURNALISM, RADIO-TELEVISION — Consists of 55 semester hours including 13 hours in advertising and six hours in related courses. Courses MC 110, 211, and 312 are required. At least 22 semester hours of credit must be in upper division courses.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS

Bachelor of Arts in Education Degree Curriculum

JOURNALISM — Consists of 45 semester hours of credit. Courses MC 110, 211, 212, 313, 320, and 480 are required. An additional 28 hours, including at least 13 in mass communications, will be approved by the adviser in consultation with the student. The remaining courses may be in mass communications or in closely related fields.

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS

JOURNALISM — Consists of 18 semester hours of credit. Courses MC 110, 211, 313, and 480 are required. The remaining courses are to be selected in consultation with a journalism adviser.

MASS COMMUNICATIONS

MC 110 Mass Communications. Survey of the functions and practices of newspapers, magazines, radio and television; laboratory practice in writing for the mass media. Two lectures, 2 hours laboratory. Credit, 3 hours.

120 Mass Media and Society. Analysis of the role of newspapers, magazines, radio, television, and motion pictures in a democratic society. Not open to mass communications majors. Credit, 3 hours.

200 Fundamentals of Radio-Television. Organization of broadcast stations; facilities, personnel, and practices of radio and television. Prerequisite: MC 110. Credit, 3 hours.

211 Reporting. Study and practice in the coverage and writing of news; structure of the news story; laboratory practice. Prerequisite: MC 110. One lecture, 4 hours laboratory. Credit, 3 hours.

212 Advanced Reporting. Main types and sources of news; interviewing and beat coverage; laboratory, and *State Press* experience. Prerequisite: MC 211. One lecture, 4 hours laboratory. Credit, 3 hours.

232 Radio-Television Announcing. Techniques of radio and television announcing. Prerequisite: MC 110 or approval of instructor. One lecture, 4 hours laboratory. Credit, 3 hours.

300 Cinema in Mass Communications. The motion picture as a mass medium. Credit, 3 hours.

311 News Photography. Instruction with field and laboratory practice in camera and darkroom techniques for newspaper and magazine photographic work. Prerequisite: MC 110 or approval of instructor. One lecture, 4 hours activity. Credit, 3 hours.

312 Communications Law. Legal aspects of the rights and responsibilities of the press, radio, and television; basic features of the law of libel, privilege, copyright, access to information; background of court reporting. Credit, 3 hours.

313 Editing and Make-up. Copyreading and headline writing; principles of typography and make-up. Laboratory practice. Prerequisite: MC 212. One lecture, 4 hours laboratory. Credit, 3 hours.

314 History of Communications. American journalism from its English and colonial origins to the present day. Development and influence of newspapers, magazines, radio, television, and news gathering agencies. Credit, 3 hours.

315 Radio-Television News. Techniques and practices of writing and editing press association and local news copy for radio and television news broadcasts; laboratory practice in preparation of news programs. Prerequisite: MC 211. Credit, 3 hours.

320 Staff Activity. Practical professional experience and responsibility in production of a newspaper. The University newspaper, the *State Press*, is used as the laboratory or work project for this class. Prerequisite: MC 313. Credit, 2 hours.

321 Television Drama. Production of television drama. Credit, 3 hours.

322 Radio-Television Programming. Radio and television programming patterns, regulations pertaining to broadcasting, and responsibilities of broadcasters. Prerequisite: MC 110 or 200. Credit, 3 hours.

336 Television Production. Planning, staging, and presentation of television programs. Prerequisite: MC 200 or approval of instructor. One lecture, 4 hours laboratory. Credit, 3 hours.

337 Television Directing. Directing television programs. Prerequisite: MC 336. One lecture, 4 hours laboratory. Credit, 3 hours.

340 Magazine Writing. Writing and marketing magazine articles for publication. Prerequisite: MC 110 or approval of instructor. Credit, 3 hours.

401 Public Relations Techniques. Publicity methods; how to communicate through newspapers, magazines, radio-television stations, and other media. Prerequisite: MC 211 or approval of instructor. Credit, 2 hours.

411 Special Assignment. Selection and performance of a major project or projects on an individual basis. Prerequisite: Approval of instructor. Credit, 2 to 3 hours.

412 Editorial Interpretation. The press as an influence upon public opinion. The editorial in analyzing and interpreting current events. Prerequisite: MC 211. Credit, 2 hours.

413 Advising High School Publications. Designed for high school publication advisers. Problems of newspaper and yearbook staffs. Credit, 2 hours.

421 News Problems. Current trends and problems of the news media with special emphasis upon editorial decisions in the processing of news. Prerequisite: Eight hours in mass communications or approval of instructor. Credit, 3 hours.

430 International Communications. Comparative study of press and broadcasting systems in foreign countries. Problems of news gathering and dissemination in other cultures and under different forms of government. Credit, 3 hours.

431 Radio-Television Writing. Principles and techniques of writing for radio and television. Credit, 3 hours.

433, 434 Radio-Television Station Operation. Program planning, traffic, music, news, continuity, and promotion; assignments in actual operations. Prerequisite: MC 332. Credit, 2 hours each semester.

472 Radio-Television Station Management. Organization, procedures, and policies of radio-television stations. Financial and creative aspects of station operation. Personnel and production problems, relationship with advertising agencies, networks and sponsors. Prerequisites: AD 301; MC 332. Credit, 3 hours.

480 Methods of Teaching Journalism. Methods of instruction, organization, and presentation of appropriate content in journalism. Prerequisite: Six hours of journalism. Credit, 3 hours.

See related courses: *AD 301 Advertising Principles; AD 311 Advertising Campaigns I; AD 312 Advertising Campaigns II; AD 371 Radio and Television Advertising; AD 461 Advertising Management.*

MATHEMATICS

PROFESSORS:

NERING (PSC A-216), BUNT, FREUND, GRACE, HEATH, KELLY, SAVAGE,
SCOTT, SINKOV, WEXLER

ASSOCIATE PROFESSORS:

CARR, KURTZ, LYON, SANSONE, SHERMAN, SMITH

ASSISTANT PROFESSORS:

ANDERSON, ARNQUIST, BEDIENT, COUNTRYMAN, GOLDSTEIN,
HASSETT, HUFF, LEONARD, LISKOVEC, LIVERMORE,
LORENZEN, McCARTER, PECK, STEWART, SWIMMER

INSTRUCTORS:

LAKE, THOMPSON

COURSE SEQUENCES IN MATHEMATICS

The Mathematics Department offers a variety of courses and course sequences to meet the needs of the various academic disciplines. For example, the sequence MA 141, 142, 243, 342 is provided for students in the social, life, and management sciences as an alternative to the standard calculus sequence MA 120, 121, 212, which is designed for students in the physical, engineering, and mathematical sciences.

For students electing a single mathematics course, MA 205 is highly recommended. MA 116 is a remedial course for students who require more than one mathematics course and have had less than 3 semesters of high school algebra. (This course will not be offered for credit after August, 1970).

The sequence MA 117, 118 is provided for students who have had 1½ years of high school algebra but less than 3½ years of high school mathematics and who plan to take the calculus sequence MA 120, 121.

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Arts Degree Curriculum

MATHEMATICS — Consists of 45 semester hours of which 30 must be in mathematics and 15 in closely related fields to be approved by the adviser in consultation with the student. Required courses are MA 120, 121, 342, 370, 443, and 470, ordinarily taken in the listed order. The additional mathematics courses will be upper division, but will not include MA 362, 380, 381, 460, 480, 481, 483, or 484. The department highly recommends a computer programming course, such as ES 103, and a year's sequence of courses (for example, PH 115, 116) in some closely related field.

Bachelor of Science Degree Curriculum

MATHEMATICS — Consists of 45 to 55 semester hours of which at least 40 must be in mathematics, and the remaining hours in closely related fields to be approved by the adviser in consultation with the student. Re-

quired courses are MA 120, 121, 342, 370, 443, 444, 450, 470, and 471, ordinarily taken in the listed order. The additional mathematics courses will be upper division, but will not include MA ~~380~~ 380, 381, ~~460~~ 480, 481, 483 or 484. In addition, the following are required: (a) A year's sequence of courses (for example, PH 115, 116) in some closely related field. (b) Either one year of French, German or Russian or a computer programming course such as ES 103, followed by MA 334 and MA 436.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS

Bachelor of Arts in Education Degree Curriculum

MATHEMATICS — Consists of 45 semester hours of credit. Required courses are MA 120, 121, 307, 342, 370, 404, 443, 483, and a computer programming course such as ES 103. A minimum of 21 hours of upper division courses is required. The remainder of the upper division requirement will be selected in consultation with the adviser, but will not include MA 362, 380, 381, 480, or 481. Any remaining courses to complete the major will be selected from mathematics or closely related fields. MA 484 is required, exclusive of the 45-hour major requirement, as part of a 25-hour professional education requirement.

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS (Secondary Education)

MATHEMATICS — Consists of 18 semester hours of credit. Courses MA 120, 121, 212 or 370 are required. The remaining courses are to be selected in consultation with an adviser.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Mathematics offers programs leading to the degrees of Master of Arts and Doctor of Philosophy. Consult the *Graduate Catalog* for requirements.

MATHEMATICS

MA 116 Intermediate Algebra. Properties of real numbers, fractions, operations with polynomials, factorization, exponents and radicals, functions and graphs, and solution of linear and quadratic equations. Credit, 3 hours. Not to be offered for credit after August, 1970.

117 College Algebra. Operations with polynomials, exponents and radicals; solution of equations and inequalities in one variable, functions and graphs, exponential and logarithmic functions, solution of systems of equations, theory of equations, sequences and series. Prerequisite: MA 116 or three semesters of high school algebra. Credit, 3 hours.

118 Plane Trigonometry. Review of pertinent fundamental concepts of algebra and geometry, measures of angle, properties and graphs of the trigonometric functions, fundamental identities, addition and half angle formulas, inverse trigonometric functions, principles of triangle solution, solution of trigonometric equations, complex numbers. Prerequisite: MA 116 or three semesters of high school algebra. Credit, 2 hours.

120 Analytic Geometry and Calculus I. Introduction to the differential and integral calculus of elementary functions along with presentation of topics from analytic geometry essential to the study of calculus. Prerequisite: MA 117, or MA 141, or 3½ years of high school mathematics. Credit, 5 hours.

121 Analytic Geometry and Calculus II. Techniques of integration, further applications of the calculus, partial differentiation, and multiple integrals. Prerequisite: MA 120. Credit, 5 hours.

141 Mathematical Analysis I. Introductory logic, the complex number system, algebraic operations, solution of equations and inequalities, numerical calculation, algebra of sets, functions and graphs, the trigonometric functions, probability theory. Prerequisite: MA 116 or three semesters of high school algebra. Not intended for majors in mathematics or the physical sciences. Not open to students who have taken MA 117 or 118. Credit, 4 hours.

142 Mathematical Analysis II. Lines and vectors, conic sections, limits of sequences and functions, introductory differential and integral calculus with applications, curve tracing, matrices, analytic geometry of three dimensions. Prerequisite: MA 141. Not open to students who have taken MA 120. Credit, 3 hours.

205 The Creative Art of Mathematics. Designed to acquaint students in the arts, humanities, and social sciences with the nature of modern mathematics and the mathematical method. Credit, 3 hours.

212 Analytic Geometry and Calculus III. Line and surface integrals, infinite series; solution of ordinary differential equations, numerical methods, Laplace transforms, existence and uniqueness of solutions. Prerequisite: MA 121. Credit, 5 hours.

226 Elements of Statistics. Basic concepts and methods of statistics, including descriptive statistics, significance tests, estimation, sampling, and correlation. Not open to majors in mathematics or the physical sciences. Prerequisite: MA 116 or three semesters of high school algebra. Credit, 3 hours.

243 Mathematics for the Social, Life and Management Sciences. Topics from set theory, probability, and linear algebra. Prerequisite: MA 142. Credit, 3 hours.

260 Differential Equations. Solution of ordinary differential equations, numerical methods, Laplace transforms, existence and uniqueness of solutions. Prerequisite: MA 121. Not open to students who have taken MA 212. Credit, 3 hours.

307 Introduction to Geometry. Congruence, area, parallelism, similarity, and volume. Euclidean and non-Euclidean geometry. Prerequisite: MA 121. Credit, 3 hours.

334 Abstract Computing Machines. Automata, Turing machines, algorithms and effective computability, limits of effective computability, symbol manipulation systems. Prerequisite: MA 342. Credit, 3 hours.

342 Introduction of Linear Algebra. Linear equations and matrices, vector spaces and linear transformations, quadratic forms and characteristic values. Prerequisite: MA 121, or 142, or approval of instructor. Credit, 3 hours.

362 Advanced Mathematics for Engineers. Topics from vector algebra, vector calculus, Fourier series, and partial differential equations. Emphasis on techniques of problem solving. Prerequisite: MA 212 or 260. Not open to mathematics majors. Credit, 3 hours.

370 Introduction to Analysis. Elements of real analysis and set theory emphasizing certain basic concepts. Set theory, algebra and topology of the real numbers, limits and continuity, differentiation, or other similar topics. Prerequisite: MA 342. Credit, 3 hours.

380, 381 Mathematics in the Elementary School. Theory of arithmetic and informal geometry. MA 380 is a prerequisite for MA 381. Credit, 3 hours each semester.

404 Projective Geometry. Projective geometry and its relationship to Euclidean and other geometries. Prerequisite: MA 307 recommended; MA 342 required. Credit, 3 hours.

408 Differential Geometry. Geometry of curves and surfaces in Euclidean 3-space with extensive use of linear algebra. Prerequisite: MA 450. Credit, 3 hours.

410 Introductory Topology. Topology of the real numbers, equivalence of sets, transfinite induction. Designed to develop the student's critical faculties and creative abilities in mathematics. Prerequisite: MA 370. Credit, 3 hours.

426 Mathematical Statistics I. Laws of probability, probability distribution and density functions, expected values and moments, limit theorems. Prerequisite: MA 212 or 370. Credit, 3 hours.

427 Mathematical Statistics II. Sampling distributions, estimation and tests of hypotheses, regression, correlation, analysis of variance. Prerequisite: MA 426. Credit, 3 hours.

428 Experimental Designs. Principles of experimental design, analysis of special designs. Prerequisite: MA 427. Credit, 3 hours.

430 Mathematical Logic. Propositional calculus, first order theories, first order predicate calculus, consistency and completeness, Godel's theorems. Prerequisite: MA 443 or 470, or approval of instructor. Credit, 3 hours.

432 Theory of Sets. Equivalence relations and partitions, similarity mappings, ordinal numbers, cardinal numbers, well ordering theorem, equivalents of the axiom of choice, axiomatic set theory. Prerequisite: MA 443 or 470, or approval of instructor. Credit, 3 hours.

434 Computability and Unsolvability. Turing machines and computability, computable and partial computable functions, recursive sets and predicates, recursively enumerable sets, unsolvable decision problems, applications. Prerequisite: Approval of instructor. Credit, 3 hours.

436 Mathematical Linguistics. Theory of grammar, methods of syntactic analysis and specification, types of artificial languages, relationship between formal languages and automata. Prerequisite: MA 342. Credit, 3 hours.

442 Advanced Linear Algebra. Deeper study of the topics in MA 342 and additional topics selected from following list: invariant subspaces, canonical forms of matrices, minimal polynomials, linear programming, and multilinear algebra. Prerequisite: MA 342. Credit, 3 hours.

443 Abstract Algebra I. Basic introduction to the most important algebraic structures including groups, rings, integral domains, and fields. Prerequisite: MA 370. Credit, 3 or 4 hours.

444 Abstract Algebra II. Continuation of MA 443 with a study of unique factorization domains, modules, and fields along with applications of abstract algebra to various branches of mathematics. Prerequisite: MA 443. Credit, 3 hours.

445 Theory of Numbers. Prime numbers, the unique factorization theorem, congruences, Diophantine equations, primitive roots, the quadratic reciprocity theorem. Prerequisite: MA 342. Credit, 3 hours.

450 Advanced Multivariable Calculus. Properties of continuous mappings from E_n to E_m and an introduction to differential forms and vector field theory based on line and surface integrals and the general Stokes' theorem. Prerequisite: MA 370. Credit, 3 hours.

460 Applied Real Analysis. Vector approach to functions of several variables, curvilinear coordinates, Jacobians and the implicit function theorem, multiple integrals, change of variables, line and surface integrals; Green's, Stokes', and divergence theorems. Prerequisite: MA 212 or 260. Credit, 3 hours.

461 Applied Complex Analysis. Analytic functions, complex integration, Taylor and Laurent series, residue theorem, conformal mapping and harmonic functions. Prerequisite: MA 362 or 370 or 460. Credit, 3 hours.

462 Partial Differential Equations. Second order partial differential equations with emphasis on Laplace, wave, and diffusion equations; solutions by the methods of: characteristics, separation of variables, Green's function and integral transforms. Prerequisite: MA 362 or 370 or 460. Credit, 3 hours.

463 Transform Theory and Operational Methods. Fourier, Laplace, and other transforms; applications to boundary value problems; generalized functions and modern operational mathematics. Prerequisite: MA 461. Credit, 3 hours.

464 Numerical Analysis I. Numerical solution of algebraic and transcendental equations, application of matrices and determinants to the solution of simultaneous linear equations, eigenvalues, relaxation techniques. Prerequisites: MA 212 or 370, and a knowledge of computer programming. Credit, 3 hours.

465 Numerical Analysis II. Finite differences, summation of series, interpolation, numerical differentiation and integration, numerical solution of ordinary differential equations. Prerequisite: MA 464. Credit, 3 hours.

470 Foundations of Analysis I. Real and complex numbers, metric and Euclidean spaces, continuity, differentiation, Riemann-Stieltjes or Riemann integration. Prerequisite: MA 370. Credit, 3 or 4 hours.

471 Foundations of Analysis II. Continuation of MA 470 with a variety of topics such

as convergence theorems, Fourier series, normed linear spaces, Lebesgue integral. Prerequisite: MA 470. Credit, 3 hours.

474, 475 Differential Equations. Linear differential equations, regular singular points, existence and uniqueness theorems, systems, autonomous systems, Sturm-Liouville problems, simple partial differential equations. Prerequisite: MA 212 or 370. Credit, 3 hours each semester.

480, 481 Mathematics in the Upper Elementary Grades. Arithmetic, algebra, and geometry appropriate for teachers of grades 6-8; appropriate materials and activities. Prerequisite: MA 381 or approval of instructor. Credit, 3 hours each semester.

483 Mathematics in the Secondary School. Selected topics in algebra and geometry. Prerequisite: Approval of instructor. Credit, 3 hours.

484 Mathematics in the Secondary School. Selected topics in probability and statistics. Prerequisite: Approval of instructor. Credit, 3 hours.

485 History of Mathematics. Topics from the history of the origin and development of mathematical ideas. Prerequisite: MA 370. Credit, 3 hours.

510, 511 Point Set Topology. Topological spaces, metric spaces, compactness, connectedness, local properties, product and decomposition spaces, mappings, covering properties, separation properties. Prerequisite: MA 410 or 470, or approval of instructor. Credit, 3 hours each semester.

513 Algebraic Topology. Homotopy theory, simplicial and singular homology, cohomology. Prerequisites: MA 443 and 510, or approval of instructor. Credit, 3 hours.

514, 515 Advanced Point Set Topology. Continuation of MA 511. Prerequisite: MA 511, or approval of instructor. Credit, 3 hours each semester.

519 Topics in Topology. Prerequisite: Approval of instructor. May be repeated for credit. Credit, 2-3 hours.

520, 521 Stochastic Processes. Stochastic models, stationary processes, Poisson processes, renewal processes, Markov chains, generalized harmonic analysis. Prerequisites: MA 342 and 471, or approval of instructor. Credit, 3 hours each semester.

522, 523 Theory of Statistics. Probability, distribution theory, limiting distributions, multivariate analysis, correlation and regression, quadratic forms in normal variables, estimation, statistical hypotheses, analysis of variance and covariance, sequential analysis, nonparametric inference, decision theory. Prerequisites: MA 427 and a knowledge of the algebra of matrices, or approval of instructor. Credit, 3 hours each semester.

525 Experimental Statistics. Applications of statistical inference, the Markov theorem, multiple linear regression and correlation, linearizing transformations, discriminate analysis and other special problems. Prerequisite: MA 428, or approval of instructor. Credit, 3 hours.

526, 527 Advanced Probability. Measure-theoretic foundations of probability, distribution functions and characteristic functions, law of large numbers and central limit theorems, conditional probabilities, martingales, and topics in stochastic processes. Prerequisite: MA 571, or approval of instructor. Credit, 3 hours each semester.

530, 531 Metamathematics. First order theories, incompleteness and undecidability, recursion theory, theory of models. Prerequisite: MA 430, or approval of instructor. Credit, 3 hours each semester.

540, 541 Banach Spaces of Analytic Functions. Fourier series, analytic and harmonic functions in the unit disc, H^p spaces, analytic functions with continuous boundary values, the Gelfand representation. Prerequisites: MA 570 and 572, or approval of instructor. Credit, 3 hours each semester.

543, 544 Abstract Algebra. Groups, modules, rings, and fields; Galois theory, homological algebras, representation theory. Prerequisite: MA 444, or approval of instructor. Credit, 3 hours each semester.

545 Advanced Topics in Number Theory. Topics selected from classical, analytic, additive, and algebraic number theory. Prerequisites: MA 445 and approval of instructor. May be repeated for credit. Credit, 1-3 hours.

547, 548 Group Theory. Groups with operators, composition series, soluble groups, Abelian groups, Sylow's theorems, linear groups. Prerequisite: MA 444, or approval of instructor. Credit, 3 hours each semester.

549 Advanced Topics in Algebra. Topics selected from Galois theory, ring theory, algebraic number theory, and algebraic function theory. Prerequisites: MA 544 and approval of instructor. May be repeated for credit. Credit, 1-3 hours.

550, 551 Methods of Mathematical Physics. Topics selected from matrices, orthogonal functions, integral equations, calculus of variations, eigenvalue problems, perturbation methods, boundary value problems. Prerequisites: MA 342 and either 461 or 470; or approval of instructor. Credit, 3 hours each semester.

552, 553, Tensor Analysis. Vector spaces, algebra and calculus of tensors, differential forms; applications to geometry and various branches of applied mathematics including mechanics, relativity and the mechanics of continuous media. Prerequisites: MA 342 and either MA 450 or 460; or approval of instructor. Credit, 3 hours each semester.

554 Calculus of Variations. Necessary and sufficient conditions of Euler, Weierstrass, Legendre, and Jacobi; direct methods and Dirichlet principle, Ritz and Galerkin methods of approximate solutions, applications to eigenvalue problems and partial differential equations. Prerequisite: MA 470, or approval of instructor. Credit, 3 hours.

559 Topics in Nonlinear Mathematics. Prerequisites: MA 470 and approval of instructor. May be repeated for credit. Credit, 3 hours.

564, 565 Advanced Numerical Analysis. Finite difference equations, orthogonal polynomials, Gaussian quadrature, approximation of functions, numerical solution of partial differential equations. Prerequisite: MA 465, or approval of instructor. Credit, 3 hours each semester.

569 Topics in Analysis. Riemann surface theory, univalent or multivalent function theory, summability processes, analytic theory of continued fractions. Prerequisite: Approval of instructor. May be repeated for credit. Credit, 3 hours.

570, 571 Real Analysis. Lebesgue integration, abstract measure theory, L_p spaces and linear functionals, differentiation. Prerequisite: MA 471, or approval of instructor. Credit, 3 hours each semester.

572, 573 Complex Analysis. Analytic functions, complex integration, Taylor and Laurent series, residue theorem, partial fractions and infinite product representation of functions; Riemann mapping theorem, analytic continuation, harmonic functions, Dirichlet problem; Green's function, conformal mapping. Prerequisite: MA 471 (and 461 desirable), or approval of instructor. Credit, 3 hours each semester.

574, 575 Theory of Ordinary Differential Equations. Systems, existence proofs, singularities, asymptotic behavior of solutions, boundedness of solutions, eigenvalues and eigenfunctions, perturbation theory. Prerequisites: MA 470 and 474, or approval of instructor. Credit, 3 hours each semester.

576, 577 Theory of Partial Differential Equations. Existence and uniqueness theorems, boundary value and initial value problems, characteristics; Green's function, maximum principle, variational and operational methods, Sturm-Liouville theory. Prerequisite: Knowledge of Lebesgue integration or approval of instructor. Credit, 3 hours each semester.

578, 579 Functional Analysis. Metric, Banach and Hilbert spaces. Bounded and unbounded transformations, spectral theory, and application to classical analysis. Prerequisite: MA 571, or approval of instructor. Credit, 3 hours each semester.

582 Modern Mathematics for Teachers. Theory of sets, real number system, transfinite numbers, and other selected topics. Prerequisite: Approval of instructor. Credit, 3 hours.

583 Abstract Algebra for Teachers. Postulational approach to algebra; elementary mathematical systems, including groups and fields. Prerequisite: Approval of instructor. Credit, 3 hours.

585 Modern Geometry for Teachers. Euclidean, projective, and non-Euclidean geometries. Prerequisite: Approval of instructor. Credit, 3 hours.

586 Probability and Statistics for Teachers. Probability theory based on the theory of sets and the modern concepts of statistical inference; problems related to the teaching of statistics in high school. Prerequisite: Approval of instructor. Credit, 3 hours.

587, 588 Analysis for Teachers. Subject matter in mathematics appropriate for accelerated programs in secondary schools, including analytic geometry and calculus. Prerequisite: Approval of instructor. Meets daily. Credit, 3 hours each semester.

591 Seminar. Credit, 2-3 hours. Topics may be selected from the following:

- | | |
|--|------------------------------------|
| (a) <i>Analysis</i> | (d) <i>Topology</i> |
| (b) <i>Applied Mathematics,</i>
<i>Mathematical Physics</i> | (e) <i>Algebra</i> |
| (c) <i>Probability</i> | (f) <i>Mathematical Statistics</i> |
| | (g) <i>Mathematical Logic</i> |

Special Graduate Courses: 590, 594, 792, 799. (See page 219.)

MILITARY SCIENCE (Army ROTC)

PROFESSOR:

KNAPP (Main 214)

ASSISTANT PROFESSORS:

BARNES, BEAUCHAMP, HARRELL,
MOERBE, NEWTON, PLATE, RENNER, STEWART

MS 101, 102 Basic Military Science. U.S. Army and national security; organization of the Army and the ROTC; individual weapons; leadership. One lecture, one hour leadership laboratory. Credit, 2 hours each semester.

201, 202 Basic Military Science. American military history; map reading and aerial photography; introduction to tactics and operations. Prerequisites: MS 101 and 102 or equivalent. Two lectures, one hour leadership laboratory. Credit, 2 hours each semester.

301 Advanced Military Science. Principles of leadership. Prerequisite: MS 201 and 202 or equivalent. One lecture, one hour leadership laboratory. Credit, 1 hour.

302 Advanced Military Science. Military teaching methods; branches of Army orientation; introduction to internal defense; small unit tactics; communications; advanced summer camp orientation. Prerequisite: MS 301. Four lectures, one hour leadership laboratory. Credit, 4 hours.

401 Advanced Military Science. Administrative management; military law; the military team; logistics; internal defense. Prerequisites: MS 301 and 302. Four lectures, one hour leadership laboratory. Credit, 4 hours.

402 Advanced Military Science. Army readiness program; military implications of recent world changes; obligations and responsibilities of Army officers. Prerequisite: MS 401. One lecture, one hour leadership laboratory. Credit, 1 hour.

403 Advanced Military Science and Flight Training. Administrative management; military law; the military team; logistics; internal defense; 18 hours of flight training including ground school instruction in weather, navigation and FAA regulations and in-flight instruction. Prerequisites: MS 301 and 302. Four lectures, one hour leadership laboratory, flight instruction by arrangement. Credit, 4 hours.

404 Advanced Military Science and Flight Training. Army readiness program; military implications of recent world changes; obligations and responsibilities of Army officers; 18½ hours of flight training including ground school instruction in weather, navigation and FAA regulations and in-flight instruction. Prerequisite: MS 401. One lecture, one hour leadership laboratory, flight instruction by arrangement. Credit, 1 hour.

MUSIC

PROFESSORS:

BROEKEMA (Aud. 105), BRUINSMA, BULLOCK, ENGLISH, FLETCHER,
LAMM, LOMBARDI, RIDER, SCOLAR, SEIPP

ASSOCIATE PROFESSORS:

AUTENRIETH, BOWERS, BRITTON, CARROLL, CHAUSOW, COHEN, DALES,
DRESSKELL, HANNA, HEFFERNAN, HINES, ISAAK, KEATING, LOPRESTI,
PUTNIK, RICKEL, ROBINSON, SPINOSA, STALZER, STELLHORN

ASSISTANT PROFESSORS:

DEMAND, HILL, RATTERREE, RAUSCH, RAVE,
MARGO SMITH, MARION SMITH

INSTRUCTORS:

ATSUMI, HANSEN

DEPARTMENTAL MAJOR REQUIREMENTS

For advisement purposes, all students registering in a music major program will enroll through the College of Fine Arts.

Bachelor of Arts Degree Curriculum

MUSIC — Consists of 45 semester hours of credit. Course work includes 12 semester hours of integrated theory, eight semester hours in the major performing medium, six semester hours of music history and literature and MU 320, 427. A piano proficiency examination is required. At least 18 semester hours must be in upper division courses. A minimum of 126 hours is required for graduation.

Bachelor of Music Degree Curriculum

Consists of 84 semester hours of credit in music. Course work will depend on the musical status of the entering student. This degree program offers fields of specialization in choral music, church music, instrumental music, music performance, and theory and composition. Instrumental and choral music majors are provided for students meeting teaching certification requirements. A minimum of 126 hours is required for graduation. Depending on the field of specialization, the course requirements are:

Music Theory	18 to 41
Applied Music	23 to 45
Music History and Literature	6 to 14
Music Education (for choral and instrumental majors only)	13 to 15
Church Music	0 to 23
Electives in Music	0 to 14

Bachelor of Arts in Education Degree Curriculum
Course Requirements for a Major in Music Education

CHORAL MUSIC OR INSTRUMENTAL MUSIC —

Consists of 45 semester hours of credit, including:

Music Theory	16
Applied Music	19 to 31
Music History	6
Music Education	6 to 9

Course Requirements for a Minor in Music Education

I. Non-music majors minoring in music will take the following courses:

MU 100 Fundamentals of Music Notation	2
(This course not required if proficiency is demonstrated on Theory Placement Exam)	
MU 101 Foundations of Music Theory	2
MU 340 Survey of Music History and Literature	3
Music Electives	4
	(Core) <u>11</u>

In addition to the core, ELEMENTARY EDUCATION majors will also take the following courses:

MU 313 Methods of Teaching Music in the Elementary School.....	3
Electives in Piano or Voice	4
Total	<u>18</u>

In addition to the core, SECONDARY EDUCATION majors will also take the following courses:

MU 480 Methods of Teaching Choral Music in the Secondary Schools	3
(or)	
MU 483 Instrumental Music Methods for the Junior and Senior High School	3
Electives in Applied Music	4
Total	<u>18</u>

II. For the CHORAL MINOR, when the student is majoring in Instrumental Music on the Bachelor of Arts in Education degree in the Department of Secondary Education, or the Bachelor of Music degree in Instrumental Music, the following courses are required:

MP 133, 134, 233, 234 Class Voice	4
MU 313 Methods of Teaching Music in the Elementary School	3
MP 339 Choral Conducting	2
MU 431 Choral Arranging	2
MU 480 Methods of Teaching Choral Music in the Secondary Schools	3
Major Ensembles (Choral)	2
PH 320 Acoustics	4
Total	<u>20</u>

III. For the INSTRUMENTAL MUSIC MINOR, when the student is majoring in Choral Music on the Bachelor of Arts in Education degree in the Department of Secondary Education, or the Bachelor of Music degree in Choral Music, the following courses are required:

MP 235, 237, 336, 337 Class Instruments	4
MP 340 Instrumental Conducting	2
MU 433 Orchestration	2
MU 483 Instrumental Music Methods for the Junior and Senior High School	3
PH 320 Musical Acoustics	4
Major Ensembles (Instrumental)	2
Music Electives	1
Total	<u>18</u>

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Music offers programs leading to the degrees of Master of Arts and Master of Music. Consult the *Graduate Catalog* for requirements.

MUSIC

MU 100 Fundamentals of Music Notation. To provide non-music majors with sufficient symbol literacy to begin work in the field of musical learning. No credit for music majors. Three hours a week. Credit, 2 hours.

101 Foundations of Music Theory. A survey of music theory. Prerequisite: MU 100 or approval of instructor. No credit for music majors. This course may be used to meet the music theory requirements for a minor in music. Three hours a week. Credit, 2 hours.

107 Introduction to Music. The correlation of music with literature, science, and art. A non-technical course in the humanities primarily for non-music majors. Credit, 2 hours.

125, 126, 225, 226 Integrated Theory. Basic theory needed for musicians to develop musical understandings and skills. Meets daily. Credit, 3 hours each semester.

127, 128, 227, 228 Integrated Musicianship. A two-year sequence designed to include the basic studies in music theory, counterpoint, orchestration, form and analysis, conducting, and composition. Prerequisite: Admission by examination and approval of department chairman. Two hours daily. Credit, 6 hours each semester.

311 Music Methods for the Classroom Teacher. Development of the classroom music program in the elementary school. No previous music experience or course work required. Not for music majors or minors. Three hours each week. Credit, 3 hours.

313 Methods of Teaching Music in the Elementary School. Methods of instruction, organization, and presentation of appropriate content in music. For music majors and minors only. Credit, 3 hours.

320, 321 Counterpoint. First semester, strict counterpoint in modal style; second semester, strict and free tonal counterpoint. Prerequisite: MU 226. Credit, 2 hours each semester.

325 Twentieth Century Theory. Meets daily. Credit, 3 hours.

340 Survey of Music History and Literature. The major periods, composers, and compositions in the history of music. A humanities course in the General Studies program. This course may be used to meet the music history requirement for a minor in music. Credit, 3 hours.

341, 342 Music History and Literature. Western music from the Greeks to the present day. Prerequisite: MU 226. Credit, 3 hours each semester.

349 Theory and Practice of Tuning. Principal tuning systems employed in music from 1500 to the present day. Limited to music majors of at least junior standing. Credit, 2 hours.

351, 352 Service Playing. First semester, study of the basic principles of hymn playing and accompaniment; second semester, advanced hymn playing and fundamentals of improvisation. Prerequisite for second semester: MU 226 or its equivalent. Credit, 2 hours each semester.

355 Survey of American Music. The growth and development of America's music. A humanities course for non-music majors. Credit, 2 hours.

356 Survey of the Musical Theater. An examination of music's place in the theater, viewed in terms of its historical importance and relative function. A humanities course for non-music majors. Credit, 2 hours.

423 Composition. Creative writing in the smaller forms including the use of harmonic textures and contrapuntal devices. Prerequisite: MU 325. May be repeated for credit. Credit, 2 hours.

427, 428 Form and Analysis. Harmonic and structural analysis of musical forms. Prerequisite: MU 226. Credit, 2 hours each semester.

429, 430 Canon and Fugue. Polyphonic studies in form and technique. Prerequisite: MU 321. Credit, 2 hours each semester.

431 Choral Arranging. Practical studies in editing and arranging for choral organizations. Preparation of suitable material for young choirs as well as for advanced groups. Study of accompaniments. Prerequisite: MU 226. Credit, 2 hours.

433, 434 Orchestration. Theoretical and practical study of scoring for orchestral instruments in various combinations, ranging from small ensembles to symphonic orchestra and concert band. Prerequisite: MU 226. Credit, 2 hours each semester.

438 Music in the Classic Era. An examination of the development of the classic style as exemplified by the works of Haydn, Mozart, and Beethoven. Credit, 3 hours.

439 Music in the Nineteenth Century. A survey of European art music after Beethoven. Credit, 3 hours.

441 Baroque Music. Seventeenth and early Eighteenth Century music. Prerequisite: MU 342 or graduate standing. Credit, 3 hours.

445 Twentieth Century European Music. Prerequisite: MU 342. Credit, 2 hours.

446 Twentieth Century American Music. Prerequisite: MU 325 or 445. Credit, 2 hours.

447 Choral Literature for the Church. Selection and study of music literature appropriate for children's, youth, and adult church choirs. Credit, 2 hours.

448 Choral Techniques for the Church. Adult, youth, and children's choir methods. Prerequisite: MP 339 or equivalent. Credit, 2 hours.

449 Worship and Liturgy. Study of various worship concepts and the consequent liturgical developments from Biblical times to the present day. Credit, 2 hours.

450 Hymnology. Historical survey and analysis of hymns of all faiths. Credit, 2 hours.

451 Repertoire. The literature available for performance in all performing media. Prerequisite: Junior standing in major performance field. May be repeated for credit. Credit, 2 hours.

453 Performance Practices of Early Music. The manners of performance of earlier times, including rhythmic expression, ornamentation, and technique. Credit, 3 hours.

458 Church Music Administration. Study of the form and content of the unified and integrated church music program. Credit, 2 hours.

459 History of Organ Design. Historical survey and practical application of the principles of organ construction and tonal design. Credit, 2 hours.

462 Elementary School Music Materials. Books, music, primary instruments, phonograph records, and films for primary, intermediate and upper grades. Credit, 1 hour.

463 Problems in Teaching Elementary School Music. For elementary school teachers and for specialist teachers of music who wish to help classroom teachers to participate in teaching music to their students. Credit, 2 hours.

464 Listening Activities in the Elementary School. Phonograph recordings, films, and radio programs suitable for use with experience units in the elementary grades. For classroom teachers and music teachers. Credit, 2 hours.

- 466 Listening Activities in the High School.** Designed to aid the teacher to develop the ability to train pupils in how to listen. Recordings, films, and other media are used to indicate the correlation of music with other forms of art. Credit, 2 hours.
- 480 Methods of Teaching Choral Music in the Secondary Schools.** Methods of instruction, organization, and presentation of appropriate content in choral music. Prerequisite: SE 311 or concurrently. Credit, 3 hours.
- 481 Performance Pedagogy and Materials.** Principles and methods of performance techniques for each performance field. Prerequisite: Senior standing or approval of instructor. Credit, 2 hours.
- 482 Theory of Rhythm.** An integration of musical organization through physiological and psychological principles based upon rhythmic perception. Prerequisites: MU 428, 445; MP 339 or 340. Credit, 2 hours.
- 483 Instrumental Music Methods for the Junior and Senior High School.** Methods of instruction, organization, and presentation of appropriate content in instrumental music. Credit, 3 hours.
- 484 Voice Clinic and Master Class in Voice Pedagogy.** Examination of the singer's vocal production mechanism and study of techniques of retraining voices. Credit, 2 hours.
- 521 Theory Techniques.** Theory techniques required of graduate students. Two hours a week. Credit, 1 hour.
- 523 Advanced Composition.** Creative writing in the larger forms for chorus, orchestra, and band. Prerequisites: MU 423, 428, 445, or equivalent. May be repeated for credit. Credit, 2 hours.
- 525, 526 Pedagogy of Theory.** Practices and principles of teaching music theory. Emphasis directed towards setting up the most desirable and practical offerings possible. Comparative studies of existing practices throughout the United States. Prerequisite: MU 321 or equivalent. Credit, 3 hours each semester.
- 527, 528 Evolution of Musical Theory.** Harmonic theory from Pythagoras to the present. Prerequisite: MU 321. Credit, 3 hours each semester.
- 530 Music Notation.** Early monophonic and polyphonic notation. May be repeated for credit. Credit, 3 hours.
- 531 History of Musical Style.** Periods of music history treated from a stylistic viewpoint. Credit, 3 hours.
- 532 Music Bibliography.** Investigations of the important primary and secondary sources for music research. Prerequisite: Reading knowledge of a foreign language recommended. Credit, 3 hours.
- 535 Bach and Handel.** Credit, 3 hours.
- 536 Renaissance Music.** Fifteenth and Sixteenth Century music. Credit, 3 hours.
- 537 Haydn, Mozart, and Beethoven.** Credit, 3 hours.
- 541 The Art Song.** Solo song from its beginning to the present day. Credit, 3 hours.
- 542 Keyboard Literature.** From the Renaissance to the present day. Credit, 3 hours.
- 544 Music of Non-Western Cultures.** The non-Western music cultures of the world, the role of music in non-literate societies, and its relationship to other aspects of culture. Credit, 3 hours.
- 550 Studies in Musical Curricula.** Scope and sequence of musical experiences. Development of criteria for the evaluation of musical curricula in terms of growth and interest. Credit, 3 hours.
- 555 Musicology.** Exploration of the fields of musicological activity. Prerequisite: MU 342 or graduate standing; reading knowledge of a foreign language recommended. Credit, 3 hours.
- 564 Instrumental Music, Advanced Rehearsal Techniques.** Rehearsal management and techniques, programming, staging, scoring, problems of instrumental care and maintenance, the marching band. Prerequisite: Approval of instructor. Credit, 3 hours.

566 Instrumental Literature for Schools. Comprehensive study and analysis of all types of instrumental music. Credit, 3 hours.

568 Choral Music, Advanced Rehearsal Techniques. Musical and vocal techniques necessary for presentation of choral literature. Analysis and experiment with psychological, acoustical, and other problems of rehearsal and performance. Credit, 3 hours.

570 Choral Literature for Schools. Comprehensive study and analysis of all types of choral music. Credit, 3 hours.

575 History of Choral Music. Study and analysis of major choral works written since 1600. Credit, 3 hours.

591 Seminar. Credit, 3 hours. Topics may be selected from the fields of music education, music history, and music theory:

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|--|-------------------------------------|
| (a) <i>Ancient and Medieval Music</i> | (f) <i>Symphonic Literature</i> |
| (b) <i>Ethnomusicology</i> | (g) <i>Chamber Music Literature</i> |
| (c) <i>American Music to 1900</i> | (h) <i>Biographical Studies</i> |
| (d) <i>Jazz</i> | (i) <i>Computer Generated Sound</i> |
| (e) <i>Contemporary Compositional Techniques</i> | |

733 Experimental Projects and Recent Trends in Music Education. A critical analysis and evaluation of recent and in-research developments which challenge traditional practices. Credit, 3 hours.

744 Major Problems in the Education of Music Teachers. A review of existing patterns of music teacher education and a projection of course outlines designed to accommodate the more comprehensive demands of the changing school music curriculum. Credit, 3 hours.

755 Philosophies of Music Education. The history of music education and the psychologies and philosophies influencing changes in curriculum content and teaching procedures. Credit, 3 hours.

Special graduate courses: 590, 592, 593, 594, 790, 791, 792. (See page 219.)

MUSIC PERFORMANCE

MP 111, 311, 511 Applied Music—Private Instruction. Piano, organ, harpsichord, voice, violin, viola, violoncello, contrabass, flute, oboe, clarinet, bassoon, saxophone, trumpet, cornet, French horn, baritone, trombone, tuba, percussion. Placement examination required. Two half-hour lessons a week. May be repeated for credit. Credit, 2 hours each semester.

121, 321, 521 Applied Music—Private Instruction. Piano, organ, harpsichord, voice, violin, viola, violoncello, contrabass, flute, oboe, clarinet, bassoon, saxophone, trumpet, cornet, French horn, baritone, trombone, tuba, percussion. Placement examination required. One half-hour lesson a week. May be repeated for credit. Credit, 1 hour.

127, 327, 527 Applied Music—Private Instruction. Performance majors only. Piano, organ, harpsichord, voice, violin, viola, violoncello, contrabass, flute, oboe, clarinet, bassoon, saxophone, trumpet, cornet, French horn, baritone, trombone, tuba, percussion. Placement examination required. Two half-hour lessons a week. May be repeated for credit. Credit, 2 or 4 hours each semester.

131, 132, 231, 232 Class Piano. A four-semester sequence of courses designed for those lacking piano experience and those who need piano as a classroom tool. Emphasis on keyboard technique, sight reading, simple accompaniments and improvisation. Two hours a week. Credit, 1 hour each semester.

133, 134, 233, 234 Class Voice. Open to all students interested in the development of basic singing techniques. Two hours a week. Credit, 1 hour each semester.

209 Elements of Conducting. Essentials of conducting techniques used by both choral and instrumental conductors. Two hours a week. Credit, 1 hour.

235, 236 Educational Methods for Strings. Practical class in gaining the string knowledge necessary for instrumental teachers in public schools. Three hours a week. Credit, 1 hour each semester.

237, 238 Educational Methods for Brass. Practical class in gaining the brass knowledge necessary for instrumental teachers in public schools. Three hours a week. Credit, 1 hour each semester.

336 Educational Methods for Percussion. Practical class in gaining percussion knowledge necessary for instrumental teachers in public schools. Three hours a week. Credit, 1 hour.

337, 338 Educational Methods for Woodwinds. Practical class in gaining the woodwind knowledge necessary for instrumental teachers in public schools. Three hours a week. Credit, 1 hour each semester.

339 Choral Conducting. Elements of choral technique and interpretation. Required of music education vocal students. Prerequisite: MP 209. Three hours a week. Credit, 2 hours.

340 Instrumental Conducting. Fundamentals of score reading, and interpretation of instrumental music. Required of all music education instrumental major students. Prerequisite: MP 209. Three hours a week. Credit, 2 hours.

345 Symphony Orchestra. Open to all students who can qualify on the basis of auditions with the director. Over a four-year period, the student is introduced to the great masterpieces of symphony orchestra literature. Five hours a week. May be repeated for credit. Credit, 1 hour.

351 Choral Union. Open to all students in the University and to interested singers in the community. Time devoted to preparation and performance of the larger choral works. May be repeated for credit. Credit, 1 hour.

352 Concert Choir. Membership chosen by audition. May be repeated for credit. Four hours a week. Credit, 1 hour.

355 Men's Glee Club. Open to all male students in the University who can qualify on the basis of auditions with the director. Experience in rehearsal and performance of music for male voices. Public performances. Three hours a week. May be repeated for credit. Credit, 1 hour.

357 Women's Chorus. Membership chosen by audition. Three hours a week. May be repeated for credit. Credit, 1 hour.

361 Symphonic and Marching Band. Open to all students who can qualify on the basis of auditions with the director. Staging of formations and drills for football games and other events; great masterpieces of symphonic band literature. Meets daily. May be repeated for credit. Credit, 1 hour.

371 Opera Workshop. Open to all students who can qualify on the basis of auditions with the instructor. Section 1 (Vocal): Exercises, improvisations, and scene performances for the singing-actor. One lecture-demonstration, one lab per week. Section 2 (Orchestra): Participation in Lyric Opera Theatre productions. Two-and-a-half hours per week. Section 3 (Production): Participation in Lyric Opera Theatre productions. Three hours per week. All sections may be repeated for credit. Credit, 1 hour.

381 Chamber Music Ensembles. String, brass, woodwind, percussion, keyboard, vocal and mixed ensembles. Prerequisite: Approval of instructor. Two hours a week. May be repeated for credit. Credit, 1 hour.

382 Collegium Musicum. Singers and instrumentalists specializing in the performance of early and unusual music. Prerequisite: Approval of instructor. Two hours a week. May be repeated for credit. Credit, 1 hour.

383 University Singers. Small choral ensemble chosen by audition. Two hours a week. May be repeated for credit. Credit, 1 hour.

539 Advanced Conducting. The study and practice of advanced baton technique for band and orchestra. Score reading, mechanics of conducting, individual criticisms of style. Prerequisites: MP 339, 340 or equivalent. Credit, 2 hours.

595, 596 Solo Performance. For Master of Music candidates in applied music only. May be full recital, major operatic role, solo performance with orchestra, or an ensemble or lecture recital. Credit, 1 hour each semester.

NURSING

PROFESSORS:

HANNER (Nur. 459), BRANSTETTER, JOHNSON, WALKER

ASSOCIATE PROFESSORS:

BRUNER, CORONA, LOGE, MADORE, SATCHELL, STUMPF,
TAYLOR, THEOBALD

ASSISTANT PROFESSORS:

BLEWETT, CHAFEY, CORLISS, ELLIS, FINCH, HUHNKE,
LENDLE, MCCLELLAN, MURPHY, NACZKI, WURZELL

INSTRUCTORS:

HOUDEN, RIEKE, SHOWALTER, TICE, WARREN, WHEELER

Bachelor of Science in Nursing Degree Curriculum

The candidate for a degree of Bachelor of Science in Nursing must complete 126 semester hours, including 40 hours in general studies, 40 hours in related non-nursing courses and electives, and 46 upper division credits in the nursing major. Required courses for the nursing major are: NU 301, 302, 311, 312, 401, 411, 412 and either 498 or 499.

GRADUATE PROGRAM

The College of Nursing offers a program leading to a Master of Science in Nursing degree with specialization in Community Mental Health — Psychiatric Nursing or in Family Health Nursing. Persons interested in applying for admission to the program should write to the Arizona State University Graduate College for a catalog and application forms.

NURSING

NU 301 Foundations of Nursing I. Trends, problems, history and ethics of nursing. Taken concurrently with NU 311. Prerequisite: Junior standing in the nursing major. Credit, 3 hours.

302 Foundations of Nursing II. Teaching-learning process applied to nursing, Team nursing. Epidemiological approach to health problems. Prerequisites: NU 301, 311. Credit, 3 hours.

306 Modern Professional Nursing. New concepts and trends in professional practice and nursing education. Prerequisites: EN 101, 102 and approval of instructor. Credit, 3 hours.

307, 308 Psychodynamics of Nursing. Concepts basic to interpersonal relations in nursing. Limited to registered nurse students. Prerequisites: PY 112, PY 240 or CD 232 and/or approval of instructor. Two hours discussion, 1 hour clinical experience. Credit, 2 hours each semester.

311 Clinical Nursing I. Knowledge and application of interpersonal skills and scientific principles related to nursing care. Introduction to the concept of levels of prevention with focus on primary prevention. Taken concurrently with NU 301. Prerequisite: Junior standing in the nursing major. Four hours lecture, 4 hours conference, 9 hours laboratory. Credit, 9 hours.

312 Clinical Nursing II. Comprehensive nursing with emphasis on setting objectives and criteria for evaluating quality of patient and family care. Nursing care will focus on secondary level of prevention. Prerequisites: NU 301, 311. Two hours lecture, 4 hours conference, 12 hours laboratory. Credit, 8 hours.

360 Recent Advances in Nursing. Advanced study and/or supervised practice in a specialized area in nursing. Credit in different areas of study may be accumulated to 5 hours. Credit, 1-5 hours.

401 Foundations of Nursing III. Implications of political, social, economic and educational issues and research for nursing. Taken concurrently with NU 411. Prerequisites: NU 302, 312. Credit, 3 hours.

407 Nursing Continuum. Intensive study of a patient and his nursing care needs based on the use of problem solving techniques and application of this knowledge in execution of a comprehensive nursing care plan. Limited to registered nurse students enrolled in the nursing major. Prerequisite: Senior status in the nursing program. Two hours lecture, 4 hours conference, 8 hours clinical practice. Credit, 6 hours.

411 Clinical Nursing III. Extends application of principles of comprehensive care to groups of patients and multi-problem families. Emphasizes the nursing role on the health team, utilization of community resources and application of current nursing research. Focus on tertiary prevention and restorative aspects of nursing. Taken concurrently with NU 401. Prerequisites: NU 302, 312. Two hours lecture, 4 hours conference, 15 hours laboratory. Credit, 9 hours.

412 Clinical Nursing IV. Opportunity to synthesize learnings in a variety of nursing situations. Emphasis on the leadership role in the nursing team and a collaborative role on the health team. Taken concurrently with either NU 498 or 499. Prerequisites: NU 401, 411. Two hours lecture, 4 hours conference, 15 hours laboratory. Credit, 9 hours.

441, 442 Medical and Surgical Nursing. Comprehensive care of patients with selected medical-surgical conditions, emphasizing the scientific principles basic to professional nursing. Includes concepts of those leadership abilities which will enhance personal and professional growth of the nurse. Prerequisites: NU 331, 332 or approval of instructor. First semester: One hour lecture, 4 hours conference, 16 hours supervised practice. Credit, 9 hours. Second semester: One hour lecture, 2 hours conference, 12 hours supervised practice. Credit, 6 hours.

452 Public Health Nursing. Principles and practice of the public health sciences and public health nursing. Consideration is given to the health needs of the individual, the family, groups of people in the home, school, at work and in the community. Prerequisite: Senior status in nursing program or approval of instructor. Two hours lecture, 3 hours supervised practice, including 2 hours conference. Credit, 4 hours.

453 Public Health Nursing. Continuation of NU 452. Prerequisite: Senior status in the nursing program or approval of instructor. Two hours lecture, 2 hours conference, 12 hours supervised practice. Credit, 6 hours.

500 Research Seminar I. Introduction to investigative methods. Purposes, aims of research. Review of research in nursing. Designed to assist the students in understanding and utilizing research concepts and methods. Credit, 1 hour, granted upon completion of NU 500 and NU 501.

501 Research Seminar II. Research design. Role of theory, methods of data collection. Definition of study problem for individual projects. Credit, 2 hours, granted upon completion of NU 500 and NU 501.

502 Research Seminar III. Collection and analysis of data for individual research projects. Credit, 2 hours, granted upon completion of NU 502 and NU 503.

503 Research Seminar IV. Completion and writing of individual research project. Credit, 1 hour, granted upon completion of NU 502 and NU 503.

580 Advanced Clinical Nursing I. Appraisal of family competencies with emphasis on group theory and family dynamics as theoretical background for nursing action. Critical examination of nursing theory, current nursing trends, role of nurse in society. Practicum. Prerequisite: Enrollment in nursing major or approval of instructor. Credit, 2 hours.

581 Advanced Clinical Nursing II. Crisis theories as theoretical base for short-term nursing intervention. Changing role of the nurse, community relationships and professional responsibility. Practicum. Prerequisite: Enrollment in nursing major or approval of instructor. Credit, 3 hours.

582 Advanced Clinical Nursing III. Nursing intervention in long-term illness. Leadership orientation and role of the nurse as a change agent. Practicum A — Family

Health Nursing. Practicum B — Community Mental Health - Psychiatric Nursing. Prerequisite: Enrollment in nursing major or approval of instructor. Credit, 4 hours.

583 Advanced Clinical Nursing IV. Theories and techniques of group work as the basis for nursing intervention. Continuation of leadership orientation and role of nurse as change agent. Group work: therapeutic and community. Practicum A — Family Health Nursing. Practicum B — Community Mental Health - Psychiatric Nursing. Prerequisite: Enrollment in nursing major or approval of instructor. Credit, 4 hours.

HUMAN DEVELOPMENT

HD 501 Human Development I. Biological, social, psychological development in infancy and early childhood. Concept of development, developmental issues and theories. Prenatal influences. Prerequisites: HO 232 or equivalent. Credit, 2 hours.

502 Human Development II. Biological, social, psychological development in childhood and adolescence. Consideration of stage theory, cognitive development, role conceptualization, norms and deviation. Prerequisite: CD 232 or equivalent. Credit, 2 hours.

503 Human Development III. Developmental changes in early adulthood through later adulthood. Consideration of biological aspects, socialization, psychological influences, the aging process, retirement and leisure, life review and death. Prerequisite: Approval of instructor. Credit, 3 hours.

Special Graduate Courses: 590. (See page 219.)

591 Seminar. Credit, 2-4 hours. Topics may be selected from the following:

- | | |
|--|---|
| (a) <i>Advanced Physiology</i> | (g) <i>The Supervisory Process</i> |
| (b) <i>Infant Behavior</i> | (h) <i>Neonatal Care</i> |
| (c) <i>Suicidology</i> | (i) <i>Current Developments</i> |
| (d) <i>Curriculum Development in Nursing</i> | (j) <i>Community Mental Health</i> |
| (e) <i>Development of Nursing Theory</i> | (k) <i>Group Dynamics</i> |
| (f) <i>Administration in Nursing</i> | (l) <i>Teaching in Nursing Programs</i> |

PHILOSOPHY

PROFESSORS:

ARNER (PS A-521), CARNEY, REIN'L

ASSISTANT PROFESSORS:

GIESCHEN, HOWELLS, HUMPHREY, STASKY, VON BRETZEL, VOTICHENKO

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Arts Degree Curriculum

PHILOSOPHY — Consists of 40 semester hours of credit of which at least 24 must be in philosophy and the remainder in approved courses within related fields.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Philosophy offers programs leading to the degree of Master of Arts. Consult the *Graduate Catalog* for requirements.

PHILOSOPHY

PI 101 Problems of Philosophy. A consideration of man and his place in the universe. Credit, 3 hours.

102 More Problems of Philosophy. Questions concerning ethical and social values. Credit, 3 hours.

103 Principles of Sound Reasoning. Fallacies, traditional logic of the syllogism, elementary parts of symbolic logic, inductive logic, and other related topics. Credit, 3 hours.

104 Elementary Mathematical Logic. Presentation of those concepts of logic upon which mathematical arguments are built. Informal presentation of logic through the predicate calculus with identity, followed by sufficient elementary set theory to introduce Boolean algebra and formal number theory. Credit, 3 hours.

301 Value Theory. Investigation of problems in aesthetics, personal ethics, and philosophy of religion. Credit, 1-3 hours.

302 Moral and Social Philosophy. Topics relating to the evaluation of political, economic, and social institutions. Credit, 1-3 hours.

303 Metaphysics. Inquiries concerning the ultimate nature of things, e.g., the mind-body problem, the existence of God, appearance and reality. Credit, 1-3 hours.

304 Theory of Knowledge. Problems such as the nature, limits, and sources of human knowledge. Credit, 1-3 hours.

305 Topics in the History of Philosophy. Discussion of selected persons, movements, and periods, both western and oriental. Credit, 1-3 hours.

306 Logic. Selected topics involving the rigorous development of mathematical logic. Investigations of meaning, reference, and truth. Credit, 1-3 hours.

401 History of Ancient Philosophy. The history of western philosophy from its beginning through the Hellenistic period. Credit, 3 hours.

402 History of Medieval and Renaissance Philosophy. The history of western philosophical thought from Augustine through the Renaissance. Credit, 3 hours.

403 History of Modern Philosophy to Hume. The history of western philosophy from the Renaissance to Hume. Credit, 3 hours.

404 History of Modern Philosophy from Kant to the Present. Completion of the history survey. Credit, 3 hours.

498 Pro-Seminar. Credit, 3 hours. Topics may be selected from the following:

- | | |
|--|----------------------------------|
| (a) <i>Theory of Knowledge</i> | (c) <i>Metaphysics and Logic</i> |
| (b) <i>Social and Moral Philosophy</i> | (d) <i>History of Philosophy</i> |

591 Seminar. Credit, 3 hours. Topics may be selected from the following:

- | | |
|--|----------------------------------|
| (a) <i>Theory of Knowledge</i> | (c) <i>Metaphysics and Logic</i> |
| (b) <i>Social and Moral Philosophy</i> | (d) <i>History of Philosophy</i> |

Special Graduate Courses: 498, 500, 591, 592, 593. (See page 219.)

PHYSICS

PROFESSORS:

STONER (PSC C-200), KEVANE, KYRALA, MEISTER, MUNCH,
NIGAM, RAWLS, ROY, SNYDER, WORK

ASSOCIATE PROFESSORS:

AHMADZADEH, LU, SCHROEDER, YALE

ASSISTANT PROFESSORS:

HANSON, HESTENES, JACOB

INSTRUCTORS:

IMPSON, VOSS

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Science Degree Curriculum

PHYSICS — Consists of 45 semester hours of credit. Required courses are PH 321, 322, 331, 332, 441, 461 and six semester hours of advanced laboratories, which must include PH 333. Additional courses in physics and

upper division mathematics will be selected with the approval of the adviser. Each student must obtain credit in one year of French, German, Russian, or other foreign language approved by the adviser.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS

Bachelor of Art in Education Degree Curriculum

GENERAL SCIENCE — Consists of 45 semester hours of credit. Required courses are MA 116 or 117; MA 118; PH 101 or PH 111, 112; CH 101 or CH 113, 114; CH 231; ZO 100; ZO 300 or 360; BO 100; 360; GL 111 or 483; GE 411; PA 121 or PA 321, 322; PL 460 or 480. The remaining courses to complete the major must be in upper division physical or biological sciences.

PHYSICS — Consists of 45 semester hours of credit. Required courses are PH 111, 112 (or 115, 116), 321, 331, and 463 (2 hours). An additional 12 hours in upper division physics courses will be approved by the adviser in consultation with the student. The remaining courses to complete the major may be in physics and/or closely related fields subject to the approval of the adviser.

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS

PHYSICS — Consists of 18 semester hours of credit. Required courses are PH 111, 112 or 115, 116; PH 460 or 361; and one hour of PH 463. The remaining hours are selected from upper division physics and physical science courses with the approval of the minor field adviser.

GENERAL SCIENCE — Consists of 26 semester hours of credit. Required courses are BO 100; ZO 100; GL 111; PH 101 or 111, 112; CH 101 or 113, 114; PA 121 or 321. The remaining hours are selected with the approval of the minor field adviser.

PHYSICAL SCIENCE — Consists of 18 semester hours of credit. Required courses are MA 116 or 117; PH 101, PA 321, CH 113 and GL 111. In certain cases appropriate substitutions may be made with the approval of the minor field adviser.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Physics offers programs leading to the degrees of Master of Science and Doctor of Philosophy. Consult the *Graduate Catalog* for requirements. The Department has administrative responsibility for the interdepartmental program leading to the degree of Master of Natural Sciences.

SCIENCE EDUCATION

Formally attached to the Physics Department, the science education faculty has primary responsibility for activities related to the teaching of science at the elementary and secondary school level, particularly those which cut across the boundaries of the individual sciences. Members of this group, with the cooperation of faculty members of the various science departments, in addition to offering formal courses and supervising general science requirements in the various degree programs for teachers, maintain a science education materials center. Other facilities include a

planetarium used both for formal instruction and as a resource for schools in the area.

PHYSICS

PH 101 Introduction to Physics. Survey of physics emphasizing applications to everyday life in the modern world. Understanding of elementary algebra is presumed. Three lectures, 1 recitation, 2 hours laboratory. Credit, 4 hours.

111 General Physics. Non-calculus treatment of the principles of mechanics, heat and sound. Prerequisite: MA 118 or equivalent. Three lectures, 1 recitation, 2 hours laboratory. Credit, 4 hours.

112 General Physics. Non-calculus treatment of the principles of electricity, magnetism and light, and a brief introduction to modern physics. Prerequisite: PH 111. Three lectures, 1 recitation, 2 hours laboratory. Credit, 4 hours.

115, 116 University Physics. Principles of mechanics, heat, electricity, magnetism, sound, and optics, using calculus. Recommended for majors in the sciences and mathematics. Prerequisite: Concurrent enrollment in MA 120, 121, respectively. Four lectures, 1 recitation, 2 hours laboratory. Credit, 5 hours each semester.

251 Sound and Optics. Wave phenomena, with applications in acoustics and geometrical and physical optics. Wave propagation, reflection, refraction, interference, diffraction, polarization, quantum nature of radiation. Designed for engineering students. Prerequisites: MA 212; ES 231 and 312. Credit, 2 hours.

320 Musical Acoustics. Simple vibrating systems, analysis of a musical tone into components, loudness and pitch characteristics of the ear, tone production mechanisms of stringed, reed, and brass instruments, correlation between the rules of harmony and the laws of acoustics. Prerequisite: Two years of music theory advisable. Credit, 4 hours.

321 Analytical Mechanics. Vector treatment of statics, kinematics, and dynamics of particles and rigid bodies; forced, damped and coupled oscillators; collisions and central force orbits. Prerequisites: PH 115; MA 121, or approval of instructor. Credit, 4 hours.

322 Analytical Mechanics. Lagrangian methods applied to problems in particle, rigid body and continuum mechanics and an introduction to Hamiltonian mechanics. Prerequisite: PH 321; MA 212. Credit, 4 hours.

324 Mechanics and Heat Physical Measurements. Experimental techniques and theory of mechanical and thermal measurements. Extra-laboratory practice in the planning of experiments, organization and presentation of results. Prerequisite: Enrollment in PH 321. Three hours laboratory. Credit, 2 hours.

331 Electricity and Magnetism. Electric fields, potentials, Gauss' law, electrostatics of conductors and dielectric materials, DC and AC circuits; Ampere's and Faraday's laws. Prerequisites: PH 116, MA 212, or approval of instructor. Credit, 4 hours.

332 Electromagnetic Fields. Solutions of Laplace's equation, magnetic materials, equation of continuity, scalar and vector potentials, Maxwell's equations, electromagnetic waves. Prerequisites: PH 321, 331; MA 212. Credit, 4 hours.

333 Electricity and Magnetism Physical Measurements. Experimental techniques and theory of electric and magnetic measurements. Extra-laboratory practice in the planning of experiments, organization and presentation of results. Prerequisite: Enrollment in PH 331. Three hours laboratory. Credit, 2 hours.

334 Electricity and Magnetism Physical Measurements. Selected experiments in advanced electric and magnetic measurements. Prerequisite: PH 333. Three hours laboratory. Credit, 2 hours.

361 Modern Physics. Spectra and atomic structure, photoelectricity, relativity, nuclear phenomena and cosmic rays. Prerequisites: ES 231 and 312; MA 212 or equivalent. Credit, 3 hours.

401, 402 Mathematical Methods in Physics. Elements of vector calculus, complex variables, ordinary and partial differential equations, integral transforms, special functions, determinants, matrices, probability and statistics, as applied to physical problems. Prerequisites: MA 212; PH 321. Credit, 3 hours each semester.

415, 416 Physics for In-Service Teachers. Concepts and principles of physics. Prerequisite: Approval of instructor. Credit, 3 hours each semester.

434 Circuit Theory and Electronics. Network theory, characteristics of non-linear elements, vacuum tubes and transistors. Basic circuits and their applications in physical measurements. Prerequisite: PH 331. Three lectures, 3 hours laboratory. Credit, 4 hours.

441 Statistical and Thermal Physics I. Statistical and experimental basis of heat, temperature and entropy. Mechanical and statistical basis of the laws of thermodynamics. Applications of macroscopic thermodynamics. Phase equilibrium. Prerequisites: PH 321, 331. Credit, 3 hours.

442 Statistical and Thermal Physics II. Principles and applications of statistical mechanics. Quantum statistics of ideal gases and simple solids. Equilibrium of phases and chemical species. Transport theory. Irreversible processes and fluctuations. Prerequisite: PH 441. Credit, 3 hours.

450 Elements of Optics. Principles and applications of geometrical and physical optics. Designed for teachers and students not majoring in physics. Prerequisites: PH 112 or 116; MA 212 or approval of instructor. Credit, 3 hours.

451 Optics. Physical and geometrical optics based on the Maxwell equations, including reflection, refraction, interference, simple diffraction theory and metal optics. Prerequisites: PH 332; MA 212. Credit, 3 hours.

452 Advanced Optics. Geometrical theory of optical imaging, rigorous diffraction theory, interference and diffraction with partially coherent light, fiber optics, crystal optics, masers and lasers. Prerequisite: PH 451. Credit, 3 hours.

453 Optics Physical Measurements. Experimental techniques and theory of optical measurements. Extra-laboratory practice in the planning of experiments, organization and presentation of results. Prerequisite: Enrollment in PH 451. Three hours laboratory. Credit, 2 hours.

460 Elements of Atomic Physics. Survey of electron and atomic physics. Designed for teachers and students not majoring in physics. Prerequisite: One year of college physics. Credit, 3 hours.

461 Modern Physics. Special relativity, origin of quantum theory, the nuclear atom, elementary particles, introductory quantum mechanics, atomic and molecular spectra. Prerequisites: PH 321, 331; MA 212. Credit, 4 hours.

462 Nuclear Physics. Static properties of nuclei, natural and induced radioactivity, nuclear reactions, nuclear models and energy levels, mesons and hyperons, interaction of photons and electrons with matter. Prerequisite: PH 461. Credit, 3 hours.

463 Physical Measurements. Selected experiments in mechanics and heat, electricity and magnetism, optics and modern physics. Designed for teachers and students not majoring in physics. Prerequisite: PH 112. Three hours laboratory. May be repeated for a maximum of 3 hours credit. Credit, 1 hour.

464 Elements of Nuclear Physics. Survey of nuclear physics. Designed for teachers and students not majoring in physics. Prerequisite: PH 460 or equivalent. Credit, 3 hours.

465 Modern Physics Laboratory. Experimental techniques and theory of modern physical measurements. Extra-laboratory practice in the planning of experiments, organization and presentation of results. Prerequisites: PH 333 and enrollment in PH 461. Three hours laboratory. Credit, 2 hours.

466 Advanced Physical Measurements. Selected experiments in advanced laboratory physics. Prerequisites: PH 333 and approval of instructor. Three hours laboratory. Credit, 2 hours.

471 Quantum Mechanics. Wave mechanics, Schrödinger's equation, barrier problems, operators and eigenfunctions, harmonic oscillator, one-electron atoms and other topics. Prerequisites: PH 322, 461, or approval of instructor. Credit, 3 hours.

472 Quantum Mechanics. Matrix mechanics, angular momentum, perturbation theory, scattering theory and other topics. Prerequisite: PH 471 or approval of instructor. Credit, 3 hours.

480 Methods of Teaching Physics. Evaluation of various approaches to the teaching of high school physics. Preparation of demonstrations and experiments. Organization

of a laboratory. Designed for secondary school physics teachers. Prerequisite: Approval of instructor. Credit, 3 hours.

481 Solid State Physics. Structure, elastic properties and dynamics of crystals; electron motions in crystals under applied fields; selected topics. Prerequisite: PH 471. Credit, 3 hours.

482 Physics of Semiconducting Materials. Brillouin zones and electron energy bands; impurity states, electron statistics and electrical conduction; carrier mobility and Hall effect; non-equilibrium effects, recombination. Prerequisite: PH 471. Credit, 3 hours.

501 Methods of Theoretical Physics. Physical applications of functions of a complex variable, algebraic eigenvalue problems, vector/function analogies in Hilbert space, boundary and initial value problems of scalar and vector fields in partial differential and integral form, Green's functions and topics selected from operator algebra, tensor and spinor calculus and quaternions. Prerequisite: Approval of instructor. Credit, 3 hours.

502 Methods of Theoretical Physics. Variational principles, applications of Laplace and Fourier transforms, dispersion relations, Markov chains, wave propagation, diffusion, potential theory and topics selected from Lorentz invariants, theory of second quantization and group representations. Prerequisite: Approval of instructor. Credit, 3 hours.

521, 522 Classical Mechanics. Variational principles, Lagrange's and Hamilton's equations; rigid body motion; canonical transformations, Hamilton-Jacobi theory; continuum mechanics; elements of hydrodynamics, elasticity theory and special relativity; selected topics. Prerequisite: PH 322. Credit, 3 hours each semester.

523 Relativity. Special and general theories of relativity. Prerequisites: PH 522, 532 or approval of instructor. Credit, 3 hours.

531, 532 Electromagnetic Theory. Boundary value problems; principal of relativity, relativistic particle kinematics; Lorentz invariant formulation of electrodynamics; comparison of microscopic and macroscopic formulations of Maxwell's equations; motion and radiation of point charges; propagation, polarization, diffraction and scattering of light; problem of a point particle with a magnetic moment; self-energy problem. Prerequisite: PH 332. Credit, 3 hours each semester.

541 Advanced Thermodynamics. Problems in thermodynamics including phase changes and phase equilibrium, liquefaction of gases, liquid helium, superconductivity and fluctuation. Prerequisites: PH 442, 471. Credit, 3 hours.

542 Statistical Physics. Probability theory and principles of statistical inference. Application to problems of evaluating experimental data and to foundations of statistical mechanics. Derivation of the general laws of thermodynamics from microscopic theories. Calculation of specific properties of bulk matter. Prerequisites: PH 441, 471; 442 (desirable). Credit, 3 hours.

543 Plasma Physics. Fundamental physical phenomena in the plasma state: equilibrium and stationarity, oscillations and wave propagation, conduction, diffusion and radiative phenomena. Prerequisite: Approval of instructor. Credit, 3 hours.

545 Low Temperature Physics. Liquid and solid helium, electrical and thermal conductivity, superconductivity and magnetic properties at temperatures approaching absolute zero. Prerequisites: PH 332, 442, or equivalent. Credit, 3 hours.

561, 562 Nuclear Physics. Two nucleon interactions, Clebsch-Gordon coefficients, internucleon forces, meson theory and high energy scattering, nuclear binding energy, nuclear models, transition probability estimates, nuclear reactions, beta decay. Prerequisites: PH 462, 576, or approval of instructor. Credit, 3 hours each semester.

563 Atomic Spectra and Structure. Atomic spectra from the viewpoint of quantum mechanics, including selection rules, intensities, the Stark and Zeeman effects, and hyperfine structure. Prerequisite: PH 576. Credit, 3 hours.

564, 565 Molecular Spectra and Structure. Molecular spectra from the viewpoint of quantum mechanics including the analysis of electronic, vibrational and rotational spectra of polyatomic molecules and the use of group theory to simplify the calculations. Prerequisite: PH 471. Credit, 3 hours each semester.

568 High Energy Particle Physics. Classification of particles, cross sections, decay

rates, isotopic spin formalism and higher symmetries, phenomenology of strong, electromagnetic and weak interactions. Prerequisite: PH 577. Credit, 3 hours.

570 Current Topics in Quantum Theory. Prerequisite: Approval of instructor. Credit, 1 hour.

576, 577 Quantum Theory. Abstract approach to quantum mechanics in Hilbert space; observables and their corresponding operators, eigenstates and eigenvalues; quantum dynamics; approximation methods; systems of identical particles; angular momentum and group representation theory; collision processes; relativistic quantum theory. Prerequisites: PH 471, 522. Credit, 3 hours each semester.

578, 579 Relativistic Quantum Theory. Relativistic one-particle equations, Klein-Gordon equation, Dirac equation, second quantization, theory of scattering, S-matrix, Feynman diagrams, quantum electrodynamics, renormalization procedures. Prerequisite: PH 577. Credit, 3 hours each semester.

580 Current Topics in Solid State Physics. Prerequisite: Approval of instructor. Credit, 1 hour.

581 Solid State Physics. Quantum theory of solids including phonons, lattice specific heats, band structure models, Fermi surfaces, thermal expansion, plasmons, electron-phonon interactions and scattering by lattice defects. Prerequisites: PH 481 or 482; 472; concurrent enrollment in PH 576. Credit, 3 hours.

582 Solid State Physics. Elements of transport theory, thermal conduction, electronic conduction in metals, mobility in semiconductors, Hall effect, magnetoresistance and selected topics of current research. Prerequisite: PH 581. Credit, 3 hours.

Special Graduate Courses: See page 219.

GENERAL SCIENCE AND ASTRONOMY

PA 110 Physical Universe. The universe as a unit, stars, the solar system, the earth, and the atom. Nature of matter and energy. Three lectures, 2 hours laboratory. Credit, 4 hours.

121 Descriptive Astronomy. Basic description of features, relationships, and origin of solar systems, stars, and galaxies in the universe. Observatory and planetarium observations. Credit, 2 hours.

122 Space Science. Developments in exploration of space and their implications for man, including topics from physical and biological sciences of importance to understanding of solar system environments. Prerequisite: PA 121. Credit, 2 hours.

321 General Astronomy. Astronomical instruments, coordinate systems, planets, origin and development of the solar system, emphasizing understanding through the application of physical principles developed in the course. Observatory and planetarium observations. Prerequisite: PH 101 or equivalent. Credit, 3 hours.

322 General Astronomy. Stars and star systems, stellar evolution, galaxies and cosmological theories, topics from current developments in astronomy and astrophysics. Observatory and planetarium observations. Prerequisite: PA 321 or approval of instructor. Credit, 3 hours.

361, 362 Science and Man. Effects upon man of his technological civilization and consideration of recent advances in both pure and applied physical sciences. PA 361 includes topics from mechanics, electromagnetic radiations and astronomy. PA 362 includes topics from geology, chemistry, and nuclear energy. Courses may be taken in either order. Credit, 2 hours each semester.

410 Origins of the Physical Sciences. Growth of astronomy, chemistry and physics and the influence of mathematics on the physical sciences. Period covered starts with earliest man and extends to the Seventeenth Century. Credit, 3 hours.

412 Concepts and Social Impact of Modern Physics. For non-physics majors. Important advances of physics during the Twentieth Century, e.g. relativity, quantum theory, nuclear energy, etc., and philosophical, social and technological issues raised by these developments. No physics or mathematics prerequisites. Credit, 3 hours.

421 Astrophysics. Selected topics from astronomy and astrophysics. Prerequisites: PH 321, 331. Credit, 3 hours.

Special Graduate Courses: See page 219.

SCIENCE EDUCATION

PL 320 Science for the Elementary School. Selected basic generalizations in the physical and biological sciences suitable for use in grades 1-8. Activities include laboratory, and a three-day science field study. Prerequisites: PA 110; BI 100; or 4 hours each of physical and biological science. Four hours a week. Credit, 3 hours.

460 Science in the Junior High School. Important science areas suitable for the junior high school. Recent developments in modern junior high school science curricula, laboratory techniques, and the processes of science are stressed. Prerequisite: PL 320 or equivalent. Two lectures, 2 hours laboratory. Credit, 3 hours.

480 Methods of Teaching Physical Science. Methods of instruction, organization and presentation of appropriate topics in physical science. Prerequisites: SE 311, 15 hours of physical science or approval of instructor. Credit, 3 hours.

Special Graduate Courses: See page 219.

POLITICAL SCIENCE

PROFESSORS:

WHITE (SS 416), ALISKY, DURHAM, GABLE, HINK,
MASON, PEEK, RICE, UHL

ASSOCIATE PROFESSORS:

JO, KAMINSKY

ASSISTANT PROFESSORS:

BERMAN, CARPENTER, DALGLEISH, EILERS, KIRSCH, MCGAW,
READER, RUHALA, VICHULES, WALKER

LECTURERS:

DEBOLSKE, VICKERS

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Arts Degree Curriculum

POLITICAL SCIENCE — Consists of 45 semester hours of credit of which 30 must be in political science and 15 in closely related fields to be approved by the adviser in consultation with the student. Courses PS 100, 200, 250 or 260, one course in political theory (440, 441, 442, 443 or 445), and 498 are required. The remaining 14 hours in political science must be selected from courses in the 400 series. At least 18 hours must be in upper division courses. Courses 310, 311, 312, 330 and 360 may not be counted toward a major in political science.

LATIN AMERICAN STUDIES EMPHASIS — Consists of the Bachelor of Arts degree requirements in political science. Thirty semester hours of the total degree program must consist of Latin American content courses selected with the approval of the adviser. A reading knowledge of Spanish is required. A reading knowledge of Portuguese is suggested.

ASIAN STUDIES EMPHASIS — Consists of the Bachelor of Arts degree requirements in political science plus a minimum of two years of Chinese or Japanese. Thirty semester hours of the total degree program must consist of Asian courses selected with the approval of the adviser.

Bachelor of Science Degree Curriculum

POLITICAL SCIENCE — Consists of 51 semester hours of credit of which 36 must be in political science and 15 in closely related fields to be approved by the adviser in consultation with the student. The 36 hours include PS 100, 200, 250 or 260, one course in political theory (440, 441, 442, 443 or 445), 401 and one course chosen from 402, 431, 432, 436, or 437, and 498. Courses PS 310, 311, 312, 330 and 360 may not be counted toward a major in political science.

Bachelor of Arts in Education Degree Curriculum**Departmental Teaching Major**

POLITICAL SCIENCE — Consists of 45 semester hours of credit. Courses PS 100, 200, one course in political theory (440, 441, 442, 443, or 445), 411, and 480 are required. An additional 29 hours, 12 of which must be in political science and 17 in closely related fields, will be approved by the adviser in consultation with the student. Courses PS 310, 311, 312, 330 and 360 may not be counted toward a major in political science.

Departmental Teaching Minor

POLITICAL SCIENCE — Consists of 18 semester hours of credit. Courses PS 100, 411, and one course in political theory (440, 441, 442, 443 or 445), and two of the following (200, 250, 260) are required. Courses PS 310, 311, and 312 may not be counted toward a teaching minor in political science.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Political Science offers programs leading to the degrees Master of Arts, Master of Public Administration and Doctor of Philosophy. Consult the *Graduate Catalog* for requirements.

INSTITUTE OF PUBLIC ADMINISTRATION

The Institute of Public Administration is a research and service agency of the University closely related to the Department of Political Science. The activities of the Institute are concentrated primarily in research and publication and public service in relation to governmental activities in the State of Arizona.

PUBLIC SAFETY ADMINISTRATION EMPHASIS

A public safety administration program for law enforcement and fire personnel with a major in political science is available at the undergraduate level. Regular departmental, college and university course requirements must be met. The Institute of Public Administration of the Department of Political Science will coordinate this program.

The requirement for a degree in political science should include 24 hours for the B.A. or 30 hours for the B.S. degree, to be chosen from the following list: PS 100, 200, 410, 411, 413, 420, 423, 431 or 433, 470, 471, 474, 498 and one course in political theory and one in international relations for a total of 30 hours or 36 hours respectively.

Related courses to meet political science or liberal arts requirements should include at least 6 hours in psychology (PX 100, 270, or 315),

9 hours in sociology (SO 101, 332, 341, 345, 440, 446 or 447), and 3 hours from anthropology (AN 311 or 351). Transcripts upon graduation, on the request of the student, may include the sub-title: Political Science - Public Safety Administration Emphasis.

POLITICAL SCIENCE

PS 100 Government and Politics. Major philosophies and institutions of modern government. Illustrative material derived primarily from American government. Meets the federal government requirement for teacher certification. Two lectures, 2 discussions. Credit, 4 hours.

200 Problems of American Government. Powers, functions, and agents of American political institutions. Meets the federal government requirement for teacher certification. Prerequisite: PS 100. Credit, 3 hours.

250 Comparative Government. Comparative study of political systems with emphasis on Britain, France, Germany, and Russia. Prerequisite: PS 100. Credit 3 hours.

260 International Relations. Introduction to contemporary international affairs through surveying the major problems in each of the important geographic regions. Prerequisite: PS 100. Credit, 3 hours.

310 Federal Constitution and Government. Constitution and government of the United States at the national level. Not open to students having credit for PS 100 or any course in U.S. national government. Meets the federal government requirement for teacher certification. May not be counted for the major, the teaching major or the teaching minor in political science. Credit, 2 hours.

311 Arizona Constitution and Government. Constitution and government of the State of Arizona. Not open to students having credit for a course in state government. Meets the Arizona government requirement for teacher certification. May not be counted for the major, the teaching major or the teaching minor in political science. Credit, 1 hour.

312 National and Arizona Government. Constitutions and governments of the United States and Arizona. Not open to students having credit for PS 100 or any course in U.S. national and Arizona governments. Meets the federal and Arizona government requirements for teacher certification. May not be counted for the major, the teaching major, or the teaching minor in political science. Credit, 3 hours.

330 Current Issues in National Politics. Major current issues facing the national government in the domestic field. May not be counted for the major or the teaching major in political science. Credit, 3 hours.

360 Current Issues in International Politics. Principal current issues involving the national-state system in the world today. Attention will also be devoted to America's role in the international arena. May not be counted for the major or the teaching major in political science. Credit, 3 hours.

401 Introduction to Political Statistics. Derivation and interpretation of measures of central tendency, variability, and correlation, and their application to political data, emphasizing logical basis of statistical inference. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

402 Political Statistics. Non-parametric statistics, multiple and partial correlation, factor analysis and analysis of variance. Prerequisite: PS 401 or approval of instructor. Credit, 3 hours.

410 Municipal Government and Politics. Politics and administration of city and town government in the United States. Problems, forms, and services of city government. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

411 State Government. Major problems of state government, including constitutional revision, governmental reorganization, legislative apportionment, and other matters. Special attention to Arizona government. Meets the Arizona requirement for teacher certification. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

412 Metropolitan Government and Politics. Political process in the metropolis with an examination of governmental organizations and decision-making structures. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

413 The Legislative Process. Lawmaking process followed in selected legislative bodies; composition of membership, organization, powers; impact of internal and external forces on legislation. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

414 The American Presidency. Office, role and power of the American Presidency in the American political system. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

420 Introduction to Public Administration. Role of the administrator in the political process with an examination of the basic concepts of bureaucracy. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

421 Organizational Theory. Organizational theories and current research emphases with an examination of their application to public administrative organizations. Prerequisite: Six hours in political science or approval of the instructor. Credit, 3 hours.

422 Governmental Budgeting and Finance Administration. Legal, social and political nature of governmental budgets and the budgetary process. Budget-making procedures are analyzed with an evaluation of administrative techniques of budget control. Prerequisite: Six hours in political science or approval of the instructor. Credit, 3 hours.

423 Public Personnel Administration. History of civil service. Problems of recruitment, examination, preparation, pay scales, promotion, employee motivation and discipline. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

424 The Regulatory Process. Role of federal and state agencies in regulating economic activity. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

425 Public Administration and Policy Development. Survey of the relationships between policy development and administrative processes as affected by the various roles of legislative bodies, executive and administrative agencies. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

426 Municipal Administration. Municipal administrative processes and practices in urban governments in the United States. Organizational structure and administrative practices, with an examination of leadership, influence groups, and legislative-administrative relations. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

427 Urban Planning Administration. Role and function of planning as a part of the urban political system. Relation of urban planning administration to the total urban decision-making environment. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

428 Comparative Administration. Analysis of theories, techniques, and procedures utilized in the study of administrative organizations of nations and governmental units at various stages of development. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

430 Political Parties. Development of the American party system. Party organization and functions. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

431 Public Opinion and Propaganda. Formation, expression, and influence of individual and organized opinion on political institutions. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

432 Introduction to Political Behavior. Designed to examine political activities of men in the community and in governmental institutions using behavioral techniques. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

433 Pressure Groups. Aims, techniques, and influence of interest groups in American politics. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

434 Problems in Comparative Politics. Comparative study of political institutions, cultures, and styles. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

435 Modernization and Political Change. Political and social problems associated with modernization. Empirical focus on one or more developing regions. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

- 436 Electoral Behavior.** Voting behavior and the attitudes, perceptions, and activities of the citizenry in the political process. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 437 Political Socialization.** Examines the learning process by which persons of various cultures acquire the knowledge, skills, and attitudes that make them able members of their political systems. Recent theories and techniques of inquiry. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 438 Revolution and the Social System.** Analytical and empirical study of the causes and consequences of revolution. Identification of systemic structures and institutions conducive to radical and moderate patterns of conflict resolution. Prerequisite: Six hours in political science. Credit, 3 hours.
- 439 Minority Group Politics in America.** Role of minority groups in American politics. Prerequisite: Six hours in political science. Credit, 3 hours.
- 440 Western Political Thought.** Western political philosophers and their theories from Plato and Aristotle to the Eighteenth Century. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 441 Recent Political Thought.** Political ideas and philosophies from the Eighteenth Century to the present. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 442 American Political Thought.** Political theories and movements from the colonial period to the present. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 443 Contemporary Political Thought.** Analysis of the ideas and systems of some representative Twentieth Century political thinkers. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 445 Eastern Political Thought.** Contemporary political ideas and theories in East and Southeast Asia including the impact of Western thought especially Communist—on revolutionary process. Prerequisite: Six hours in political science. Credit, 3 hours.
- 450 Government and Politics of the Soviet Union.** Description and comparative analysis of Soviet government and institutions. Appraisal of the Soviet economic system and incentives, and of the machinery for control of the people. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 451 Governments and Politics of Eastern Europe.** Governments and politics of Eastern European nations. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 452 Governments and Politics of Communist Asia.** Background of the Communist revolution, political processes, and developmental problems in mainland China and other Communist states. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 453 Governments and Politics of South America.** Governmental institutions, political processes, and developmental problems of the South American states. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 454 Government and Politics of Mexico.** Mexican federal, state, and local governmental institutions. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 455 Governments and Politics of Central America and the Caribbean.** Governmental institutions, political processes and developmental problems of the nation states and dependent areas of Central America and the Caribbean. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 456 Governments and Politics of Western Europe.** Structures and behavior of governmental institutions and political processes in selected countries of Western Europe. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 458 Governments and Politics of Non-Communist Asia.** Political background. Governmental institutions, political dynamics, and developmental problems of selected non-Communist nations in Asia. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 460 World Politics.** Development of the modern system of nation-states. Power politics. Role of international law. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.

- 461 American Foreign Policy.** United States in world affairs. American foreign policy since World War I. Techniques in formulating American foreign policies. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 462 International Relations of the Communist World.** Nature and objectives of foreign policy of the Communist camp, emphasizing Soviet foreign policy and the Sino-Soviet conflict. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 463 Inter-American Relations.** Diplomatic relations among the Latin American states. Development of U. S. foreign policy toward Latin America. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 465 International and Regional Organizations.** Theory, development and practices of international and supranational organizations. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 466 The United Nations.** League of Nations system and its demise. Formation of the United Nations and its present structure, function and operation. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 467 National Defense Policy.** Problems and issues of the organization and control of effective defense establishments within the context of various political systems. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 468 International Relations of Asia.** Relations among the Asian nations as well as their interactions with the great powers. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 470 Constitutional Law I.** Development of the United States Constitution as reflected in decisions of the Supreme Court: Jurisdiction and organization of the federal courts; judicial review; separation of powers: federalism; the commerce clause; national taxing and spending power; state police power. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 471 Constitutional Law II.** Development of the United States Constitution as reflected in decisions of the Supreme Court: Due process; equal protection of laws; individual rights; civil liberties. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 472 International Law.** Law of the nations as developed by custom and agreement and as exhibited in decisions of international and national tribunals. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 473 Administrative Law.** Nature, sources, and scope of administrative law; government agencies and personnel; internal remedies and judicial control of administrative action. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 474 Law and Society.** Nature, purposes and sanctions of law; sources of law; private law and public law, common law and civil law. Prerequisite: Six hours in political science or approval of instructor. Credit, 3 hours.
- 480 Methods of Teaching Government.** Methods of instruction, organization, and presentation of subject matter in political science. Prerequisite: SE 311 or concurrently, and 15 hours in political science or approval of instructor. Credit, 3 hours.
- 498 Pro-Seminar.** Recent trends and developments in various fields of political science; group study and research. Prerequisite: Political science major with senior standing or approval of instructor. Credit, 3 hours.
- 501 Empirical Theory.** Empirical orientations to the study of politics, such as systems, structural-functional, decision-making, communications, and game theories. Prerequisite: Approval of instructor. Credit, 3 hours.
- 502 Political Philosophy.** Selected traditional and contemporary topics in political philosophy. Prerequisite: Approval of instructor. Credit, 3 hours.
- 503 Quantitative Research Methods.** Research techniques, including elements of research design, measuring, sampling data analysis and statistical inference, emphasizing computer applications. Prerequisite: PS 495. Credit, 3 hours.
- 526 Internship in Government.** Required of all Master of Public Administration candidates without previous experience in government service. An internship to be served in an agency of federal, state, or local government. Credit, 3 hours.

591 Seminar. Credit, 3 hours. Topics may be selected from the following:

- | | |
|-----------------------------------|------------------------------------|
| (a) <i>American Government</i> | (e) <i>International Relations</i> |
| (b) <i>Politics</i> | (f) <i>Public Administration</i> |
| (c) <i>Public Law</i> | (g) <i>Political Theory</i> |
| (d) <i>Comparative Government</i> | |

PSYCHOLOGY

PROFESSORS:

_____ (SS 321), BACHRACH, JONES, MEYERSON, SHERMAN

ASSOCIATE PROFESSORS:

BARDRICK, FALK, GERSTEN, LEVINE, SUTTON

ASSISTANT PROFESSORS:

BIRCH, DEGROOT, DILLOW, HEGGE, KENNEDY, KILLEEN,
REICH, RIMM, ROSSI, SAMSON, TAYLOR

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Arts Degree Curriculum

PSYCHOLOGY — Consists of 45 semester hours, of which 30 must be in psychology and 15 in related courses to be approved by the adviser in consultation with the student. Required courses in psychology are 100, 112, 230, 301, 320, 330; one course from among 315, 341, 350, 366; one from among 321, 323, 325; and either 414, 423 or 426. Required related courses are MA 141, 142; PH 101; and the remainder to be chosen from courses in anthropology, philosophy, sociology and history as approved by the adviser in consultation with the student. Sixteen semester hours of a foreign language must be completed. At least 18 semester hours must be in upper division courses.

Bachelor of Science Degree Curriculum

PSYCHOLOGY — Consists of at least 51 semester hours, of which 30 must be in psychology and a minimum of 21 hours in related courses to be approved by the adviser in consultation with the student. Required courses in psychology are 100, 112, 230, 301, 320, 330; one course from among 315, 341, 350, 366; one from among 321, 323, 325, and either 414, 423, or 426. Required related courses are MA 141, 142; PH 111, 112; ZO 201, 202 or CH 113, 114. Eight semester hours of a foreign language must be completed. At least 18 semester hours must be in upper division courses.

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS

(Secondary Education)

Consists of the following courses, totaling 18 semester hours of credit: PX 100, 270, 315, 341, 350 and 366.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Psychology offers programs leading to the degree of Doctor of Philosophy. Consult the *Graduate Catalog* for requirements.

PSYCHOLOGY (PY)

Courses which may be applied toward the General Studies requirement in sciences and mathematics.

PY 112 Introduction to the Experimental Analysis of Behavior. Basic principles of behavior analysis. Required for psychology majors. Prerequisite: PX 100. Three lectures, 2 hours laboratory. Credit, 4 hours.

230 Introduction to Statistics. Introduction to set theory, probability theory, probability distributions, and sampling. Prerequisites: PY 112 (concurrent), MA 141. Two lectures. Credit, 3 hours.

301 Advanced General Psychology. Extension of basic principles of behavior to the problems of general experimental psychology. Prerequisites: PY 230. (PY 330 concurrent). Credit, 3 hours.

320 Analysis of Behavior. Methods and concepts of experimental research with lower animals and humans. Training in digital logic control equipment. Prerequisite: PY 112. Not open to freshmen. Three lectures, quiz section, 4 hours laboratory. Credit, 4 hours.

321 Experimental Analysis of Human Learning. Extension of experimentally established behavior principles to complex human learning. Prerequisites: PY 112, 230, (330 concurrent), 301. Three lectures, 2 hours laboratory. Credit, 4 hours.

322 Conditioning. Drive and reinforcement factors in conditioning. Classical conditioning of visceral and motor responses. Prerequisites: PY 112, 301. Credit, 3 hours.

323 Perception and Stimulus Control. Discriminative processes, psychophysics, and signal detection theory. Prerequisites: PY 112, 301, 320, 330. Three lectures, 2 hours laboratory. Credit, 4 hours.

325 Introduction to Physiological Psychology. Physiological variables in the control of behavior. Prerequisites: PY 112, 230, 301. Two lectures, quiz section, 3 hours laboratory. Credit, 4 hours.

330 Statistical Methods. Application of statistics to psychology. Prerequisite: PY 230. Two lectures, 2 hours laboratory. Credit, 3 hours.

421 Child Behavior. Laboratory studies of child behavior. Prerequisites: PY 112, PX 341. Two lectures, 2 hours laboratory. Credit, 3 hours.

423 Comparative Psychology. Generality of behavioral laws throughout the animal kingdom, as well as behaviors specific to different species. Prerequisite: PY 320 or 325. Two lectures, 3 hours laboratory. Credit, 3 hours.

425 Physiological Methods in Psychology. Application of combined methods from psychology and physiology to the analysis of behavior. Individual participation in projects investigating specific topics in physiological psychology. Prerequisite: PY 325. Two lectures, 3 hours laboratory. Credit, 3 hours.

426 Theories of Learning. Contemporary theories and systems in human and animal learning. Prerequisites: PY 320 or 321 or 322. Credit, 3 hours.

429 Behavioral Pharmacology. Problems and methods of drug research from the standpoint of experimental psychology. Prerequisite: PY 325. Credit, 3 hours.

440 Directed Experience with Children. Special studies adapted to the needs of the student, including experience with play therapy when the student has sufficient background to participate in this program. Prerequisite: Approval of instructor. Credit, 3 hours.

498 Pro-Seminar. Credit, 3 hours. The following topics are regularly offered by the Department:

(a) *Neuroanatomy.*

(b) *Neurophysiology.* Prerequisite: Neuroanatomy.

(c) *Neuropharmacology.* Prerequisite: PY 325.

(d) *Biological Bases of Behavior.* Prerequisite: PY 325.

512 Systems and Theories of Psychology. Development of contemporary systems and theories. Prerequisite: Nine hours in psychology. Credit, 3 hours.

514 History of Psychology. History of psychology, primarily since Descartes. Prerequisites: PX 414 and approval of instructor. Credit, 3 hours.

520 Advanced Experimental Analysis of Behavior. Contemporary research literature in the experimental analysis of behavior. Prerequisite: PY 320. Credit, 3 hours.

521 Human Learning. Research methods and findings in human motor and verbal learning. Prerequisite: PY 321. Credit, 3 hours.

522 Methods in Experimental Psychology. Basic procedures and equipment used in the psychological laboratory. Prerequisite: Approval of instructor. Two lectures, 1 hour laboratory. Credit, 3 hours.

524 Advanced Physiological Psychology. Theories of physiological mechanisms and brain function in behavior. Prerequisite: PY 325 or Pro-seminar in Neuroanatomy and Neurophysiology. Credit, 3 hours.

525 Language Processes. Theoretical and experimental analysis of language behavior. Prerequisite: PY 321. Credit, 3 hours.

526 Advanced Learning. Advanced formulations and procedures in learning and conditioning. Prerequisites: PY 320, 426. Credit, 3 hours.

528 Sensory Processes. Psychophysics, signal detection, communication and information theory. Prerequisites: PY 323, 325. Credit, 3 hours.

530 Intermediate Statistics. Application of statistics to psychology with emphasis on statistical inference and experimental design. Prerequisites: PY 330, MA 141. Two lectures, 3 hours laboratory. Credit, 3 hours.

533 Quantitative Methods in Psychology. Logic, procedures, and problems of psychological measurement. Nature of variables, functional relations, scaling, curve fitting, reliability and validity as used in psychological research and testing. Prerequisite: PY 330. Credit, 3 hours.

540 Developmental Psychology. Basic principles, data and methods in the study of human development. Prerequisite: PX 341 or 342. Credit, 3 hours.

550 Advanced Social Psychology. Advanced study of the relationships between individuals and social groups. Prerequisite: PX 350. Credit, 3 hours.

558 Group Dynamics. Theories and methods of group leadership, group effectiveness, communication within groups, and relations between groups and individual members. Prerequisite: PX 350. Credit, 3 hours.

560 Theories of Personality. Critical analysis of theories of personality currently significant in psychology. Prerequisite: PX 315. Credit, 3 hours.

562 Experimental Foundations of Clinical Psychology. Contributions of experimental methods to clinical psychology. Fundamentals of general-experimental psychology underlying clinical practice. Prerequisite: Approval of instructor. Credit, 3 hours.

564, 565 Somatopsychology. Fact and theory in the psychological aspects of chronic illness, physical disability, and mental retardation. Prerequisite: Ph.D. core program. Credit, 3 hours each semester.

568 Play Therapy. Methods and theories of play therapy with parallel supervised laboratory, experiences in play therapy. Conferences with parents and teachers. Prerequisite: Approval of instructor. Two lectures, 2 hours laboratory. Credit, 3 hours.

571, 572 Evaluation of Abnormal Behavior. Measurement theory and research relating to clinical assessment techniques, especially with regard to personality and intelligence tests. Supervised practice in the various assessment procedures. Prerequisite: Admission to clinical Ph.D. program. Credit, 3 hours each semester.

573 Development of Abnormal Behavior. Theory and research relating to the contribution of psychological, social, physiological and genetic factors to the development and persistence of abnormal behavior. Prerequisite: PY 571. Credit, 3 hours.

574, 575 Modification of Abnormal Behavior. Major current theories and methods used in modifying abnormal behavior including traditional psychotherapy and behavior therapy, with emphasis on the research literature and applications to clinical research. Prerequisite: Prior or concurrent enrollment in 571, 572. Credit, 3 hours each semester.

576, 577 Clinical Practicum. Supervised experience in the application of assessment procedures, psychotherapy and behavior modification techniques with children and adults. Prerequisites: PY 574, 575. Credit, 3 hours each semester.

578 Experimental Personality. Laboratory course investigating problems in experimental personality research with emphasis on providing skills necessary for independent work in personality research. Prerequisite: PY 573. Credit, 3 hours.

580 Psychology and Systems Analysis. Systems theory, cybernetics, and the experimental analysis of behavior. Prerequisites: PY 320 and approval of instructor. Credit, 3 hours.

581 Theory and Research in Child Behavior. Advanced study of theory and methodology pertaining to the study of children, emphasizing research findings and their implications. Prerequisite: Advanced standing in clinical Ph.D. program or approval of instructor. Credit, 3 hours.

582 Clinical Neurology. Abnormal behavior relating to neurological pathology. Prerequisite: Advanced standing in clinical Ph.D. program or approval of instructor. Credit, 3 hours.

583 Medial Models in Clinical Psychology. Theory and research in development of verbal and non-verbal language, communication processes, imagery, associative processes, construct systems and related phenomena. Prerequisite: Advanced standing in clinical Ph.D. program or approval of instructor. Credit, 3 hours.

584 Advanced Treatment Methods. Advanced study of theory, research and techniques of psychological treatment methods. Prerequisites: PY 574, 575, advanced standing in clinical Ph.D. program or approval of instructor. Credit, 3 hours.

585 Social Factors in Clinical Psychology. Role of social and cultural factors in determining behavior; examination of research in epidemiology, anthropology, and familial patterns, emphasizing research implications for the prevention of abnormal behavior. Prerequisite: Advanced standing in clinical Ph.D. program or approval of instructor. Credit, 3 hours.

586 Advanced Clinical Assessment. Selected topics in research literature dealing with clinical assessment and prediction. Prerequisites: PY 571, 572; advanced standing in clinical Ph.D. program or approval of instructor. Credit, 3 hours.

587 Learning and Motivational Approaches to Personality. Application of major theories of learning and motivation to the analysis of personality phenomena. Prerequisite: Advanced standing in clinical Ph.D. program or approval of instructor. Credit, 3 hours.

591 Seminar. Credit, 3 hours.

PSYCHOLOGY (PX)

Courses which may be applied toward the General Studies requirement in social and behavioral sciences:

PX 100 Introduction to the Science of Psychology. Required for psychology majors. Credit, 3 hours.

270 Mental Health. Principles and practices of mental health derived from clinical and experimental research. Credit, 3 hours.

315 Psychology of Personality. Definition and description of personality in terms of theoretical methodological approaches. Prerequisite: PX 100. Credit, 3 hours.

341 Introduction to Developmental Psychology. Behavior development analyzed in terms of psychological principles. Current research in the area of human development. Prerequisite: PX 100. Credit, 3 hours.

342 Psychology of Adolescence. Methods and findings of recent studies of the development, growth and problems of the adolescent with implications for education. Prerequisite: PX 100 or 341. Credit, 3 hours.

350 Social Psychology. Individual and social behavior. Analysis of concepts and research dealing with social variables. Prerequisite: PX 100. Credit, 3 hours.

366 Psychopathology. Study of abnormal behavior. Prerequisite: PX 100. Credit, 3 hours.

380 Applied Psychology. Application of psychological principles and procedures to various settings and problems. Prerequisite: PX 100. Credit, 3 hours.

414 History of Psychology. Development of psychology emphasizing its relation to other sciences. Prerequisite: PX 100. Credit, 3 hours.

SOCIAL SERVICE ADMINISTRATION

PROFESSORS:

LUNDBERG (Nur. 324), MECH

ASSOCIATE PROFESSORS:

CRANMER, ENGELHARDT, HILL, JAQUA

ASSISTANT PROFESSORS:

POLENZ, WELLONS

SW 601 Social Work in American Society. Social work's purposes, assumptions, values and responsibilities. Its historical development provides perspective to the study of social work, its professional associations and education. Credit, 1 hour.

602 Social Services and Policy I. Historical antecedents and current programs designed to meet social needs. Comparative analysis of social welfare services and policy among Western societies. Functions of professions and their evolution in a changing society. Social, political and economic forces affecting the development of social services. Credit, 2 hours.

603 Social Services and Policy II. Social welfare problem, policy and provision in the framework of current programs. History of philosophical and social work principles and concepts evaluated and related to Phoenix and Arizona public and private agencies. Credit, 2 hours.

610, 611 Human Behavior and the Social Environment I-II. Normal behavior and social functioning of the infant, child, pre-adolescent, adolescent, mature and senescent individual as it is affected by factors of culture; physical, intellectual, and emotional endowment and development; spiritual involvement; group relationships. Credit, 4 hours first semester, 2 hours second semester.

615-616 Social Work Methods I-II. A multi-method course. Basic principles of case-work, group work and community organization practice; structure of problem-solving process; nature and uses of professional relationship; identification, assessment and treatment of problems of social functioning; choice of intervention in problem-solving process. Credit, 2 hours each semester.

620 Dynamics of Group Process. Dynamics of groups: roles, ascribed status to members, leadership. Beginning knowledge of theoretical aspects of group behavior. Credit, 2 hours.

625 Community Organization. Offered as integrated part of the social work methods sequence. Components of community organization method in social work practice; nature of community and problems to which the method is directed; organizing principles and concepts characteristic of community organization practice. Credit, 2 hours.

630 Social Research. Theory and method in social and behavioral research. Emphasis on problem formulation, hypothesis development, derivation of representative designs and instrument construction. Credit, 2 hours.

631 Practice-Oriented Research. Critical survey of current research literature in selected fields of social work practice. Emphasis placed upon ascribing implications for social work policy and practice. Credit, 2 hours.

640, 641 Field Instruction. Individual instruction, social work practice in a qualified agency: experience in the disciplined use of self in a professional helping relationship. Two consecutive semesters in same agency. Credit, 4 hours each semester.

650 Social Services and Policy III. Agency-focused study of social services and structure in medical, correctional, public school and social welfare agencies. Existing organization patterns are contrasted with "ideal." Credit, 2 hours.

651 Social Issues, Problems, and Policy. Contemporary social issues, problems and relevant present or potential policy. Relationships in social work profession: educationally, in membership associations, and to social work practice. Credit, 2 hours.

655 Social Welfare Administration. Administrative structure of social agencies and aspects of social worker's job. Administration as process. Responsibilities in being employee, staff member, agency representative, supervisee, colleague and citizen. Credit, 2 hours.

660, 661 Human Behavior III-IV (Pathology). Knowledge of human behavior, relating it to abnormal social functioning and entities of pathological behavior. Deviant behavior associated with origin in various stages of psychosexual development. Credit, 2 hours each semester.

665, 666 Social Work Methods III-IV. Application of principles and techniques to more complex problems of social functioning, collaborative relationships and secondary practice settings. Concepts and techniques of social work applied to work with individuals, groups and in community. Criteria are offered for intervention in these methods. Credit, 2 hours each semester.

675, 676 Community Organization Practice I-II. Community organization method; analysis of means of identifying and assessing social welfare problems and planning related to development of social services in both primary and secondary community organization agencies. A two-semester sequence open to students in community organization concentration. Credit, 2 hours each semester.

680, 681 Field Research. Concurrent seminar and practicum with emphasis on applications of research strategies to social work practice. Completion of practice-related study is required. Students participate in cooperative project or elect individual thesis. Credit, 2 hours each semester.

683 Experimental Social Work. Analysis of experimental methodology in relation to planning, evaluation and implementation of solutions to contemporary problems in social work practice. Prerequisite: SW 630 or equivalent. Credit, 2 hours.

690 Reading and Conference.

693, 694 Field Instruction. Individual instruction, social work practice in a qualified agency: a continuation of SW 640, 641 in a different type of agency. Two consecutive semesters in same agency. Credit, 5 hours each semester.

729 Educational Aspects of Field Instruction. Educational theory underlying field instruction, normally required of field instructors in their first semester with the School. Prerequisite: Master's degree in social work and instructor's approval. Open for audit. Credit, 2 hours.

SOCIOLOGY

PROFESSORS:

HOULT (SS 107E), HUDSON, KUNKEL, LINDSTROM, MANHEIM,
MAYER, OWEN

ASSOCIATE PROFESSORS:

GEISEL, GUILLOT, HARWARD, PARKER, PFUHL, SEBALD, WHITAM

ASSISTANT PROFESSORS:

GORDON, HARDERT, HENZE, NAGASAWA

DEPARTMENTAL MAJOR REQUIREMENTS

Bachelor of Arts and Bachelor of Science Degree Curriculums

SOCIOLOGY — Departmental requirements are the same for the Bachelor of Arts and for the Bachelor of Science degrees; see the College of Liberal Arts section of this catalog for the additional requirements for each degree. The departmental requirement for either degree consists of 45 semester hours of credit of which 30 must be in sociology and 15 in

closely related fields to be approved by the adviser in consultation with the student. The 30 hours must include SO 101 or 301, 390, 483, 490, and at least one course from at least three of the following five areas: institutional forms and processes, demography and ecology, social problems, social organization, and social psychology (details available in the department office). At least 18 semester hours must be in upper division courses.

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS (Secondary Education)

SOCIOLOGY — Consists of 18 semester hours of credit, at least six of which will be upper division. SO 101 or 301 is required. The remaining 15 hours must be approved by the sociology adviser in consultation with the student, and must include at least one course from at least three of the following five areas: institutional forms and processes, demography and ecology, social problems, social organization, and social psychology (details available in the Sociology department office).

SOCIAL WELFARE EMPHASIS

A social welfare emphasis is available for interested students in either the Bachelor of Arts or Bachelor of Science major in sociology. The program requires, in addition, SO 371, 372, 478, with other courses in related fields approved by the adviser in consultation with the student.

PUBLIC SAFETY EMPHASIS

A public safety emphasis is available for law enforcement and fire-fighting personnel in either the Bachelor of Arts or Bachelor of Science major in sociology. The 30 hours must consist of SO 340, 360, 440, 446, 447, and 470 in addition to SO 101 or 301, 390, 483, and 490. Applicable courses taken outside the Department of Sociology may be used to meet the requirement of 15 hours in closely related fields approved by the adviser in consultation with the student. Upon graduation, those successfully completing the program will receive suitable recognition on their transcripts.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Sociology offers programs leading to the degree of Master of Arts. Consult the *Graduate Catalog* for requirements.

SOCIOLOGY

SO 101 Introductory Sociology. Fundamentals of sociology, organization of human groups and society, and the processes of interaction and social change. Not open to students who have credit for SO 301. Credit, 3 hours.

250 The Community. Development and organization of institutions in human communities of various types. Prerequisites: SO 101. Credit, 3 hours.

251 American Society. Systematic analysis of the major institutions of economic activity, political structure, science, education and religion in contemporary America. Prerequisite: SO 101. Credit, 3 hours.

271 Social Welfare. Observation and analysis of community welfare services. Two lectures, 3 hours field trips and discussion. Not open to students who have credit for SO 470. Credit, 3 hours.

301 Principles of Sociology. Intensive and critical analysis of the concepts of sociology. Not open to students who have credit for SO 101. Credit, 3 hours.

305 Courtship and Marriage. A functional approach to marriage; courtship, engagement, marital adjustment. Credit, 3 hours.

332 The Modern City. Growth, characteristics, and problems of the modern city. Prerequisite: SO 101 or 301. Credit, 3 hours.

333 Population Problems. Theories of population change; births, deaths, migration; population policies. Prerequisite: SO 101 or 301. Credit, 3 hours.

340 Sociology of Deviant Behavior. Introduction to and analysis of deviant behavior. Delineation of the sociological and social psychological factors which give rise to deviant behavior such as suicide, drug addition, homosexuality, prostitution, etc. Prerequisite: SO 101 or 301. Credit, 3 hours.

341 Modern Social Problems. Race relations, poverty, unemployment, and other current issues. Credit, 3 hours.

351 Industrial Sociology. Social and cultural analysis of industry. Occupational roles, status, and social participation of workers. Prerequisite: SO 101 or 301. Credit, 3 hours.

352 Social Change. Patterns of social change, resistance to change, and change-producing agencies and processes. Prerequisite: SO 101 or 301. Credit, 3 hours.

360 The Social System and the Individual. Interaction patterns between the socio-cultural order and individuals; socialization process; norms, roles, and statuses; collective behavior. Prerequisite: SO 101 or 301. Credit, 3 hours.

362 Sociology of Adolescence. Cultural values and the social processes that help explain the development of the phenomenon of modern adolescence, including investigation of adolescent subcultures and cross-cultural references. Prerequisite: SO 101 or 301. Credit, 3 hours.

371, 372 Social Welfare as a Social Institution. Development of social welfare as an institution meeting changing human and system needs; analysis of present-day philosophy and function. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor; 371 prerequisite for 372. Credit, 3 hours each semester.

390 Social Statistics. Application of statistical methods to research problems in sociology; problems of scale-construction, measures of central tendency and variability, simple relationship statistics, sampling, and presentation of data. Prerequisites: SO 101 or 301; MA 116 or equivalent, or approval of instructor. Credit, 3 hours.

410 Sociology of Religion. Interrelationship of culture, society and religion; religion and social stratification; religion and economic and political institutions; social change and religion. Emphasis on American society and institutions. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

415 The Family. The family considered from the institutional viewpoint; its historical development, and its adaptation to a changing culture; the family system in many cultures. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

416 Marriage Problems in Contemporary Society. Marital and family problems in today's society from the viewpoint of personal and cultural adjustment. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

432 Human Ecology. Patterns and laws of societies' adjustments to the physical environment; distribution of communities and institutions. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

433 Demographic Methods. Science of population analysis; problems in measurement of the size, composition and changes in population. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

440 Racial and Ethnic Minorities. Analysis of problems of minorities in the United States and in other racially and ethnically heterogeneous societies. Evaluation of theories of prejudice and of research dealing with discrimination, desegregation, and assimilation. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

446 Criminology and Delinquency. Causation of crime; juvenile delinquency; classes of crime; criminal as a social type. Prerequisites: SO 101 or 301, and 340, or approval of instructor. Credit, 3 hours.

- 447 Sociology of Corrections.** Theories of punishment; methods of dealing with convicts; police, courts, prisons, probations, and parole. Prerequisites: SO 446, or approval of instructor. Credit, 3 hours.
- 448 Gerontology.** Social processes in aging and their relationship to the physical changes. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.
- 451 Sociology of Occupations and Professions.** Rise of occupational groups and professions, their role in modern societies, and their impact on the development of newly industrializing nations. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.
- 452 Sociology of Complex Organizations.** Sociological studies of government agencies, industrial firms, labor unions, military establishments, and other large-scale organizations. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.
- 453 Social Class and Stratification.** Social classes and the function of these groupings in a society. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.
- 454 The Afro-American in Modern Society.** Social and cultural heritage of Black Americans; achievements and current trends. Prerequisite: Approval of instructor. Credit, 3 hours.
- 462 Social Control.** The significance of social control in society, and the various methods used by individuals and groups to control others. Prerequisite: SO 360 or approval of instructor. Credit, 3 hours.
- 463 Small Group Interaction.** Theoretical and applied aspects of social interaction, with particular emphasis on the processes involved in small groups. Prerequisite: SO 360 or approval of instructor. Credit, 3 hours.
- 470 Community Resources.** Existing social agencies, the needs they meet and how they meet them. Especially designed for teachers, nurses, police, and related professions. Prerequisite: Approval of instructor. Not open to students who have credit for SO 271. Credit, 3 hours.
- 478 Social Service as a Profession.** Professionalization of social services; the philosophical and scientific basis for practice. Prerequisites: SO 371, 372, or approval of instructor. Credit, 3 hours.
- 479 Field Experience in Social Service.** Two half-days a week supervised field experience in a social agency and one two-hour class meeting on basic concepts and current issues. Prerequisites: SO 371, 372, 478, and/or approval of instructor. Credit 4 hours.
- 483 History of Social Thought.** Social thought in human culture. The background of modern sociology. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.
- 490 Sociological Research.** Methods of sociological research, including the fundamental assumptions underlying research, and some practical experience in research design, data collection techniques, and data analysis. Prerequisites: SO 101 or 301, 390, or approval of instructor. Credit, 3 hours.
- 491 Community Surveys and Analysis.** Application of sample survey methods to the study of communities and large-scale organizations. Analysis of community problems through an actual field study. Prerequisites: SO 101 or 301, 490, or approval of instructor. Credit, 3 hours.
- 494 Intermediate Social Statistics.** Multivariate and correlational analysis as used in survey research, sociological experiments and field studies. Prerequisite: SO 390 or equivalent. Credit, 3 hours.
- 498 Pro-Seminar.** Topics to be selected. Credit, 3 hours.
- 500 Research Methods.** Prerequisite: SO 490, or approval of instructor. Credit, 3 hours.
- 515 Studies of the Family.** Current developments in the study of marriage and the family. Prerequisite: Approval of instructor. Credit, 3 hours.
- 532 Studies in Ecology and Demography.** Current literature in ecology and demography; group and individual projects. Prerequisites: SO 432, 433, or approval of instructor. Credit, 3 hours.

546 Criminology and Criminal Law. History of criminal law and punishment as a means of social control; the use of indeterminate sentences, probation, and parole; the legal foundations of the juvenile court; the law of arrest, search, and seizure; and the role of psychiatry in criminal law. Prerequisite: Approval of instructor. Credit, 3 hours.

552 Social Aspects of Economic Development. Social prerequisites, concomitants, and effects of industrialization, and the evaluation of recent research in these areas. Prerequisite: Approval of instructor. Credit, 3 hours.

561 Small Group Experiments. Methods used in studying small groups. Participation in the design and execution of experiments. Prerequisites: SO 463, 490. Credit, 3 hours.

585 Contemporary Sociological Theory. Nature and functions of modern sociological theory. Major theoretical approaches. Prerequisite: SO 483, or equivalent, or approval of instructor. Credit, 3 hours.

586 Current Sociology. Contemporary issues in sociology; their implications for future research and theory. Prerequisite: Approval of instructor. Credit, 3 hours.

591 Seminar. Credit, 3 hours. Topics may be selected from the following:

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|-----------------------------------|--|
| (a) <i>Ecology and Demography</i> | (f) <i>Philosophical Issues in Sociological Theory</i> |
| (b) <i>Social Problems Theory</i> | (g) <i>Methodological Problems</i> |
| (c) <i>Social Organization</i> | (h) <i>Sociology as an Academic Discipline</i> |
| (d) <i>Social Psychology</i> | |
| (e) <i>Social Conflict</i> | |

595 Methodological Issues in Sociology. Systematic examination of basic methodological issues in the application of scientific methods to the study of human social life. Emphasis placed on a limited number of major works, with contrasting approaches to the issues. Prerequisite: SO 490 or approval of instructor. Credit, 3 hours.

Special Graduate Courses: 590, 591, 592, 593. (See page 219.)

SPEECH AND DRAMA

PROFESSORS:

RICHARDS (LL 605), STITES

ASSOCIATE PROFESSORS:

CLUFF, DAVIS, DOYLE, MOWRER, WITT, YEATER

ASSISTANT PROFESSORS:

CASE, GOHEEN, PERRILL, RICE, RITTERBUSH, SMITH, WILLSON

INSTRUCTOR:

BARTZ

DEPARTMENTAL MAJOR REQUIREMENTS

All departmental majors are required to take at least one course in each of the major areas of the departmental curriculum: Drama, Speech, or Speech Pathology and Audiology.

Bachelor of Arts Degree Curriculum

SPEECH — Consists of 45 semester hours of which at least 24 must be in speech and at least 15 in a related area. In addition to the departmental requirement (listed above), a major in speech must include some course work in public speaking, argumentation and debate, discussion, oral in-

terpretation, and history and criticism. The speech major is required to earn at least 2 hours of credit in Speech Activities (SE 301); but not more than 4 hours earned in such activities may be counted toward the major. Specific courses are selected in conference with the major adviser.

DRAMA — Consists of 45 semester hours of which at least 24 must be taken in drama and at least 15 in a related area. In addition to the departmental requirement (listed above), a major in drama must include some course work in acting, technical theatre, directing, and history and criticism. The drama major is required to earn at least 2 hours of credit in Theatre Production (DR 301); but not more than 4 hours earned in such activities may be counted toward the major. Specific courses are selected in conference with the major adviser.

Bachelor of Science Degree Curriculum

SPEECH PATHOLOGY — Consists of 45 semester hours of which 27 must be in speech pathology courses and 18 in a related area. Courses PY 112 and 341, SA 267, 280, 324, 395, 423, 425, and 428 are required. The remaining hours in speech pathology and related areas are selected by the student in conference with his major adviser. At least 18 hours must be in upper division courses. A minimum of 200 clock hours of supervised clinical practice is required, of which at least 50 must be in audiology.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS

Bachelor of Arts in Education Degree Curriculum

SPEECH AND DRAMA — Consists of 45 semester hours of which at least 24 must be in one of the major areas (speech or drama) and 18 in the other. In addition to the departmental requirement (listed above), a major in speech and drama is required to take at least one course in each of the following areas:

Acting	Argumentation and Debate
Directing	Discussion, Persuasion, or
History and Criticism of	History and Criticism of
the Theatre	Public Address
Technical Theatre	Oral Interpretation
	Public Speaking

The major in speech and drama is required to earn at least 2 hours of credit in Speech Activities (SE 301) and/or Theatre Production (DR 301), but not more than 4 hours of such activities may be counted toward the major. Specific courses are selected in conference with the major adviser.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Speech and Drama offers programs leading to the degrees of Master of Arts and Master of Science. Consult the *Graduate Catalog* for requirements.

DRAMA

DR 110 Survey of Acting. An introduction to acting methods and theories, with laboratory projects in acting, mime, make-up and movement. Two hours lecture-demonstration, 2 hours laboratory. Credit, 3 hours.

111 Introduction to Theatre. A survey of all of the elements of the theatre: play-writing, directing, acting, design and architecture. Credit, 3 hours.

113 Make-up. Techniques of theatrical make-up; laboratory projects. Prerequisite: DR 110 or approval of instructor. Credit, 2 hours.

212 Acting: Expression. Bodily and vocal expression for acting through exercises and performances. Prerequisite: DR 110 or approval of instructor. Credit, 3 hours.

213 Introduction to Technical Theatre. Design and construction of scenery. Lighting, costumes and properties. Three hours lecture-demonstration, 3 hours laboratory. Credit, 4 hours.

301 Theatre Production. Participation in University Theatre productions. Prerequisite: Written approval of instructor. May be repeated for credit. Credit, 1 hour.

311 Creative Dramatics. Theories, procedures, and materials for creative dramatics in the elementary and junior high schools. Consideration of related speech activities such as story telling, choral speaking, and puppetry. Credit, 3 hours.

312 Acting: Improvisation. Emotional and expressive freedom for acting through improvisational theatre techniques. Prerequisites: DR 110 and 212, or approval of instructor. Credit, 2 hours.

313 Make-up: Special Problems. The study of special problems, styles, and materials for stage make-up. Prerequisite: DR 113 or approval of instructor. Credit, 2 hours.

314 Acting: Characterization. Techniques and methods of interpreting and projecting a role through study and performance. Prerequisite: DR 110 and 212, or approval of instructor. Credit, 3 hours.

315 Directing. Techniques of interpreting and directing plays. Prerequisite: DR 110 and 213 or approval of instructor. Credit, 2 hours.

316 Directing Projects. Practice in directing scenes with student actors. Prerequisite: DR 315 or approval of instructor. Two hours laboratory. Credit, 1 hour.

317 Scene Study. Analysis and presentation of scenes from masterpieces of dramatic literature. Prerequisite: DR 312 and 314 or approval of instructor. Credit, 2 hours.

318 Children's Theatre. Acting, directing, and producing techniques for child audiences. Includes participation in a children's theatre production. Credit, 3 hours.

320 History of the Theatre. Major developments in the history of theatre production. Credit, 3 hours.

330 Introduction to Costuming. History of theatrical costume; laboratory projects in construction of costumes. Two hours lecture, 3 hours laboratory. Prerequisite: DR 213 or approval of instructor. Credit, 3 hours.

335 Technical Theatre: Stagecraft. Practices in material selection, drafting of working drawings, tool operation, and construction techniques in modern stagecraft. Two hours lecture, 3 hours laboratory. Prerequisite: DR 213 or approval of instructor. Credit, 3 hours.

340 Scene Design. Theory and practice of scenery design for the theatre. Laboratory projects. Prerequisite: DR 213. Credit, 3 hours.

345 Technical Theatre: Lighting. Electrical and design principles of modern stage lighting. Design and execution of light plots and instrument schedules and design and operation of sound effects. Two hours lecture, 3 hours laboratory. Prerequisite: DR 213 or approval of instructor. Credit, 3 hours.

410 Technical Theatre: Contemporary Concepts. Modern theories of theatre production, including contemporary concepts of theatre architecture. Laboratory projects. Credit, 3 hours.

411 Advanced Studies in Creative Dramatics. Application of theories, techniques, and materials for dramatization. Regular participation with children. Prerequisite: DR 311 or approval of instructor. Credit, 3 hours.

412 Puppetry. Construction and manipulation of marionettes and puppets. Credit, 3 hours.

414 Acting: Styles. Techniques of acting in major non-realistic styles through scene study and performance. Two hours lecture-demonstration, 2 hours laboratory. Prerequisite: DR 312 and/or 314 or approval of instructor. Credit, 3 hours.

415 Directing: Theories and Styles. Theories of play direction and laboratory projects in various periods, lyric and experimental plays with student actors. Two hours

lecture-demonstration, 2 hours laboratory. Prerequisite: DR 315 or approval of instructor. Credit, 3 hours.

420 History of the American Theatre. History of the plays, artists, and events in the development of the American theatre from Colonial to modern times. Credit, 3 hours.

430 Advanced Costume Design. Special design and construction practices, particularly in period costume. Prerequisite: DR 330. Credit, 3 hours.

440 Advanced Scenery Design. Specialized techniques in modern scene design. Prerequisite: DR 330. Credit, 3 hours.

445 Technical Theatre: Advanced Lighting. Specialized techniques in stage lighting, including design practices for arena and thrust stages. Prerequisite: DR 315 or approval of instructor. Credit, 3 hours.

450 Theatre Organization and Management. Principles of administering professional and non-professional theatre production organization. Credit, 2 hours.

460 Playwriting. Fundamentals and theories of playwriting. Class work culminating in the writing of a short play. Credit, 3 hours.

465 Dramatic Theory and Criticism. The study of major dramatic theories and criteria from the classical period through the Twentieth Century. Prerequisite: DR 320 or approval of instructor. Credit, 3 hours.

481 Teaching Practicum. Working with high school students to develop special skills in dramatic activities. Credit, 2 hours.

520 Historical Studies in Classical Theatre. Investigation of aspects of classical theatre and drama. Credit, 3 hours.

591 Seminar. Credit, 3 hours. Topics may be selected from the following:

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| (a) <i>Theatre History: Renaissance</i> | (g) <i>Directing</i> |
| (b) <i>Theatre History: Seventeenth Century</i> | (h) <i>History of Scene Design</i> |
| (c) <i>Theatre History: Nineteenth Century</i> | (i) <i>Technical Theatre Planning and Production</i> |
| (d) <i>Theatre History: Contemporary Period</i> | (j) <i>Children's Theatre and Creative Dramatics</i> |
| (e) <i>Dramatic Theory and Criticism</i> | |
| (f) <i>Acting</i> | |

SPEECH

SE 100 Elements of Speech. Basic theory and principles of the oral communication process. Individual and group experiences, such as public speaking, discussion, and oral reading. Credit, 3 hours.

120 Backgrounds of Speech. Orientation to the field of speech as an academic discipline. Theory and limited practice in group communication, public speaking, speech science, oral interpretation, history and criticism of public address. Credit, 3 hours.

200 Introduction to Human Communication. Human communication processes and systems. Orientation to the communication experience and the scientific bases of speech behavior. Credit, 3 hours.

211 Public Speaking. Organization and delivery of various types of speeches. Emphasis on types which occur most often in everyday life. Prerequisite: SE 100 or 120 or approval of instructor. Credit, 3 hours.

214 Introduction to Forensics. Examination of practical problems involved in the development and presentation of argument, including participation in intercollegiate debate. Credit, 3 hours.

221 Speech Improvement. Intensive personal and group experiences to improve normal vocal usage, including articulation and pronunciation of English for platform, stage, or mass media. Credit, 2 hours.

241 Oral Interpretation. Techniques of reading aloud prose, poetry, and drama. Prerequisite: SE 100 or 120. Credit, 3 hours.

300 Principles and Methods of Discussion. The development of attitudes and skills for effective participation and leadership in discussion. Practice in symposiums, panels and conferences. Prerequisite: Approval of instructor. Credit, 3 hours.

301 Speech Activities. Participation in speech activities. Prerequisite: Written approval of instructor. May be repeated for credit. Credit, 1 hour.

310 Parliamentary Procedure. Theory of parliamentary law. Practice in organizing and conducting parliamentary proceedings. Credit, 2 hours.

312 Principles of Argumentation. Examination of the philosophical and theoretical foundations of argumentation with emphasis upon problems in argumentation and debate. Prerequisite: SE 214 or approval of instructor. Credit, 3 hours.

341 Interpretation of Dramatic Literature. Dramatic literature for purposes of developing understanding, appreciation, and ability to communicate orally. Prerequisite: SE 241 or approval of instructor. Credit, 3 hours.

400 Leadership in Group Communication. Group communication process and procedure, with emphasis on the philosophy and behavioral nature of leadership in group situations. Prerequisite: SE 300 or approval of instructor. Credit, 3 hours.

410 Forms of Public Address. Advanced theory of the organization and composition of public speeches. Practice in oral presentation and criticism. Credit, 3 hours.

411 Business and Professional Speech Communication. The application of principles of oral communication to specific business and professional communication situations. Practice in using the forms of persuasion, conference speaking techniques, and group participation methods. Credit, 3 hours.

415 Speech Improvement for the Classroom Teacher. Intensive training in the organization, amplification and oral presentation of materials; to provide improvement in the oral skills of classroom teachers. Credit, 3 hours.

441 Oral Interpretation of Prose. Study of prose literature for purposes of understanding, appreciation, and oral communication. Prerequisite: SE 241 or approval of instructor. Credit, 3 hours.

442 Oral Interpretation of Poetry. Study of poetry for purposes of understanding appreciation, and oral communication. Prerequisite: SE 241 or approval of instructor. Credit, 3 hours.

450 Contemporary Public Address. Leading contemporary public speakers and their influence on social and political life. Credit, 3 hours.

460 American Public Address. Survey and rhetorical evaluation of outstanding American speakers from the Seventeenth Century to the Twentieth. Credit, 3 hours.

470 British Public Address. Survey and rhetorical evaluation of outstanding British orators. Credit, 3 hours.

473 Persuasion. Study and practice of persuasive principles that influence and modify the belief and action of an audience. Prerequisite: SE 100 or 312. Credit, 3 hours.

480 Methods of Teaching Speech and Drama. Analysis, organization, and presentation of textual and other classroom materials. Credit, 3 hours.

481 Teaching Practicum. Teaching high school students the fundamentals of forensics. Offered in Summer Session only. Credit, 2 hours.

514 Administration of the Forensics Program. Examination of the theoretical and practical problems of forensics programs on the college and secondary level. Credit, 3 hours.

591 Seminar. Credit, 3 hours. Topics may be selected from the following:

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|--|---|
| (a) <i>Classical Rhetorical Theory</i> | (f) <i>Group Communication</i> |
| (b) <i>Modern Rhetorical Theory</i> | (g) <i>Speech Education</i> |
| (c) <i>Rhetorical Criticism</i> | (h) <i>Quantitative Studies in Oral Communication</i> |
| (d) <i>Persuasion</i> | (i) <i>Communication Theory</i> |
| (e) <i>Theories of Oral Interpretation</i> | |

SPEECH PATHOLOGY AND AUDIOLOGY

SA 267 Speech Behavior in Early Childhood. The processes of speech and language development in the normal child. Credit, 2 hours.

280 Speech Pathology. Orientation to the disorders of speech and their significance within our society. Prerequisite: PY 112 or approval of instructor. Credit, 3 hours.

324 Voice Production and Phonetics. The scientific basis of vocal behavior in the production of speech sounds, including the application of the International Phonetic Alphabet to American speech. Credit, 3 hours.

395 Methods of Speech Correction. Principles and techniques of modifying speech and language behavior. Two lectures, 4 hours laboratory. Prerequisite: Approval of instructor. Credit, 4 hours.

396 Speech Correction in the Public Schools. The problems of practicing speech therapy within the public school environment. Prerequisite: SA 395 or approval of instructor. Credit, 2 hours.

420 Survey of Speech and Hearing Problems. The role of the teacher and parent in understanding and aiding speech and hearing development in normal and speech-defective children, with emphasis upon the recognition and prevention of disorders. May not be counted toward the major in speech pathology and audiology. Credit, 3 hours.

423 Clinical Practice in Speech and Hearing. Case treatment of speech disorders in the University Clinic. Prerequisite: SA 395 or approval of instructor. May be repeated for credit. Credit, 2-3 hours.

425 Audiology. The normal process of hearing and the nature, causes, and rehabilitation of hearing disabilities. Credit, 3 hours.

426 Audiometry. Theory and practice of testing hearing acuity, and of evaluating and interpreting test results. Credit, 3 hours.

427 Clinical Practice in Audiology and Audiometry. Practical experience in testing and rehabilitating the hearing handicapped. Prerequisite: SA 425 or approval of the instructor. May be repeated for credit. Credit, 2-3 hours.

428 Principles of Speech Diagnosis. Methods of clinical diagnosis of speech disorders. One lecture, 3 hours laboratory. Prerequisite: Approval of instructor. Credit, 2 hours.

430 Anatomy and Physiology of Speech and Hearing. Anatomy and physiology of the neural, muscular and skeletal systems which subserve human speech behavior. Credit, 4 hours.

431 Stuttering. Causes, therapies, and current research trends. Prerequisite: SA 421 or approval of instructor. Credit, 3 hours.

432 Lip Reading and Auditory Training. Therapies and theories of lip reading and auditory training. Prerequisite: SA 425 or approval of instructor. Credit, 3 hours.

481 Domestic and Industrial Hearing Conservation. Factors related to the identification and elimination of causes of noise-induced hearing loss within the community. Credit, 3 hours.

482 Experimental Audiology. Investigation of the approaches to and bases of experimental audiology. Prerequisite: SA 426 or approval of instructor. Credit, 3 hours.

483 Principles and Procedures in Pediatric Audiology. The problems and procedures in evaluating hearing performance in children from birth to seven years of age. Prerequisite: SA 426 or approval of instructor. Credit, 2 hours.

485 Instrumentation in Speech Science. Introduction to, and use of, instrumentation in speech science and speech therapy. Credit, 3 hours.

486 Principles of Programming in Speech Therapy. Basic principles in writing instructional programs designed to modify vocal behavior of children and adults. Credit, 3 hours.

527 Advanced Clinical Practicum in Audiometry. Practical experience in audiometric diagnosis of hearing pathologies and supervision of students enrolled in SA 427. Prerequisite: SA 426 or approval of instructor. Credit, 3 hours.

570 Language Development of Mentally Retarded Children. An investigation of factors responsible for language development as well as the utilization of special techniques to stimulate growth in this area. Credit, 3 hours.

576 Neurological Disorders of Speech. Aphasia and cerebral palsy as they affect speech and language behavior. Prerequisite: SA 395 or approval of instructor. Credit, 3 hours.

577 Oral-Laryngeal Disorder of Speech. Study of speech disorders related to cleft palate and laryngeal pathologies. Prerequisite: SA 425 or approval of instructor. Credit, 3 hours.

591 Seminar. Credit, 3 hours. Topics may be selected from the following:

(a) *Oral-Laryngeal Speech Disorders*
(b) *Stuttering Behavior and Therapy*

(c) *Administration of Public School Speech Therapy Programs*
(d) *Neurological Disorders of Speech*

TECHNOLOGY

PROFESSORS:

BURDETTE (ITC 201), BARTEL, BROWN, KIGIN, LITRELL, THOMASON

ASSOCIATE PROFESSOR:

PRUST

ASSISTANT PROFESSORS:

ADAMS, BOARD, BURK, CAVALLIERE, EDWARDS, HIGBEE,
KAUFMAN, KEITH, PARDINI, RIGGINS

INSTRUCTOR:

BAGLEY

LECTURERS:

ANDERSON, DIKE, MINTER, REED, ROPER, RUITER, SCHOEN, SPERSTAD

Bachelor of Science Degree (Technical Fields of Specialization)

The Division of Technology offers fields of specialization in aeronautical technology, electronic technology, graphic arts technology, industrial technology (communications, design, and manufacturing), and technical education technology.

Bachelor of Arts in Education Degree Curriculum (Fields of Specialization)

Students majoring in Industrial Arts Education may specialize in one of the following areas: transportation and power, drafting, electronics, graphic arts, metals, woods, and general industrial arts.

AERONAUTICAL TECHNOLOGY

(Flight instruction costs are not included in University tuition.)

TA 180 Aircraft and Aerospace Structures. Design considerations, construction, manufacturing techniques and processes. Two lectures, 4 hours laboratory. Credit, 3 hours.

181 Aircraft and Aerospace Systems. Modern aircraft and space systems, hydraulics, electrical equipment, control systems, weight and balance, and inspection methods. Prerequisite: TA 180. Two lectures, 4 hours laboratory. Credit, 3 hours.

182 Air Navigation. Flight principles, charts and navigation problems, radio procedures, and pertinent Federal air regulations. Credit, 3 hours.

183 Glider Pilot Rating. Prepares the student for an FAA Glider Pilot Rating. Satisfactory completion of FAA tests required. Prerequisite or corequisite: TA 182. Credit, 2 hours.

185 Private Pilot Certificate. Flight school primary. Flight training to meet FAA requirements. Satisfactory completion of FAA tests required for certification. Prerequisite or corequisite: TA 182. Credit arranged; limit, 3 hours.

287 Aircraft and Aerospace Powerplants. Theory of internal combustion engines, components, power curves, thrust, inspection, and processes. Two lectures, 4 hours laboratory. Credit, 3 hours.

288 Aircraft and Aerospace Powerplant Systems. Theory and design, operation, inspection, engine installation, analysis of engine systems, and accessories. Prerequisite: TA 287. Two lectures, 4 hours laboratory. Credit, 3 hours.

300 Aircraft Design. Consideration, theory, and concepts; stressed skin aircraft, missile and aerospace vehicles, VTOL/STOL, correlation of design requirements with manufacturing practice. Prerequisites: TA 181, 288, PH 111, ME 380. Credit, 3 hours.

301 Applied Aerodynamics. Properties of air, airfoil theory, Reynold's number, performance analysis, stability and control, wind tunnel testing, and wind tunnel model development. Prerequisite: TA 300. Two lectures, 3 hours laboratory. Credit, 3 hours.

302 Meteorology. Atmospheric phenomena, nephology, low and high altitude weather, weather interpretation, analysis, evaluation, and safety considerations. Credit, 3 hours.

303 Federal Air Regulations. System definition, implementation, enforcement methods, and definition of terms. Aircraft and airmen certification requirements, flight safety, aircraft operation and maintenance. Credit, 2 hours.

305 Weight and Balance. Procedure related to aerodynamic stability of aircraft. Weighing and loading techniques, use of weighing devices, load adjusters, and computations. Credit, 1 hour.

306 Aerospace Electrical and Electronic Systems. Theory, design, reliability requirements, manufacturing process, applications of complex, electrical and electronics systems and instrumentation used in aircraft and aerospace vehicles. Prerequisites: TA 181, 288, TE 100, PH 112. Credit, 2 hours.

307 Aerospace Systems Design. Current and future aircraft and missile systems, specifications, numbering systems, control mechanisms, cost analysis and performance evaluations. Prerequisite: TA 300. Credit, 3 hours.

308 Combustion Analysis. Principles of combustion systems, components, chemical and physical performance analysis of fuels and lubricants using standard ASTM Testing Methods. Prerequisites: TA 288, ME 380. Credit, 2 hours.

309 Aviation Communications. Radio communication and navigation equipment operation. Techniques, procedures, and regulatory aspects. Credit, 2 hours.

310 Instrument Systems. Principles of aircraft instrument design and operation. Airborne and ground environment equipment control of aerospace vehicles. Prerequisite: TA 300. Credit, 2 hours.

311 Air Traffic Control. History and development of procedures involved in control of airborne traffic during VFR and IFR conditions. Governing regulations and safety requirements. Credit, 2 hours.

312 Enroute Traffic Control I. Basic techniques of manual and radar enroute traffic control, including simulated control of air traffic. Credit, 2 hours.

313 Terminal Area Control, IFR I. Basic techniques of manual and radar control of terminal area traffic under instrument flight rules. Simulated control of air traffic. Credit, 2 hours.

314 Enroute Traffic Control II. Simulator and controlled laboratory practice in enroute traffic control, leading to an advanced level of proficiency. Credit, 2 hours.

315 Terminal Area Control, IFR II. Simulator and controlled laboratory practice in control of terminal area traffic under instrument flight conditions, leading to an advanced level of proficiency. Credit, 2 hours.

316 Terminal Area Control, VFR. Aircraft visual identification, controller phraseology, and procedure for control of visual traffic in the terminal area. Credit, 1 hour.

382 Advanced Air Navigation. Advanced navigation methods and underlying principles, including radio navigation, celestial navigation, grid navigation, pressure pattern navigation, and operational concepts of navigation systems and equipment. Prerequisite: TA 182. Credit, 2 hours.

383 Instrument Rating. Prepares the commercial pilot for an FAA Instrument Rating. Satisfactory completion of FAA tests is required. Prerequisites: TA 382, 385, or approval of instructor. Credit, 2 hours.

384 Airport Planning. Community airway and traffic control, airport types, design requirements, planning and construction; lighting, building and hangar design. Credit, 2 hours.

385 Commercial Pilot Certificate. Flight training to meet FAA requirements. Satis-

factory completion of FAA tests required for certification. Prerequisite: TA 185, or approval of instructor. Credit, 2 - 8 hours.

386 Flight Instructor Rating. Prepares the commercial pilot for an FAA Flight Instructor Certificate. Satisfactory completion of FAA tests is required. Prerequisites: TA 382, 385, or approval of instructor. Credit, 2 hours.

387 Multi-Engine Rating. Prepares the commercial pilot for an FAA Multi-Engine Rating. Satisfactory completion of FAA tests is required. Prerequisites: TA 382, 385, or approval of instructor. Credit, 1 hour.

388 Propulsion. Principles, thrust, performance, combustion systems, metallurgy, gas turbines, ram jets, rockets, and combustor design considerations. Prerequisite: TA 308. Two lectures, 3 hours laboratory. Credit, 3 hours.

390 Aerospace Systems Analysis. Theory, research and development methods, parameters, analysis of product flow, planning control, methods, total system concept and evaluation. Prerequisite: TA 388. Credit, 3 hours.

391 Airport Operation. Operational functions; commercial airlines, general aviation operations, terminal building utilization, support facilities, community relationships and airport financing. Prerequisite: TA 384. Credit, 2 hours.

487 Aircraft and Aerospace Design Data. Analysis of design data for aircraft and aerospace vehicles; value analysis, production requirements and manufacturing techniques. Prerequisites: TA 300, 388. Credit, 3 hours.

488 Airline and Flight Operations Management. Administrative problems and airport management; unit organizations, personnel problems, interline agreements, fixed base operations, governmental regulations, promotions and publicity. Credit, 3 hours.

490 Aerospace System Analysis. Research and development methods, feasibility, costs and needs of present and future space systems; cost reduction, value analysis and methodology. Prerequisites: TA 300, 390. Credit, 3 hours.

491 Aviation Safety. Critical analysis of aircraft accidents, accident prevention, development and evaluation of aviation safety programs. Credit, 2 hours.

492 Aircraft Accident Investigation. Development and analysis of data, evaluation, and recommendations for preventative practices. Prerequisite: TA 491. Credit, 3 hours.

493 Airline Administration. Administrative organizations, and economics of airline administration; operational structure, cost analysis, relationship with Federal governmental agencies. Prerequisite: TA 488. Credit, 2 hours.

ELECTRONIC TECHNOLOGY

TE 100 Electricity/Electronics. Electrical units, components, reactances, impedances, transformers, resonance, rotating equipment, power systems, vacuum tubes, and semiconductors. Two lectures, 6 hours laboratory. Credit, 4 hours.

101 Introductory Analysis. Circuit elements, simple and complex circuits. Kirchoff's laws, Thevenin's theorem and vector analysis. Prerequisites: TE 100, MA 141. Credit, 3 hours.

200 Circuits I. Theory and applications of circuit components. A study of resistors, capacitors and inductors in various circuit configurations. Prerequisite: TE 101. Two lectures, 3 hours laboratory. Credit, 3 hours.

213 Active Devices. Semiconductor devices including diodes and triodes. Principles of vacuum tubes including diodes, triodes and other multi-element tubes. Prerequisites: TE 100, MA 141. Two hours lecture, 3 hours laboratory. Credit, 3 hours.

220 Radio Communications. Rules, regulations, and commercial procedures. International Morse Code. Prerequisite: TE 100. One lecture, 3 hours laboratory. Credit, 2 hours.

300 Circuits II. Continuation of TE 200 with emphasis on theory and applications of RCL circuits when operating on alternating current. Prerequisite: TE 200. Two lectures, 3 hours laboratory. Credit, 3 hours.

301 Electrical Machinery. Study of d.c. and a.c. motors and generators; servos, synchros, stepping motors, and printed circuit motors. Prerequisite: TE 213. Two lectures, 3 hours laboratory. Credit, 3 hours.

315 Electro-Mechanical Processes. Breadboarding techniques as a preliminary to construction. Modern circuit layout and construction. Prerequisite: TE 330. One lecture, 6 hours laboratory. Credit, 3 hours.

320 Audio Systems. Industrial sound and noise problems, frequency response, decibels and volume units, attenuators, amplifiers and recording systems. Prerequisite: TE 213. One lecture, 3 hours laboratory. Credit, 2 hours.

328 Avionics. Theory and functions of aerospace electronic systems. Prerequisite: TE 100 or IT 220. Credit, 3 hours.

330 Solid State Electronics. Semiconductor devices: diodes, triodes, tetrodes, special devices, and characteristics. Prerequisite: TE 213. Two lectures, 3 hours laboratory. Credit, 3 hours.

331 Switching and Waveshaping Circuits I. Electronic circuits in which active devices operate in switching modes. Circuits include: clippers, clampers, multivibrators and logic. Prerequisite: TE 330. Two lectures, 3 hours laboratory. Credit, 3 hours.

340 Electronic Measurements. Application of electronic test instruments. New methods in measurement, using digital and programmed devices. Prerequisite: TE 330. Two lectures, 3 hours laboratory. Credit, 3 hours.

400, 401 Circuit Analysis. Network theorems, analysis, LaPlace transformations, and Fourier analysis. Complex network theorems and analysis. Prerequisites: TE 300, 330 and MA 142 or 120. Credit, 3 hours each semester.

412 Microwaves. Spectrum, waves, antenna theory and types, transmission lines, measurement techniques and industrial uses of microwave devices. Prerequisites: TE 300, 330 and MA 142 or 120. Credit, 3 hours.

415 Video Systems. Synchronizing circuits, video amplifiers and picture tubes in systems applications. Prerequisites: TE 300, 330 and MA 142 or 120. Two lectures, 3 hours laboratory. Credit, 3 hours.

418 Communication Circuits. Amplitude modulation, frequency modulation, television and single-sideband transmitter circuits. Prerequisites: TE 300, 330 and MA 142 or 120. Two lectures, laboratory arranged. Credit, 2 or 3 hours.

419 Communication Systems. Continuation of TE 418 emphasizing antennas and space communications. Prerequisite: TE 418. Two lectures, laboratory arranged. Credit, 2 or 3 hours.

430, 431 Computer Systems. Principles of logic circuits; binary arithmetic, counter circuits and memory circuits used in computer systems. Prerequisite: TE 331. Two lectures, 3 hours laboratory. Credit, 2 or 3 hours each semester.

440 Electronics for Instrumentation. Electronics in instrumental devices, systems control, and numerical control. Prerequisites: TE 213, 301. Two lectures, 3 hours laboratory. Credit, 3 hours.

441 Control Systems Analysis. Design and application of instrumental control for processes or systems of related processes; control of resistive loads, magnetic amplifiers, saturable reactors, amplidyne, logic control systems, frequency responses of components, feedback controllers and their responses. Prerequisite: TE 440. Two lectures, 3 hours laboratory. Credit, 3 hours.

470 Electronics for Modern Man. Fundamentals of electricity and electronics. Active devices, semiconductors and vacuum tube principles. Applications of electronics to the sciences, communications and general education areas. For the non-electronic major. Two lectures, 3 hours laboratory. Credit, 3 hours.

471 Electronics for Modern Man. Continuation of TE 470. Electronic circuitry in instrumentation, telemetry and control circuits. Prerequisite: TE 470. Two lectures, 3 hours laboratory. Credit, 3 hours.

477 Television Systems. Equipment operation and care; components and systems including transducers; use of meters; camera chain from random interlaced industrial to EIA synchronized vidicon and image orthicon cameras; synchronization generators; video and audio recorders; film chains and multiplexers; signal distribution. Prerequisite: TE 471 or 213. Two lectures, 3 hours laboratory. Credit, 3 hours.

478 Camera Care and Capabilities. Use and care of television cameras; types, lenses, controls, synchronization and interconnections. Prerequisite: TE 477. Two lectures, 3 hours laboratory. Credit, 3 hours.

GRAPHIC ARTS TECHNOLOGY

GA 135 General Graphic Arts. Type composition, presswork, book binding, screen processes, duplicating. One lecture, 5 hours laboratory. Credit, 3 hours.

136 Graphic Arts Processes. Layout and design, photo-offset lithography, photo screen processes, production techniques. One lecture, 5 hours laboratory. Credit, 3 hours.

236 Graphic Design and Layout. Principles of layout, design, and printing in relation to their commercial application. Preparation of roughs, working layouts and comprehensives. Credit, 3 hours.

237 Typography. Typographic planning, typesetting and letterpress activity. Prerequisites: GA 135, 136. One lecture, 5 hours laboratory. Credit, 3 hours.

238 Copy Preparation. Planning, visualizing and designing copy for photographic reproduction. Cold and hot type techniques. One lecture, 5 hours laboratory. Credit, 3 hours.

333 Offset Lithography (Presswork). Planography and operation of the offset press. Etches, gums, solvents. One lecture, 5 hours laboratory. Credit, 3 hours.

334 Offset Lithography (Camerawork). Materials, methods and equipment used in the production of photographic negatives and positives for offset lithography; line and halftones. One lecture, 5 hours laboratory. Credit, 3 hours.

336 Offset Lithography. Methods of producing separation negatives. Prerequisite: GA 334. One lecture, 5 hours laboratory, Credit, 3 hours.

337 Production Management. A study of various systems used in the graphic arts industry for planning and controlling work flow. Credit, 3 hours.

339 Estimating and Cost Analysis. Estimating printing operations and materials; elements of cost finding using Franklin and PIA Systems. Credit, 3 hours.

435 Plant Management. Independent documentary research; problems in equipment and personnel selection, plant site selection and layout, and recent developments in production management. Credit, 3 hours.

436 Technical and Research Problems. Individual activities involving investigation, and experimentation in any technical area in the field of graphic arts. One lecture, 5 hours laboratory. Credit, 3 hours.

438 Graphic Arts Techniques and Processes. Graphic arts production. Complex technology of paper, ink, and related materials with reference to printing processes. Two lectures, 4 hours laboratory. Credit, 3 hours.

INDUSTRIAL TECHNOLOGY — DESIGN

TD 100 Design Technology. Design process, professions, methods, and systems. The design technologist's education and role in society. Credit, 2 hours.

111 Technical Graphics. Graphical communication in technology. Orthographic and axonometric projection. Technical sketching, blueprint reading, dimensioning practices. Elements of descriptive geometry. Two lectures, 3 hours laboratory. Credit, 3 hours.

112 Descriptive Geometry. Double curved and warped surfaces; intersection and development of complex surfaces. Vector and industrial applications. One lecture, 3 hours laboratory. Credit, 2 hours.

121 Technical Analysis and Design. Graphic and electronic methods of computation; slide rule. Technical problem analysis and design with application to all fields of technology. Two lectures, 3 hours laboratory. Credit, 3 hours.

160 Technical Illustration. Basic techniques; applications of industrial methods. Prerequisite: TD 111 or equivalent. One lecture, 3 hours laboratory. Credit, 2 hours.

200, 201 Technical Drawing. Application emphasized in all fields of industrial drafting. Working drawings, layouts, detailing; application of commercial and industrial standards. Two lectures, 3 hours laboratory. Prerequisite: TD 112. Credit, 3 hours each semester.

220, 221 Communication. Composition, speech, and technical reading. Credit, 3 hours each semester.

260, 261 Industrial Design. Industrial design projects and design techniques employing professional presentation media. Prerequisite: TD 160. Two lectures, 6 hours laboratory. Credit, 4 hours each semester.

262 Machine Tool Operation. Engine lathe mechanical features and operations; single point tool design, cutting fluids, measurement, cutting speeds and feeds. Prerequisite: MT 161. Two lectures, 3 hours laboratory. Credit, 3 hours.

264 Arc Welding Procedures. Design and procedures; electrode selection and costs, power units and equipment. Destructive testing. Prerequisite: MT 164. Two lectures, 4 hours laboratory. Credit, 3 hours.

266 Tungsten Inert Gas Welding (Heli-arc). Welding aluminum, magnesium, chrome molybdenum and stainless steels; aerospace program applications; power supplies and equipment; operating costs. Prerequisite: MT 164 or 166. Two lectures, 3 hours laboratory. Credit, 3 hours.

301, 302 Industrial Design. Advanced presentation rendering techniques applied to creative product development. Design project oriented. Prerequisite: TD 261. Two lectures, 6 hours laboratory. Credit, 4 hours each semester.

303 Graphical Simulation. Applications of numerical control in graphics. Computer-aided design drawing preparation. Prerequisites: TD 112, EE 226. Two lectures, 3 hours laboratory. Credit, 3 hours.

305 Precision Design. Layout and dimensioning for production. Use of catalogs, standards, specifications, including military. Prerequisites: TD 200; ME 230, or equivalent. One lecture, 3 hours laboratory. Credit, 2 hours.

308 Nomography. Graphical methods of representing relationships between variables; chart construction and publication emphasized. Credit, 2 hours.

310 Applied Mechanics. Statics; vectors, force systems, friction, equilibrium, centroids and moments of inertia. Prerequisites: MA 120, PH 111. Credit, 3 hours.

315 Applied Mechanics. Strength of materials emphasis. Prerequisite: TD 310. Credit, 3 hours.

330, 331 Electro-Mechanical Design. Block schematic diagrams, components, and assemblies, printed circuits, and electronic equipment packaging. Prerequisites: TD 201, TE 100 or equivalent. Two lectures, 3 hours laboratory. Credit, 3 hours each semester.

340 Fluids. Static and dynamic properties of fluids. Flow measurement and fluid control design. Prerequisite: PH 111, MA 120, or equivalent. Credit, 3 hours.

350, 351 Design Laboratory. Research, design, construction; experimental laboratory projects. Prerequisite: Approval of instructor. Three hours laboratory. Credit, 1 hour each semester.

360 Mechanics of Machinery. Masses, motion kinematics, and dynamics of machinery. Prerequisite: TD 310. Credit, 3 hours.

363 Metal Processes. Cutting, stresses, physical and thermal properties of tool and material; cutting fluids and wear rates; single point tools, milling and grinding. Prerequisite: MT 161. One lecture, 3 hours laboratory. Credit, 2 hours.

364 Welding Procedures. Arc welding alloy steels; electrode selection, power units, operating costs, thermal cutting, destructive testing; qualification tests. Prerequisite: MT 164. Two lectures, 4 hours laboratory. Credit, 3 hours.

365 Industrial Sheet Metal. Development problems, machine emphasis, industrial applications, and estimating. One lecture, 5 hours laboratory. Credit, 3 hours.

366 Production and Quality Control. Gaging equipment, physical dimensions, surface roughness, hardness, compression, tension, shear; destructive and non-destructive tests. Two lectures, 3 hours laboratory. Credit, 3 hours.

369 Non-Destructive Testing. Magnetic particle, dye penetrant, eddy current, radiographic, and ultrasonic inspection of ferrous and non-ferrous welds. Two lectures, 3 hours laboratory. Credit, 3 hours.

370 Tool Design. Jigs and fixtures. Prerequisite: TD 200. Two lectures, 3 hours laboratory. Credit, 3 hours.

371 Tool Design. Punches and dies. Prerequisite: TD 200. Two lectures, 3 hours laboratory. Credit, 3 hours.

- 380, 381 Technical Journalism.** Integration of technical illustration, writing, editing and publishing to industrial literature and handbooks preparation, usage, publications. Credit, 3 hours each semester.
- 400 Technical Communication.** Industrial speaking, writing, editing, and publishing; assignments developed from industrial applications. Credit, 3 hours.
- 402 Value Analysis.** Manufacturing cost reduction techniques, cost-function relationship of manufactured components with design considerations. Credit, 3 hours.
- 406 Mechanical Design.** Design of mechanical elements. Prerequisites: TD 305, 315, 360. Three lectures, 3 hours laboratory. Credit, 4 hours.
- 407 Mechanical Design.** Design of mechanical elements. Prerequisite: TD 406. Three lectures, 3 hours laboratory. Credit, 4 hours.
- 410, 411 Biomechanical Design.** Design of mechanical devices for efficient use by human operators. Corequisites: TD 406, 407 or approval of instructor. Credit, 3 hours each semester.
- 450, 451 Design Technique.** Professional application of the creative design process; systems design, including comprehensive proposal generation and design project presentation. Prerequisite: Senior design standing. Two lectures, 3 hours laboratory. Credit, 3 hours each semester.
- 460 Control Designs.** Manual through automatic controls; pressures, temperature flow and level control; control combinations and system analysis for basic pneumatic, hydraulic and electronic circuits. Two lectures, 3 hours laboratory. Credit, 3 hours.
- 461 Machine Tool Operations.** Milling machines and shapers; design cutters, holding devices and typical production operations. Prerequisite: MT 161. One lecture, 5 hours laboratory. Credit, 3 hours.
- 462 Production Processes.** Complex milling, shaping, grinding problems, as they apply to fabrication of industrial products. Prerequisite: MT 461. One lecture, 5 hours laboratory. Credit, 3 hours.
- 463 Manufacturing Analysis.** Economics of tooling operations; productivity of machines; tool maintenance, costs and estimating. Credit, 2 hours.

INDUSTRIAL TECHNOLOGY — MANUFACTURING

- MT 101 Manufacturing Operations and Materials.** A study of current manufacturing operations, including metal casting, welding, high energy rate forming, metal shaping and forming, chemical milling, plastics molding and fabrication. Two lectures, 3 hours laboratory. Credit, 3 hours.
- 161 Metal Processes.** Survey of machines, tool and processes: precision measurement and layout. Two lectures, 3 hours laboratory. Credit, 3 hours.
- 164 Welding Survey.** Oxy-acetylene welding and cutting, arc welding low carbon steel, low temperature brazing. Two lectures, 4 hours laboratory. Credit, 3 hours.
- 166 Aeronautical Welding.** Oxy-acetylene and inert gas welding chrome molybdenum, stainless and aluminum. Low temperature brazing, adhesive bonding. Two lectures, 4 hours laboratory. Credit, 3 hours.
- 464 Automatic Arc and Inert Gas Welding.** Automatic welding processes using submerged arc, multiple arc, electro gas and slag, tig, mig and plasma arc. Production costs of each process. Prerequisite: MT 164 or 166. Two lectures, 4 hours laboratory. Credit, 3 hours.
- 466 Welding High Temperature Alloys.** Welding equipment and processes for welding cobalt, molybdenum, tungsten, columbium, and titanium alloys. Use of electron beam, laser, vacuum and controlled atmosphere equipment. Quality control and inspection. Prerequisites: MT 164; ME 330. Two lectures, 4 hours laboratory. Credit, 3 hours.
- 467 Tooling Operations.** Design, construction and experimentation for quantity production. One lecture, 5 hours laboratory. Credit, 3 hours.
- 468 Production Tooling.** Design, construction and operation of dies for quantity production. Prerequisite: MT 461. One lecture, 5 hours laboratory. Credit, 3 hours.

469 Metallurgy of Welded Metals. Thermal, chemical, physical and metallurgical changes in metals during and after welding. Effects of alloying elements—temperature changes during and after welding. Prerequisites: MT 164; ME 330. Two lectures, 4 hours laboratory. Credit, 3 hours.

470 Welding Research and Technical Problems. Individual problems, research and development in the technical area of welding. Prerequisite: MT 164 or equivalent. One lecture, 5 hours laboratory. Credit, 3 hours.

INDUSTRIAL TECHNICAL EDUCATION

IT 121 Industrial Wood Processes. Wood technology, construction and history. One lecture, 5 hours laboratory. Credit, 3 hours.

160 General Metals. Properties, tools and machines, welding, casting, heat treating. One lecture, 5 hours laboratory. Credit, 3 hours.

170 Transportation and Power. Historical development, sources of power and the design of mechanisms for power conversion; electrical, mechanical and chemical. One lecture, 3 hours laboratory. Credit, 2 hours.

174 Automotive Systems. Components and their functions. Two lectures, 3 hours laboratory. Credit, 3 hours.

204 Industrial Arts Design. Design principles and problems; architectural drafting. Prerequisite: TD 111. One lecture, 3 hours laboratory. Credit, 2 hours.

220 Electricity. Direct-current circuits, magnetics, alternating-current circuits and a-c motors. Two lectures, 3 hours laboratory. Credit, 3 hours.

222 Wood Technology. Power tool operation, testing and strength of materials, laminations, industrial applications. Prerequisite: IT 121. One lecture, 5 hours laboratory. Credit, 3 hours.

270 Fluid Power. Principles and techniques. Demonstration and operation of hydraulic and pneumatic circuits and components, and the basic laws and principles by which they operate. Prerequisite: IT 170. Two lectures, 3 hours laboratory. Credit, 3 hours.

273 Automotive Electrical Equipment. Principles, specifications, and circuitry. Two lectures, 3 hours laboratory. Credit, 3 hours.

323 Equipment Maintenance. School and industrial maintenance organization and operations of laboratory equipment. One lecture, 3 hours laboratory. Credit, 2 hours.

326 Experimentation in Wood. Modern industrial techniques, forming, laminating, adhesion, bend allowances, structural design and testing. Prerequisite: IT 222. Two lectures, 3 hours laboratory. Credit, 3 hours.

327 Finishing Materials and Techniques. Materials origin composition and application for woods and metals. Prerequisite: IT 121. Two lectures, 3 hours laboratory. Credit, 3 hours.

342 Selection of Subject Matter. Selective learning units through analysis technique and industrial technical course development. Credit, 3 hours.

346 American Industries. Classification, origin, development, organization, materials of industry, production systems, occupations. Credit, 2 hours.

361 Materials Laboratory. Design and activities in plastics, leather, lapidary; industrial emphasis. One lecture, 3 hours laboratory. Credit, 2 hours.

371 Automotive Construction Materials. Forming and shaping to measurements, finishing, styling, modern plastics and metals; electroplating, anodizing; effects of heat, wear and corrosion. Two lectures, 4 hours laboratory. Credit, 3 hours.

377 Internal Combustion Engines. Principles, cylinder pressures, flame temperatures, combustion phenomena; machining processes. Prerequisite: IT 174. One lecture, 5 hours laboratory. Credit, 3 hours.

401 Vocational Education in American Schools. Basic principles and philosophies of vocational education. Relationship of vocational education to general education, history, and legislation. Credit, 3 hours.

405 Drafting Procedures. Methods, evaluation, drafting problem sequences, and equipment. Credit, 3 hours.

421 Production Analysis. Product and process design, jigs and fixtures, quality control, assembly, finishing. Prerequisite: IT 222. One lecture, 5 hours laboratory. Credit, 3 hours.

423 Industrial Arts for Elementary Teachers. Tool and material centered activities related to teaching children about technology; classroom problems; integrated instruction; instructional aids. One lecture, 5 hours laboratory. Credit, 3 hours.

424 Techniques of Construction. From prints to completion; FHA standards. Two lectures, 3 hours laboratory. Credit, 3 hours.

427 Industrial Plastics. Fabrication techniques, physical qualities, manufacturing processes, injection molding, vacuum forming, welding, lamination, casting. One lecture, 5 hours laboratory. Credit, 3 hours.

442 Facility Planning and Management. Planning, organizing, and managing industrial technical education laboratories; equipment and supply selection, facility arrangement. Credit, 3 hours.

443 Safety. Industrial accident frequency analysis, causal factors, means of reduction and prevention. Public school accident prevention and liability. Credit, 3 hours.

444 Modern Industries. Aspects of management, labor, plant and product; for interpretation of industry in secondary school industrial education programs. Credit, 3 hours.

445 Industrial Internship. Technical assignment commensurate with student's instructional program. Includes manufacturing processes, technical information, and management experiences. Prerequisite: Approval of department chairman. Credit, 1-10 hours.

446 Instructional Materials. Selection, method, preparation and construction. Credit, 3 hours.

461 Hot Metals Techniques. Properties of metals; non-ferrous casting; chipless machining; metal finishing. Two lectures, 3 hours laboratory. Credit, 3 hours.

465 General Metals. Numerical control, electroplating, metal spinning, study in areas of special interest. Prerequisite: IT 160. One lecture, 5 hours laboratory. Credit, 3 hours.

478 Engine Analysis. Evaluative instrumentation with reference to power, efficiencies and performance; fuels and fuel mixtures. Prerequisites: JT 174, 273 or equivalent. Two lectures, 3 hours laboratory. Credit, 3 hours.

480 Teaching Industrial Subjects. Teaching techniques, philosophy, organization, planning, and evaluation of teaching efficiency. Prerequisite: IT 342. Credit, 3 hours.

502 Industrial Technical Program Development. Improvement and development of programs for secondary and post secondary institutions. Credit, 3 hours.

513 Experimental Activities. Investigation and solution of selected industrial arts activities and projects involving material design and analysis. Credit, 3 hours.

515 Electrical Laboratory Design. Studies of high school laboratories for electricity and electronics, equipment, materials, instructional aids. Credit, 3 hours.

540 Evaluation in Industrial Subjects. Evaluative factors such as attitudes, behavioral factors, skills, technical information; instrument construction; evaluation of program effectiveness. Credit, 3 hours.

542 Philosophy of Industrial Technical Education. Current concepts, anticipated policies, practices and objectives. Credit, 3 hours.

544 History of Industrial Technical Education. Factors motivating evolution of modern programs; implication for future; trends. Credit, 3 hours.

546 Technical Education. Trends, community surveys, need, curricula, instruction, evaluation of technical programs, financing, emphasis on thirteenth and fourteenth years. Credit, 3 hours.

548 Administration of Industrial Technical Education. Improving instruction, fund and material control, student personnel problems, curricular patterns. Credit, 3 hours.

549 Current Literature and Research. Analysis of literature, individual investigations, development of instruments. Credit, 3 hours.

ZOOLOGY

PROFESSORS:

GERKING (LSC 171), BENDER, BERTKE, CASTLE, CAZIER, COLE,
HANSON, LANDERS, STAHNKE, WOOLF

ASSOCIATE PROFESSORS:

CLOTHIER, FOUQUETTE, HASBROUCK, MINCKLEY, PATTERSON,
PIKE, RASMUSSEN

ASSISTANT PROFESSORS:

HADLEY, JUSTUS

VISITING PROFESSOR:

MATSON

LECTURERS:

GREEN, SUN

RESEARCH ASSOCIATE:

BURCH

DEPARTMENTAL MAJOR REQUIREMENTS

The department offers course work in the environmental, systematic, physiological, genetic, morphological, developmental, and behavioral areas of zoology. Organisms are studied at the molecular, cellular, individual and population levels of organization. Majors are expected to attain a basic knowledge in each of these areas and levels.

Bachelor of Science Degree Curriculum

ZOOLOGY, ENTOMOLOGY — Consists of a minimum of 28-30 semester hours of credit. Required courses are ZO 100, 250 or ET 300, ZO 270 or 330, 360 or 460-461, 425 or 428, 430; BI 340, 445. The following supplementary courses amounting to an equivalent of 44-46 semester hours of credit are required; one year of a foreign language; BO 100; CH 113, 115, 331, 332, 335, 336; EE 226; MA 141, 142 or 121; PH 111-112.

WILDLIFE BIOLOGY — Consists of a minimum of 45 semester hours of credit, of which 18 must be in upper division courses. Required courses are BO 100, 270; ZO 100, 250, 270, 411, 412, 425, 427, 471, 472, 473; BI 415 or MA 226 or equivalent, BI 426; CH 113; PH 101; MA 141; AG 232, 338; CE 241; one year of a foreign language.

DEPARTMENTAL GRADUATE PROGRAMS

The Department of Zoology offers programs leading to the degrees of Master of Science and Doctor of Philosophy. Consult the *Graduate Catalog* for requirements.

BIOLOGY

BI 100 The Living World. Major biological principles as illustrated by the areas of behavior, biogeography, ecology, evolution, morphology, physiology, reproduction and development, and taxonomy. Does not meet science requirement in pre-professional curriculum. Not open to majors in the Biological Sciences. Three lectures, 2 hours laboratory. Credit, 4 hours.

218 History of Medicine. From Babylonian times through present medicine. For pre-medical and pre-dental students. Credit, 1 hour.

310 Special Techniques in Biology. Approval of instructor and chairman of department required. May be repeated for credit. Credit, 1-3 hours.

318 The History of Biology. Development of biological concepts from about 2000 B.C. through the present day. Prerequisite: 12 hours of biological sciences. Credit, 2 hours.

330 Ecology and Conservation. Ecological and biological concepts of conservation; the use of basic and applied ecology to understand man-made ecological problems and the purpose for conservation. Three lectures and two field trips. Credit, 3 hours.

340 General Genetics. Science of heredity and variation. Prerequisite: BI 100 or BO 100 or ZO 100 or equivalent. Three lectures. Credit, 3 hours.

412 Biological Electron Microscopy. Methods of preparation of biological materials for electron microscopic examination. Basic theory and use of the electron microscope. Two lectures, 3 hours laboratory. Credit, 3 hours.

415 Biometry. Statistical methods applied to biological problems, including design of experiments, estimation, tests of significance, analysis of variance, regression, correlation, chi square, and bioassay. Prerequisite: MA 141 or equivalent. Two lectures, 6 hours laboratory. Credit, 4 hours.

420 Immunology. Principles of immunity and their application to diagnosis, systematics and allergies. Prerequisites: MI 202; CH 231 or equivalent. Two lectures, 6 hours laboratory. Credit, 4 hours.

426 Limnology. Dynamics of inland waters, stressing the interrelations of climatic, geological, topographical, physical, and chemical factors with special reference to aquatic life. Prerequisites: BO 100; CH 113; ZO 250. Two lectures, 3 hours laboratory. Credit, 3 hours.

429 Advanced Limnology. Study of recent literature, developments, methods and limnological theory; field and laboratory application to some particular topic in limnology. Prerequisite: BI 426. Credit, 3 hours.

441 Cytogenetics. Chromosomal basis of inheritance. Prerequisite: BI 340. Three lectures. Credit, 3 hours.

442 Cytogenetics Laboratory. Microscopic analysis of meiosis, mitosis, and aberrant cell division. Prerequisite or concurrently: BI 441 and graduate status. Four hours laboratory. Credit, 2 hours.

443 Physiological Genetics. Nature and function of the gene. Prerequisites: BI 340; organic chemistry. Three lectures. Credit, 3 hours.

445 Organic Evolution. Principles and processes of evolution. Prerequisites: Twelve hours of biological sciences, including BI 340 and a course in systematics. Three lectures. Credit, 3 hours.

480 Methods of Teaching Biology. Methods of instruction, experimentation, organization, and presentation of appropriate content in biology. Prerequisites: SE 311 or concurrently and 20 hours in the biological sciences. Two lectures, 2 hours laboratory. Credit, 3 hours.

518 Immunochemistry. Chemistry of antigens and antibodies; the chemical basis of immunity and resistance to disease. Prerequisites: BI 420; CH 464. Two lectures, 6 hours laboratory. Credit, 4 hours.

520 Biology of the Desert. Factors affecting plant and animal life in the desert regions and adaptations of the organisms to these factors. Field trips will be taken to various desert areas. Prerequisite: Ten hours of biological sciences and/or approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.

567 Radiation Biology. Effects of ionizing radiations upon living cells and organisms; techniques of isotopic tracers in biology. Prerequisites: CH 225 and approval of instructor. Two lectures, 6 hours laboratory. Credit, 4 hours.

ENTOMOLOGY

ET 300 General Entomology. Form, activities, and classification of insects. Prerequisite: ZO 100 or equivalent. Three lectures, 3 hours laboratory. Credit, 4 hours.

400 Aquatic Insects. Systematics and ecology of aquatic insects. Prerequisite: ZO 250 or ET 300. Credit, 3 hours.

411 Applied Entomology. Recognition, economic importance, life history and habits of harmful and beneficial insects. Properties, mode of action and recommended uses of commercially important insecticides will be considered. Prerequisite: ET 300 or approval of instructor. Two lectures, 4 hours laboratory or field trips. Credit, 4 hours.

424 Medical Entomology. Identification, ecology, life histories, and host-parasite relationships of insects of medical and veterinary importance. Prerequisite: ET 300 or approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.

425 Insect Bionomics. Study and collection of insects in their natural habitats, with emphasis on ecology, life histories, and field recognition. Prerequisites: BO 100; ET 300 or approval of instructor. One lecture, 6 hours laboratory. Credit, 3 hours.

430 Insect Morphology. Morphology of typical insects including both external and internal structure. Prerequisite: ET 300. Two lectures, 6 hours laboratory. Credit, 4 hours.

450 Systematic Entomology. Classification of insects; taxonomic categories and procedures; bibliographical methods; nomenclature, museum practices. Prerequisite: ET 300. Two lectures, 6 hours laboratory. Credit, 4 hours.

460 Insect Physiology. Life processes of insects. Prerequisites: ET 300 and organic chemistry. Two lectures, 4 hours laboratory. Credit, 4 hours.

502 Entomology for Teachers. Methods of collection, recognition and preparation of insects for classroom use. Care and handling of living as well as pinned specimens. Emphasis placed on Arizona insects and their biology. Prerequisite: Ten hours in biology and/or approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.

550 Insect Identification. Detailed consideration of classification and literature of a selected order of insects with practice in identification of adult and immature forms. Prerequisites: ET 300, 450. Nine hours laboratory. Credit, 3 hours.

ZOOLOGY

ZO 100 General Zoology. Fundamental principles of zoology. Three lectures, 3 hours laboratory. Credit, 4 hours.

201 Human Anatomy-Physiology. Consideration of the structure and dynamics of the human mechanism. Three lectures, 3 hours laboratory. Credit, 4 hours.

202 Human Anatomy-Physiology. Prerequisite: ZO 201 or approval of instructor. Three lectures, 3 hours laboratory. Credit, 4 hours.

250 Invertebrate Zoology. Characteristics, life cycles, habits, economic importance, and evolution of the major groups of invertebrate animals. Prerequisite: ZO 100 or approval of instructor. Two lectures, 4 hours laboratory. Credit, 4 hours.

270 Vertebrate Zoology. Characteristics, classification, evolution, and natural history of the major groups of vertebrate animals. Prerequisite: ZO 100 (250 recommended). Two lectures, 4 hours laboratory. Credit, 4 hours.

300 Biogenetics of Man. Concepts of ecology, heredity, and evolution and their importance and influence in human affairs. Not offered for credit to majors in the biological sciences. Four lectures. Credit, 4 hours.

310 Problems in Zoology. Approval of instructor and chairman of department required. May be repeated for credit. Credit, 1-3 hours.

311 Animal Microtechnique. Zoological microtechnique, including the preparation for

microscopic examination of animal structures, tissues, cells and whole mounts. Prerequisite: ZO 100. Six hours laboratory. Credit, 3 hours.

330 Chordate Anatomy. Structure, development, and homology of the chordata. Prerequisites: ZO 100 (270 recommended). Two lectures, 6 hours laboratory. Credit, 4 hours.

341 Human Genetics. Human heredity and variation with emphasis on population and medical genetics. Prerequisites: BI 100 or BO 100 or ZO 100 and MA 141 or equivalent. Credit, 3 hours.

360 Basic Physiology. Basic physiological mechanisms of the higher vertebrates. Prerequisites: ZO 100, 270; CH 231 or equivalent. Two lectures, 3 hours laboratory. Credit, 3 hours.

400 Poisonous Animals of Arizona. Form, activities, and identification of venomous animals of Arizona and others thought venomous. Prerequisite: ZO 100 or equivalent and approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.

411 Wildlife Management. Principles and theory of wildlife management. Prerequisites: ZO 471, 472 or approval of instructor. Three lectures, 3 hours laboratory or field trip. Credit, 4 hours.

412 Wildlife Management. Emphasis on practices and techniques of wildlife management. Prerequisite: ZO 411. Two lectures, 6 hours laboratory or field trip. Credit, 4 hours.

413 Fishery Biology. Basic ecology of North American fishes, with special reference to commercial and game species and their life histories. Prerequisite: ZO 473 or approval of instructor. Two lectures, 6 hours laboratory or field trip. Weekend field trips required. Credit, 4 hours.

420 Field Zoology. Field techniques and experience in collection and preparation of zoological specimens. Taught only in summer session; one week of preparation and four weeks in the field. Prerequisites: Minimum of 20 hours in biological sciences and approval of instructor. Credit, 6 hours.

424 Parasitology. Morphology, physiology, and life histories of animal parasites; therapeutics, control, and host-parasite relationships. Prerequisite: ZO 250 or approval of instructor. Three lectures, 3 hours laboratory. Credit, 4 hours.

425 Animal Ecology. Interrelations of animals and their environments. Prerequisites: BO 100; ZO 270. Three lectures. Credit, 3 hours.

427 Animal Ecology Laboratory. One discussion period per week, 30 hours field and laboratory work per semester scheduled on Saturdays and weekends. Prerequisite: ZO 425 or concurrent enrollment. Credit, 1 hour.

428 Biogeography. Patterns and significance of world plant and animal distributions of the past and present. Three lectures. Credit, 3 hours.

430 Embryology. Animal development with emphasis on the vertebrates. Prerequisites: ZO 100, 330 or approval of instructor. Two lectures, 4 hours laboratory. Credit, 4 hours.

432 Animal Cytology. Structure and function of the cell, based upon ultrastructural organization. Prerequisite: ZO 100. Two lectures, 4 hours laboratory. Credit, 4 hours.

433 Animal Histology. Microscopic study of animal tissues and their identification. Prerequisite: ZO 330 or approval of instructor. Two lectures, 4 hours laboratory. Credit, 4 hours.

446 Immunogenetics. Current concepts of the genetics of hereditary antigens in blood. Prerequisites: BI 340 or ZO 341 and approval of instructor. Credit, 2 hours.

450 Advanced Invertebrate Zoology. Prerequisites: ZO 250 or equivalent and approval of instructor. Two lectures, 6 hours laboratory. Several weekend field trips. Credit, 4 hours.

453 Protozoology. Systematics and biology of protozoa. Prerequisite: ZO 250. Two lectures, 3 hours laboratory. Credit, 3 hours.

460 Experimental Physiology. Physiological phenomena of osmoregulation, thermoregulation, respiration, nutrition, excretion and intermediary metabolism. Prerequisites: Twelve hours of zoology; organic chemistry. Two lectures, 3 hours laboratory. Credit, 3 hours.

461 General and Comparative Physiology. Physiological phenomena of circulation, bioelectricity, motor, sensory, and integrative functions. Prerequisites: Twelve hours of zoology; organic chemistry. Two lectures, 3 hours laboratory. Credit, 3 hours.

465 Environmental Physiology. Physiological responses and adaptations of animals to various aspects of the physical environment. Prerequisites: ZO 360, 425, 427. Three lectures. Credit, 3 hours.

466 Environmental Physiology Laboratory. Individually directed research applying instrumentation and techniques used in the study of environmental adaptation. Prerequisites: ZO 465 or concurrent enrollment and approval of instructor. Credit, 1-2 hours.

467 Venomology. Harmful noxious secretions and the systematics and biology of the animals that produce them. Prerequisite: ZO 100 or approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.

471 Ornithology. Natural history and field study of birds with emphasis on Arizona species. Prerequisite: ZO 270 or approval of instructor. Two lectures, 3 hours laboratory. One weekend field trip. Credit, 3 hours.

472 Mammalogy. Classification, structure, habits, ecology, and distribution of mammals, with emphasis on North American forms. Prerequisite: ZO 2.0 or approval of instructor. Two lectures, 3 hours laboratory or field trip. One weekend field trip. Credit, 3 hours.

473 Ichthyology. Systematics and biology of recent and extinct fishes. Prerequisites: ZO 270, 425 or approval of instructor. Two lectures, 3 hours laboratory or field trip. Weekend field trip required. Credit, 3 hours.

474 Herpetology. Systematics and biology of recent and extinct reptiles and amphibians. Prerequisite: ZO 270 or 330. Two lectures, 3 hours laboratory or field trip. Credit, 3 hours.

475 Natural History of the Higher Vertebrates. Natural history of birds and mammals, emphasizing southwestern species. Prerequisite: BI 100 or ZO 100 and approval of instructor. Three lectures, 3 hours laboratory or field trip. Credit, 4 hours.

510 Topics in Zoology. Detailed presentation in the following areas of zoology: environmental, systematic, physiological, genetic, morphological, developmental, behavioral. Prerequisites: Graduate standing and approval of instructor. May be repeated for credit. Credit, 2 hours.

515 Populations. Mathematical models in the description and analysis of populations and communities, including both genetical and ecological parameters. Prerequisites: ZO 425, 445; MA 142 or approval of instructor. Credit, 3 hours.

560 Experimental Vertebrate Physiology. Directed experiments to develop skill in the use of physiological equipment and in the handling of animals. An independent study project required. Prerequisite: Approval of instructor. One lecture, 6 hours laboratory. Credit, 3 hours.

562 Histo and Cytochemistry. Identification and localization of compounds in tissues on a cytological scale. Prerequisites: ZO 360 or equivalent; organic chemistry. Two lectures, 4 hours laboratory. Credit, 4 hours.

565 Advanced Parasitology. Historical and analytical approach to the treatment of selected areas in the body of knowledge relating to parasites and parasitism. Prerequisites: MI 202; ZO 424. Credit, 3 hours.

Special Graduate Courses: 500, 590, 591, 592, 593, 594, 600, 700, 790, 791, 792, 799. (See page 219.)

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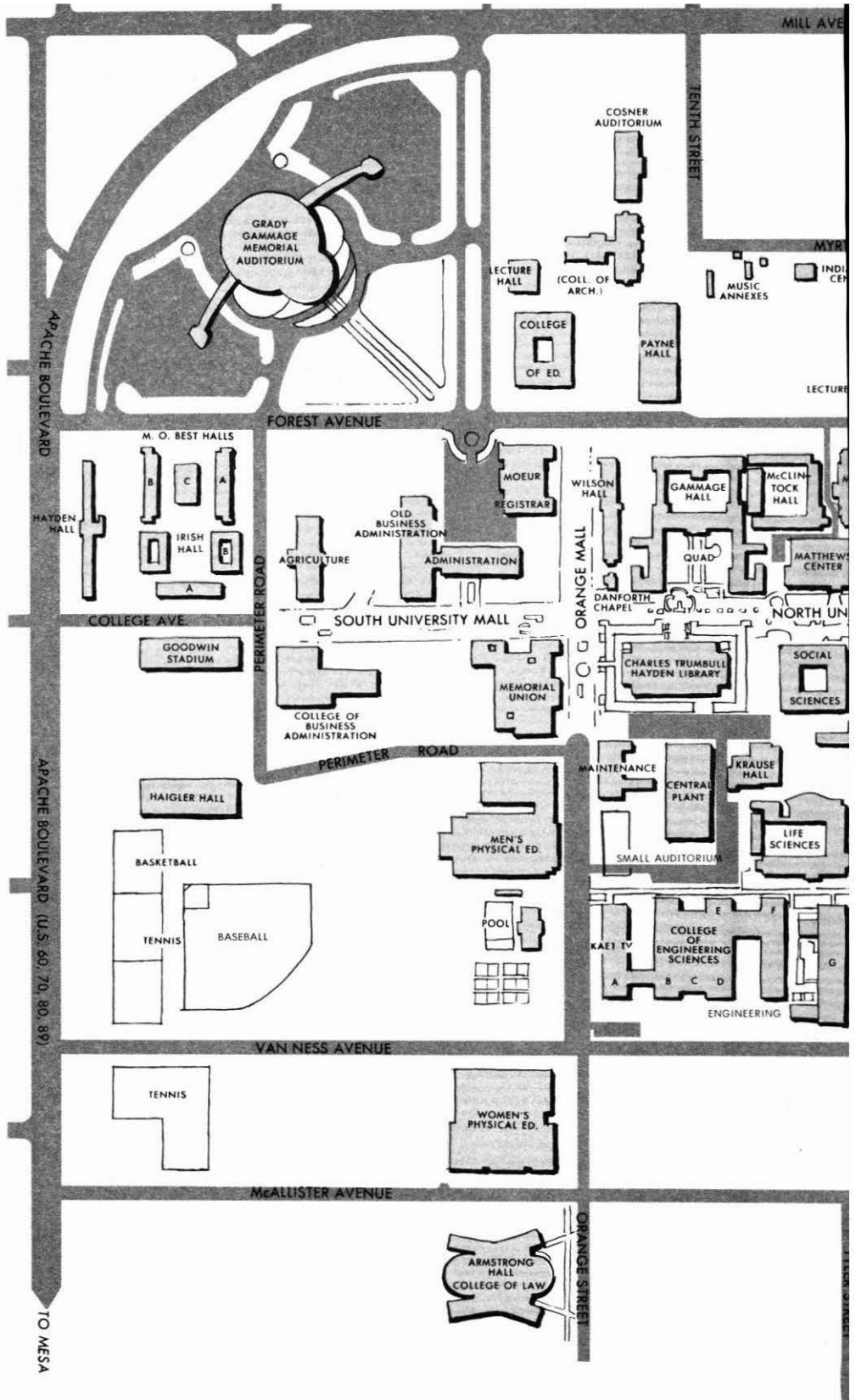
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APACHE BOULEVARD

APACHE BOULEVARD (U.S. 60, 70, 80, 89)

TO MESA

FOREST AVENUE

COLLEGE AVE

PERIMETER ROAD

PERIMETER ROAD

VAN NESS AVENUE

McALLISTER AVENUE

ORANGE MALL

ORANGE STREET

TENTH STREET

MILL AVE

GRADY GAMMAGE MEMORIAL AUDITORIUM

COSNER AUDITORIUM

LECTURE HALL

(COLL. OF ARCH.)

COLLEGE OF ED.

PAYNE HALL

MUSIC ANNEXES

LECTURE

M. O. BEST HALLS

HAYDEN HALL

IRISH HALL

AGRICULTURE

OLD BUSINESS ADMINISTRATION

ADMINISTRATION

MOEUR REGISTRAR

GAMMAGE HALL

McCLINTOCK HALL

MATTHEWS CENTER

SOUTH UNIVERSITY MALL

COLLEGE OF BUSINESS ADMINISTRATION

MEMORIAL UNION

DANFORTH CHAPEL

CHARLES TRUMBULL HAYDEN LIBRARY

SOCIAL SCIENCES

GOODWIN STADIUM

HAIGLER HALL

BASKETBALL

TENNIS

BASEBALL

MEN'S PHYSICAL ED.

POOL

MAINTENANCE

CENTRAL PLANT

KRAUSE HALL

SMALL AUDITORIUM

LIFE SCIENCES

KAET TV

COLLEGE OF ENGINEERING SCIENCES

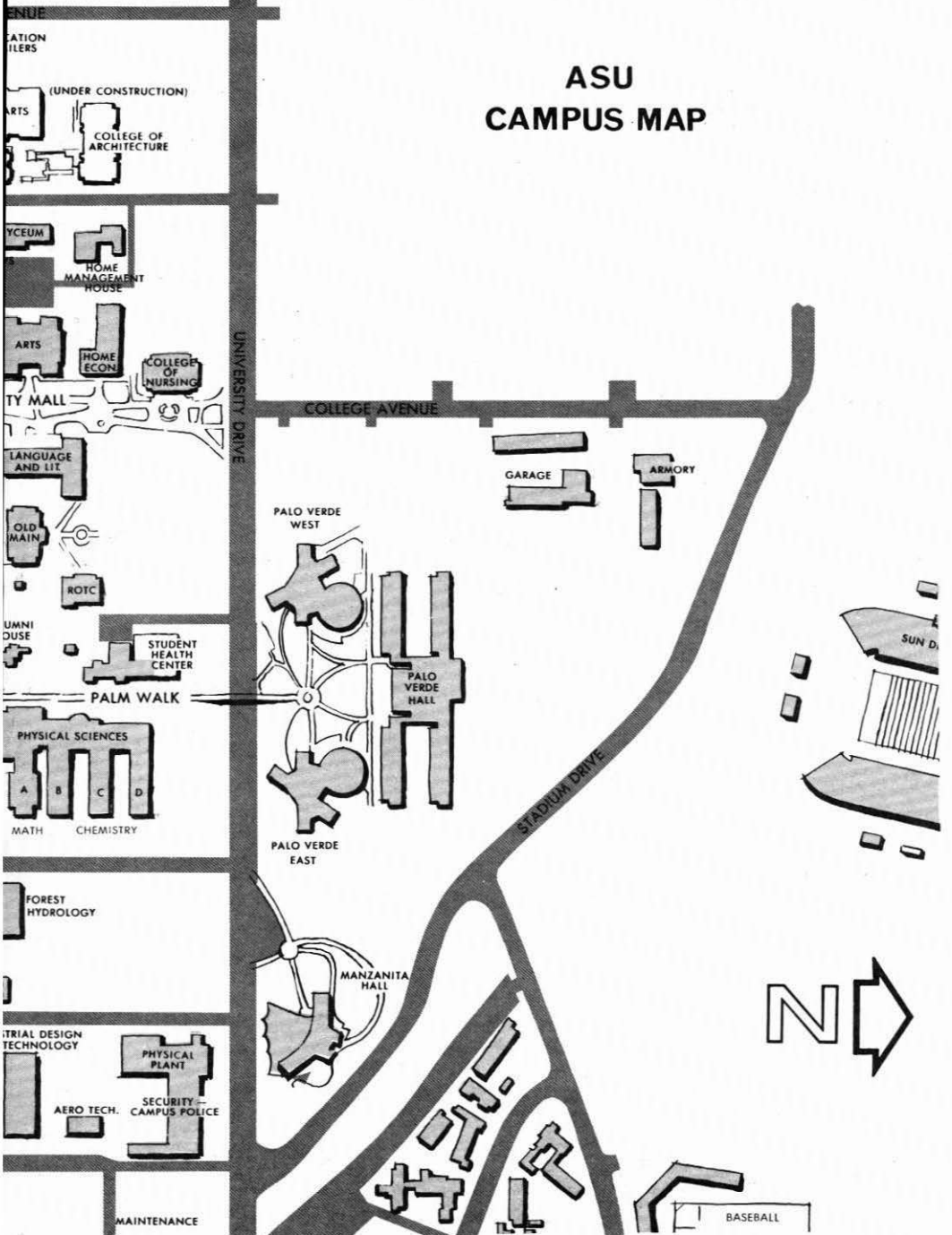
ENGINEERING

TENNIS

WOMEN'S PHYSICAL ED.

ARMSTRONG HALL COLLEGE OF LAW

ASU CAMPUS MAP



UNIVERSITY DRIVE

COLLEGE AVENUE

STADIUM DRIVE

PALM WALK

PHYSICAL SCIENCES
A B C D
MATH CHEMISTRY

PHYSICAL PLANT

AERO TECH. SECURITY CAMPUS POLICE

MAINTENANCE

BASEBALL

FOREST HYDROLOGY

TRIAL DESIGN TECHNOLOGY

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A B C D
MATH CHEMISTRY

PHYSICAL PLANT

AERO TECH. SECURITY CAMPUS POLICE

MAINTENANCE

BASEBALL

FOREST HYDROLOGY

TRIAL DESIGN TECHNOLOGY

UNIVERSITY DRIVE

COLLEGE AVENUE

STADIUM DRIVE

PALM WALK

PHYSICAL SCIENCES
A B C D
MATH CHEMISTRY

PHYSICAL PLANT

AERO TECH. SECURITY CAMPUS POLICE

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~~Edward T. Whittaker~~

Mathematics