566 International Education. Ed ıcat on n the wor d commun ty w th spec a reference to cross c ı t ıra prob ems of fore gn students prepar ng for teach ng abroad Cred t 3 hours

711 Adult Education. Types methods and adm nis trat n of adu t programs Ways and means of mp ement ng adu t activ ty and to the use of adu t act vity n the study and mprovement of educat na serv ces prov ded n oca com mun t es Each student w part cipate n a research study of some area of adu t educat on Cred t 3 h u s

Special Courses: See pages 46 47

EDUCATIONAL FOUNDATIONS

EF 111 Exploration of Education. Edu at on as an str ment n the deve opment of the nd v dua and soc ety ts s gn f cance as an Amer can nst tut on Cred t 3 ho rs

200 Self-Assessment for Teaching. nstr ct n and othe exper ences des gned to enab e st ents t determ ne whether they want t become teacher n ud ng f e d exper ence career r f rm at on and exper e ces n se f assessment a d dec on n ak ng Cred t 1 6 hours

333 Basic Issues in Education. Basic s c a and ph os ph a ssues fac ng educat rs thr ugh ıse of prob em s v ng and ph osoph ca ana ys Cred t 3 hours

411 General Semantics in Education. Demon tra t ons research ntens ve read ng n or g na doc ments and app cat on n genera sem ant s Cred t 3 h urs

422 Group Dynamics and the Educational Process. Leadersh p potent a by ınderstand ng a d is ng gr up pro e es n educat on and l ıman re a t ns Format on of gr ups eve opment of gro ıp eadersh p c mmun cat ons w th n groups a d re at n between g oup and nd v dua n embers Tl e ıse of prob ems and expectat ons of gro ıp work as an educat ona nstrı n ent Cred t 3 hours

445 Education for Survival. Content mater a s and methods for teachers n creat ng awareness of the surv va of fe on earth overpopula t on technology, energy usage. resource dep e t n and general env ronmenta degradat on Cred t 3 hours

500 Educational Research. Designed for students w th a m n ma background in stat st cs tests, and measurements and re ated ski s Emphas zes the product on and consumpt on of educat ona research as bas c to a c ass nstruct on and f undat ona to graduate programs Research study is requ red Cred t 3 hours

SOCIAL AND PHILOSOPHICAL FOUNDATIONS

SF 411 History of American Education. The s c a fe deas and nst tut ons that have g ven d rect on t ed cat on n the n ted States A backgro nd f r understand ng and eva uat ng present ed cat ona prob ems Cred t 3 h ur

422 Educational Sociology. Educat n n re a to t soc a n t t ıt ons C ns ders meth ds f gather ng data n s c a research t e fam y proble ns of educat o a reconstruct soc a e at onsh ps and soc a measureme t Cred t 3 hours

433 Philosophy of Education. Ph os ph ca foundat ons of contemporary educat ona deas ntrod ıctory cons derat ns f r the deve op ment of a ph osophy of educat on Cred t 3 hours

435 Education and National Goals. Case st ıd es n comparat ve and nte nat ona educat on terre at nsh p of edu at on w th po t ca deo og es e n m c cond t ons so a orga zat or and va ues ex st ng n erta n se ecte cı t ıres Cred t 3 ho ırs

511 School and Society. nterre at onsh p f scl oo a d so ety and the p ace of educat on n soc a change Cred t hours

522 Education and Democratic Values. Educa t on a a mora enterpr se n wh ch the schoo seeks to cult vate schoo va ues by the sub e t matter and methods t emp oys n ts program Cred t 3 h urs

533 Comparative Education in the Western World. Educat ona systems deas and trad t ons of the lead ng nat ons of Europe nc ud ng the Sov et Un on. Cred t 3 hours

534 Education and Change. Ro e of educat n n produc ng change n e onom c and soc o po tica cond t ons n the deve op ng nat ons of Afr ca As a and Latin Amer ca Cred t 3 hours

544 Philosophical Foundations of Education. Ma r po nts of v ew n c ntemporary edu a t ona thought emphas z ng th e bas s es n genera ph osophy wh h are fo ındat na t ı ed cat on Cred t 3 h ours

555 Education Classics. Se e ted d c ıment_ fr m t e past f the pı rp se f f ıd g u efu s g jest ı s f r dea g w th p sen' educa t a pr b en s C ed t h ı rs

566 History of Education Deve opment of edu at ona nst tı t s a d deas the Western W r d fro anc ent t mes t th e 20th e tury Cred t 3 h o rs

635 Education, Politics and Power. Edu at na system s as agen es f p t a s a zat n F rces wh ch shape edu at na p y a t of resources to educat ı s f p wer and nf uence gr ups dec s on mak ng n the sch Cred t 3 hours

711 Social and Historical Foundations of Education Cr t ca exam nat on of the chara ter st cs and prob ems of m dern Amer can educa t on and the so a and h st r ca context from wh h they have emerged Prereq s te SF 544 Cred t hours

722 Recent Developments in Philosophy of Education. Trends n contemporary edı at na th ught Prerequ s te SF 544 Cred t 3 h urs

Special Courses See pages 46 4~

Counselor Education

The doctora programs of the Department of Counse or Educat or are approved by the Amer an Psycho g ca Assoc at on

Professors:

NOB E ED B 401A B ACKHAM
B AESSER DAANE DAV S
HAMM HE MANN N CHOLS

Associate Professors:

CAB ANCA CHR STIANSEN CUMM NGS
GROSS GU N ARD
McWH RTER R PLEY SHELL SNYDER

Assistant Professors:

ANDERSON CHURCH LL MAZEN M LLER

CE 512 Principles of Counsel'ng and Student Personnel Work. Areas f studen nt personne wo k w th coı s de at on of the nterre at on of the var ous sch o serv ces and commu ty agenc es Cred t 3 hours

522 Personality Development nteract f e ı t a a d g t ve fact rs n pe na ty deve p r e nt at d fferen t ag ev s Va o ıs per ona t th e r es exar ed C d t 3 h urs

523 Psychological Tests. Sta dard zed te ts t e t ıdy f t e nd v dua w th emphas s n te t s re terpretat on n counse ng Prereq s te r o eq ı s tes CE 512 522 Cred t 3 o ır

534 Occupations and Careers. The w r d of w k va ue mate ar d job ass f cat n y tem educat o a and tra n ng cr ter a re gard ng occ pat na entry a d vert a mob ty. Prereq te or oreq s tes CE 512 and 2 Cred t 3 hours

545 Analysis of the Individual Theory and methods c m n n y emp oyed n st dy ng the n d v dua Observat na ethods d agnost c nterv ew tru t red a d sem structured me t d for stı dy g perso a ty Pr equ s tes or c r qu s tes CE 5 5 2 523 Cred t 3 h rs

567 Group Procedure. Pı nc p es a d tech n ques f gr ıp pr cedu es ther than cou se ng Pre equ s te CE 523 534 545 Cred t 3 ł o ıs

577 Counseling. Pı nc p es a d app cat n of u se g w th art cu ar emphas s on the o ı e ng nterv ew Prerequ s te CE 523 545 C ed t 3 h urs

612, 613 Child Counseling. App at ons of nse ng the ry n work ng w th ch dren n c n c and e ementary schoo sett ngs Prac t c n requ red and ntegrated w th d dact c nstru t n Prereq s te or c req ı s te CE 680 an J approva f nstructor Cred t 3 h ırs each sen ester

622 Group Counseling. Pr p es and app ca t n f group c ınse ng techn q es Prereq u s te CE 577 Cred t 3 h urs

633 Organization and Administration of Student Personnel Programs. Organ zat ona procedures and atter s and adm n strat ve re at onsh ps student personne programs Prerequ s tes CE 57 and 622 Cred t, 3 hours

634 Organizational Theory and Change. Concep tua n de s usefu to the counse r n unde stand g how rgan zat ona str ctures en erge deve p and dec ne Organ zat a goa s th e r es f rgan zat on author ty s ıbord ate ı e mun cat n w th and between o ga n zat o Prerequ s te CE 577 Cred t 3 ours

644 Psychology of Careers. Str ıctı rə and de ve opn enta theor e regard ng atter s f c upat o a ho e he ro e f coun e ng n the career p ann ng funct on Prereq ı s te CE 7 Cred t h urs

655 Student Personnel Work in College and Uni versity. H st ca deve opment and p ese t stat n re at n t chang ng con epts a d f r ct ns n gher educat on jun r co ege co ege and un vers ty bservat on on co ege campu es Prerequ s te or corequ s te exper ence or urse work n h gher educat on Cred t 3 h ırs

656 The American Col ege Student. E nphase c ude te act on of the student and the edu cat ona env ronme t nat re of st d t con mun t es n ı or ty groups st dent act vism stude t nf ue e and var ed pattern f struc ture and funct on of the co ege Credit 3 h ırs

666 Comparative Theories of Personality. C m parat ve ana ys of persona ty theor es n re at n to nse ng pract ces P erequ s te CE 522 Cre t 3 ho

667 Patterns of Behavior Disorders. Commo pe sona ty and or en t na d st rbances n dren ad escents and adu ts Et o ogy and dynan cs of pr mary behav or d so ders ne rot cop ng sty es persona ty d sorders and var us types f psych somat c ness Pre requ s te CE 522 545 Cred t 3 ho rs

668 Personality Assessment Advanced study a d r terpretat n of sem tructured per on a ty nstruments heoret ca at ona e a m n strat n and use of pro ect ve draw ngs and then at c apper ept on dev es. Prerequ s te EP 560 CE 667 Cred t, 3 h urs

677 Advanced Counseling. App ed tech qı e and tape a a ys Pr ed ıres and structı re of c un e g pac ng c mmun cat o empathy and the l e p ng re at nsh p Prerequ s te CE 577 C ed t ours

681 Supervised Practice. A s gnment n a sch or c mn un ty age y for uperv sed ex per e ces n personı e work Prereqı s te ap pr va f r stıuct r Cred t 2 6 ho r

Special Courses: See pag 46 47

Educational Administration and Supervision

Member Un vers ty Counci for Educat ona Adm n strat on

Professors:
ED A 107 ASHE DEEVER
HUNN CU T MENKE METOS, NEWBURN
M STOUT WOCHNER WOOTTON

Associate Professors:
BOGART DEMEKE LEVAN

Assistant Professors:
MAYHEW WALKER

EA 511 School Law. Const tut ona statutory and ase aw that re ates to a sch o per sonne pup s the schoo d str ct and other governmenta un ts C ntracts d sm ssa s ten ıre ret rement pup n ur es ab ty of perso ne and d str ct schoo d str ct b undary changes bond ng Cred t 3 ho rs

524 Theory and Application of Educational Administration. H st ry and deve opment of pub c scho admin strat on n the Un ted States curr nt rgan zat na patterns for pub c edı cat o at oca tern ed ate state and nat ona eve s and o' entat on t and emphas s o current tl eoret ca p s t ns n educat ona adn n strat on Cred t 4 h urs

525 Human Relations and Societal Factors in Educational Administration. nterre at ns be tween pr b ems of educat na adm strat on and nterd c p nary soc a sc ences Factors n hun an re at ons nc ud ng commu cat n sk s mora e a ıthor ty and percept on through the case appr ach Soc eta fact rs nc ud ng educat on s ıe at n h p to the econ my futur st s c o ogy comparat ve and changing va ue systems n nor ty st ce and opportun ty f r c ı m n ty educat n a d commun ty power structu e Prerequ s te EA 524 r equ va ent Cred t 4 h ırs

526 Instructional Leadership. Adm n stering curr cu um mprovement nservice educat on eva uat ng and mprov ng teach ng competence the pr nc pa s nstruct ona respons b t es pract ca exper ences w th s mu ated prob ems Prerequ s te EA 524 or equ va ent Cred t 6 h urs

527 Managerial Functions in School Administration. The manager a aspects of edı cat ona ad m n strat on as re ated t the w rk of the centra d str ct off ce staff and the schoo pr nc pa The ıse of human resources property management and the organ zat on and management of t me by the adm strat ve staff ıs en phas zed Prerequ s te EA 524 or equ va ent Cred t 6 hours

534 Instructional Leadership. Curr cu ar prac t ces and processes used by nstruct ona eaders who p an organ ze and coord nate the profess na act v t es n e ementary and sec ndary schoo s Not offered after A Y 1973 74 Cred t 3 h rs

538 Administration of the Community School. Ph osophy h story organ zat on and operat on of the commun ty centered schoo ntroduct on of the con m nity edu at on concept nto a school system and mak ng t operat ona Cred t 3 hours

544 Public School Finance. Schoo b ıdget proce dures accounting revenues state and county f nance, and prob ems re at ng to f anc ng p b c educat on Prerequ s te adm ss on t Educat a Adm st at on program Cred t hours

548 Public Relations: The Community School. Adm n strat ve factors of pr mary mportance deve op ng commun ty nvo vement n pub c scho s Emphas s on theory and sk of schoo system and nd v dı a comm ın cat n Prerequ s te· EA 538 or appıova of nst ı ct r C ed t 3 h u s

549 Programming and Financing Community Education. Prov des for n depth nvest gat on f component prograı s effect ve as a veh c e f r con mun ty educat on area schoo s atten t n g ven t p ans wh ch e p sc o s change st ı y f node s for fund ng con mun ty edu cat on c ud ng p anning sources and expend ture patterns Prerequ s te· EA 538 or approval of nstructoı Cred t 3 hours

555 School Plant Planning and Maintenance. Schoo bu d ng needs educat ona p anning for fac t es respons b t es of arch tects dut es of c ntractors equ pp ng and furn sh ng f schoo bu d ngs Prerequ site adm ss on to Educat onal Adm n stration program Cred t, hours

566 Human Relationships in Educational Administration. The adm nistrator's profess ona re at onsh ps w th teachers, parents pup s and other educat ona eaders w th n the d s tr ct Factors n human re at ionsh ps nc ud ng commun cat on sk s mora e, author ty and percept on through the ase approach Not offered after A Y 1973 74 Cred t, 3 hours

568 Role and Responsibility of Supervising Teacher. Exper e ces and content for those p an n ng t become supervisors of student teach ng n teacher edı cat on programs Also serves as nserv ce tra n ng f r those a ready work ng n stude t teach g Prerequ s te approva of nstruct r C ed t 3 hours

571 School Business Management. Purchas ng budget ng acco nting pay oll management aud ting f nanc a report g nsurance and adm n strat on f nonteach ng personne and serv ces Prerequ s te. EA 544 Credit 3 ho ırs

573 School Personnel Administration. Organ za t o for personne se v ces deve opment of po cy to g vern se ect n or e tat on p ace ment remuneıat on transfers separat ns and deve opment of mora e among ınstruct ona and non nstruct ona personne Prerequ s te ad m ss n to Edı cat ona Adn n strat on program Cred t 3 h ur

576 The School Principalship. Prob em and abo at ry approaches u ed t prov de app cat n of adm strat ve act v t es of e ementary and secondary schoo s Prerequ s te. adm ss on to Ed cat na Adm n strat on program Cred t 3 h rs

611 Societal Factors Affecting Educational Administration terre ated nature f educa

tional administration and the behavioral sciences. Not offered after A/Y 1973-74. Credit, 3 hours.

658 Problems and Issues in Administering Community Education. Utilizes a multidisciplinary approach to provide community educators with an understanding and skill in areas such as school law, school plant management, personnel administration, business practice, school legislation, community education history, research and utilization of local resources. Prerequisite: EA 548 and 549. Credit, 3 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 or approval of the instructor. 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, audio-visual, 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, 3 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, 3 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, 3 hours.

NOTE: A laboratory is maintained in the Southwest Regional Center for Community School Development covering materials and practices in the field of Community Education. The use of the laboratory may be scheduled with the secretary in Room 415, Farmer Education Building.

HIGHER EDUCATION

HE 522 Introduction to Higher Education. General introduction and orientation to the broad field of higher education. Credit, 3 hours.

533 The Community-Junior College. The junior college as an institution in American higher education. The history, functions and organization of the junior college are presented. The course is accepted toward professional certification by the Arizona State Board of Directors of Junior Colleges. Credit, 3 hours.

611 Curriculum and Instruction in the Community-Junior College. Principles, patterns and procedures underlying the development of the curriculum in the junior college. Factors affecting the organization and improvement of instruction within such institutions. Prerequisite: HE 533 or approval of the instructor. 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 approval of instructor. Credit, 3 hours.

644 Financing Higher Education. Income and expenditures for higher education and an analysis of trends in the support of the programs, particularly public higher education. Prerequisite: HE 522 or approval of the instructor. Credit, 3 hours.

679 Administration of the Community-Junior College. Organization and administration of the junior college. Examination of organizational relationships, administrative problems encountered and practices employed in the operation of this type of institution. Prerequisite: HE 533 or approval of instructor. Credit, 3 hours.

689 Administration of Higher Education. Problems involved in the administration of institutions of higher education. Prerequisite: HE 522 or approval of instructor. Credit, 3 hours.

NOTE: The Center for the Study of Higher Education maintains a laboratory-library for the students in Higher Educational Administration. Individual study stations are assigned to full time resident students. All materials are available to students in the library during the day, but may be checked out for the night. Arrangements to use the library should be made through the secretary in Room 106.

Special Courses: See pages 46-47.

Educational Psychology

Professors:
VAN WAGENEN (ED B 325C GAFFNEY, HELMSTADTER, KERR, STAFFORD
Associate Professors:
FRY KLINGENSMITH SATTLER
Assistant Professors:
HARR S KULHAVY

EP 310 Educational Psychology. Human behav or n educat onal situat ons presented through nstruct onal modules Prerequ s te PX 100 or approva of the nstructor Students may re-enro for cred t to a total of s x hours Cred t, 1-6 hours

450 Principles of Measurement and Evaluation. Major oncepts and bas c log c nvo ved n the assessment of human ab t es and school accom p shment Nature of tests the use of test nformat on n mak ng educat ona dec s ons systems of grad ng, the process of test standard zat on and the concepts of test rel ab ty and va d ty. Cred t 3 hours

452 Laboratory in Test Construction and Interpretation. Pr nc p es of educat ona measure ment and eva uat on. Construct on of c assroom exam nat ons, the ass gnment of grades and the nterpretat on of w de y used group measures of schoo abi ity and ach evement Cred t 2 hours

454 Introduction to Measurement and Descriptive Data Analysis. Bas c concepts n the quant fica t on of human performances the nature of tests espec a y the character stics of object v ty, va d ty re ab ty, and standard zat on descr pt ve stat st cs frequency d str butions types of test scores measures of centra ten dency var ab ty, corre at on and regress on Cred t 3 hours

510 Essentials of Classroom Learning. Emp r ca approaches to the deve opment of earn ng and mot vat on acqu sit n and forgett ng transfer of tra n ng and the contro of ncent ve condi t ons presented on an exper menta bas s and re ated to educat ona processes Prerequ s te EP 310 or eq va ent Cred t 3 hours

512 Special Topics in Educational Psychology. A concentrated survey of the major content areas and exper menta approaches n educationa psycho ogy Prerequ s te: approva of nstruc tor Credit 3 hours

514 Psychology of the Adolescent. Menta phys cal soc a and emotiona deve opment n ado-escence and emphasis on the inf uence of var ous aspects and act v t es of the secondary school on adolescent deve opment Prerequ s tes PX 100 EP 310 or equiva ents Credit 3 hours

516 Behavioral Approaches to School Instruction. Prov des behav ora approaches for work ng w th earn ng mot vat on and soc a problems that are typ ca y encountered n the school. Prerequ s te approval f nstructor Cred t 3 hours

530 Theoretical Issues and Contemporary Research in Child Development. Psycho og cal theor es research and methods re evant to ch ld deve opment emphas z ng the re at ons between early deve opment and ater perform ance Prerequ s te EP 512 Credit 3 hours.

532 Psychology of Exceptionality. Genera psycholog ca theory and exper menta research relevant to exceptional ty emphasiz ng mp ca t ons for educat ona programs which take cogn zance of un que earner character st cs Prerequ s te EP 512 Cred t 3 hours

534 Principles of Behavior Modification. A systemat c cons derat on of the pr ncip es of cond t on ng as app ed to behav or mod f cat on a d a survey of the c rrent research on the exper menta ana ys s of behav or n educat na psycho ogy Cred t 3 hours

540 Theoretical Views of Learning. C ass ca and cognit ve theor es of earn ng p us recent or entat ons ustrat ve exper menta and rat ona foundat ons, mp cat ons for ed ca t ona pract ce whenever feas b e Prerequ s tes 12 semester hours in psycho ogy or educa t ona psy hology Cred t 3 hours

542 Learning of Text Materials: Research and Theory. Cr t ca rev ew and eva uat on of re search on earning var ab es as they app y to nstr ct on Mode s of feedback, nterference, attent on e aborat on organ zation and cog n t on re evant to the acqu s t on and reten-t on of nstruct onal materials Cred t 3 hours

544 Psychology of Reading. A ternat ve ana ysis of the read ng process des gns and procedures used to invest gate instructiona and nonin-struct na var ables re ated to read ng achieve ment Prerequ s tes EP 454 510 or 512 Credit 3 hours

550 Current Issues in Measurement. Current major ssues n measurement exam ned through a rev ew of research terature emphasizing the deve op ment of theoret ca approaches to educat ona measurement and the mp cat ons of these deve pments for educationa measurement and eva uat on Prerequisites EP 450 454 Cred t 3 hours

552 Measurement and Inferential Data Analysis Techniques. Measurement prob ems n the nter pretat on f educational research data to-gether with the nferent a procedures used n the ana ys s of such data probabi ty and theoret ca frequency d str but ons, the nature of samp ng des gn exper menta design and stat stica nference the ogic of hypothes s test ng and the bas c nonparametr c and para metr c pr cedures nc ud ng introduct on of ana ys s f var ance. Prerequ s te EP 454 or equ va ent Cred t 3 hours

554 Multivariate Procedures in Data Analysis. Bas c procedures for ana yzing educat na data nvo v ng many var ab es inc uding mu t ple c ass f cat on ana ys s of var ance, ana ysis of covar ance mu t var ate ana ys s of var ance d scr m nant funct o and app ed mu t p e n-ear regress on Prerequ s te EP 552 or equ va ent Cred t 3 hours

555 Data Processing Techniques in Measurement and Research. App cat on of modern data pro cess ng meth ds to prob ems n educat ona measurement and research Introduct on to com puter programm g use of c mputer brar es fam ar ty with bas c tabu ating equ pment cod ng and ana ys s of mass data ar s ng in test ng pr grams and educat a research Pre

requis tes EP 450 and 454 Cred t 3 hours

556 Special Quantitative Techniques. Specia techn ques for ana yzing educationa data n c ud ng factor ana ys s psychometr c sca ng soc ometry the semant c d fferent al techn que and spec a nonparametr c procedures Prerequi- s tes EP 550 554 Cred t 3 hours

560 Individual Measurement in School Psychology. Ind vidual test adm n strat on and exper ence n nterpret ng the resu ts of the test to schoo personne Prerequ s tes EP 450 510 or 512 and approva of nstructor Cred t 3 hours

562 School Psychology: Theory and Practice. Deve opment and present status of schoo psy cho ogy w th an emphasis on ro e and funct ons educat ona d agnosis schoo test ng programs, nterv ew ng report wr t ng consu tat on and i serv ce tra n g Prerequ s tes EP 454 532 and 560 Cred t, 3 hours

566 Diagnosis of Learning Difficulties. C n ca d agn s s of earn ng d ff cu t es emphas z ng spec f academ c p b ems Use and nterpreta t on f d agnost c nstruments n pract ca schoo s tuat ons Prerequisites EP 450 510 r 512 560 and 562 Credit 3 hours

636 Experimental Analysis Methods of Research on Teaching. An exper menta ana ys s a terna t ve to stat stics n the concept on des gn and conduct of ed cat ona research Spec a emphas s s p aced on wr t ng the research pro posa Approva of nstructor requ red Cred t 3 hours

710 Educational Psychology. Theory and resear h iterature n educat ona psycho gy and the r mp cat ons for educat o a pract ce Credit 3 hours

748 Recent Studies in Educational Psychology. Recent se ected ter ature n educat ona psy ch ogy vo v ng cr t ca read ng and dis cuss on Prerequ s te 15 semester hours n educat ona psycho ogy Cred t 3 h urs

Special Graduate Courses: Se page 46 47

Special Education

Professors:
ABRAHAM ED B 301 SUNDWALL
Associate Professors:
BROWN FAAS B MOORE
NELSON WARREN
Assistant Professors:
GILL KAPLAN MULLEN
ROBERTS VERDUZCO

SPECIAL EDUCATION

SP 311 Orientation to Education of Exceptional Children. Study f except ona ch dren nclud ng g fted menta ly retarded, s ght hear ng speech, emot ona d stu bance d sadvantaged spec f c earn ng d sab t es and others. Ob servat on of except ona ch dren n c assroom s tuat ons Cred t 3 hours

312 Mental Retardation. Causat on and charac ter st cs of menta retardat on n ch dren and adu ts Term no ogy educationa programm ng and therapeut c procedures are emphas zed Cred t. 3 hours

320 Participation with Exceptional Children. C n ca and aboratory exper ence w th excep t ona ch dren n co perat ng c n cs inst tu t ons cho s and agenc es Prerequ s te SP 311 Cred t 3 h rs

321 Methods of Teaching the Mental y Retarded and Other Exceptional Children. A genera ntr ductory s rvey of proced res mater a s and r u a s ted for retarded and other excep t na h dren Prerequ s tes SP 311 SP 3 0 r c ncurre t y Cred t, 3 ho irs

404 Societal Influences on Handicapping Conditions. Research eg s at on pub c and pr vate agenc es pressure groups, and other s c a forces that nf uence the preva e ce management and treat ent of except ona ch dren Prerequ - s tes SP 311 and bas c cou rse n o e except n a ty Cred t 3 h urs

436 Behavioral and Emotional Problems in Children. Patterns of ma adapt ve behav or in chil dren and ado escents Exp orat on of the iso ated deve opmenta and ma ntenance var ab es contr b ut ng to the behav or patterns. Cred t 3 hours

437 Social Maladjustments in Children. The current status of del nquency drug abuse self- destruct ve behav or and other soc a ma adjust ments of ch dren and ado escents D scuss ons of effect ve techn ques a d programs for work ng w th youngsters w th these prob ems Cred t 3 ho rs

446 The Disadvantaged Child. The depr ved ch d n terms of h s phys ca soc a econom c psycho og ca and educat na needs Mater a from a the major d sc p nes used to he p understand the ch d and h s prob ems Cred t 3 ours

447 Methods of Teaching the Disadvantaged. Techn ques for or gan z ng and prov d ng spec a educat o a exper ences for students from de prived or cu tura y d fferent backgrounds. Pre requ s te SP 446 Cred t 3 hours

448 The Mexican American Child. Cons derat n f var ab es n teach ng Mex can Amer can ch dren Scho pr gramm r g based on b ngua cu tura and re ated factors. May be offered on Extens on on y Cred t 3 hours

461 Characteristics and Diagnos s of Learning Disabilities. Def n tions nc dence causes and d agnos s of spec f c earn ng d sabi t es Cred t 3 hours

462 Methods of Remediating Learning Disabil - ties. Methods and mater a s for use n the remed ation of spec f c earn ng d sab t es Prerequ s te SP 461 Cred t 3 hours.

471 Art, Music and Crafts for the Handicapped. Use of art mu sic and crafts n th e motivat on and deve opment of the sensory motor sk s f the hand capped Pre equ s te SP 321 or equ v a ent Cred t, 3 hours

488 The Gifted Child. G fted ch dren s needs and character st cs appropr ate mater a s and methods teacher qua f cat ons echn ques and va ues re ated to acce erat on enr chment spec a c asses research of Terman Ho ng

worth W tty and others Cred t 3 hours

511 The Exceptional Child. Educat ona needs of hand capped and gifted ch dren Not ava ab e to students who have completed SP 311 or the Summer Workshop n Except ona Ch dren Cred t 3 hours

512 The Mentally Retarded Child. Et ology, d ag nos s and management of menta y retarded ch dren Current trends n prevent on programm ng and teache preparat on Cred t 3 h rs

514 Methods of Perceptual-Motor Training. Methods and mater a s for the deve opment of the sensory mot r sk s for menta y retarded emot ona y-d sturbed earn ng d sab ed and d sadvantaged ch dren w th emphas s on perceptua n ot r sk s v sua motor ntegra t on and other read ness act v t es Prerequ s tes SP 511 r equ va ent and bas c course n one except r a ty Cred t 3 hours

515 Methods for the Remediation of Basic Learning Problems. Methods and mater a s for remed at ng the bas c academ c pr b ems of n enta y retarded em t ona y d sturbed earn g d sab ed and d sadvantaged c dren P ereq s tes SP 511 or eq va ent and bas c c r e n one except ona ty Cred t 3 h rs

522 Experience in Exceptional Child Clinics. Prov des expe ence w th except ona ch dren n cooperating c nics organ zat ons and nst tut ons Ar z na wh ch work w th menta y retarded orthoped c s ght speech hear ng b ngua and other areas n Spec a Educat on Prereg strat on necessary Prerequ s tes SP 594 Sun mer Workshop n Except ona Chi dren and teach ng exper ence Cred t 6 hours

531 Behavior Management Approaches with Exceptional Children. Eva uat n of var us behav r ma agen ent approaches and tech ques for dea ng w th ma adapt ve and or nappro pr ate behav or f ex ept ona ch dren n the sch o sett ng G de nes f r dea ng w th spec f c pr b ems Prerequ s te SP 511 or eq va ent Cred t 3 hours

537 Methods of Teaching the Emotionally Disturbed. Spec a meth d and techn q es n the deve pment f a therapeut c ed cat ona atm sphere for socia y ma adjusted and emot ona y d sturbed ch ldren Prerequ s te SP 436 Cred t 3 hours

566 The Visually-Handicapped Ch ld. V sua y hand capped chi dre s needs and character st cs appropr ate mater a s and teach ng methods teacher qua fica on def n t ons and term no ogy Cred t 3 hours

574 Educational Evaluation of the Handicapped. Educat ona eva uat on techn ques for use by teachers in determ n ng ntra nd v d a d f ferences of hand capped ch dren Emphas s on diagn s s and prescr pt ve p ann ng Prerequ s tes SP 511 or equ va ent a methods co rse for except ona h dren or appr va of the nstructor Cred t 3 h r

578 Educational Procedures in Mental Retardation (Curriculum, Materials and Methods). Teach ng th e menta y retarded ch d emp as z ng spec f c methods, mater a s of nstruct on and curr cu um deve opment Meets state requ re ment of Spec a Education methods Prerequ s te SP 512 or approva of nstructor Cred t 3 ho rs

579 Vocational Programs for the Mentally Retarded. Curr c um p ann ng and methods of teach ng n seco dary s hoo and post schoo programs for the menta y retarded Work eva u at on work study she tered em p oyment and other aspects of vocati na programs Prerequ te SP 312 r 512 Cred t 3 ho rs

581 Methods of Teaching the Trainable Mentally Retarded. Deve opment of mater a s procedures and programs for the tra nab e menta y retarded pre schoo through adu thood Prerequ s te SP 312 or 512 Cred t 3 hours

INDIAN EDUCATION

IE 411 Indian Education. Foundat ons and his t ry of nd an edu at o and present day mp cat ons. Cred t 3 hours

422 Methods of Teaching Indian Children. Mate r a s and methods part cu ar y s ted to the educat on f nd an students Effect ve se of oca and triba ater a s the c assr om Exper mentat on w th new deas prov ded. Pre requ s te IE 411 Cred t 3 hours

424 Curriculum and Practices for Indian Educat on. Curr cu um prob ems and recomme ded pract ces of nd an educat on Rev ew f past and pre e t Bureau of nd an Affa rs and pub schoo curr cu ums Spec f c techn ques exam ned f r curr c u um mprovement n Ind an educat n Prerequ s te E 411 Cred t 3 hours

425 Educational Applications in Anthropology. Educat n and ts re at on t anthropo ogy Va ues and mp c t c u tura assumpt ons w th the r mpact on educat on Use of case study approach n understand ng the nf uence of soc a and c u t ra fa tors n the educat ve process Prereq s te E 411. Cred t 3 hours

433 Guidance for the Indian Student. Prob ems faced n prov d ng adequate gu dance serv ces to nd a students and the ne ess ty for cu tura understa d ng gu dance Co s derat n g ven to the effect of tr ba va ues and the r re a t onsh p to effect ve gu dance Prerequ s te IE 411 Cred t 3 hours

490 Problems of Teachers of Indian Children. Current ssues trends and prob ems enc untered by teachers of nd an h dren Ora and wr tten Eng sh and ead g rece ve emphas s Current researc rev ewed and eva uated Prerequ s te IE 411 Cred t 3 hours

511 School-Community Relations in Indian Education. Spec f c techn ques and methods ut zed n rea z ng harmon us and effect ve re at ons between the sch w th nd an ch dren a d the commun ty n wh ch these ch dren ve Credit 3 h urs

522 Education of Indian Adults. Methods used to estab s Ind an ad t educat on pr n p es nvo ved n determ n ng course se ect on and c ntent suc essfu r d an adu t ed cat o pr grams a d the r essent a ngred ents Cred t 3 ho rs

544 Community Development in Indian Education. Methods and techn ques f r n t at ng commun ty deve pment programs n nd an c mmun t es ro e and respons b t es of sch o personne

commun ty leaders and nd v dua s Cred t 3 hours

Special Courses: See pages 46 47

Educational Technology and Library Science

Professors:
SULL VAN ED B 146 BENED CT
GERLACH VERGIS
Associate Professors:
H GG NS KAUFFMAN SATTERTHWAITE
Assistant Professors:
BOETTO, MAMAL S MOFF T

AUDIOVISUAL EDUCATION

AV 411 Audiovisual Materials and Procedures in Education. Ro e of earn ng and commun cat on pr nc p es n the se ect o preparat on, eva u at on and ut ızat on of mater als and equ p ment n nstruct ona contexts Pract ca nstruct ona and techno og ca deve opments n educat on Tw ectu es 2 hours aboratory Cred t 3 hours

412 Audiovisual Practices. Pract ca experience n the p ann ng and design of nstruct ona mater a s Emphas s on m re comp ex med a n c ud ng s des f ms a d te ev s on Prereq u te AV 411 r approva f nstructor Two ectures 2 h urs aboratory Cred t 3 hours

422 Radio and Television in Education: Utilization. Effect ve use of rad o and te ev s on n educat on Means of adapt ng mater a s for earn ng ex er ences Cred t 2 hours

455 Television and Cinema. nf uence of con ten porary TV and c nema o ch d e and yo ıng peop e these nass med a as they affe t educa t on Cred t 3 urs

501 Audiovisual Methods of Teaching. Newer med a for nstruct on Se ect on and eva ua- t n of mater a s and procedures Operat on of equ pment and product n of n ater a s Th s course may not be used for credit n a graduate major Credit 3 hours

502 Production of AV Materials. Product on of projected and nonprojected audiov sua mater als nc ud ng transparenc es s des record ngs Ut zat on of AV mater a s n d v dua sma gro ıps and arge group nstruc t ona sett ngs Th s co ırse may not be used for cred t n a graduate major Cred t 3 hours

522 Advanced Production of AV Materials. n struct o n photography sound c nematogra phy telev s on and graph cs app ıcat on to the deve opment of educat ona mater a s F rc ass room teachers on y May be repeated for credit Prerequ s te AV 411 or 501 or approva of n structor One hour ecture, 2 hours aboratory Cred t, 2 hours

523 Listening and Sound in Education. Tech niques for produc ng and record ng sound as an nstr ıct ona st mu us Deve pment of sten ng mater a s Prerequ s te ET 501 r equ va- ent One ecture 2 hours laborat ry Cred t 2 hours

524 Photography in Education. Theo y and prac t ce of st i p cture ut ızation n educat on Product on of col r and b ack and wh te photo graphs to mp ement nstruct ona goa s Pre requ s te ET 5 1 or equ va ent One ecture 2 h urs laboratory. Cred t 2 hours

525 Graphic Arts in Education. Theory and prac t ce of ut zing graph c mater a s n educa t on Product on of graph c mater a s for nstruct on Prerequ site ET 501 or equ va ent One ect ıre 2 hours aboratory Cred t 2 hours

526 Cinematography in Education. Theory and pract ce of us ng mot on pictures n educat on Product on of nstru t ona f ms Prerequi s tes AV 523 a d 524 o approva of i structor One ecture 2 hours aboratory Credit 2 hours

527 Educational Television Production. The ry and pract e f te ev s on n edu at n Tech n q es of scr pt wr t ng and pr gram pr duct n Pr duct on of te ev sion programs Prereq ı s tes AV 523 and 525 or approva of nstruc tor Cred t 2 h urs

528 Educational Media: Advanced Production. Deve opment of ski s ın design and product on of graph c photographic telev s on and aud o materia s not covered n prerequ s te courses. Specia emphas s on mu t med a techn ques One ecture 2 hours aboratory Prerequ sites AV 523, 524 and 525 or approva of nstructor Cred t 2 hours.

533 Management of Audiovisual Services. Pro- cedures n the eva uat on se ect on storage ret eva ma ntenance and budget ng of aud o v sua mater als and equ pment Competenc es, funct ons and respons b t es of the audio sua oord nator of a schoo or d str ct med a program Prerequ s te 9 hours n AV and or ET Credit 3 ho rs

534 Instructional Resource Centers. Techn ques of ntegrat ng brary and aud v sua person ne and nstruct ona med a nto un f ed nstr ct ona resource ce ters Pr nc p es of personne space and f nance superv s on and management Procedures for facu ty and program deve opment w th n schoo s, d str cts and a ger ed ıcat ona un ts Prerequ s te AV 533 or LS 481 Cred t 3 hours

560 Current Issues in Audiovisual Education. dent f cat on and ana ys s of cr t ca areas of med a t zat n educat ona systems Re at onsh p to p t ca soc o e onom c and c ı tura prob ems of soc ety Prerequ s te 9 ho rs n AV and r ET Cred t 3 hours

EDUCATIONAL TECHNOLOGY

ET 501 Foundations of Educational Technology. C rre t pract ces n nstruct ona techno ogy Cred t 3 hours

502 Design and Development of Instruction. Deve opment of n ater a s and env ronments for fac tat ng earn ng and assessment of the r effect veness Cred t 3 ho rs

503 Research Techniques for Instructional Development. Pro edures for ana yz ng the effects of a ternat ve nstr ıct ona pract ces Cred t 3 h urs

504 Installation of Instructional and Account-

ability Systems. Techn ques for nsta at on of new nstru t onal programs n the schoo s and for mon tor ng and mprov ng teacher effect ve ness Cred t 3 hours

505 Cybernetics and Education. Theory and tech no ogy of object vated systems Spec f c app i cati n to deve opment of nstructi nal mater a s and env ronments Prerequis tes ET 501 503 Cred t 3 hours

507 Individualized Instruction. Procedures for adapt ng nstruction to the ab t es and nterests of nd v dua learners Deve opment of d ag nost c assessment nstruments subject matter mastery tests nd v dua zed nstructiona mater a s remed ation act v t es and c assroom management systems Emphas s on using earn ng reso rce centers nstructiona med a and computer techno ogy to d v duate c ass r om nstruct on Cred t 3 hours

508 Games and Simulations. Design ng test ng and rev s ng nstruct ona games and s mu at ons is ng b th pr nt and nonpr nt med a Cred t hours

521 Programmed Instruction. Constr ct ng test ng a d rev s ng a programmed earn ng sequence App cat on of pr nc p es of prog amme n struct on to both pr ted and nonpr nted med a C ed t hours

522 Computers in Education. App ication of c mputer techn ogy to nstruct ona and adm n st at ve funct ons Or entat on to capab t es f comp iters and techno g ca upport of pup s a d per onne Cred t 3 ho rs

523 Computer Programming for Instruction. A ithor anguages and programm ng techn ques for nstruct ona p rposes Student acqu res suff e t ompetence t deve op a ma or computer contro ed program of nstruct on a a f na p oject Cred t 3 hours

524 Advanced Computer Programming for Instruction. Deve opment f pr f c ency n add t o a aut or anguages Use of computer contro ed projecto s recorders, p ayba k sys tems and ther hardware nstruct on Prerequ s te ET 523 or approva of nstructor Cred t 3 hours

560 Current Issues in Educational Technology. Cr tica ana ys s of current terature Assess ment of current pract ces n instruct na research and deve opment Cred t, 3 hours

LIBRARY MEDIA

LM 311 Children's Literature. Modern and fo k terature for e ementary schoo ch dren e e ments of a good book for chi dren techn ques for pron ot ng apprec at on of terature Pro v des background for supp ementary mater a s n a areas of the schoo curr cu um Cred t 3 ho rs

533 Evaluation of Children's Literature. Soc a and ed i ational con epts and va es expressed terature Standards of terary cr t c sm Cred t 3 hours

LIBRARY SCIENCE

LS 313 Library Skills for Teachers. A c ass room teacher s ntroduct on to sch o brary mater a s organ zat on and serv ces Most freq e t y used ready reference mater a s and pr ced ires for us ng the b ary n teach g No cred t o L brary S ence m nor Cred t 3 f o r

423 Books, Libraries and Society. H st ry of b ok a d b ar es as re ated to soc ety and a study of brar ansh p as a profess on Cred t 3 f ir

440 Classification and Cataloging. Pr c p es of ib ect c ass f at n ass gn ng Cu tte n mbers su b ect trac ngs c mp g she f st ata j g brary mater a s Cred t 3 hours

461 Selection of Library Materials. Cr ter a prob e s and po c es n the se ect n f mater a s f r the sch o brary Gu des and a ds p ib shers dea ers ar d ead g nterests Cred t f ours

463 Library Materials for Children. Bo ks and e ated ater a s f r ch dren s brar es and the e ementary schoo program Cr ter a se ec t o and procedures for ntegrat ng v ta mater a s t the school curr cu um and or free read ng program n the schoo brary Prerequ s te LS 461 or approva of nstructor Cred t 3 h urs

464 Library Materials for Adolescents. Books and re ated mater a s for yo th brar es and the secondary scho program Cr ter a f r se ect n and procedures f r ntegrat ng v ta mater a s nto the s hoo c irr c um and free read ng pr gram n the schoo brary Pre equ s te LS 461 or appr va of nstructor Cred t, 3 hours

471 Basic Reference Resources. Co te t and use f the bas types of ready referen e works suc as d ct onar es e cyc oped a yearbooks b og aph a d ct onar es geograph ca sources d rector es f agenc es h andbo ks ma ua s ser a s n dexes b b graphies g vernment p b cat ns a d a d v sua sour es Cred t 3 h urs

481 Library Administration. Organ zat on and management of the schoo brary ts back gr u ds serv ces funct o s personne mater a s and equ pment Prerequ s tes LS 423 440 461 and 4 1 Cred t 3 hours

511 Advanced Cataloging. P b e ms re ated t contemp rary cata og r g ts struct re and pur p se as a funct on of b b og aph ca ontro Prerequ s te S 440 Cred t 3 h urs

522 Advanced Reference Resources Cr t a eva uat n f ti e m st fre j ert y used eference ater a n h ar t es ces ar d a c ences Prerequ s te S 471 Cred t 3 hours

531 Instructional Materials Centers. Organiza t or and management of the bra y as an nte gra part of an nstruct ona mater a s center P e eq te L L a y Sc en e n nor Cred t h urs

533 Current L brary Problems Profe s ona ead ng and d scuss or on cu r ent ssues n brar ansh p as re ated part ar y t per v s n n schoo d str cts Prerequ s te LS 481 r appr va f nstru to Cred t 3 hours

Special Courses: See pag s 46 47

College of Engineering Sciences

LEE P. THOMPSON, PH.D.
Dean

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 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 career but also will develop character, judgment, ideals, breadth of view, and general culture. Students are prepared to live and work with the recognition that their efforts will cause change and that they must accept responsibility for the social consequences of their efforts.

Organization

The College of Engineering Sciences is organized to offer the following programs:

Division of Agriculture

AG INDUSTRY: Agribusiness Management, Agribusiness Operations, International Agriculture.

BIO AGRICULTURAL SCIENCES: Nutritional Sciences, Physiological Sciences, Pre-Veterinary Medicine.

ENGINEERING OF AGRICULTURAL SYSTEMS.

ENVIRONMENTAL RESOURCES IN AGRICULTURE: Environmental Horticulture, Quality of Agricultural Environment, Renewable Resources and Conservation.

Division of Construction

CONSTRUCTION OFFICE OPERATIONS.

ELECTRICAL CONSTRUCTION.

EQUIPMENT AND MATERIALS DISTRIBUTION.

HEAVY CONSTRUCTION.

INDUSTRIAL CONSTRUCTION.

MECHANICAL CONSTRUCTION.

SYSTEMS BUILDING.

School of Engineering

CHEMICAL AND BIO ENGINEERING (KE): Chemical Process Engineering, Biomedical and Biochemistry Applications, Computer Applications, Environmental Control, Materials, Mathematical Modeling, Nuclear, Optimization and Plant Management, Simulation and Control.

CIVIL ENGINEERING (CE): Construction, Environment, Geotechnics, Structures, Urban Systems, Water Resources.

ELECTRICAL ENGINEERING (EE): Antennas and Microwaves, Applied Math, Bioengineering, Communications, Computer Languages, Controls, Digital Circuit Design, Digital Systems Design, Lasers and Coherent Optics, Networks, Power Systems and Machinery, Solid State Electronics.

ENGINEERING SCIENCE (ES): Astronautics and Aeronautics, Bioengineering, Computer Science, Engineering Mathematics, Engineering Mechanics, Engineering Science, Industrial Systems, Information Systems, Materials Engineering, Measurement Systems Engineering, Nuclear Engineering, Operations Research, Physical Metallurgy, Urban Systems Engineering. Also Business and Pre-Law, Education, Pre-Medical, Public Administration, Social Systems.

INDUSTRIAL ENGINEERING (IE): Computer Science, Industrial Systems, Information Systems, Operations Research are offered as undergraduate patterns in Engineering Science.

MECHANICAL ENGINEERING (ME): Aerospace, Biomechanical, Computer Methods, Controls and Measurement Systems, Design, Energy Conversion and Power Systems, Environmental, Nuclear, Thermosciences, Vehicular Engines.

MECHANICS, MATERIALS AND MEASUREMENT ENGINEERING (EM): Acoustics and Noise Control, Astronautics and Aeronautics, Biomechanics, Continuum Mechanics, Engineering Mechanics, Engineering Mathematics, Engineering Science, Geophysical Fluid Mechanics, Materials Engineering, Measurement Systems Engineering, Physical Metallurgy, Vehicle and Structural Mechanics

Division of Technology

ENGINEERING TECHNOLOGY

AERONAUTICAL ENGINEERING TECHNOLOGY

ELECTRONIC ENGINEERING TECHNOLOGY Electrical Power Systems, Electronic Computers, Industrial Controls and Measurement.

MANUFACTURING ENGINEERING TECHNOLOGY Machine Tool, Welding.

MECHANICAL ENGINEERING TECHNOLOGY: Design, Management.

INDUSTRIAL TECHNOLOGY

AERONAUTICAL TECHNOLOGY Aerospace, Air Transportation, Air Transportation Management

ELECTRONICS: Communications, Industrial, Electro Technology, Instrumentation and Control, Microwave Electronics, Power Systems and Distribution, Video Systems

GRAPHIC COMMUNICATIONS Communications Graphic Arts

INDUSTRIAL DESIGN

INDUSTRIAL DESIGN Product Design, Graphic Design.

MECHANICAL DESIGN Gerber, Agricultural.

TECHNICAL MANAGEMENT

INDUSTRIAL TECHNICAL EDUCATION

INDUSTRIAL ARTS EDUCATION Extended Major, Major, Minor.

INDUSTRIAL TRAINING AND SUPERVISION: Safety, Fire Science, Health, Industrial Technology, Business, Engineering Technology

TECHNICAL TEACHER EDUCATION Aeronautics, Electronics, Graphics, Manufacturing.

Research Center

The Research Center provides an opportunity for students in all fields of study at both the undergraduate and the graduate level to augment their coursework with both theoretical and applied experiences.

Degrees

Baccalaureate Degrees. The completion of a four-year program of study in agriculture, construction and technology leads to the degree of Bachelor of Science (BS). The completion of a four-year program of study in engineering or engineering-based interdisciplinary programs leads to the degree of Bachelor of Science in Engineering (BSE) or Bachelor of Science (BS).

Integrated BSE-MSE Program. (For Engineering Students Only.) To provide greater opportunity for highly qualified students, they may undertake a program which provides an integrated fourth and fifth year sequence of study in one of several fields of specialization in engineering. This gives the student an opportunity to meet the increasing demands of the profession for graduates who can begin their engineering careers at an advanced level.

Students admitted to this program are assigned a faculty committee to supervise a program of study in which there is a progression in the coursework and in which earlier work is given application in the later engineering courses for both the Bachelor's and Master's degree. Entry into the integrated program will require an application submitted to the Dean through the faculty adviser and the Chairman. Applications will be reviewed by a college committee which will recommend the appropriate action to the Dean. The application may be submitted in the fifth semester.

Master of Science in Engineering Degree (MSE). The Master of Science in Engineering degree is awarded upon successful completion of prescribed graduate level coursework, engineering projects and research endeavor. Entry into this program normally requires a Bachelor's degree from an accredited engineering program.

Master of Science Degree (MS) (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 and research endeavor.

Master of Science Degree (MS) (Agriculture). This program provides competent students with opportunities to specialize in study areas designed to serve the needs of agriculture in relation to business and industry.

Master of Science Degree (MS) (Technology). This program provides both the technical background and the professional education experience for post-secondary technical teachers.

Doctor of Philosophy Degree (PhD) (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 of this catalog.

General Information

Definition of Terms. The terms used in this College to describe offerings are defined below for purposes of clarity.

PROGRAM OF STUDY A broad term describing the complete array of courses included in the study leading to a degree Example engineering, industrial technology, construction, agriculture.

FIELD OF SPECIALIZATION A specialized group of courses contained with n the program of study Example· program of study engineering, field of specialization mechanical engineering, Example program of study agriculture; field of specialization bio agricultura sciences.

AREA OF EMPHASIS OR PATTERN An elective select on of courses within a field of specialization Example field of specialization me chanical engineering; area of emphasis aero space Example field of specialization engi neering sc ence; pattern bioengineering

Admission. Students who wish to be admitted to full freshman standing in the College of En gineering Sciences should present certain secondary units which are specified in the require ments of the Divisions and the School of Engineering Students who have omissions or defi ciencies in secondary school subject matter preparation may be required to complete addit onal university credit coursework which may not be applied toward their degree Because of the expanding international opportunities for graduates of the programs offered in this College, it is recommended that all students interested in these programs take at least two years of a foreign language in high school

Transfers. Credit s granted for transferred courses which are substantially equivalent to corresponding courses in the selected program of st idy, subject t grade ird sen of residence requirements. Credits will be accepted by trans fer from a junior college to meet lower division requirements only. It should be noted that some courses taken in other colleges or univer sities or in other colleges of this University may be acceptable for general University credit but may not be acceptable toward the degree requirements of this College. Determination of those courses acceptable to a specific degree program will be made within the appropriate Division or School with the approval of the Dean

Advisement and Counsel. For assistance and co insel in planning a program of study, each student will be assigned a faculty advisor who is familiar with his chosen field of special ization In addition, a student adv sement coordinator is available to all students for counsel and assistance

English Proficiency Requirement. English proficiency is expected and may be satisfied by completing EN 102 or EN 104, however, 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 sup plementary work, including additional course work, consistent w th the needs of the student The gr inting of a degree may be delayed until the work is completed satsifactor ly

Pass-Fail Grades. Students enrolled in the College of Engineering Sciences must take all courses on a graded basis in fulfillment of degree requirements

Entry into Upper Division Courses. Prior to enrolling in courses at the 300 level and above, all students in good academic standing must secure the approval of their advisor Students who are not in good academic standing must secure the appr val of their advisor *and* Divi sion Director of Faculty Chairman Students whose grades in 300 level courses are unsatis factory may be required to retake one or more courses for which credit has previously been granted

Academic Honors. Students who maintain a 3.0 or above cumulative index are awarded, at the College Honors Convocation, a Certificate of Scholastic Excellence, and or are listed in the Honors Convocation program. Students completing baccalaureate degree requirements will receive the appropriate Honors designations on their diplomas consistent with the requirements specified by the University.

General Studies

Higher education should provide the student not only with c mpetency in his chosen sub ect f eld, but also with experiences which facilitate the student's gr wth in abi ity to perceive significant relationships, to make ntell gent value judgments, to express himself with ease, clarity and good taste, and to develop the qualities c f character and personality requi site for a successful career. The development of mora , ethical and social concepts, along with a sound professional attitude, is re quired 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 advisor to provide planned sequences and to place emphasis on the interrelationships that exist among fields of knowledge.

The General Studies requirements for students in the College of Engineer ng Sciences include *approv ed* selections made from the areas of study listed below Students in the Divisions of Agri culture, Construction, and Technology should co nsult their advisor for a list of approved selections *Students in the School of Engineering* should make selections as approved by their advisor in accordance with the additional provisions given under *General Studies* in the *Scho ol / Engineer ng*

	Semester Hours
BEHAVIORAL AND SOCIAL SCIENCES	6
Aerospace studies, anthropology, business administration, cultural geography, economics, education, educational and social and philosophical foundations), engineering, health education, history, home economics, mass communications, military science, political science, psychology (PX courses only), sociology.	
HUMANITIES AND FINE ARTS	8
Architecture, art, dance, theatre, English, foreign languages, interdisciplinary humanities, music, philosophy, speech.	
SCIENCES AND MATHEMATICS	8
Agriculture, botany, chemistry, engineering, geology, mathematics, physical geography, physics, psychology (PY courses only), zoology.	
GENERAL STUDIES ELECTIVES	12

General Studies in the School of Engineering. The humanities and social science requirements for students pursuing a baccalaureate program in engineering are more closely structured than for other degree programs, as follows:

1. Total hours required for humanities and social studies 17
2. A minimum of 8 semester hours in humanities and 8 semester hours in social sciences is required
3. It is required that at least 6 of the 17 semester hours total be 300- or 400-level courses
4. It is required that the student select a two-course sequence (6 hours or more) from either Group A or Group B listed below and at least one course (3 hours or more) from the other Group (A or B). The sequence cannot include EC 201.
5. EC 201 Principles of Economics is a *required* selection in the social studies category
6. Special interests of the students may be satisfied by selection of the remaining hours from Groups A, B, C, or D (subject to requirement No. 3)
7. Sciences, Mathematics and the General Studies Electives requirements are met by the Engineering Core

GROUP A:

Humanities and Fine Arts

Art History: AH 101, 102

Architectural Philosophy: AP 100, 301, 312, 313*, 314*

English: EN 103, 201, 202, 221, 222, 358

Humanities: HU 101, 102, 301*, 302*, 402

Music: MU 107

Philosophy: PI 301, 302, 303, 304

GROUP B:

Behavioral and Social Sciences

Anthropology: AN 102, 322, 323, 331*, 332*, 333, 351*, 416*, 479

Civil Engineering: CE 371, 471

Economics: EC 201, 202

Educational Foundations: EF 111, 333, 411, 422

Educational Psychology: EP 310

Engineering Science: ES 402, 403

Cultural Geography: GC 121, 141, 361, 364, 401, 44

History: HI 100, 101, 102, 103, 104, 303*, 304*, 305*, 306*, 343*, 344*, 409, 410

Mass Communications: MC 120, 314

Mechanical Engineering: ME 201, 300, 301, 302, 401

Political Science: PS 100, 200, 250, 260, 420, 425, 426, 427, 43)

Psychology: PX 100, 315, 341, 350, 414

Social and Philosophical Foundations: SF 411, 422

Sociology: SO 301, 322, 333, 351, 352, 360, 410, 415, 440, 483

(*Recommended sequence of courses)

NOTE. Students with a good high school background in American and western civilization history are encouraged to take eastern civilizations or Latin American history.

GROUP C:

Humanities and Fine Arts

Any AH, AP, HU course.

Any EN course except 101, 102, 104, 111, 112, 21, 2, 2, 471, 480, 485

Any Foreign Language literature course in the 300 series.

Any MP (Music Performance) course, 300 level or above, except repeated for credit courses.

Any MU course except 100, 101 and teaching methods.

Any PI course except 104.

Speech Communications: SC 20, 214, 300, 310, 312, 400, 411.

Any TH (Theatre) course except 1, 3, 2, 3, 313 and repeated for credit courses

GROUP D:

Behavioral and Social Sciences

Any Anthropology (AN), Cultural Geography (GC), Educational Foundations (EF), Social and Philosophical Foundations (SF), History (HI), Political Science (PS), Psychology (PX) course. Any Sociology (SO) course except 271, 305, 390, 491, 494

Division of Agriculture

R. R. Christensen, D.V.M., Ph.D., *Director*

Purpose

The Division of Agriculture provides the foundation for professional development in four fields of specialization: ag-industry, bioagricultural sciences, engineering of agricultural systems, and environmental resources in agriculture. Bioagricultural sciences and environmental resources in agriculture have a scientific orientation, whereas ag-industry and engineering of agricultural systems are functional, industry-oriented fields. The more traditional study of the life cycle of animals and plants is expanded to include analysis of the effects of environment, either to enhance or inhibit desired production of a particular agricultural organism. The ag-industry field focuses on the operational functions and management of the broad spectrum of agriculturally related industries from the supply of resources and services needed by producers of agricultural commodities, to the processing and marketing of raw agricultural products, to the management of food and fiber processing plants. The multidisciplinary curricula integrate the fundamentals of physical, biological and social sciences with mathematics, engineering and business and broaden the student's scope within either (a) modern, agricultural science and environmental resources, or (b) relevant ag-industry. Unique opportunities are available to study the relationship of agriculture to warm, arid climatic conditions and to the rural-urban interface.

The Division also provides relevant agricultural courses for those already in ag-industry positions but who have had little or no college-level work in agriculture, as well as for those enrolled in other colleges and departments who are planning to go into ag-industry positions.

Organization

The Division of Agriculture is composed of students, faculty, administrators, staff and physical facilities including the ASU Field Laboratory. The subject matter is organized in the following manner: ag-industry, bioagricultural sciences, engineering of agricultural systems and environmental resources in agriculture. These fields of specialization involve areas of emphasis described below from which a student is to make selection.

Degrees

Bachelor of Science (B.S.). A minimum of 120 semester hours of credit, including University General Studies, the Division and field courses, and area of emphasis courses lead to the Bachelor of Science degree. Forty percent of semester hours required for graduation must be upper division.

Master of Science (M.S.). Curricula leading to the Master of Science degree are offered. Requirements for this degree are given in the *Graduate Catalog*.

Curricula in Agriculture. Curricula in Agriculture include the General Studies requirement, the Division of Agriculture core requirement, the field of specialization core requirement, together with the area of emphasis courses and elective courses to complete the graduation requirement of 126 credit hours. Prior to entering the junior year, each student, with the aid of a faculty advisor, is expected to select a field of specialization and an area of emphasis.

Division Core Courses. All students pursuing a Bachelor of Science degree in the Division will complete the following general core courses:

		Semester Hours
BAE 13	Plant Science	3
BAE 5	Animal Science	3
EAS 325	Statistics	3
EAS 340	Conservation of Agricultural Resources	3
MAE 38	Computer Integration in Agriculture	3
		15

Fields of Specialization with Areas of Emphasis. Four fields of specialization are provided within which several areas of emphasis are permitted. Each field includes a specified core of courses. Further, each area of emphasis will require specialized agricultural courses, a selection of additional hours from a list of supporting courses, and enough electives to complete the program. All of these are to be selected in consultation with an advisor.

AG INDUSTRY: Agribusiness Management, Agribusiness Operations, International Agriculture.

BIOAGRICULTURAL SCIENCES: Nutritional Sciences, Physiological Sciences, Pre-Veterinary Medicine.

ENGINEERING OF AGRICULTURAL SYSTEMS.

ENVIRONMENTAL RESOURCES IN AGRICULTURE: Environmental Horticulture, Quality of Agricultural Environment, Renewable Resources and Conservation.

Ag-Industry. The Ag-Industry field of specialization covers the management and operational functions of the broad spectrum of agricultural industries. These include the supply of resources and services needed by producers of agricultural commodities, the processing and marketing of raw agricultural products and the management of food and fiber processing plants. It is designed to give the student academic knowledge regarding food and fiber production and marketing in a form that can be applied to

the business and operational aspects of agricultural industries. Included in this field are courses to prepare graduates to enter jobs with companies providing supplies to the farm and those who process the products of the farm. It also embodies preparation for government regulatory agencies, quality control specialties and many technical positions related to agricultural production, distribution and food manufacturing.

Students selecting ag industry as a field of specialization are required to take the following courses.

Ag-Industry Core

			Semester Hours
EC	201	Principles of Economics	3
CH	10	Introductory Chemistry	4
AE	312	Agricultural Marketing	3
BA	35	Nutritional Science	3
AE	364	Food Technology	3
AE	402	Farm Cooperatives	3
AE	443	Agribusiness Management	3
AE	453	World Agricultural Resources	3
			25

Areas of emphasis in this field are

Agribusiness Management combines business and agriculture training. It focuses on management techniques applicable to management and operations positions in agricultural industry. It combines business principles with agricultural resource management, thus providing foundations for functional leadership in any agricultural enterprise. Graduates from this area are qualified to enter a broad range of agricultural enterprises and eventually to obtain management status.

Agribusiness Operations is directed toward the operation of today's intensified agriculture. Emphasis is given to the production requirements and an understanding of the latest agricultural practices. Career opportunities exist in operating agricultural production enterprises and in closely related agricultural service industries.

International Agriculture relates worldwide agricultural resources to the food and fiber requirements and production potentials of the various nations. Particular emphasis is given to agricultural production in arid countries and to international trade organizations. This area is specifically designed to train either the U.S. or foreign student to enter the development of agricultural potential in the world. It provides a basic knowledge of the U.S. agricultural techniques and extends to the global aspects of agriculture. Graduates in this area should be particularly qualified to aid the development of the world's agricultural potential to provide food to meet the world's food needs. Jobs exist in the commercial agricultural industry sector, U.S. government agencies and foreign government agencies.

Bio-Agricultural Sciences. The bio-agricultural sciences field of specialization is concerned with the study of the scientific aspects of agriculture. It focuses on the biological functions of domestic animals and plants. These functions include the study of birth, growth, development, nutrition, reproduction and adaptation to the various environmental factors.

Students selecting bio agricultural sciences as a field of specialization are required to take the following courses:

Bio-Agricultural Sciences Core:

			Semester Hour
MA	141	Mathematical Analysis I	4
CH	13	General Chemistry	4
ZO	100	General Zoology	4
CH	23	Elementary Organic Chemistry / CH 33 and 335 General Organic Chemistry 4)	4
CH	30	and 36 Elementary Biochemistry	4
BA	350	Nutritional Science	3
			23

Areas of emphasis in this field are:

Nutritional Sciences concerns the study of nutrients, their requirements, metabolism and uses for animals, plants and man. This area also permits the student to select greater depth of learning in animal nutrition, plant nutrition, or foods for man. It is a broad based nutritional area designed to prepare students for future graduate work or to accept jobs in the agricultural industry, government, or very importantly in solving the food crisis of the world.

Physiological Sciences concentrates on the study of the biological functions and their control in animals and plants. These functions are studied under normal conditions as well as their adaptation to environmental changes and adverse conditions such as stress and disease. This area of emphasis is based on the physiological functions of both animals and plants but does permit selection by the student for greater depth of study in either. It is intended to prepare students for future graduate work or to accept scientifically related jobs in the agricultural industry, medicine, government or colleges.

Pre-Veterinary Medicine is primarily designed to meet the entrance requirements of professional veterinary medical schools in the United States and Canada. Selection of this area will permit students to complete the pre veterinary requirements for entrance to professional veterinary school. It is also designed to provide the completion of all requirements for a Bachelor of Science degree in Agriculture at Ari

zon State University by completing additional credits, if desired. Although this area of emphasis is primarily intended for the student preparing to enter professional veterinary medicine as a career, it is also an excellent basis for future degree programs or many of the scientifically related jobs in the agricultural industry and government.

Engineering of Agricultural Systems.

The engineering of agricultural systems is a field of specialization that combines the engineering sciences with agriculture. Agriculture has become highly automated, particularly under the intensified management systems currently practiced. Engineering knowledge is vital to design and maintain the automated equipment from the planting of the seed to the packaging of processed foods. Graduates can enter a challenging field of engineering with ample opportunities in the agricultural industry or governmental agencies.

Students selecting engineering of agricultural systems as a field of specialization are required to take the following courses:

Engineering of Agricultural Systems Core:

		Semester Hours
CH [illegible]3	General Chemistry (CH [illegible]4 General Chemistry for Engineers	4
	or ES [illegible]8 General Fundamentals of Engineering 4	
MA 2[illegible]	[illegible] Analytical Geometry and Calculus I and	
MA 2[illegible]	Analytic Geometry and Calculus II	5
ES [illegible]	Introduction to Engineering	[illegible]
ES [illegible]4	Engineering Graphics	[illegible]
ES 1[illegible]	Computer Programming	[illegible]
ES 2[illegible]	Mechanics and Heat	4
ES 2[illegible]2	[illegible] Science	4
AI 364	Food Technology	3
EA 326	Soils Laboratory	1
EA 333	Water Resource Quality and Utilization	3
		4[illegible]

Environmental Resources in Agriculture.

Agricultural success depends largely on the available environmental resources, such as air, water, soil and others related to plant and animal life. Variations in these resources, both natural and man made, are considered. Basically, four different environments are identified. These include the rangelands, cultivated croplands, urban landscapes and controlled environments. Students in this field should acquire a fundamental understanding of the functions of air, water, soil and other resources in their relation to plant and animal life. This field is basically designed for students interested in the management of our resources and their role in the environmental crisis.

Students selecting environmental resources in agriculture as a field of specialization are required to take the following courses:

Environmental Resources in Agriculture Core:

		Semester Hours
BO [illegible]	General Botany	4
MA [illegible]41	Mathematical Analysis I	4
CH [illegible]3	General Chemistry	4
EA 326	Soils Laboratory	
EA 3[illegible]	Soil Fertility	3
EA 352	Agricultural Chemicals	3
EA 333	Water Resource Quality and Utilization	3
EA [illegible]	Environmental Horticulture	3
EA 44[illegible]	Crop P[illegible]	3
EA 448	Plant, Soil and Environmental Quality	3
		3

Areas of emphasis in this field are:

Environmental Horticulture is designed to help beautify the areas around homes, gardens, industry and the general landscape. Increased urbanization results in a very different plant population than existed on farms. The lawns, shrubs, trees, flowers and home gardens involve specific requirements for plants, seeds, fertilizers, pesticides and machinery. Specialized plant knowledge by the homeowner as well as for trained nurserymen and individuals skilled in plant maintenance and landscaping is required. Public areas, particularly parks and golf courses, require skilled management by superintendents. Production of crops in climate controlled greenhouses is emphasized as an important agricultural enterprise in arid and urban areas. Skilled production in small areas, be it for food, beauty or recreation, is the focal point. Graduates of this area are particularly qualified for employment in nurseries, parks, and greenhouse enterprise.

Quality of Agricultural Environment is a technical area for the student who wishes to involve himself in the measurement of the quality of various environmental factors, including known waste products, and the evaluation of these factors within the agricultural sector. Identifying and evaluating agricultural hazards as a prelude to their alleviation is a challenging field for the future. Graduates in this area should be particularly qualified to enter industrial, urban and government jobs to evaluate the environmental factors of the future.

Renewable Resources and Conservation covers the wise management of the existing natural resources which are of great value to both the rural and urban populations. Students planning to enter forestry school should choose this area to complete their two year pre-forestry curriculum. Students who wish to enter the resource conser

vation field or rat gc management of the indus trial or government sectors should choose the entire four ye u program

Agriculture

Professors:
CHALQ EST AG 221 BARRETT
M L ER MOODY R CHARDSON ROB NSON
STILES TAYSOM
Associate Professors:
LYTLE MONTY RASMUSSEN

AG-INDUSTRY

AI 236 Agricultural Pract ces. S perv sed ex per e ce p ant ng feed ng breed ng and n anag g agr t ra c n mod t es One e t re 3 hours ab rat y C ed t 2 rs

262 Equitation. Car e e t and r g a d r d ng of horses O e ecture 3 hou rs ab ra tory May be epeated for cred t Cred t 2 hours.

300 Livestock Production and Management. Methods of produ t o vest ck enterpr ses econom c oss prevent on and market ng Pre requ s te BA 150 Cred t 3 hours

312 Agricultural Marketing. An verv ew of commod ty market ng arrangements f r produc ers Credit 3 hours

325 Farm Power and Mechanization. Mechan ca so ut ons t agr cu tura pr duct n prob ems n the U a d abroad together w th selec t on eva uat fie d operat on and serv c ng of produ t on harvest ng and pest contro equ p ent Two ectures 3 h urs aboratory Cred t 3 hours

333 Agribusiness Purchasing. W rk ng w tl supp ies for agr business nc ud ng standards nventor es and rec rds Cred t ho rs

342 Field Crops. Latest te hn ques produc ng arvest ng and ut z ng the maj r f e d cr ps w th emphas s on th se grow under rr gated env ro ments Prerequ s te BA 130 Two ectures 3 hours aboratory Credit 3 hours

343 Fruit and Vegetable Crops. Product on of cr ps n f e ds orchards v neyards and green h uses Emphas s on subtrop ca fru ts and w nter vegetab es Prerequ s te BA 130 Two ectures 3 hours aboratory Cred t, 3 hours

344 Forage Crops. Producti n and storage of forage rops pasture management and the p ace of f rage crops n rotat ons and s c nserva tion Prerequ s te BO 100 Two ectur s 3 ho irs aborat ry Cred t 3 hours

350 Livestock Marketing. A descr pt ve ana y s s f vest ck n arket ng channe s fur ct r s a d tre ds assoc ated w th an ma market ng and pr c ng operat or s Prerequis te A 312. red t 3 hours

351 Livestock and Carcass Evaluation. Eva ua t n of the phys a appearance of vest ck a d carca e wo ectures f urs ab ratory Cred t 3 h irs

363 Veterinary Practices Observat n f and part c pat o n veter nary n ed c e a d su gery s perv sed by oca v-ter nar ans Four f i per week w th vete nary p act t one p o e ur per week sem ar Op n t ad var ced pre veter nary tude ts n y Cred t 2 I ou s

364 Food Technology. Process ng and preser vat n f food pr d icts wo ectures 3 hour ab ratory Cred t 3 f ours

372 Horse Production Pr d t on feed ng b eed and n a agen t t of h rses Pre eq i te BA 15 Cred t 2 f ours

375 Horse Breeding and Management. C ns d ers curre t meth ds of mpro ng genet c tra ts ar d reprod i t ve erf rma ce of h rses Tw e tures h t s ab atory Cred t 3 hours

376 Horse Feeding and Nutrition. Rat n f rmu at on and ıutr ent requ rements for gr wth and reprodu t n of h rses C ed t 2 h urs

380 Government Regu ations n Agriculture. Des r pt o f government age ıc es the r for ıat on and adm n strat n of regu at ns af fect g agr cu ture Cred t 3 h ur

402 Farm Cooperatives. Orga zat on opera t on and management of agr c tura coopera t ves Cred t 3 hours

403 Agribusiness Public Relations. Aspects of the mage of agr c ı ture nc ud ng ns dera t on f the agr cu tura press Prerequ s te A 312 Cred t hours

430 Range Livestock Management. Operat on and management of beef catt e and sheep n ra ıge area emphas z g ar d range cond t ons P ereq s tes EA 338 Al 300 Cred t 3 h urs

431 Intensified Livestock Management. Pr nc p es operat ons and management techn ques n h gh de ty an n a gr w ng un ts Prerequ s te A 3 Tl ree ectures 3 h urs aborat ry Cred t 4 h r

432 Feedlot Management. Managen ent aspects f feed t operation ase stud es and manage ment pr b em ana ys s w be c uded Cred t 3 h urs

440 Food Manufacturing and Distribution. Pr n p es f f od pr duct f mu ation packag ng ar d d str but on Prerequ s te A 364 Cred t, 3 h ır

443 Agribusiness Management. App at on f anage ı er t pr p e t agr tura y r ented l esses Cred t 3 h ı

444 Agribusiness Analysis. dent f es the s ze pe and rgan zat o of the var ı s agr cu tura y r ented ndustr es Cred t 3 hours

445 Crop Production and Management. Crop r duct n factors and the r app cat n to farm n a age ent Crop p a s are repared f r cr p pr duct on enterpr se Prerequ s te s x hours f rops courses Cred t 3 h urs

453 World Agricultural Resources. Wor d pro duct on and co sumpt on f agric tura products nternat a re at onsh ps and agenc es con cerned w th wor d agr cu tura deve opment prob ems Cred t 3 hours

454 International Agricultural Trade. D men s ons o at ns m x meth ds and changes of n ternat ona trade n agr cu tura products Cred t 3 hours

457 Animal Production in Arid Regions of the World. Se ect on nutr t on market ng and

ut ızat on of an ma s ın ar d countrıes Cred t 3 h urs

458 Crop Production in Arid Regions of the World. mportance of the major f e d crops n ar d c mates of the wor d and the r potent a for supp y ng the future need for food and f ber Cred t 3 hours

459 Soil Management in Arid Regions of the World. So sc ence and soıl management prac t ces for ma ntenance of the fert l ty reservo r phys ca cond t on and product vıty as related to ti age rr gat on and conservat on n ar d reg ons Cred t, 3 hours

495 Recent Advances in Agribusiness. Reports and discuss ons of current top cs and prob ems assoc ated wıth agrıbus ness Cred t, 2 hours

496 Recent Advances in International Agriculture. Reports and discussions of current top cs and prob ems assoc ated w th nternat ona agr cu t re Cred t 2 hours

508 Advanced Agricultural Marketing. Theory and ana ys s of market ng farm c mmod tıes. Cons ders r sks and effect of future trad ng on cash prices Credıt 3 hours

510 Advanced Agribusiness Management. Rev ew of management funct on ın agr bus ness Case stud es and prob em analys s w be nc uded Prerequ s tes MG 301 or A 443 Credit 2 hours

515 World Food Biodynamics. Trans tıon and de ve opment of raw agr cu tura commodıt es ınto nutr t ona food products usefu to man s con tınued surv va Credıt 3 hours.

516 International Agricultural Techniques. Coord nat on of productıon and market ng tech n ques to consumpt on object ves w th agr cu tura products ın fore gn countrıes Credit 3 hours

518 Agricultural Development in Arid Countries. Factors that nf uence productıon processıng and market ng of agr cu tura products ın arıd countrıes Credıt 3 hours

BIO AGRICULTURAL SCIENCES

BA 130 Plant Science. Pr nc p es of p ant growth and development n the rura and urban env ronment Two lectures 3 hours aboratory Cred t 3 hours.

150 Animal Science. Comparat ve growth de ve opment and propagatıon of farm an mals Two ectures 3 hours aboratory Cred t 3 hours

350 Nutritional Science. Energy and nutr ents n v ng systems Cred t 3 hours

351 Nutritional Science Laboratory. Experımen ta tr als nvo v ng the pr nc p es of nutrıt on and the physıo ogıca roles of nutr ents ın me tabo sm Corequis te BA 350 Three hours ab oratory Cred t 1 hour

353 Applied Anımal Nutrition. Feedstuffs feed ng standards and their app cat on n n eet ng nutr t ona needs of an ma s produc ng food and f ber Prerequ site BA 350 Cred t 3 hours

360 Crop Physıology. P ys o gy of crop p ants as nf uenced by cu tura pract ces and env ronmenta factors Prerequ s te BA 13 Cred t 3 hours

452 Monogastric Nutrition. Concerns nutr ent requ rements ut zatıon and metabo sm ın monogastr c an ma s Prerequ s te BA 350 Cred t 3 hours.

453 Ruminant Nutrition. Metabol sm of rat ons and their fermentat on products Prerequ site BA 350 Credıt, 3 hours

454 Physiology of Nutrition. Metabo sm of nu tr ents n the fe processes Prerequ s tes BA 353 CH 361 or equ va ent Cred t 3 hours.

456 Animal Breedıng. Genet cs app ed to an ma breed ng Prerequ sıtes ZO 100 Bl 340 or ZO 341. Cred t, 3 hours

460 Animal Physıology. Contro and funct ons of the phys o og ca systems of domest c an ma s Prerequ s tes BA 150 CH 113 ZO 100 Three ectures 3 hours laboratory. Cred t, 4 hours

461 Endocrinology. Funct ons of the endocr ne glands n the regu at on of an ma phys ologı- ca processes Prerequ s te BA 460 or ZO 360 Cred t 3 hours

462 Adaptation of Domestic Animals. Phys o log ca morpho og cal, genetıc and behav oral adaptat on of domest c anıma s to the r env - ronment Prerequ s te BA 460 or ZO 360. Cred t 3 hours

463 Physiology of Animal Reproduction. De ve opment funct on and contro of the reproduct ve system of domest c an ma s Prerequ s tes BA 150 CH 113 ZO 100 Cred t 3 hours

471 Diseases of Domestic Animals. Contro and prevent on of ınfectıous and nonınfect ous d seases of domest c an mals Prerequ sites BA 460, M 201 Cred t 3 hours

472 Diseases of Wild Animals. Indent f cat on and contro of nfect ous dıseases of wı d an n a s Prerequ s tes BA 460 or ZO 360, MI 201 a so preferred Credıt 3 hours.

495 Recent Advances in Nutritional Sciences. D scuss on and cr t ca eva uat on of current top cs n nutr t on and metabo sm research Cred t 2 hours

496 Recent Advances in Physiological Sciences. Discussıon and cr tıca eva uat on of current top cs n phys o og cal research Cred t, 2 hours

557 Advanced Animal Physiology. Advanced concepts of the control and functıon of phys o og cal processes Prerequ s tes BA 460 and BA 461 Credıt 3 hours

564 Experimental Physiology. C ass ca and modern techn ques of physıo og ca ınvestıga tıon Prerequısite BA 460 Two ectures, 3 hours aboratory Cred t 3 hours

ENVIRONMENTAL RESOURCES IN AGRICULTURE

EA 325 Soils. Fundamenta propert es of so s the r re at on to plant growth and the nutr t on of man and an ma s Re at on of so s to env ronmental qual ty Prerequ s te CH 101 or 113, or equıva ent Cred t 3 hours.

326 Soils Laboratory. Se ected exerc ses to br aden the backgro ınd and understand g of bas c so prıncıp es Corequis te EA 325 T ree hours aboratory Cred t 1 hour.

330 Soil Fertility. Use of fert zers crop

rotat ons and water n the management of so s Prerequis te: EA 325. Two ectures 3 hours ab- oratory Credit 3 hours

331 Agricultural Utilization of Rural and Ur ban Wastes. Prob ems of waste d sposa and their solution by us ng so and crop produc tion as the recyc ng system Cred t 3 hours

332 Agricultural Chemicals. Compos tion, prop ert es and use of agr cu tura commerc a fer t l zers and pest c des and the r effects on soi , a r and water qua ity. Prerequis te EA 325 Cred t, 3 hours

333 Water Resources, Quality and Utilization. Sources, supp ies and water resource deve op ment emphas z ng ar d regions Water qua ity and water ut lizat on n agriculture and urban areas soc a and lega considerat ons of water resource use and conservation Cred t 3 hours.

338 Range Management. mprovement and ut - zat on of range and Prerequ s tes BA 150 BO 1 0 Credit 3 hours

340 Weeds and Weed Control. dent f cat on of weeds and methods of contro n re at on to the env ronment Prerequ s te. BO 100 Two ec tures 3 hours aboratory Cred t, 3 hours

346 Conservation of Agricultural Resources. Developing an understand ng of the re at on- sh ps of agr cultura resources Credit 3 hours

380 Environmental Horticulture. Plant cu ture and use in urban agriculture Prerequ s te· BA 130 Credit 3 hours

381 Plant Propagation. Pr nciples and sk s n propagat on of p ants using seeds cuttings and grafting Prerequisite BO 100 Two ectures 3 hours aboratory Cred t 3 hours

382 Lawns and Greens. Selection, establish- ment and ma ntenance of turf grasses for awn park and sports areas Two ectures, 3 hours aboratory Cred t 3 hours

383 The Science of Home Gardening. Use of natura systems in food product on Two ec tures 3 hours aboratory Cred t, 3 hours

438 Advanced Range Management. Spec a ized prob ems in sc ent f c range adm n stration and management. Prerequ s te EA 338 Cred t 3 hours

440 Crop Ecology. Env ronmental factors affect ing the adaptat on and d stribut on of crops Prerequis te. BA 130 Cred t 3 hours

446 Soil Conservation. So conservation and ts relat onsh p to renewab e resources Prerequ - site EA 325. Cred t 3 hours

448 Plants, Soils, and Environmental Quality. Effects of air qua ity on p ants and so ls and the role of p ants and so s in remov ng undes rab e contaminants from the atmosphere Cons derat on s a so given to the prob em of concentrat ng contam nants n food cha ns Prerequisite. EA 325. Cred t, 3 hours

463 Hydroponics and Greenhouse Management. Princip es and techn ques of grow ng p ants nutr ent cu ture under control ed env ronmenta cond t ons Prerequ site EA 325 Two ectures 3 hours laboratory Cred t 3 hours

495 Recent Advances in Environmental Re- sources. Current terature and s gn f cant deve opments nvo v ng environmenta resources Prerequ s te 12 hours of re ated cou rses Cred t, 2 hours

503 Advanced Soil Science. Pr nc p es of so chem stry so physics and so m crobio ogy and the r nteract on n deve opment and f nc t oning of so systems and other p ant growth media Cred t, 3 hours

510 Photosynthesis and Environmental Quality. Environmental effects on plants emphasiz ng methods of measurement and mod f cat on through changes n rate of photosynthes s Two ectures 3 hours aboratory Cred t 3 hours

515 Environmental Effects on Plants. An n depth study of the response of p ants to contaminants n the env ronment from a r so l and water sources, and the economic eva uat on of p ant njury caused by contam nants Cred t 2 ho irs

Division of Construction

Purpose

Degree programs in construction meet a literal revolution i the processes by which man con- structs his world. Although the construction industry has long been a leader of the economy in terms of size, growth, complexity and talent employed, education for this diversely technical, entrepreneurial and professional field has only recently been unified and brought to operational status as a separate and independent academic discipline.

The advantage of this approach is that con str iction can be treated as an aggregated manage- ment and techn ical process having economic, social and ecological breadths well beyond basic technical fundamentals. The central purpose re- mains, as it has sin ce 1957 it Ar zona State University to prepare students directly for posi tions of functional responsibility and leader- ship in the f eld

Toward these ends instructional programs have developed from fundamental architectural, busi- ness, construction and engineering curricula, with the counsel of advisory groups representing leading associations of builders and contractors, to ensure a balanced understanding of the philo sophic, technical and professional standards wh ch distinguish modern-day constructors and bui ders.

General Information

Scholarships. Apart from those given by the U niversity generally, a number of scholarships are awarded from the construction industry on the basis of work done in the construction program.

Externship (Work-study). As an adjunctive part of the program, participating contractors

and builders may provide summer jobs and offer part time or work-study arrangements to aid and encourage students to augment classroom theory with practical work experience

Bachelor of Science Degree in Construction

Students seeking a Bachelor of Science Degree in Construction must satisfactorily complete a curriculum of not less than 130 hours Those students who have omissions or deficiencies in subject matter preparation may be required to complete additional university credit course-work which may not be applied toward a construction degree One or more of the courses CH 113; EN 101; MA 117, 118, PH 111 are usually taken to satisfy omissions or deficiencies

Construction careers are so broadly diversified that no single curriculum will entirely fit the student for universal entry into all fields As an example, engineering contractors usually place heavier emphasis on technical and engineering science skills than do housing industry employers who prefer a greater depth of knowledge in management and urban science Nevertheless, construction has a common behavioral, management and engineering science core upon which students may build defined fields of specialization to suit individual backgrounds, aptitudes and objectives These fields of specialization are not absolute but generally match major divisions of the construction industry.

Fields of Specialization:

Construction Office Operations
Electrical Construction
Equipment and Materials Distribution
Heavy Construction
Industrial Construction
Mechanical Construction
Systems Building

(Should the student be undecided as to his career pattern, the Heavy Construction curriculum option is recommended as permitting perhaps the greatest flexibility of later choice)

Each field of specialization is arranged to develop management, leadership and competitive qualities in the student and accents requisite technical skills. Prescribed are a combination of General Studies, a broad range of theoretical and applied management science subjects fundamental to the business side of contracting, and structured technical patterns basic to the execution of engineering and architectural construction work Not only must the student be educated to survive heavy demands for explicit technical performance during his initial career years he ought also to understand the functions of his employers and the industry whose agency he serves, and, for the long run to have achieved a pattern of self growth and learning which, when combined with experience, will qualify him for positions of eventual administrative judgment and authority

Students in all fields of specialization except office operations will be required to complete a core of science based engineering and management courses. Since the credit hours vary for some alternative courses in the core, any differences will be made up in the required courses in the selected option to achieve a minimum of 130 hours

Construction Core

(For All Fields of Specialization Except Office Operations)

			Semester Hours
MA	2	Analytic Geometry and Calculus	5
MA	121	Analytic Geometry and Calculus	5
ES	104	Engineering Graphics	2
ES	20	Mechanics and Heat	4
ES	202	Electrical Science	4
ES	32	Engineering Mechanics (Dynamics) or ID 36 Applied Dynamics	3
ES	341	Probability and Statistics for Engineers or QS 271 Quantitative Analysis and Statistics	3
ES	401	Engineering Communications	3
EC	231	Principles of Economics	3
EC	232	Principles of Economics	3
AS	35	Business Law	3
AC	111	Elementary Accounting	3
CE	241	Surveying	3
CO	26	Construction Analysis	2
CO	321	Static Mechanics	3
CO	243	Systems Building Design or KE 211 Chemical Process Calculations	3
EE	313	Electrical Construction Fundamentals or ES 330 Electrical Networks	3
CO	323	Strength of Materials	3
CO	331	Construction Safety Engineering	2
CO	344	Mechanical and Electrical Systems or ES 38 Thermodynamics	3
CO	365	Construction Engineering	3
CO	374	Construction Systems Management	3
CO	383	Construction Estimating	3
CO	389	Construction Finance	3
CO	392	Field Study	
CO	4	Construction Operations Analysis	3
CO	453	Construction Labor Management	2
CO	462	Project Planning and Control	3

CO	482	Cost Engineering	3
CO	496	Contract Administration Seminar	3
AP		Introduction to Architecture	2
SP	100	Elements of Speech Communication or SP 3 Principles and Methods of Group Communication	3
		MINIMUM HOURS	93

Construction Fields of Specialization: One field to be elected by the student

CONSTRUCTION OFFICE OPERATIONS. This field of specialization is designed to provide graduates capable of organizing, operating, managing and effecting the unique and demanding systems, procedures and services in both construction field office and general office operations. Included are accounting, procurement, finance, records, labor relations, personnel, statistics, data processing, office methods and services. This field of specialization prepares students for construction office management careers in any type or size construction firm.

Required Courses: AC 101, 102, 201, 202, AP 100, AS 233, 305, 306, 431; CO 128, 243, 331, 365, 374, 383, 389, 453, 455, 456, 496, EC 211, 212, ES 400, MG 355, 434, 455, 463, MA 141, 142; MK 300; OA 355; PH 101, PI 100, PX 100; SP 100 or 300; QS 161, 221, 302, and electives to total 130 semester hours.

ELECTRICAL CONSTRUCTION. The electrical construction field of specialization provides personnel capable of managing the installation and erection of electrical components and systems for the generation, transmission, and distribution of electrical power. Major divisions of this field are: utility plant and line construction; and interior electrical installations for residential, commercial and industrial projects.

Required Courses: ES 312, 330, 340, in the core; MA 212; EE 302, 314, 361, 470; CO 486, EL elective (not EE 313).

EQUIPMENT AND MATERIALS DISTRIBUTION. This field of specialization fills a growing need for graduates capable of specifying, advising and inducing engineering sales to the construction industry. Included are customer design applications, delivery, installation, operation and service investigations for architectural and engineering materials, mechanisms, instruments, components and modular building systems. Of key importance is the solution of ownership, utilization, maintenance and repair problems related to contractor's plant, equipment and heavy machinery.

Required Courses: AS 306; CE 310; CO 424; MK 300, 12 hours Construction, Engineering, Marketing, or Planning electives.

HEAVY CONSTRUCTION. The heavy construction field of specialization prepares students for careers with contracting organizations building transportation, utility, defense, sanitary and other engineered service systems. Typical projects are roads and highways, railroads, airports, irrigation, and rapid transit systems; harbor and waterfront construction, pipelines, dams, tunnels, bridges, canals, sewerage and water works, mass earthwork, and other heavy public works.

Required Courses: AS 306; CE 310, 344, 380, 450, CO 424, 463, 484, MK 300, and Planning elective.

INDUSTRIAL CONSTRUCTION. This field of specialization is structured to provide graduates who can organize and manage the design and construction of capital manufacturing facilities for heavy industry. These facilities are usually erected for the extraction or processing of raw materials. Typical projects include mine and smelter works, refineries and chemical plants; pulp, paper, fiber, and roving mills, pollution and waste recovery facilities, fossil fuel and nuclear power plants; and many other types of producers' works.

Required Courses: ES 312, 330, 340, 381, KE 211, in the core; MA 212, KE 331, EM 355, CE 450, CO 463, 424; ES 364, EE elective (not EE 313).

MECHANICAL CONSTRUCTION. Graduates of the mechanical construction field of specialization fill a growing need for managers with the technical skills to install systems for the environmental control of buildings, including: heating, ventilation, air conditioning, duct work, sanitary and waste piping, and control instrumentation for such facilities. Increasing emphasis is given to systems coordination for more economic building design and construction. Operations often include heavy fabricated piping for industrial plants.

Required Courses: ES 312, 330, 340, 381 in the core; MA 212, CE 311, KE 331, ES 364, ME 382, 486, EM 355; EL elective (not EE 313).

SYSTEMS BUILDING. The systems building field of specialization provides an educational basis for students who wish to follow careers as managers or owners of firms engaged in the construction of residential, commercial and institutional structures. While conventional building is still a major factor in this field, modern educational focus is on industrialized building systems required for the mass development and production of large scale, turnkey projects and structures. Building construction is treated as a complete administrative process from initial conception through delivery of completed facilities to users.

Required Courses: CE 310, 380, 450, CO 424, 463, 471, MK 300, RI 251, 411, and Planning elective.

Construction

Associate Professors:
BURTON M CHELS PETERMAN WARD
Assistant Professor:
WOOD NG

CO 128 Construction Analysis. Plans and spec f cat ons Computat ona and quantity survey techniques Lecture rec tat on, aboratory Cred t 2 hours

221 Static Mechanics. Forces that act on struc tura members Centro ds equ br um, fr ction sect on propert es Prerequ s tes ES 201 MA 121 Cred t 3 hours

243 Systems Building Design. Incorporat on of construct on mater a s nto bu d ng systems Component spec f cat ons and standards Modu zat on and modu ar mathemat cs Graph c analy s s S x hours ecture and aboratory Prereq u s te arch tectura or eng eer ng draft ng and CO 128 Credit 3 hours

323 Strength of Materials. Ana ys s of strength and r gid ty of structura members in res sting app ed forces Stress stra n shear moment def ect ons comb ned stresses connect ons Prerequ s te CO 221 Credit 3 hours

331 Construction Safety Engineering. Econom cs of accident prevent on Hazard ana ysis De s gn for safe f eld pract ce Protect ve equ p ment and dev ces Occupat ona d sease Worker educat on Occupat ona Safety and Health Act R sk management Cred t 2 hours

344 Mechanical and Electrical Systems. Acoustic l ght ng power transportat on and c mate contro systems for bu dings Instru mentation Ut lity, san tary and ndustr a p ping des gn Economic ntegrat on of struc tura and env ronmenta systems Fie d trips S x hours ecture and aboratory Prerequisites CO 243 EE 313. Cred t, 3 hours

365 Construction Methods Engineering. Design and emp oyment of contractor s p ant and equ p ment product on va ue ana ys s crew s zing Work effect veness studies. Qua ity opt mization Lecture and f e d stud es Cred t, 3 hours

374 Construction Systems Management. Organi zation and systems theory for construction. In- dustry funct ons processes and econom cs Soc otechn ca or gins and foundat ons E e ments of eadersh p and human d rect on Credit 2 hours

383 Construction Estimating. Theories and sys tems of bu d ng est mat ng Quant ty survey techn ques standard formats, c ass f cat on and analys s of work, organ zation of deta , un t cost determ nat ons s mulated bids Re qu res a know edge of FORTRAN prior to admis sion Prerequ s tes AC 101 CO 243 Four hours ecture and aboratory Cred t 3 hours

387 Building Construction Estimating. Commer- cia and res dentia bui ding construction esti mat ng Not open to Construct on majors. Credit 3 hours

389 Construction Economy and Finance. Nature of construct on cost nvestment mode s, depre- c at on and tax theory var able equ pment costs Cash flow theory prof tab ty analy s s Fund ng sources and arrangements. Risk Bu der s nsurances Th s course requ res a know edge of FORTRAN pr or to adm ss on Pre requ s te AC 101 Cred t, 3 hours

392 Field Study. Work exper ence or f eld study of an actua construction project The work exper ence requires cert f cat on for 500 hours of acceptab e construct on employment The f e d study requ res a wr tten report of on go ng construct on operat on nc ud ng draw ngs photographs and appropr ate cr t cism May be repeated for cred t upon approva of D vis on Director) Cred t 1 hour

411 Construction Operations Analysis. Project dec s on theory Risk and cont ngency eva ua t on, compet t ve b dd ng strateg es Cost benef t analys s opt m zation theory Prereq uis tes CO 383 389 Corequ s tes CO 365 453 Cred t 3 h urs

424 Structural Design. Econom c use of stee re nforced concrete and wood n bu ld ng and engineer ng structures E ast c p astic and u timate strength design. Prestressed concrete. Student des gn projects Prerequisite: CO 323 Credit 3 hours

453 Construction Labor Management. Un on structure, h story and pract ce emphas z ng bui d ng and construct on trades Work customs and project environments Area product v ty different a s Labor goa s econom c power, jur sdict ona d sputes, gr evance procedures Col ect ve barga n ng government regulat on Lecture and rec tat on. Prerequis te. EC 202 Cred t 2 hours

455 Construction Office Methods I. Adm n s trative systems and procedures for the con struct on company off ce nc ud ng methods mprovement and work s mp if cation off ce ayo it bus ness forms and des gn, office manuals Cred t 3 hours

456 Construction Office Methods II. Adm n s- trat ve systems and procedures for the con struct on company off ce nc ud ng methods im provement and work simp fication, off ce ay out, bus ness forms and des gn off ce manua s Cred t, 3 hours

462 Project Planning and Control. P ann ng and schedu ing of resources and operations Man- power and equ pment al ocat on L near program ming network CPM PERT cost time relat on sh ps Prerequ site CO 411 Cred t 3 hours

463 Foundations and Concrete Structures. Sub s rface construct on theory and pract ce for foundat ons of bu d ngs and eng neered fac t t es Underp nning, pil ng dry and wet excavat ng dewater ng cofferdams ca ssons so l stab zation Concrete form des gn for foun dat ons and structural frames Structura erec t on techniques. Prerequ s te CO 323 Cred t 3 hours.

471 Industrialized Building. Adm n strat ve processes and systems management for urban bu d ng and deve opment Program contro tech n ques. Product on design market ng, econom c and f sca requ rements for mass hous ng Con sumer needs and trends Case studies Prerequi- s te sen or stand ng Cred t 3 hours

482 Cost Engineering. Funct ons of the c n struct r during the research f nance des gn and constr ict on phases of comp ex projects Computer based cost ana ys s and conceptual ost est mation Cost standard synthes s learn ng curves mode s for pr c ng and con tro . Corequ s te CO 462 Credit 3 hours

484 Heavy Construction Estimating. Methods ana ys s and cost est mat on for construct on of h ghways p pe nes, br dges tunne s dams and other eng neer g works Prerequ s tes CE 344 CO 383 or approva of nstructor F ur hours e ture and aboratory Credit 3 hours

485 Mechanical Construction. Est mat ng and construct n methods for p umb ng p pef tt ng heat ng and a r c nd t on ng n b i ding con truct on Prerequ s te CO 383 Cred t, 3 hours

486 Electrical Construction. nd v dua e e tr ca construct on pract cum for resident a commerc a and ndustr a pro ects Mater a s methods and est mat ng Prerequ s te CO 383 Cred t 3 hours

496 Contract Administration Seminar. Case stud es Eth ca practice soc a respons b ty, cens ng c des and p ib c egu at n of c ntra t ng Qua ty contro requ rements Techn ca and f sca fa u e C a ms payments and cha ges Bond g nsurance demn f ca t on proced res Form at on of management c n tracts p e contracts ubcontracts nt vent ire and co s rt um agreements Arbitra t on t gat n and spec f cat on ana ys s Prerequ s te sen or stand ng Cred t 3 hours

531 Economics of the Construction Industries. Deve opment of near programm ng and other types of m de s of the constr ict on ndustr es nclud ng an vest gat on of the types and sources of ava ab e data Ana ys s of the factoi and product markets by use of these mode s Prerequ s tes. CO 411 or EC 4 1 and 402 Cred t 3 hours

532 Construction Project Generation. S c a econo c po t ca eng eeri g and arch tec t ra para neters of the den a d for str ictures a id the r nf ence ipon the dependen y re a t nsh p between onstruct on pro ects Cred t 3 h s

551 Facilities Operation and Maintenance. Ana ys s of ma tenance work Str icture of the ma ntena ce organ zati n Contracts and ega constraints force ac ount econ m cs Ma n tenance des g econom cs Supervis on of oper at ons Cred t 3 hours

577 Construction Systems Engineering. App cat on f the systems approach to the p anning and management of the construct on process in c ud ng the adaptat on of nformat n systems for construction Credit 3 h urs

School of Engineering

I H P Thompson, Ph D , *Dire tor*

Purpose

The Engineering program of study seeks the at tainmer t by e ich graduate of certain bro id ob ec tives It is designed to make effective a philos c phy of education for careers of leadership in app ied science, engineering ind industry. Society's needs in the decades ahead call for er gineering talent on a scale not previously seen Engineering education should, therefore, provide an opportunity for the optimum develop n ent of a wider var ety of activities, aptitudes and interests, including moral, ethical and profess onal concepts Students are expected to acquire a t orough understanding of the fundamentals of mathematics and the sciences and their applications to the various engineer ing f elds. The program is designed to develop a balance between science and system orienta t on in the sub ect matter of eng neering education and an understanding of the econom c and soci l c nsequences of engineering activity The goals ncl ide the promotion of the general we fare of the eng neer ng profession

The courses offered are designed to meet the needs of the following students (1) those who wish to obtain a degree in engineering and who plan careers in which science, mathematics and ar alytical methods are of special va ue, (2 th se 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 engineer ng for the purpose of deciding which program to undertake or those who desire to transfer to another college or university, (5) tl ose who wish to t ike certain e ectives in engineering while pursuing another program in the U niversity.

General Information

Admission. Students who wish to be admitted to full freshman standing it Engineering should present certain secondary school units in ad dition to the minimum U niversity requirements A tot al of 3 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 un t in chemistry One un t of b ology s strongly recommended.

Students who have omiss ons or deficiencies in sub ect matter preparation may be required t complete add tional in versity credit course-work which may not be applied toward an engineer ng degree. One or more of the courses M A 117 College Algebra, MA 118 Trigo nometry, PH 111 and 113 General Physics, EN 101 First Year English, C H 113 General Chemistry are usually taken to satisfy omis s ons or deficiencies

Program of Study. The program of st idy in en gineering is based on the engineering core which consists of a highly correlated group of courses of fundamental in portance and basic

concern to engineers. The core provides a broad base of science, mathematics and engineering upon which the various programs are founded. A number of fields of specialization, which are extensions beyond the engineering core, are offered to provide variety in the program of study, and each student is allowed considerable latitude in developing an area of emphasis 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, systems, and design as related to a specific engineering discipline. For convenience, the traditional fields of specialization offered are designated as ChE, CE, EE, EM, IE and ME. In addition, the engineering science (ES) field accommodates those students whose educational objectives require more flexibility than is possible in the other fields.

Well-prepared students can usually complete the program of study leading to an undergraduate degree in engineering 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 program 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 program should be extended to five years or longer.

All the undergraduate fields of specialization — chemical, civil, electrical, mechanical, and the regular areas of emphasis of engineering science — are accredited by the Engineers' Council for Professional Development (ECPD). Since the engineering based, interdisciplinary patterns lead to professional work in fields other than engineering, evaluation by ECPD has not been requested. The first degree in industrial engineering — the Master of Science in Engineering — is also accredited by ECPD.

Degrees

Bachelor of Science in Engineering (BSE) and Bachelor of Science (BS). The satisfactory completion of a program of study of a minimum of 127 semester hours, including general studies, the engineering core, and both required and elective courses, leads to either the degree Bachelor of Science (BS) or Bachelor of Science in Engineering (BSE). 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 programs of study in engineering are devoted to the basic sciences, mathematics, the fundamentals of engineering science, and their application to the solution of engineering problems. The courses are not training courses for any of the mechanical or manipulative skills, but rather are planned to provide preparation for development, design, practice, research, graduate work, and, with certain electives, for operation, production, testing, maintenance and management.

Integrated BSE-MSE Program

(This program is described on page 161.)

Engineering Core. The engineering core presents unifying concepts of engineering in a group of engineering oriented, science based courses and a sequence of supporting courses in basic science and mathematics fundamental to the field of engineering. The objectives are twofold:

(1) To provide the student with an understanding of idealized models in the context of realistic engineering situations.

(2) To provide the student with an understanding of the relative utility of mathematical and empirical approaches in predicting the consequences of physical interactions and in solving realistic engineering problems.

Course content is designed to introduce the student to these two aspects of engineering in sufficient depth to provide him with a basis for his chosen career; for extending himself into engineering activity outside his chosen career and for choosing his technical electives to emphasize preparation for his career in engineering application or research.

Engineering Core Requirement
(82 hours minimum)

			Semester Hours
ES	102	Introduction to Engineering	2
ES	104	Engineering Graphics and Design	2
ES	122	Computer Programming	2
MA	120	Analytical Geometry and Calculus	5
MA	121	Analytical Geometry and Calculus II	5
MA	212	Analytical Geometry and Calculus III / ES 345 Methods in Engineering Analysis	5
Approved Mathematics Elective			3
CH	114 /	General Chemistry / CH 115 and CH 116 General Chemistry and Lab / ES 115 Chemical Foundations in Engineering	4
ES	2[illegible]	Mechanics and Heat	4
ES	222	Electrical Science	4
ES	203	Engineering Wave Phenomena	2
ES	211	Engineering Mechanics, Statics	2
ES	301 /	Economics Analysis / ES 304 Storage and Nuclear Principles	2
ES	312	Engineering Mechanics Dynamics	3

ES	313	Mechanics of Materials	4
ES	330	Electrical Networks	4
ES	331	Electronic Engineering ES 361 Measurement Systems Engineering or ES 364 Chemical Process Instrumentation	4
ES	350	Structure and Properties of Materials	3
ES	371	Fluid Mechanics	4
ES	381	Thermodynamics	3
ES	400	Engineering Communications	3

In addition to the requirements shown above, the program of study must include, from the field of specialization, a minimum of 6 hours of engineering sciences content and a minimum of 6 hours of synthesis, systems, or design content.

NOTE PH 115, 116, 117 and 118 will satisfy the requirements of ES 201, 202 and 203

Since the credit hours on some alternate core courses vary from the stated hour requirement, any differences will be adjusted in the approved technical electives

Except as noted below, the engineering core is common to all fields of specialization. This arrangement gives the student time to become adjusted, and to choose that for which he is best adapted. The counseling previously described is provided in order to aid the student in making his choices

To obtain the necessary chemical science background, chemical engineers may use the following alternatives: CH 117, 118 for ES 118; CH 417, 418 for ES 350 and ES 304, KE 331 for ES 311, and KE 342 for ES 381

Chemical and Bio Engineering

The chemical engineer is generally concerned with processes involving a chemical change or separation. He applies chemistry as well as physics for the development, design and operation of processes and equipment. Mathematics is applied in computer analysis and design with economics as a practical guide. Since chemistry is involved in most activities, the chemical engineer is found in a diversity of industries which manufacture conventional chemicals, metals, ceramics, space propellants, solid state devices, petroleum products, plastics, foods, drugs, and health care equipment. Training in chemical engineering provides a broad background which prepares one for a variety of occupations including environmental control, extractive metallurgy, oceanography, biomedics, and nuclear engineering. Although the bachelor's degree has sufficed for the majority, research and development activities often make graduate study desirable. Students expecting to undertake a graduate program should consult with their advisor before the senior year to obtain the best selection of courses for an integrated Master of Science in Engineering program.

Living systems represent the most complicated chemical processes requiring analysis. In order to provide instruction for the growing interaction between engineering and life sciences, interdisciplinary options of bioengineering are given for all engineering majors. A strong minor program can be developed from the following courses: KE 411, 413, 415, 492, 513, 515, 517; IE 425, 520, 521, BA 457; CH 361, 367, 461, 462, 467, 468, ZO 201, 202, 360.

Chemical Engineering Core

The following courses are normally required for chemical engineering students as part of the engineering core requirements

			Semester Hours
CH	117, 118	Chemistry I, II	6
CH	417, 418	Chemistry V, VI	6
ES	348	Applied Mathematical Analysis	3
ES	364	Chemical Process Instrumentation	3
KE	33	Transport Processes	4
KE	342	Applied Chemical Thermodynamics	3

The following additional courses are normally required for chemical engineering core:

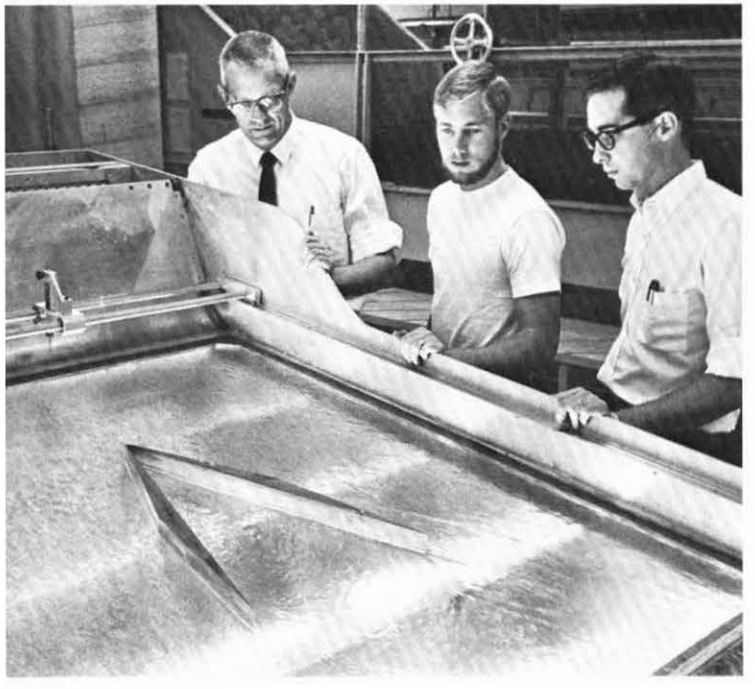
CH	19, 20	Chemistry Laboratory I, II	4
CH	3 , 318	Chemistry III, IV	6
KE	2	Chemical Process Calculations	2
KE	332	Chemical Engineering Operations	4
KE	333	Transport Phenomena Laboratory	1
KE	442	Chemical Reactor Design	3
KE	451, 452	Chemical Engineering Laboratory	4
KE	461	Process Control	3
KE	462	Process Design	4
Approved elective			4

The chemical engineering core gives a fundamental chemical engineering education. A choice of electives allows some specialization in a student's interests. Appropriate technical electives are chosen with the advice and consent of the advisor. When the special interests of the student necessitate a more diverse background, such as in bioengineering, a maximum of two courses in the chemical engineering core may be replaced by selected courses meeting engineering education standards if approved by the advisor and faculty chairman.

Special Program for Medical Personnel. A flexible sequence of coursework has been formulated to allow medical and paramedical professionals the opportunity to gain a general engineering and physiological educational experience which is aimed at helping them cope

with future advances in their respective fields. To accommodate those with diverse prior education the instructor will determine if the student without the stated prerequisites has "equivalent knowledge." Eight courses are included in the engineering based program. Four are designed to allow students with an adequate high school, technical school, or junior college background to develop their skills to cope with the subsequent four advanced courses.

Four courses which are engineering based are: KE 250, 251, 252, and 411. Courses in a parallel physiology sequence which may be taken independently are: ZO 100, BA 457, and KE 415. A final course KE 413 builds on both sequences in a mixed environment.



Civil Engineering

Civil engineers are responsible for the planning, design, construction, research and management of many structural, urban and environmental projects which form the basis of our modern civilization. These include buildings, bridges, highways, dams, canals, irrigation projects, water and waste treatment plants and various multipurpose systems. Education in this field is established on scientific fundamentals with extensive training and practice in one or more areas of emphasis.

In addition to the engineering core, the civil engineering program requires the completion of the courses listed below. In so doing, the student may choose a course of study leading to a Bachelor's or Master's degree by means of an integrated Bachelor's-Master's program.

Civil Engineering Core

			Semester Hours
CI	241	Surveying	3
CI	312	Engineering Materials	2
CI	321	Structural Mechanics	4
CI	322	Fundamentals of Structures	4
CI	351	Soil Mechanics	3
CE	361, 362	Environmental Engineering	5
CE	372	Transportation Engineering	3
CI	381	Applied Fluid Mechanics	3

Bachelor's Degree Program. Requirements for the bachelor's degree include the completion of the civil engineering core courses and one of the seven elective areas listed below. Course selection should be made by the student with the approval of his advisor and must include at least one design option course (CE 423, 452, 466, 475, 481). In addition, certain areas can be strengthened by choosing General Studies courses from the recommended lists. HU 101 and 102 or HU 301 and 302 are recommended for all elective areas. To insure completion of a degree in the minimum number of hours, students are advised to select their elective area and file their program of study at least one semester before taking such courses.

Civil Engineering Elective Areas

Required semester hours 10

General (1) Two or more design option courses, (2) approved 300, or above, level technical electives.

Urban Systems City Planning, Transportation, Highways. CE 371, 466, 471, 474, 481; IE 473; (ES 300, 340). *General Studies:* AN 101; SO 301; PX 100; GC 361; EC 451.

Environment Sanitary Engineering, Public Health, Industrial Hygiene. CE 461, 463, 464, 466, 471, 481; MI 201; CH 231; BI 320; (ES 340). *General Studies:* AN 101; PX 100; SO 301.

Water Resources Hydraulics, Hydrology, Water Systems Analysis. CE 463, 466, 481, 495; IE 473; GL 301; (ES 300, 340). *General Studies:* EC 451; PS 100, 425; SO 301, 432.

Geotechnics Soil Mechanics, Foundations, Geological Engineering. CE 452, 453, 473; GL 301, 310, 321, 324, 410, 418, 435, 446; (ES 300, 348).

Structures Architectural, Aerospace, Structural Mechanics. CE 423, 431, 432, 438; AT 445, 446; GL 301; EM 415; ME 331, 427; (ES 344, 346).

Construction CE 344, 452, 475, (ES 300), GI 301, CO 374, 383, 411, 462, 484, 496 *General Studies* AP 100.

Integrated Bachelor's-Master's Program. Because of the greater technical complexity and expanding responsibilities of the civil engineer, increasing emphasis is being placed on the master's degree as the first professional degree. To accomplish this objective in an efficient manner, the integrated bachelor's master's degree program is offered to qualified students. Upon acceptance into the program, the student is assigned a faculty committee to assist in selecting the appropriate courses for both bachelor's and master's degrees. These courses include the civil engineering core and culminate in an individually prepared professional degree program using one of the undergraduate elective areas for its foundation.

Electrical Engineering

The professional activities of electrical engineers directly affect the lives of most of the world's population every day. Electrical engineers are responsible for the production and transmission of the vast quantities of electrical energy that our industrial society requires for its operation, and for the analysis, design and development of systems to control automatically the machines and processes of our factories. Electrical engineers are also responsible for the design and development of complex signal processing systems such as telephone, radar, television and analog and digital computers. Indeed, an electrical engineer is likely to be involved whenever power is utilized, intelligence is transmitted, or control of a physical process is required.

The curriculum in electrical engineering, like all other engineering curricula at Arizona State University, is based upon the fundamental principles of mathematics, science, and engineering developed in the engineering core. In addition to the engineering core, each electrical engineering student completes the electrical engineering core which increases his knowledge of basic electrical engineering, and through approved technical electives, provides him with an opportunity to study in greater depth technical subjects in which he has special interests.

Electrical Engineering Core

The following courses are required for electrical engineering students as part of the engineering core.

			Semester Hours
MA	2	Analytic Geometry and Calculus III	5
MA	36	Advanced Mathematics for Engineers Applied Mathematics	3
ES	304	Matrix and Network Principles	2
ES	33	Electrical Engineering	4

In addition the following courses are required to fulfill the electrical engineering core requirements.

EE	32	Electrical Networks	3
EE	332	Electrical Engineering Systems, Systems, Design	4
EE	34	Electromagnetic Field Engineering Sciences	3
EE	357	Semiconductor and Solid State Devices Engineering Sciences	3
EE	362	Electromechanics Synthesis Systems, Design	4
EE	4	Distributed Parameter Networks	4
EE	48	Feedback Systems	4
EE	496	Professional Seminar	

Approved Technical Electives
(minimum total 12 semester hours).

Technical electives may be selected from one or more of the following technical areas of emphasis:

A. Antennas and Microwaves: EE 441, 443, 445

B. Applied Math: EE 320, 426, 434, 483; ES 340, 344, 441, 445, 446; MA 342, 363, 426, 442, 461, 462, 464, 465

C. Bioengineering: EE 495

D. Communications: EL 455, 456, 483, 484, ES 441

E. Computer Languages: EE 320, 426; ES 422, 423

F. Controls: EE 320 or 420, 425, 428, 455, 462, 483, 484; ME 451.

G. Digital Circuit Design: EE 422, 423, 428, 43 .

H. Digital Systems Design: EE 420, 421, 428; ES 423

I. Lasers and Coherent Optics: EE 434, 448

J. Networks: EE 402, 405, 406, 425, 445

K. Power Systems and Machinery: EE 461, 462, 470, 4 1, 472; ME 411, 413; EC 451, (GC 364 recommended for Social Sciences.

L. Solid State Electronics: EE 431, 432, 433, 434, 435; KE 423

With the approval of the student's faculty advisor, technical electives may also be chosen from other courses in engineering, mathematics, the sciences and business administration at or above the 300 level.

Engineering Science

The engineering science curriculum accommodates students whose education objectives require more curricular flexibility than traditional engineering fields of specialization generally permit. For many students engineering studies form the basis of preparation for professional engineering work where proficiency in the application of science and the physical and social technologies are brought to bear on problems of large scope. The necessary breadth that these students seek is not often obtainable by branching from existing engineering fields. Rather, especially designed patterns of coursework that merge the required principles and approaches drawn from all fields of engineering and other pertinent disciplines are desired. As an answer to this need, two types of course arrangements are available: (1) regular patterns of engineering science that lead to the degree Bachelor of Science in Engineering; and (2) engineering based interdisciplinary patterns that lead to the degree Bachelor of Science.

The regular patterns are designed primarily for students intending to pursue engineering careers at a professional level. The engineering-based interdisciplinary patterns accommodate those students who desire the integrity of an engineering education but plan to enter professions other than engineering. Both are developed beyond the engineering core.

Both the regular patterns of engineering science (BSE degree) and the engineering based interdisciplinary patterns (BS degree), consisting of required and elective courses, must be approved by the Engineering Science Advisory Council. Patterns that have received approval are shown below, and others may be designated as student needs appear.

Regular Patterns of Engineering Science (ECPD Accredited)

Bachelor of Science in Engineering

Astronautics and Aeronautics. Those engineering sciences that relate directly to the design, control, and missions of aerospace and high speed ground transportation systems are emphasized. The aerospace industry is a major employer of engineering talent. Additionally, the field of high speed transportation is a young developing field with many needs for imaginative engineering innovation. This pattern recognizes the variety of directions in which the aerospace and transit industries must move in order to solve many of the important problems of society, and prepares the student to operate effectively in the future in new and unanticipated problem situations. A professional orientation of aerospace engineering is acquired by the student as he studies those topics most pertinent to the industry.

	Semester Hours
Required courses: ME 372, 450, 451, 453, LM 413, 414, 415, 422, 427; ES 492 (ES 361 required in engineering core)	29
Approved engineering electives from an area of emphasis	8

Bioengineering. Bioengineering bridges the engineering, physical, and life sciences. Engineers, physicists and mathematicians routinely join with the biologist and physician in developing techniques, equipment and materials. The multidisciplinary approach to solving problems in medical treatment and research has evolved from exchanges of information between specialists of the concerned areas. Advanced study beyond the bachelor's degree is acutely needed in bioengineering, requiring a depth of knowledge from two diverse disciplines. This pattern is designed for entry into such programs.

	Semester Hours
Required courses: CH 331, 332, 335, 461; BA 457, IE 425; KE 411, 413, LS 492 (ES 361 or 364 required in engineering core)	26
Approved engineering electives from an area of emphasis (one course must be of engineering sciences content)	11

Computer Science. Computer technology has had a significant impact on our way of life in general and on engineering education and engineering practice in particular. This impact may even be greater in the future as the full potential of modern computing systems and techniques is realized. The computer science pattern gives emphasis to the structure of information, to programming the use of the computer in solving engineering problems, and to the nature of information processing systems.

	Semester Hours
Required courses: EE 320; 325 or IE 463, IE 473 or 476; 475, ES 322 or MA 464, ES 422 or 424, 423; ES 441 or 442, ES 492 (ES 360 and 340 required in engineering core)	27
Approved engineering electives from an area of emphasis	10

Engineering Mathematics. The engineer of the future will continue to 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 must have preparation in the abstract fields of modern mathematics; therefore, pure mathematics, applied mathematics and courses from a field of specialization are combined in this pattern

	Semester Hours
Required courses MA 370, 470, 474; ES 344 or MA 464, ES 44 or 442, ES 444 or MA 342, ES 445 or MA 461, ES 446 or MA 462, ES 492 (ES 340 and 36 required in engineering core	27
Approved engineering electives from an area of emphasis (one course must be of engineering sciences content and one of design-synthesis-systems content)	10

Engineering Mechanics. This pattern strengthens the student's understanding of the basic fundamentals of mechanics and mathematics and their application to a number of important problems of society such as transportation, noise abatement, and vehicle crash worthiness. Such an education enables the engineer to adapt more easily to a rapidly changing technology and to utilize new concepts and techniques as they arise. This area of emphasis makes available to the student a wide range of employment possibilities in all fields of engineering and also establishes an excellent foundation for graduate study

	Semester Hours
Required courses EM 411, 413, 415, 422, 424, 450, 471, ES 444 492 (ES 361 required in engineering core)	26
Approved engineering electives from an area of emphasis	11

Engineering Science. For students who desire a fundamental and multidisciplinary undergraduate engineering education, this area of emphasis includes course work associated with many of the contemporary challenges of society such as acoustics and noise control, oceanography, energy sources and conversion, man's environment, water resources and distribution, and nuclear reactor systems. The student can choose to continue this broad based engineering education or to specialize in one of several fields of engineering or other disciplines by the nature of his choice of the approved electives. The engineering science graduate is well prepared for a multitude of jobs in industry or for specialized graduate work in engineering or non engineering fields

	Semester Hours
Required courses EE 341, CE 301; EM 411, 424, 471 ME 411, 487, ES 492 (ES 361 required in engineering core)	24
Approved engineering electives from an area of emphasis	13

Industrial Systems. For students wishing to pursue an industrial engineering career concerned with the design, improvement, and installation of integrated systems of men, materials and equipment, this area of emphasis provides a strong engineering and mathematical foundation. The ability to analyze systems for improvement and to predict the consequences of decisions prior to their implementation is built upon this foundation. The term "industrial" is used in its broadest sense, and is 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

	Semester Hours
Required courses AC 300, ME 332, IE 422 or 474; 431, 461; IE 473 or 476, ES 322, ES 442 or 441; ES 492 (ES 300 and 340 required in engineering core)	27
Approved engineering electives from an area of emphasis	10

Information Systems. Modern management systems are highly dependent upon the timely flow of accurate information. There is a growing demand for engineering analysts who can study the information needs of organizations and are qualified to recommend efficient systems for collecting, sorting, classifying, and interpreting data. Information acquisition and control for effective management decision making, particularly as it relates to technically oriented organizations, is emphasized in this pattern

	Semester Hours
Required courses AC 300, IE 422, 431, 461, 475, 476, 478, IS 424, 492 (ES 300 and 400 required in engineering core	27
Approved engineering electives from an area of emphasis	10

Materials Engineering. All engineering disciplines involved with designing and manufacturing products depend upon the materials engineer for the selection and development of materials that are used in the product and the manufacturing process. Thus, materials engineers are employed in virtually every manufacturing industry today, including solid state electronics, plastics, aerospace, and metals. To understand and be able to control the properties of materials, a materials engineer must acquire a fundamental understanding of material structure and of the physical laws which the materials obey. This pattern is interdisciplinary, including chemistry, physics, and engineering, and allows the student to elect additional courses to support a particular area of special interest, and at the

same time give him an excellent background for pursuing a graduate program in materials science or related fields

	Semester Hour
Required courses, CH 331, KE 342, 423, EM 35 , 450, 451, 452, 455, ES 492 (ES 361 required n engineering core)	28
Approved engineering electives from an area of emphasis	9

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 of the areas of engineering. For this reason, job opportunities in industry are particularly promising for engineers with this preparation

	Semester Hour
Required courses FT 302, 341 or ML 457, FT 362; FM 452 or IE 357; FM 463 or 462 ME 372, 405 or FT 480 ME 485; ES 492 (ES 304, 346 and 361 required in engineering core)	28
Approved engineering electives from an area of emphasis	9

Nuclear Engineering. Nuclear engineering is concerned with the release, control and utilization of nuclear energy, including an understanding of basic principles in the design and application of nuclear reactors for electrical power generation, marine propulsion, sea water desalting and power systems for outer space. Advanced research methods are also studied using neutron activation analysis and radio isotope techniques in the fields of medicine, biology, agriculture and industry. This pattern is deeply rooted in the thermal and electrical sciences as well as nuclear science

	Semester Hour
Required courses ES 361 ME 372, 382, 411, 412, 413, 415, 488, ES 492 (ES 304, 331 and 346 required in engineering core	25
Approved engineering electives from an area of emphasis	9

Operations Research. This pattern enables the student to formulate operational problems of an engineering and socio economic variety, with emphasis on the quantitative tools and techniques used by operations researchers Problems are described in a decision theory framework involving objectives and constraints resulting from budgets, corporate policy, and federal regulations.

	Semester Hour
Required courses, IE 431, 461, 473, 476 MA 460, ES 322 or IE 475, ES 441, 442, 492 (ES 300 and 340 required in engineering core)	27
Approved engineering electives from an area of emphasis	10

Physical Metallurgy. The field of physical metallurgy includes the selection of metals and alloys for optimum utilization, the control of processing and fabrication variables, failure analysis, and the development of new alloys. Modern technology requires the continued development of metals to meet standards previously considered impossible while at the same time the dwindling resources of some of our most important metals require their optimum utilization Thus, the metallurgist routinely faces challenges that are both demanding and exciting Fortunately he has a far better understanding of the underlying structure of metals than his predecessor and can therefore make better use of basic physical science in achieving his objectives. However, this more exact knowledge of the atomic scale behavior of metals has not diminished the requirement for an engineering approach in the solving of metallurgical problems the basic purpose of this pattern

	Semester Hour
Required courses PH 441 442, EM 450, 451, 453, 455, 456, ES 492 ES 361 required in engineering core	26
Approved engineering electives from an area of emphasis	1

Urban Systems Engineering. Frequently civilizations are measured by their cities. For the past 00 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 in urban area with a concentration of 1,00(,0)0 people is not always functionally the same as another area with a population of 100,00) The problems of urban areas are highly interrelated and interdisciplinary This pattern leads into such areas as urban engineering, transportation planning, environmental engineering, city planning, urban management and decision making, or perhaps serving the electorate directly.

	Semester Hours
Required courses ES 442, CE 371, 372, 46 , IE 431, 473, 476 ES 492 (ES 300, 340 and 36 required in engineering core)	24

Approved engineering electives from an area of emphasis 13

NOTE PX 100 and SO 301 must be selected as a part of the General Studies requirement

Engineering-Based Interdisciplinary Patterns

Bachelor of Science

Business and Pre-Law. This pattern accommodates those engineering students who 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 established. 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 degree Master of Business Administration in one calendar year

	Semester Hours
Required courses AS 305, AC 3), FI 300; MG 301, MK 3(0, FS 322, 442· IE 473, ES 492 (FS 34 and 361 required in engineering core)	27
Approved engineering electives from a field of specialization (one course must be of engineering sciences content)	0

NOTE EC 202 must be selected as a part of the General Studies requirement.

Education. Recent surveys have pointed to an acute shortage of well qualified high school and junior college teachers of mathematics and the sciences, including engineering science This pattern accommodates 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 degree and a secondary teaching certificate with a major in engineering science, and minors in mathematics and physics

Regular Program

	Semester Hours
Required courses SE 310, 311, 411, 433, EP 31 , ES 492 (ES 361 required in engineering core) . . .	22
Approved education elective	3
Approved engineering electives from a field of specialization (two courses must be of engineering sciences content and one of design synthesis-systems content	2

On-Site Program

	Semester Hours
Required courses SE 400 40 , 433, 434, ES 492	25
Approved engineering electives from a field of specialization (two courses must be of engineering sciences content and one of design synthesis systems content)	12

NOTE PS 310 and 311 must be selected as a part of the General Studies requirement in social science

Pre-Medical. In the past decade the interrelation between engineering and medicine has become vigorous and exciting Our rapidly expanding technology dictates 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 This pattern would be of special interest to students desiring entry into a medical college and 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 pattern could be compatible with any field of medical endeavor

	Semester Hours
Required courses BI 340, CH 331, 332 335, 336, ZO 100, 230, ES 492 (CH 115 116 and ES 304 and 361 required in engineering core)	22
Approved Pre Medical elective .	4
Approved engineering electives from a field of specialization (two courses must be of engineering sciences content and one of design synthesis system content .	1

Public Administration. The primary purpose of this pattern is to equip the engineering student for graduate study in political science It is important that sound engineering judgment not be ignored in making political decisions. For the future, engineers must be more knowledgeable in political science, and servants of the electorate must be more aware of the technological consequences of their decisions Students selecting this pattern will be better equipped to implement proposed engineering programs involving the public health and safety, and aesthetic considerations

	Semester Hours
Required courses HI 303, 304; PS 250 or 260, PS 428; SO 301 341, SO 352 or PX 325 ES 492 ES 301, 340 and 36 required in engineering core)	24
Approved engineering electives from a field of specialization (two courses of engineering sciences content and	

one of design synthesis-systems content) 13

NOTE PS 100 and PS 200 must be selected as part of the General Studies requirement in social science

Social Systems. Much of the progress and many of the problems of modern society are derived from a technologically oriented culture Today such societal problems as environmental pollution and urban decay continue to increase in both quantity and complexity. This pattern is responsive to achieving a better understanding of their causes and effects The multidiscipline background provided is drawn from the social studies and engineering with strong emphasis being given to management system optimization, and data acquisition and processing

	Semester Hours
Required courses CE 371, 461, IE 431, IE 473 or 476, PS 417, SO 341 ES 492 (ES 300, 340 and 361 required in engineering core . . .	21
Approved Humanities or Social Science Electives . . .	4
Approved engineering electives from a field of specialization (one course must be of engineering sciences content and one of design synthesis systems content	12

NOTE PS 100 and 200 must be selected as part of the General Studies requirement in social science.

Industrial Engineering

Industrial engineering provides a multidisciplined 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 applied statistics, computer science, human factors, industrial systems, operations research, organizational control and reliability.

The purpose of the industrial engineering field of specialization, therefore, is to provide each student with an understanding of 1) how operational systems are designed, (2) how each component of a system contributes to overall system effectiveness, (3) the methodologies of systems analysis, (4) the probabilistic nature of events and decision outcomes, (5) the human being as a complex system component, and (6) organization to facilitate planning and control. Economics plays an important role in the evaluation of system effectiveness and in the decision making process

Undergraduate students interested in industrial engineering begin their studies in the engineering science field of specialization pursuing one of the following ES patterns

Computer Science
Industrial Systems
Information Systems
Operations Research

These patterns, described on pages 178 181 of this catalog require the selection of ES 300 Engineering Economy, and ES 340 Probability and Statistics for Engineers (as the approved mathematics elective), in the engineering core The patterns also include basic course work related to industrial engineering in the areas of computer systems, engineering administration, operations research, probability and statistics, scheduling and control, and systems design.

For the well qualified undergraduate student who seeks both the BSE and the MSE degrees in an integrated five year study plan, an advanced degree program in industrial engineering is available The advanced degree program builds on the 90 semester hours of humanities, social sciences and engineering core work normally taken in the first 2 3 years of study, and it culminates in the Master of Science in Engineering degree with Industrial Engineering specialization Admission to this program is normally at the junior or senior level and requires an application to the Dean through the Faculty and the Chairman. Admission does not automatically qualify the student for admission to the fifth year graduate program, but it is expected that qualified students in this program will complete both the BSE and MSE degrees within a five year term of full time study in engineering

The advanced degree program includes undergraduate specialization, 12 hours of which also fulfill engineering core requirements, and 30 hours of graduate work. Building on top of the 90 semester hours of specified engineering core subjects and the humanities and social sciences, the following 37 hour program satisfies the minimum requirement of 127 semester hours for the BSE degree (ES 300 and 340 must be selected in the Engineering Core)

Industrial Engineering Core for the Advanced Degree Program

		Semester Hours
AC 3	Survey of Accounting	3
ES 322	Advanced FORTRAN with Systems Applications	

		IE 475 C p t r Syst s and pplic ti s	3
MF	332	P d ct P ss	3
IE	362	f t l Engi r Anl ss	3
IE	427 /	I t t r Acoust I 474 Acoustic Signal n	3
IE	43	E gn rg Ad st t n	3
ES	44 /	P b bl t r Engi rs ES 442 Engineering Statistics	3
IE	461	Plan ng, S ed l and Control f Res rces	3
IE	473 /	F nd t o f Ind str l Engi r g II 470 Operations Research Models	3
ES	492	P j ct Design and Development	3
		Engineering Electives	7

The 30 semester hours of graduate work builds on the above 37 hour undergraduate portion to provide an integrated and efficient path to the MSE degree. This fifth (graduate) year provides design patterns in applied statistics, computer science, human factors, industrial systems, operations research, organization control and reliability. Composition of the fifth year includes:

Probability Statistics	
Mathematics Elective	3
Operations Research Elective	3
Management or Economic Analysis Elective	3
Engineering Design and Systems Electives	12
Other Electives	6
IE 592 Engineering Report	3

Mechanical Engineering

Mechanical Engineering as a profession is broadly concerned with energy including its transformation from one form to another as well as its transmission and utilization. This includes, for example, the conversion of chemical, nuclear or solar energy into mechanical work, the transmission of energy via heat exchangers, pipe lines and mechanical systems, and the harnessing of energy to perform useful tasks. Mechanical engineers are employed by every kind of industry to seek new knowledge through research, to do creative design and development and to build and control the modern devices and systems needed by society.

The undergraduate mechanical engineering field of specialization includes a core of basic mathematics, physics and engineering science courses common to all branches of engineering. Advanced mechanical engineering courses provide for the analytical study of the fundamental laws governing the use of energy, the principles of design, and the principles and use of measurement and control devices. Laboratory experiments illustrate the application of these principles in practical devices. The field of specialization emphasizes the research and design aspects of mechanical engineering. At the undergraduate level, mechanical engineering students may elect to specialize in a variety of areas of emphasis: aerospace, biomechanical, computer methods, controls and measurement systems, design, energy conversion and power systems, environmental, nuclear thermosciences and vehicular engines. In addition, a general area of emphasis can be used to generate a pre-approved sequence that is of particular interest to the student.

Mechanical Engineering Core

The following courses are required for mechanical engineering students as part of the engineering core requirements:

			Semester Hours
CH	114	General Chemistry for Engineers	4
ES	304	Atomic and Nuclear Principles	2
ES	361 /	Electronic Engineering ES 361 Measurement Systems Engineering	4
ES	346	Methods in Engineering Analysis	3

In addition the following courses are required to fulfill the requirements of the Mechanical Engineering Core:

EM	415	Vibration Analysis	3
EM	427	Mechanics of Materials	2
ME	372	Fluid Mechanics	3
ME	382	Thermodynamics	3
ME	441	Principles of Design I	3
ME	445	Engineering Design	3
ME	458	Heat Transfer	3
ME	49	Experimental Mechanical Engineering	3
ME	492	Mechanical Engineering Projects	2
		Approved area of emphasis electives	6

Mechanical Engineering Areas of Emphasis

In each area, a course in numerical analysis or computer programming (at 300 level, at least) may also be used.

Aerospace. Select 12 hours from the following: EM 414, 427, ME 450, 451, 453, 455, 471, 487, 493.

Biomechanical. Select 12 hours from the following: EE 302, 362, EM 462, 463; KE 411, 413 (recommended), ME 321, 412.

Computer Methods. Select 12 hours from the following: ES 322, 340, 344, 348, 425, 441, 442, 444, IE 475, KE 481, MA 464, 465, ME 47

Controls and Measurement Systems. Select ? ours f om the fo owing EE 302, 320, 325, 341, 483, FM 462 or 463 recommended), ES 331, 340, ME 45 465 rec mmended , 487 493

Design. Select 12 hours from the fol owing: FM 351, 413 425, 427, 462· ES 331 340 361 402, ME 321, 332, 442, 465, 487, 493,

Energy Conversion and Power Systems. Se ect 12 hours from the fo owing EE 302, 367 461, 471 471 472· MF 411, 415, 455, 456, 483 487

Environmental. Select 12 hours from the fo - l wing BI 32 · CE 361, 362, 461, 463 464, 465; EM 471, ME 412, 456, 486

Nuclear. Se ect 12 hours from the follow ng EE 341, 434; ME 411 rec mmended , 412, 413, 4 5 4 7 465 487

Thermosciences. Select 12 hours from the following EM 471, ME 411, 450, 453, 455, 47 , 483 486 487, 489 493

Vehicular Engines. Select 12 ho irs from the following EE 3 2, 362, 461, ME 455, 456, 465, 483, 487, 493

General. Student must submit a deta led plan cor sisting of 12 h urs of rel ted co irses for ppr va by the Mechanical Eng neering Curricul im Cmmitte

Mechanics, Materials and Measurement Engineering

The mechanics, materials and measurement engi neering curricula emphasize the f ndamentals of the engineering sciences and mathematics and their app icati n in solving important tech n ogical pr blems of society This f nda mental educat on gives an engineer the flexibil ty and understanding necessary for the utilizat on of new deve opments and techniques Add t onally, these backgrounds will prepare the student for career opportunities in research development, and consulting positions n governmental and industrial organizations and n teaching and research positions in universities. These curricula also offer dvanced courses for engineers in such fields s civ l, electrical and mechanica eng neering who find that their work demands a greater depth of understanding in mechanics, materials c measuren ent systems

Graduate students in either mechanics, materia s or measurement engineering pursue indiv d ual pr grams of study which are planned, with the student's undergraduate background n mind, to provide a proper balance in mathe mat cs th e basic and engineering sciences; and design, synthesis and systems. Areas of emphasis include· ge ophys cal flu d mech n cs, space mechanics, vehicle and str ctural dynam cs, eo istics and n ise contro , solid n echanics, continuum mechanics, experimenta meth ds, measurement systen s, n aterials sci ence, and appl ed n athematics

U ndergraduate programs, appropriate for en trance into the mechanics, materials or measure ment engineering graduate programs, are offered in the regular patterns of the engineering science curriculum, including engineering mechanics, engineering science, astronaut cs and aeronautics, engineering mathematics, mate als engineering, physical metallurgy and meas re ent systems engine ring It is a sc c stomary for students from other fields of engineering to pursue graduate degrees in mechanics, materials or measurement systems engineering

The degrees awarded in mechanics, materials and m easurement engineering include Master of Science in Engineering, the Master of Science and the Doctor of Philosophy

Integrated BSE-MSE Program

This program is for academically qualified undergraduate engineering students who desire a more efficient integration of their under graduate and graduate programs Qual f ed st dents are assigned a faculty committee to ass st th r in selecting appropriate courses f r both the bachelor's and master's degrees

Chemical and Bio Engineering

Professors:
RE SER EC G 136B BERMAN
CRAIG DORSON

Associate Professors:
KUES ER SATER

Assistant Professor:
CALK NS

KE 211 Chemical Process Calculations. Pr nc p es of phy cs and chem stry app ed to the for n at on f mater a and energy ba ances Prerequ te CH 118 c requ s te MA 121 Cred t 2 h ur

250 Mathematics in Medicine. Symbo c nota t on t represent phys o og c var ab es Ap p es bas c c cept n d ffere t a and nte gra ca cu us as n the representat on of res p ratory f ow by ung vo ume hange and ntro- duces the use of med ca computers stat s t cs expe menta des gn rate pr esses and graph ca techn ques For non eng neer ng n ajors Prerequ s tes h gh schoo algebra and tr g n metry or equ va ent kn w edge Cred t 3 h urs

251 Basic Biomechanics. Phys ca and phys chem ca pr c p es app ed t fe processes Med ca app cat ons empha z ng mech an sms of the muscu ar card ovascu ar and resp ratory system . Concepts of force work f w energy and p wer deve oped and app ed to t o g a systems F r non eng neer ng ma ors Prerequ s te KE 250 or equ va ent co ege eve mathemat cs Cred t 3 hours

252 Basic Bioelectronics. E ectr ca e ectro stat c and e ectromagnet c e ements of c as

s ca phys cs and chem stry deve oped and ap pl ed to phys o ogy neuro ogy and pract ca med c ne to prov de a genera nderstand ng of nstrumentat on used n the hosp ta and abora tor es as we as the e ectr ca safety measures needed For non engineer ng majors Prerequ s tes KE 251 or equ va ent co ege phys cs and mathemat cs Cred t 3 hours

331 Transport Processes. Deve opment and app cat on of the pr nc ples of momentum, energy and mass transfer Corequ s te KE 211 Cred t 4 hours

332 Chemical Engineering Operations. Pro cess perat ons nc ud g d st at n extrac t on absorpt on dry ng crysta zat on f trat on mater a s hand ng and preparat on Pre requ s te KE 331 Cred t 4 hours

333 Transport Phenomena Laboratory. Phys co chem ca meas rements and determ nat on of tra sport pr pert es Prerequ s te KE 331 Three hours aboratory Cred t 1 h r

342 Applied Chemical Thermodynamics. Energy re at ons a d equ br m co vers ons based n chem ca p tent a s and phase equ br a Pre requ s te KE 211 Cred t 3 hours

411 Biomedical Engineering. Transport meta bo c a d autoreg at y processes n the human b dy s g eng neer g term no ogy and ana y s s cu rent survey of human system s mu at on prosthet c dev ces d agn st c meth ds e g neer ng cr ter a and propert es of b o g ca f u ds Prerequ s te KE 251 or equ va ent Cred t 3 h urs

413 Physiological Instrumentation. Prob ems, concepts and techn q es f b omed ca nstru mentat on n stat c and dynam c env ronments phys o g ca , d agnost c prosthet c and psy ch g cal system nterd scip nary commun ca t ons n b oeng neer ng Lecture and ab ratory ass gnments Prereq s te ZO 360 or BA 457 and KE 252 or equ va ents Cred t 3 hours

415 Introduction to Pathophysiology. Dynam cs f d s upt ons to n rma phys o ogy are de- f ned Systemat c deve opment of ma funct ns by systen s c ud ng d seases due to hered ty tress ma nutr t on nfect on phys ca and chem ca agents body flu d d sturbances homeostasis en docr ne dysfunct on, hypersensit v ty and aut m- mun ty t mors ag ng and psychosomat c factors Prerequ s te ZO 36 or BA 457 or equivalent Cred t 3 hours

423 Materials Processing. Phase transforma t ons crysta ography growth processes k net cs of so d state transformat ons techno ogy of h gh and ow temperatures vacuum sys tems h gh pressure and c ean env ronments. Pre requ s te ES 381 Cred t 3 hours

442 Chemical Reactor Design. App at on of k net cs to chem ca reactor design Prereq u s te KE 342 Cred t 3 hours

451, 452 Chemical Engineering Laboratory. Op e at on contro and des gn f exper menta and ndustr a process equ pment ndependent re search pro ects Corequ s te KE 332 S x ho rs aboratory Cred t 2 hours each semester

461 Process Control. Process dynam cs nstru mentat on and feedback app ed to automat c pro cess contro Prerequ s tes MA 212 KE 331 Two ectures 3 hours aboratory Cred t 3 hours

462 Process Design. App cat on of e onom c p nc p es to opt m ze equ pment se ect on and des gn deve opment and des gn of process sys tems Prerequ s te KE 332 Cred t 4 hours

481 Optimization Techniques. Deve opment and app at on f c ass ca search and dynam c pro gramm ng methods for pt m z ng unconstra ned eq a ty c nstra ned and nequa ty constra ned pr b ems Prere u s te MA 212 Cred t 3 ho rs

513 Rheology of Fluids. Phys ca and mathe mat ca f undat on of the const tut ve f u d eq a t ons and the r app cat n nc ud ng b o og ca f ds uses and m tat ons of exper menta v s ometry deve opment of mu tid mens ona f ow equat on for a genera f u d Prerequ s te ES 371 Cred t 3 hours

515 Physiological Transport Processes. Ana ys s of eat mass momentum a d e ectr ca en ergy transfer n mamma s der vat on of both r croscop c and macroscop c mode s based on c rrent research Cred t 3 hour

517 Prosthetic and Diagnostic Engineering. Cr ter a f r mechan ca rep acement or ass st ance of rgan funct ons and d agnost c meth ods equ pme t and sage ex st ng methodo ogy and future requ rements nclud ng deta ed de s gns Cred t 3 hours

523 Materials Processing. So d state theory contro of morpho ogy pur ty growth and de fects format n structure and propert es of th n f ms m cro crysta s wh skers organ c crysta s Cred t 3 hours

527 Polymer Science and Engineering. Syn thes s chara ter zat on and process ng of com merc a h gh polymers Cred t 3 hours

533 Transport Processes. Un f ed treatment f n me tum eat and n ass transfer fi m mo ec u a theory and co t u r p nts f v ew Ex amp es n ude cont nuum equat ns for m cro sc p c and macroscop systems m t compo ne t and mu t phase systems Cred t 3 hours

534 Mass Transfer. App cat ons of the trans p t equat ons to mu t component and m t phase ystems Compar son of meth ds of so ut on and comp ter a gor thms for d fferent mass trans fer processes w th emphasis on mu t stage sep arat ons Cred t 3 hours

543 Thermodynamics of Chemical Systems. C as s ca and stat st ca thermodynam cs of n n dea phys c chem ca systems a d processes pred ct n of opt mum perat ng cond t o s Cred t 3 h rs

544 Chemical Process Kinetics. Rea t n rates thermodynan cs and tra sport pr nc p es ap p e to the des gn and perat on of ch em ca rea tors Prereq s te KE 543 Cred t 3 hours

562 Chemical Systems Engineering. Pr cess dynam cs systems ana ys s comp ter app ca t ons pr ess contro Cred t 3 hour

563, 564 Chemical Engineering Design. Com putat ona methods the des gn of hem ca p ants and pro esses Cred t 3 h urs each semester

571 Electrochemical Engineering. Pr nc p es of e ectroche n ca rea t ons app ed t se e ted top cs u h as chen a p duct n e ectr p at ng e e trod a y s n c f e ce s C ed t h urs

581 Multistage Optimization Principles. Uni- f ed theory of opt m zat on inc ud ng differen tia var at ona and search techn ques appl ed to the design of opt mum mu t stage systems Credit 3 hours

Special Graduate Courses: 498 500 591 592 593, 594 692 799 See pages 46 47

Civil Engineering

Professors:
NEWLIN EC G 136A , ALLEN
BETZ BLACKBURN, HILL KLOCK
PIAN, W LSON
Associate Professors:
LUNDGREN MATTHIAS O BANNON
ROSNER RUFF
Assistant Professors:
BORGO SEGALL

CE 241 Surveying. Theory and f e d work n construct on and and survevs Prerequ s te MA 118 Two ectures 3 hours aboratory Cred t 3 hours.

310 Materials for Construction. Str ictura and behav ra character stics eng neer ng proper- t es measurements and app cat on of c nstruc t o mater a s Not open to eng neer ng students Prerequ s te CO 323 or equ va ent One ecture 3 hours aboratory Cred t 2 hours

312 Engineering Materials. Structure and be- havior of c v l eng neer ng mat a s Labora tory nvest gat ons and test cr ter a Prereq- u s te ES 313 One ecture 3 hours aboratory Cred t 2 hours.

321 Structural Mechanics. Methods of ana ys s of structura systems Truss and beam def ec t ons; nfluence l nes and mov ng oads, s ope def ect n, moment distr but on three moment theorem ntroduction to work ng stress, u t mate strength and plast c design concepts Pre requisite ES 313 Three ectures 2 hours ab- orat ry Credit 4 hours

322 Fundamentals of Structures. Theory of de- sign of stee and re nforced concrete structura e ements according to work ng stress u t mate strength and plastic des gn concepts Prereq u s tes CE 312 and 321. Three ectures 3 hours aboratory Cred t 4 hours

340 Surveying and Mapping. Large sca e map ping of sma areas by p ane tab e trans t stad a and gr d squares Computat on of tra verses and areas topograph c map reading Not open to eng neer ng or construct on stu de ts Prerequ s te. h gh schoo or co ege tr gonomet y One ecture 6 hours aboratory Cred t 3 hours

343 Computations and Adjustments. Survey- ng adjustments Least squares adjustment of geodet c survey data by observat on and cond t on equations us ng matr ces Problems n weighting observat onal data Prerequis te CE 241 Two ectures 3 hours laboratory Cred t 3 hours

344 Route Surveying. S mp e compound and trans t on curves reconna ssance pre m nary and ocat on surveys Ca cu at on of earthwork Solar observat ons for az muth. Prerequisite CE 241 Two ectures 3 ho rs aboratory Cred t 3 hours

351 Soil Mechanics. Index properties and en g neer ng characterist cs of so s Compaction shear compress b ity and permeab ty Prereq u s te ES 31 Two ectu es 3 ho irs ab ra t ry red t 3 h ur

361 Environmental Engineering. Man s env ron ment water resources hydro og c cyc e chem stry of natura waters, qua ty requirements and water treatment water d str but on systems Cred t hours

362 Environmental Engineering. Man s env ron- ment, the carbon cyc e and b ochem stry of wastes pr nc p es of waste treatment dra n age systems Credit 2 hours

371 Selected Urban Problems. Prob ems of the modern urban env ronment. Concepts of compre hens ve p ann ng H story of urban development tra sportat n pub ic service zon ng and d v s on urban renewa ne ghborhood p ann ng Cred t 3 hours

372 Transportation Engineering. E ementary forms of transportat on highway ra water air S m ar t es and d fferences n constr ic t on operat on p ann ng and adm n strat on Credit, 3 hours

380 Hydrology and Hydraulics. Water supp y and water d stribution, precip tat on and run- off we ls F ow n pressure condu ts and open channels Hydrau c machinery Not open to en g neer ng students Two ectures 2 hours ab- oratory Credit 3 hours

381 Applied Fluid Mechanics. Ana ys s of f u d-f ow concepts and bas c equat ons Ap- p cat on of f u d mechanics to pressure con du t and free surface f ow unsteady f ow and turbo mach nery Prerequ sites ES 312 and 313 Two lectures 2 hours aboratory Cred t 3 hours

423 Structural Design. Ana ysis and des gn of structura systems. Prerequ s te CE 322 Two ectures 3 hours aboratory Credit 3 hours

431 Theory of Structures. E ast c curvature, rea work v rtua work, Cast g ano s theorems cons stent deformat on, three moment equat on s ope def ect on moment d str but on e ast c centers and nf ue ce nes Prerequ s te CE 321 Cred t 3 hours

432 Stress Analysis. Theory of e ast c ty unsymmetr a bending shear center tors on of nonc rcu ar sect ons beam o umns curved beams, beams n e ast c foundat n contact stresses stress concentrat on P erequ s te ES 313. Cred t 3 hours

438 Structural Models. D mens ona ana ys s and pr nc ples of s mi tude D rect mode ana ysis nc uding materia s fabr cat on oad ng a d nstrumentation techn ques nd rect mode s, photoe ast c ty Corequ s te CE 431 Cred t 3 hours

450 Soil Mechanics in Construction. So me chanics as applied to the construction f e d App cat on for foundations h ghways, reta n ng wa s and slope stabi ty Re at onship between so characterist cs and geo og c forma- tions Prerequisite: sen or stand ng or approva of nstructor Not open to eng neer ng stu dents Two ectures 3 hours aboratory Credit 3 hours

452 Foundations. App cat ons of so mechan- cs t s ope stab ty h ghways earth dams foundat ons and stress d str but on n so l med a Prereq ı s te CE 351 wo e tures, 3 hours ab ratory Cred t 3 h urs

453 Geological Engineering. Geo og ca n vest gat ns for eng neer ng purposes case histor es ma or aspects of geo g c structure weather ng r ver mechan cs, g ac a depos ts e an depos ts airph to nterpretat on for en g neer ng s te ocat ons Cred t 3 hours

461 Environment and Man. Phys ca chem cal and b og ca c mponents of the natura en v ronment mpact of man or g ns and types of po it on Env ronmenta factors affect ng man Open t a Un ve s ty n ors sen ors and graduate students Cred t, 3 hours

463 Environmental Chemistry Laboratory. Anal- ys s of water domest c and ndustr a wastes ab ratory procedures for contro of water and waste treatment processes Prerequ s te. CE 361 or 362 Two ectures 3 hours aboratory Cred t 3 h urs

464, 465 Industrial Hygiene. Se ected t p cs nclud g survey methods ega and phys og ca aspects of occupat ona hea th hazards Methods f measureme t and ana ys and phys olog ca act ons of such contam nants as t x c gases m nera d sts meta s and the r con pound and ndustr a so vents Two ectures, 3 hours ab oratory Cred t 3 ho rs each semester

466 Sanitary Systems Design Capa ty p a n ng and des gr of water supp y domest c and st rm dra nage and o d waste systems Cred t 3 h rs

471 City Planning. Mun c pa organ zat on and adm n strat on pub ic ut t es, serv ces zoning rep ann ng crit ca stud es Two ectures 2 hours aboratory Cred t 3 hours

473 Engineering Interpretation of Land Forms. North Amer ca by geograph c reg ons and the eng neer ng prob ems and character st cs of each area Cred t 3 hours

474 Traffic Engineering. Operator and vehic e character st cs street ca ac ty s gna s s gn and mark ngs etc A phases of traff c eng neer ng as app ed to urban areas Cred t 3 hours

475 Highway Geometric Design. Des gn of the v s ble e ements of the roadway Fundamenta des gn contro s w th app cat on to rura roads, at grade ntersections freeways and n terchanges Prerequ s tes CE 344 372 Two ec tures 2 hours aboratory Cred t, 3 hours

481 Water Resources Engineering. Water re sources systems for var ous types of water ut zat on nc ud ng rr gat on hydroe ectr c power navigat on and f ood c ntro Phys ca hydro ogy Econom c ana ys s Case stud es Cred t 3 hours

482 Free Surface Flow. Steady and unsteady f ow n open channe s surface curves trans t ons and contro s hydrau c jump surges and waves Secondary f ows Prerequ s te· CE 381 Cred t hours

495 Topics in Civil Engineering. Se ect on and eva uat n of the s gn f cant var ab es n c v eng eer ng prob ems App cat on of con cepts acqu red n undergraduate curr cu um to the deve opment of a rat ona and feas ble pr b em so ut on Prerequ s te sen or stand ng. Cred t 1 h r

524 Steel Structures. Strength pr pert es of stee and the r effects n structura behav r E ast c des gn of stee str ctures P ast c ana ys s and des gn of beams frames and bents P ast c def ect ons P ast c des gn requ re me ts Ana ys s and des gn of mu t' st ry bu d ngs Recent deve opments n stee struc tures Cred t 3 hours

525 Bridge Design. Computer a ded des gn of br dges and bridge components Super structure des gn of co t nuous g rder c nt n ous truss arch and suspens on br dges Comp ete des gn of a cont nuous p ate g rder br dge Prerequ s te CE 431 Two hours ecture 2 hours aboratory Cred t 3 hours

526 Building Design. Struct ra design e ast c and p ast c of bu d ngs and frames Methods of fram ng w nd and earthquake forces, spec a systems Prerequ s te CE 423 Corequ s te. CE 431 Cred t 3 hour

527 Concrete Structures. E ast c ult mate strengt and y e d ine theory Def ect on tors on shr nkage and p ast c f ow Prestressed concrete, spec a systems Prerequ s te CE 431 Cred t 3 hou rs

528 Stability of Structures. E ast c and ne ast c bu k ng f ro ed and co d formed co umns and beams Stab ity of p ates r g d frames and trusses Cred t 3 hours

532 Matrix Methods in Structural Analysis. Matr x methods app ed to structura eng neer ng and structura mechan cs St ffness and f ex b ty methods, f n te e ements f n te d f ferences Prerequ s te CE 431 or equ va ent and computer programming background Cred t 3 h urs

533 Optimization of Design. L near and non n- ear mathemat ca techn ques ead ng to opt mum we ght and opt mum cost des gn. Appl cat on to c v and aerospa e structures and c v sys tems Cred t 3 hours

534, 535 Plate and Shell Structures. Deve op ment of equat ons and app cat ons of theory to the ana ys s of p ates and she s emphas z ng numer ca so ut ns Membrane and bend ng stresses n stee and conc ete structures Pre requ s te CE 431 432 and part a d fferent a equat ons Cred t 3 hours each emester

536 Dynamics of Structures. Ana ys s of struc tures and structura members sub ected to dy r am c oad ngs resp nse spectra the ry w th emphas s on earthquake app cat ons nvest ga t ons of the resp nse of mu t degree of freedom str ctu es matr x n ethods f ana ys s Prereq u s te CE 431 C ed t 3 hou s

553 Theoretical Soil Mechanics. E g neer ng prope t es of s s app cat on of theory of e ast c t to s n ed a fa ure t e r es the r es f conso dat n and shear trength of g an ı ar n ater a s Prerequ s te CE 351 Tw ec t ures 3 ho urs aboratory Cred t 3 h urs

554 Theoretical Soil Mechanics. Shear strength of cohes ve mater a s c ay m nera ogy and s structure theor es f bear ng capac ty s ope stab ty and ntroduct on to so dynan cs Prerequ s te CE 351 Two ectures 3 hours aboratory Cred t 3 hours

555 Applied Soil Mechanics. App cation of theoret a so mechan cs t eng neer ng prob ems. Subso nvest gations samp ng tech n ques f e d n easurements underp nn ng de water ng systems chem ca and mechan ca tab zat on techn q ies Prerequ s te CE 553 Tw ectures 3 hours aboratory Cred t 3 ho rs

556 Seepage and Earth Dams. Trans ent and steady state f ow of water thr ugh s med a, nf ned and unconf ned f ow pore water pre ures and app cat on f theor e t the des g f earth dams Prerequ s te CE 351 Two ec t re ho rs at at ry Cred t 3 h irs

557 Advanced Foundation Engineering. Des gn f sha w f ındat ons deep f undat ons, re ta g wa s b aced excavat ns anch red bL khead and cofferda Prerequ s te CE 553 Cred t 3 hours

561 Water and Waste Water Treatment. Theory and des gn of phys ca and chem ca pr cesses for t e treatment of water and waste waters Pre requ s te CE 361 or equ va ent Cred t, 3 hours

562 Waste Water Treatment. Theory and des gn f b o g a waste treatment systems Po u t n and env r nmenta ass m at n of wastes Prereq ı s te CE 362 or equ va ent Cred t 3 hours

563 Sanitary Engineering Processes Laboratory. Lab rat ry stL dy f Lnt processes nvo ved n water and waste treatment One ecture 6 h rs ab ratory Cred t 3 h ırs

567 Atmospheric Pollution. Atmos her c c mp s t o and dy an cs oı g ns and chem stry of ntam nat n b o og ca s gn f cance ana yt a neasu en ent eng neer ng ntro meth ds and a r po ut on ejs at n C ed t 1 3 hours

568 Epidemiology and Public Health Engi neering. B o ogy and t ansm ss on of d seases ıathemat ca the ry f ep dem cs sa tat on and pub c hea th adm n strat n Cred t 1 3 ours

571 Airport Engineering P ann g and des gn of a rport fac t es f nanc ng a r t aff c on tro a rcraft chara ter st cs demand s te se ec t n runway c nf g rat n and term na areas Prerequ s te CE 3~2 wo ectures 2 h urs aboratory Cred t 3 h ur

572 Design of Highway and Airport Pavements. Design pract ces mater als and test ng of f ex b e and r g d pavements Prerequ s tes CE 351 372 Two ectures 3 hours aboratory Cred t 3 h ırs

573 Urban Transportation Planning. App ca t on f and se parameters traff c generat on theory traff c d str b t on and ass gnment node s tra s t ana ys s and econom factors to the so t o of the urban transportat on prob em Cred t 3 ho rs

574 Highway Engineering, Planning and Eco nomics. H ghway transportat on nc ud ng des gn perat on p ann ng e v ronmenta mpact ec n c feas b ty and f nanc g H ghways as a reg na syste n Cred t 3 h ur

581 Hydrology. Advanced hydro og c pr nc p es Hydr g measurements stat st ca ana ys s of data des gn storms f ood rout ng ground water tl e ry Prerequ s te CE 381 Cred t 3 ho irs

584 Hydromechanics. The ret ca cons derat n of water waves jets wakes cav t es strat f ed f ows d ffus on phe mena unsteady f ow n p pes and surge pr b ems pote t a f ow c n cepts and turbu ence Cred t, 3 hours

585 Applied Hydromechanics. Advanced top cs se ected accordance w th st dent nterests sed mentat on phenomena water waves coasta pr cesses f w n porous med a cav tat on dens ty curre ts transport phenomena and f u d m x ng Prerequ s te CE 5 4 Cred t 3 hours

586 Water Resources Systems. E g ee ng ec n ı c ega po t ca ad n strat ve and so c a factors affect ng dec s ons n reso rce a ocat on and water res urces systems Prerequ s te CE 481 Cred t, 3 hours

587 Water Resources Systems. Water resources roject f rn ı at on e m c ana ys s c st a cat on and eva uat on of performance Case stud es Prerequ s te CE 481. Cred t 2 3 hours

588 Physical Oceanography. Current systems r u at n a d w d dr ven c rrents empha s z ng the ıpper ocean Cred t 3 hours

Special Graduate Courses: 498 59 91 592 593 594 799 See pages 46 47

Electrical Engineering

Professors:
CE EC A 209 BARKSON
DONNELLY KAUFMAN KE LY
P E R SSEL S RK S T B THOMPSON
WELCH

Associate Professors:
CLARK DEMASSA GELOPULOS
H GG NS JELSMA PALAIS,
PATTERSON ROBB NS SN DER STE NMANN
WOODFI Z MMER

Assistant Professors:
B ACK EDGE VAN ORNUM

Lecturer:
SAK OT S

EE 302 Electrical Networks. Ana ys s of net works and near systems Prerequ s te ES 330 C ed t 3 hours

313 Electrical Construction Fundamentals. E ectr ca c rcu ts and mach nery E ements f p wer transm ssion and d str but on Re ated meas rement and nstrumentat on essent a s Not for degree cred t f r EE ma ors Pre req s te ES 02 Tw hours ecture 3 hours ab ratory Cred t ho ır

314 Illumination um nous ntens ty and f ux m nat on fr m ne and area sources App cat ons of the pr nc p es of opt ca des gn Photometr c measuren e ts App ed ght ng ca cu at ons P erequ s te PH 112 oı equ va ent N t f ı degree cred t fo EE ma ors Cred t ho rs

320 Digital Computer Fundamentals. Switch ng theory number systems a thn et c Computer system hardware and software Prerequ s te un r stand ng Cred t not qranted for both EE 320 and 420 or for both EE 320 and 428 Cred t 3 hours

325 Analog Methods. Introduct n to ana og mpute Ana og tec n ques app ed to s mu a- t o of e ectr ca mechan ca hydrau c and

other dynam c systems Not for degree credit for EE majors) Prerequisites ES 345 or MA 212 ES 312 330. Two lectures 3 hours laboratory Cred t, 3 hours

332 Electronic Engineering. Amp f ers· mode ng feedback, frequency response app ca t ons Prerequ s te ES 331 Three ectures, 3 hours laboratory Credit 4 hours

341 Electromagnetic Fields. Maxwe 's equa t ons e ectromagnet'c waves rad at on mate r a propert es Prerequis tes: ES 202 MA 362 Cred t, 3 hours.

357 Semiconductors and Devices. Sem conduc tors dr ft d ffus on gene at on recomb nat on junctions d odes sw tch ng, trans stors, Ebers Mo equat ons. Prerequ s tes EE 341, ES 350 Credit 3 hours

362 Electromechanics. Magnet c circu ts and e ectromechan ca energy conversion ntroduc t on to ana og and dig ta s mu at on and to ma chinery aboratory Prerequ s te EE 302 Three ectures 3 hours aboratory Cred t, 4 hours

401 Distributed Parameter Networks. Ana ys s and app cations. Prerequ s tes EE 302 341 Three ectures 3 hours aboratory Cred t 4 hours

402 Network Analysis. Prerequ s te EE 302 Cred t 3 hours

405 Network Design. Modern network synthes s. Frequency doma n approx mat ons Theory of two port networks Prerequ s te EE 302 Cred t, 3 hours

406 Computer-Aided Network Design. Computer methods in AC DC and trans ent ana ys s of near and non inear networks Se ected gen era purpose programs such as ECAP CIRCUS and SCEPTRE Act ve dev ce mode ing Prereq u s te EE 302 Cred t 3 hours

420, 421 Digital Systems Design. Computer ar thmetic ogica design, and c rcu t tech no ogy Hardware and software of a part cular system CPU technology and the use of on- ne assembly and ut ty systems Prerequ s te jun or stand ng 2 5 hours ecture, 1 5 hours aboratory Cred t 3 hours each semester

422 Digital Systems Circuits. Mode s and ana ysis of BJT s and FET s n non inear e ec trica c rcu ts for ogic t m ng sw tch ng memory and osc ations n d g ta and ana og systems Prerequ s te ES 331 corequ s te EE 423 or equ va ent Cred t 3 hours

423 Digital Circuits Laboratory. ncorporat on of dig ta components nto c rcu ts for d g ta systems appl cat ons Corequ s te EE 422 Three hours Cred t 1 hour

425 Analog and Hybrid Computers. Des gn and use of hybr d analog-d g ta computer systems and components such as op amps, mu t p iers, analog sw tches and comparators A D and D A converters Specia comput ng techn ques Prerequ s tes EE 362 332 Two ectures 3 hours aboratory Credit 3 hours

426 System Programming Methods. Tab e ook up procedures, h erarch ca data-structures macro programm ng and system imp ementat on anguages Prerequ s te ES 422 coreq isite ES 423 Cred t 3 h rs

427 Fundamental Computer Algorithms. Subrou t nes corout nes nterpret ve rout nes. O buffer ng and t m ng Informat on structures stacks queues, dequeues sequent a a location l nk ng techn ques bas c sts and b nary trees Prerequ s te. ES 423 or equ va ent Lec ture and aboratory. Cred t 3 hours

428 Digital Switching Theory. M n m zat on of Boo ean funct ons for comb nat ona s ng e and mu t p e output sw tch ng c rcu ts Sym metr ca funct ons threshold funct ons mem- ory e ements and completely specif ed sequen t a mach nes Prerequ s te jun or stand ng. Credit 3 hours

431 Semiconductor Devices. Nonun formly doped narrow base d odes dr ft trans stors Base trans t t me h gh frequency network mode s f e d effect devices varactors PNPN struc tures Prerequis te EE 357. Two hours ecture, 3 hours aboratory Credit 3 hours

432 Field Effect Devices. Surface effects gradua case and spac charge mode s f r FET's and M S trans stors trans t t me m tat ons sma signa and switch ng mode s and app ca t ons Prerequ s te EE 357 Credit 3 hours

433 Transistor Circuit Design. Design of elec tron c c rcu ts nc ud ng amp if ers m xers osc ators and power supplies Prerequ s tes EE 302 332 or equ va ent hree hours ecture 3 h urs aboratory Cred t 4 hours

434 Wave Mechanics. Probab ty Schroed nger equat on e genfunct ons harmon c osci lator per od c pote t a superposit on angu ar m mentum scatter ng tunne ng perturbat on theory Prerequ s tes MA 362, EE 341 Cred t 3 hours

435 Microelectronics. Pract ce of so d state dev ce fabr cat on techn ques nc ud ng th n f m and ntegrated c rcu t fabr cat on princ p es Prerequis te EE 357 or equ va ent Tw hours ecture, 3 hours aboratory Cred t 3 h urs

441 Electromagnetic Waves. Gu ded waves ra- d at on propagat r ref ect on and refract on of waves Prerequ s te EE 341 Cred t 3 hours

443 Antennas. Eng neer ng pr nc p es arrays ieas irement numer ca m tat s Prereq u s tes EE 341 401 Cred t 3 hours

445 Microwaves. Components systems and mea- surements Prereq s tes EE 341 401 Three lec tures 3 ho rs aboratory Cred t 4 hours

448 Coherent Optics. Ana ys s and des gn of systems us ng asers Prerequ s te EE 341 Cred t 3 hours

451 Error Correcting Codes. App cat on of modern a gebra to the ana ys s a d synthes s of random error detect ng and e ror c rrecting b o k odes Prerequ s te EE 320 or 428 Cred t 3 hours

455 Communication Theory. Spectra ana ys s f s gna s and no se L near and exponent a r odu at n Samp ng theory and pu se modu a t on C mparat ve ana ys s of systems Pre requ s tes EE 302 332 Three ectures 3 hours aboratory Cred t 4 hours

456 Communication Systems. Stat stica meth ods n commun cation systems Representat on f random s gna s Detect on and est mat on theory Prerequ s te EE 455 Cred t 3 ho irs

461 Synchronous Machines. C ass ca and mod ern n ode s of syn hronous mach nes emphas z

ng power ut ty app cat ons Prerequ s te EE 362 Cred t 3 hours

462 Control Problems in Power Systems. Area t e and generat n contro exc tat on contro systen s exc tat o supp en entary contro and govern s C requ s te EE 480 Cred t 3 hours

470 Alternating Current Circuits. Phasor a a ys s and meter ng of s ng e phase ba an ed and unba anced po yphase c rcu ts Steady tate AC mach nery re at onsh ps Prerequ s te EE 3 2 Cred t 3 hours

471, 472 Electric Power Systems. P wer system ana ys s Prereq s te EE 362 or 4 0 r equ va e t Cred t 3 ho rs eac semester

480 Feedback Systems. Ana ys s and des gn of near feedback systems Frequency respo se and root ocus techn ques ser es compensat on and state var ab e feedback Prerequ s tes EE 332 362 Three ectures 3 hours aboratory Cred t 4 hours

483 Theory of Systems. Techn ques used in the a a ys s of cont nuou s and d screte near sys ten s N t nter ded f r EE graduate st dents P ereq s te EE 3 2 Cred t h urs

484 Information Systems Engineering. nd v d ua and group pr jects emphas z ng phys ca ntera t ns and m tat ons n mmun ca t on c ntr a d f rmat on process ng system perf rm a e env ronmenta a d eco om c c derat ons eva uat on cr ter a and pro ect rgan zat on Prereq i s tes ES 331 EE 341 362 C ed t 3 hours

495 Bio-Engineering Seminar. App cat ons of the concepts and methods of e ectr ca eng neer ng to the b og ca and med ca sc ences May be repeated for cred t Prerequ s te sen or stand ng Cred t 3 h urs

496 Professional Seminar. Top s f nterest to graduat g e e tr ca eng neers Prerequ s te se r tand ng One ecture Cred t None

501 Passive Filter Synthesis. Advanced meth ds f r the synthes of pa s ve f ters fre que y and t n e d ma n appr x mat o c p ter a ded des g tect que Prerequ te EE 4 5 a d 55 r eq va ent Cred t h rs

502 Foundations of Passive Network Theory. T me and frequency doma n representat on of near networks Topo og ca ana ys s Rea zab ty theory and the foundat ons of pass ve netw rk synthes s Prerequ s tes EE 302 and 55 or equ va ent Cred t 3 ho rs

503 Active Networks. Theory of etw rks con- ta n ng genera act ve e ements L near amp f er des gn Prereq tes EE 302 and 550 or equiv a e t Cred t 3 hours

504 Active Network Synthesis. Sy thes s of act ve networks for w frequency f ter ng ap p cat o s Use of negat ve mpedance converters gyrators and operat ona amp f ers as act ve e ements Prerequ s te EE 405 Cred t 3 hours

505 Digital Processing of Signals. Frequency doma n des r pt n f d g ta f ter ng D s crete spectrum ana ys s by z transform, and d screte F ur er transform w th q ant zat on effects Prerequ s tes EE 302 and 550 r equ v a ent Cred t 3 h urs

516, 517 Logical System Engineering. System des gn f d g ta comp ters n mber systems and ar thmet c computer organ zat on Des gn and app at on of ser a and para e g ca com p ne t c i ng nte s eg te s ana g t d g ta cor v ters adders t tra tors data tr ct res system pr gramm g bas c ha dware and s ftware set Part f graduate tegrated system e g eer ng pr gram Cred t 3 t s eacl sen ester

518 Digital System Engineering. Des gn of d g ta systems hardware and software Methods and techn ques of trans at ng systems requ re ments nto opt mum hardware des gns for a w de ra ge of app cat ons and systems requ ements and systems des gn of the software c mponents of d g ta systems nc ud ng assemb ers nter preters comp ers mon tors and ma ntenance systems Part of grad ate ntegrated system en g neer ng program Cred t 3 h urs

521 Digital Systems Hardware. Deta ed study f the memory and nput output c mponents of the d g ta systen stud ed n EE 421 and sur vey f ther d g ta systems hardware Prereq u s te EE 421 Cred t 3 h urs

522 Digital Circuit Design. Vo tage and cur rent t me base generators mu t v brators neg at ve res stance c rcu ts act ve and magnet c memory e ements Prerequ s te EE 422 Credit hours

524 Digital Systems Software. Des gn of d g ta system software nc ud ng e ocatab e oad ers assemb ers on ne t ty systems and mu t programm ng operat ng systems A cont n uat on of EE 421 Prerequ s te EE 421 Cred t 3 hours

526 Design of Automatic Programming Systems. Methods and techniques of des gn ng comp ers for anguages such as FORTRAN and ALGOL Prerequ s tes ES 422 423 Cred t 3 hours

527 Computer Operating System Algorithms. Theory and pract ce n computer operat ng sys tems Se ected top cs from d spatch ng nter r pt process ng dynam c resource a ocat on v rtua memor es nonnumer ca and sem n mer ca a gor thms Prerequ s te EE 4 7 or 426 Lecture and aboratory Cred t, 3 hours

528 Advanced Switching Theory. App cat on f n atr ces part a y ordered ets att ces equ va ence and compat b ty re at ons t og a des g of comp ete y and ncomp ete y spec f ed sequentia mach nes Prerequ s te. EE 428 Cred t 3 ho rs

529 Digital Systems Seminar. Se ected top cs n theory des gn or app cat on May be repeated for red t Cred t 3 hours

531 Semiconductor Device Theory I. Advanced study of ju ct n d des junct n trans stors and f e d effect trans stors n mogeneous m pur ty prof es h gh n ect on effects bas fabr ation techn ques surface effects ana ys s of MOS f e d effect trans stors Prereq u s te EE 431 or equ va ent Cred t 3 hours

532 Semiconductor Device Theory II. Sem con- d uctor dev e phen mena nc ud ng ght a d heat ffects tunne ng meta nsu at r sem conduc tor dev ces Prerequ s te EE 531 Cred t 3 hours

533 Integrated Circuit Design. ntegrated c r c t fabr at o dev ce m de ng active and pass ve para t cs Compar son f ntegrated and

d crete rc ts Character zat on and des gn f ntegrated og c and sma s gna c rcu ts Pre requ s tes EE 3 2 332 and 4 1 or equ va ent Cred t, 3 ho rs

534 Topics in Solid State Device Theory. E ectr a and therma transport pr pert es Excess arr er dynam cs Equ br um and non equ br um pr cesses Prerequ s tes EE 431 and 434 r equ va ent C ed t 3 h urs

541, 542 Advanced Electromagnetic Fields. Ana yt a techn ques app ed to e ectr mag net c f e d prob ems Prerequ s te EE 341 or equ va ent Cred t, 3 hou s each semester

543 Antennas. Ana ys s and synthes s f se ected rad at ng structures and systems Prerequ s te EE 44 r equ va ent Cred t 3 hours

545 Microwaves Component c tr dev ces and c rcu ts Prerequ s te EE 445 Cred t 3 t our

547 Microwave Solid State Electronics. se of ferr te sem conductor and p ezoe ectr c mater a s n m c owave systems Prerequ s tes EE 357 and 445 o equ va ent. Cred t 3 hours

548 Optical Electronics. Laser c mmun cat on dev es and systems Prerequ s te EE 448 Cred t 3 h ι s

549 Laser Engineering. Theory and des gn f asers Prerequ s te EE 448. Cred t 3 hours

550 Transform Theory and Applications. App at ons of c mp ex var ab es t Four er Lap ace and z transf rm s Or ented to app ca t ons n contro network comm ιn cat on a d near system theory Prerequ s te EE 302 Cred t 3 hours

551 Error Correcting Codes. Bι rst error c rrect ng codes convo ut on codes comma free codes ar thmet c odes and error contro probab ty Prerequ s te EE 451 Cred t 3 hours

554 Random Signal Theory. App cat n f sta t st ca techn ques to the representat on and ana ys s of e ectr ca s gna s and to commun cat on systems ana ys s Prerequ s te EE 302 Cred t 3 h urs

555 Electrical Communications. Process ng f s gna s n the presence of no se Random s gna s rre at o frequency spectra est mat on f ter ng r se pred ct ι tran ents Pre requ s te EE 554 Cred t 3 hours

556 Detection and Estimation Theory. C mb nat on of the c ass ca techn ques f tat s t ca nference and the random process chara ter zat n f commun cat radar a d other m dern data pr cess g systems Prerequ s tes EE 455, 555 Cred t 3 hours

557 Information Theory. Def n t ons of nfor mat on sources and hanne s funda ne ta theo rems f nf rmat theory and the r s gn f ca e s mp e error detect ng and err r orre t ng des Prerequ s te EE 554 Cred t ιrs

558 Modulation Theory. L near and non near mod at on opt m m pro ess rs nc d ng the deve op ent of perf rma e bo inds Prerequ tes EE 45 555 Cred t 3 hours

559 Quantum Communication Theory. Vectors and operators n H be t space L e pr ducts and the uncerta nty pr nc p e stat st ca dens ty perator no se phys ca systems Prerequ s tes EE 434 and 555 o eq va ent. Cred t 3 hours

570 Symmetrical Components. App cat on f symmetr ca ompo ents to the ana ys s of pow er systems and mach nes Prerequ s tes EE 362 and 401 or equ va ent Cred t 3 h urs

571 Power System Stability. rans ent and steady state stab ty m ts of p wer systems Prerequ s te EE 471 r eq ι va ent Cred t 3 ours

575 Analysis of Power Networks. Tensor and matrix meth ds app ed to prob ems nv v ng extens ve comp ex networks Prerequ s te EE 471 or equ va ent C ed t, 3 hours

580 Sampled Data Control Systems. Samp ng process z transforms t n e and frequency responses con pensat on synthes s f samp ed data systems n t me and frequency doma ns P e requ s tes EE 550 582 Cred t 3 hours

581 Random Processes in Control Systems. Ra dom processes n near systems state es- t mat on and c ntro system des gn us ng W ener f ter ng Ka man f ter ng system parameter est mat o c mb ned est mat on and contro Prerequ s tes EE 550 554 582 Cred t 3 hours

582 State Variables in Control Systems. System representat on n state var ab e form Coord ιate systems ear transformat o s observ ab ty nt ab ty Prereq ι s te EE 480 Cred t 3 h ur

586 Nonlinear Control Systems. Stab ty theory ιd g pl ase p ane desc ι b ng fun t on apunov s n ethod frequency doma n cr ter a for non near systems Re ay systems Prerequ s tes EE 55 58 Cred t, hours

587 Optimal Control Systems. App cat on of ca c us f var at ons Pontryag n s pr nc p e and dynam c programm ng to contro prob ems Com tat ona techn ques for so v ng opt ma contro prob ems Prerequ s tes EE 550 582 Cred t 3 hours

588 Automata. Theory of f n te state mach nes and the r connect n w th mathemat ca ngu s t c n ode s Prerequ s te EE 52 Cred t 3 hours

589 Artificial Intelligence. Pι ogress prob ems a d pr spe ts of aut nat ng cogι t ve and f eur st c reason ng processes Prerequ s te: O e 5 0- eve course n omp ιt ng r equ va ent red t 3 hour

Special Graduate Courses: 49 590 591 592 593 594 ¯99 See pages 46 4¯

Engineering Science
(Core Courses)

ES 102 Introduction to Engineering. Ro e of the eng eer e ementary eng neer ng prob ems, current trends n engineer ng methods of eng neer ng des gn, and des gn pro ect Lec ture rec tation and aboratory Cred t 2 hours

104 Engineering Graphics and Design. Graph cs as a fundamenta means of commun cat on n en g neer ng ana ys s and design Sketch ng spa t a v s ıa zat n descr ptive geometry and mode n eng neer ng draw ng practices for de s gn app cat on S x h urs ecture aboratory Cred t 2 hours.

118 Chemical Foundations of Engineering. Atom c and mo e u ar structure states of matter and the r energies chem ca equ br a and react on rates rgan c compounds and ndustr a pro esses Prerequ s te super or performance n one year of gh sc o phys cs and chem stry Lec t ıre dem nstrat ons and rec tat n Cred t 4 t o ırs

122 Computer Programming. Def n t on formu at on and f w chart ng ead ng to the so u t on of comp ex pr b ems by d g ta computer us ng FORTRAN Computer made ava ab e to students for so ut on of requ red pro ects C requ s te MA 120, or prerequ s te MA 142 or 60 Cred t, 2 hours

200 Engineering Drawing. Orthograph c project on auxiliary views, section v ews, dimen sion ng mechan ca or structura deta ıng Prereq ıs te ES 104 or D 112 S x hours ecture-aborat ry Cred t, 2 hours

201 Mechanics and Heat. Bas c concepts of me han cs and heat w th app cat ons to eng neer ng Lecture demonstrat ons and laboratory Prereq u s te. MA 120 Cred t 4 hours

202 Electrical Science. Bas c concepts of e ectr c ty and magnet sm w th app cat ons to eng nee ng Lect re, demonstrat ons and abo ratory Prerequ s te ES 201 c requ s te MA 121 Cred t 4 h urs

203 Engineering Wave Phenomena. Bas c con cepts of wave phenomena with appl cat ons to en g neer ng Prerequ s te. ES 202 Cred t 2 hours

211 Engineering Mechanics, Statics. Force systems, resu tants equ br um d str buted forces fr ct on F rst and second moments of areas Prereq s te ES 201 corequ s te. ES 345 or MA 212. Cred t, 2 hours

226 Digital Computer Programming. FORTRAN programm ng and the use of d gita computers Prerequ s te MA 1 6 or equ va ent Not f r en g neer ng degree cred t ect re and aboratory Cred t 2 hours

300 Economic Analysis for Engineers. Econom c eva uat o of eng neer ng a ter atives empha s z ng the t me va ue of money Cred t 2 hours

304 Atomic and Nuclear Principles. Bas c c n cepts of atom c and nuc ear pri c p es w th ap p cat ons to eng neei ng Prerequ s te ES 202 coreq ı s te ES 203 Credit 2 hours

309 Technical Writing. The mecha cs of tecl n ca wr t g w th some pract ce n report wr t ng Not f r eng neer ng or c nstruct on degree cred t Prerequ s te EN 101 Cred t 3 f ours

312 Engineering Mechanics, Dynamics. K ne mat c and k net cs of pa t c es trans at g and r tat ng coord nate systems R g d body k nemat cs. Dynam cs of systems f part c es and r g d bod es Energy and momentum methods Prerequ s tes ES 211 ES 345 or MA 212 Cred t 3 h urs

313 Mechanics of Materials. Concepts of stress and strain Hooke s Law, strength and def ection of ax a force members shafts n tors on and beams n f exure, comb ned stress stab ty of co umns Prerequ s tes ES 211 ES 345 or MA 212 Lecture demonstrat ons and aboratory Cred t 4 hours

322 Advanced FORTRAN with Systems Applications. Advanced concepts of FORTRAN program m ng and e ementary numer cal methods for so v ng systems eng neer ng problems Emphas s s on FORTRAN methods of approx mat on differen t at on tegrat on nterpo at on extrapo a t on a gebra c and s mu taneous near equa t ons. Prerequ s tes: ES 122 or 226 MA 121 Cred t 3 hours

330 Electrical Networks. Ana ysıs of net works and near systems Corequ s tes ES 202 ES 345 or MA 212 Lecture dem nstrat ons and ab rat ıy Cred t, 4 hours

331 Electronic Engineering. E ectron c cır cu ts sem conductor dev ces and app cat ons Prerequ s te ES 330 Lecture demonstrat ons and aboratory Cred t, 4 hours.

340 Probability and Statistics for Engineers. Fundamenta concepts n probab ty and stat s t cs Top cs nclude d screte and cont nuo s d str but ons random var ab es samp ıng and descr ptive stat st cs as we as tests of hypo theses and est mates Prerequ s te MA 121 Cred t 3 hours

344 Numerical Analysis in Engineering. Ap p cat on of numer cal procedures to the so u- t on of comp ex eng neer ng prob ems. Ana ys s and organ zat on of pract ca pr grams for nu mer ca so ut on of n t a boundary and e gen- va ue prob ems Prerequıs te ES 345 or MA 212 Cred t 3 hours

345 Methods in Engineering Analysis. L ne and surface ntegra s ınf n te ser es exact and numer cal so ut ons of ord nary d fferent a equat ons w th app cat ons to the prob ems that frequent y appear n eng neer g. Prerequ site MA 121 Cred t 5 hours

346 Methods in Engineering Analysis. Top cs from advanced calcu us d fferent at on and n tegrat n of funct ons of severa var ables vector d fferent a and ntegra ca cu ıs Fourier ser es and orthogona funct ons nf n te ser es app cat on t eng neer ng prob ems Prereq u s te ES 345 or MA 212 Cred t 3 hours

348 Applied Mathematical Analysis. Treat ent and nterpretat on of engineer ng data mathemat cal mode s of engineer ng prob ems near a gebra and ıntroduct on to opt m za t on techn ques and computat ona techn ques for so v ng no near equat ons Prerequisite ES 345 or MA 212 Cred t 3 hours

350 Structure and Properties of Materials. Bas c concepts of mater a structure and ts re at on to propert es. App cat on to engi neer ng prob ems Corequ site ES 381 Cred t 3 hours

360 Measuring Systems. App cat ons of systems concepts to measurements Fundamenta theory of stat c and dynam system behav or D scuss on of carry ng process ng shap ng and convert ng energy and nformat on Lec- ture d scuss on groups aboratory Not for eng neer ng degree cred t Prereq is tes TA 36 PH 11 D 311 and TE 201 Cred t 3 ho rs

361 Measurement Systems Engineering. System des gn concepts appl ed to stat c and dynam c measurements Behavior of transducers va da t on of exper menta data Prerequisites ES 313, 330 Lecture demonstrat ons aboratory and ec tat on Cred t 4 hours

364 Chemical Process Instrumentation. Theory and app cations of analyt cal a d con tro strumentat on sed n the chem ca pro ces ndustr es Prerequ s tes ES 118, 203 33 Lect re demonstrat ons and aboratory Cred t 3 ho irs

371 Fluid Mechanics Bas c princ p es of con t nuu n f u d nechan cs Prerequisite ES 381 Lect re den onst at on and laboratory. Cred t 4 l ours

381 Thermodynamics. Work heat and energy transformat ons Re at on of properties. Laws concepts and modes of ana ysis common to a l appl cat ons of thermodynam cs n eng neer ng Lecture rec tat on. Corequ s te ES 312. Cred t, 3 hours

400 Engineering Communications. Compos tion for technica papers reports, and sc entif c art c es su tab e for pub cation Ora and wr tten presentat on Prerequ s te upper d v s on stand ng Cred t 3 hours

402 Technology, Society and Human Values. Exan nat on of va ues wh ch motivate mank nd to create technology Areas of conf ct and resolut on between bas c human va ues and techno og cal soc ety Read ng and d scuss on with vis t ng ecturers A so sted under HU 402) Prerequ s te jun or stand ng or above Credit, 3 hours

403 Engineering Technology and Public Policy. Techno ogy assessment env ronmenta protec t on resource management and the soc a conse- quences of techno ogy re ated to pub c pol cy formu at on and the respons b t es of the eng neering profess on Case stud es and group pro ects Prerequ s te jun or stand ng Credit 3 hou rs

422 Programming Languages. Programm ng anguage spec ficat on and ts app cation to FORTRAN IV and ALGOL l ke anguages Prereq q s tes ES 122 or 226 ES 345 or MA 212 Cred t 3 hours

423 Symbolic Programming. Symbo c assemb y ang uage programm ng techniques and app ca t ons Prerequ site ES 122 or 226 Lectures and aboratory Cred t, 3 hours

424 Introduction to BASIC and COBOL. Inter act ve anguage BASIC and the bus ness or ented anguage COBOL COBOL emphas s on appl ca t o t n anagement nformat on systems Pre requ s te ES 122 r 226 Cred t 3 hours

425 Advanced Programming. Concept of pro gramm ng as a d sc pline app cab e to a broad spectrum of subjects Semant cs of the FORTRAN anguage Top cs searchi g sorting magnet c tape merg ng, chara ter hand ng mach ne de pendency plott ng, and profess ona program m ng pract ces Prerequis te. ES 122 or 226 MA 117 Lecture and aboratory Cred t 3 hours

441 Probability for Engineers. Foundat ons of probab ty Topics nclude transformation of var ab es Markov cha ns and s mp e t me dependent stochast c pr cesses appl cat ons n eng neering Prerequ s te ES 340 Cred t, 3 hours

442 Engineering Statistics. Topics nclude regress on ana ys s and corre at on, ana ys s of var ance maximum kel hood marginal and condit ona d str but ons exper mental design, and qual ty contro and reliab ity Prerequ s te ES 340 Credit, 3 hours

444 Linear Algebra in Engineering. Matr x theory and numerica ana ysis of matr x opera tions App cat ons from mechan ca , structura e ectr ca and control f e ds of eng neer ng Prerequ s te ES 346 or MA 460 Cred t, 3 hours

445 Complex Analysis in Engineering. Complex var ab es n eng neer ng ana ytic funct ons integra s, power ser es conforma mapp ng app cat on of conf rma mapp ng and transforms to prob ems n f u d f ow, heat transfer and e ec tric potent a Prerequ s te ES 346 or MA 460 Cred t 3 ho rs

446 Partial Differential Equations in Engineering. Ord nary different a equat ons ser es so ut ons boundary va ue prob ems Four er ser es separa t on of var ables homogene us pr b ems. Prereq i s tes ES 345 or MA 212 ES 346 r MA 460 Cred t 3 hours

447 Partial Differential Equations in Engineering. C ass f cat on of second orde part a d fferen t al equat ons, propert es of e pt c hyper bo c and parabo c eq at ons general zed Green s dent t es and functions ntegra transf rms var at ona methods Prerequ s te ES 446 Cred t 3 hours

449 Statistical Applications in Chemical Engineering. Descr pt ve stat st cs inear and non ear regress on ana ys s, experimenta des gn, a d experimenta opt mum seek ng tech ques Cred t 3 hours

490 Directed Writing for Graduate Research. Compos t on and thes s research meth ds for graduate students transferr ng to ASU who have not demonstrated a prof c e cy in Eng sh Not for engineeri g degree cred t Cred t, 1 hour

492 Project in Design and Development. n d v dual pro ect n creat ve des gn and syn thes s Cred t 2 3 hours

Special Graduate Courses: 498, 500 59 591 592 593 594, 799. See pages 46 47

Industrial Engineering

Professors:
YOUNG EC G 136C), BEDWORTH
DECKER HOYT SCHAMADAN
Associate Professors:
LEW S LOVELL ROLL ER, SM TH
Assistant Professors:
DEAN MOOR

IE 301 Words and Human Behavior. Tech n ques for recogn z ng and avoid ng those ha b tua responses to fam ı ar words that gener ate much everyday host l ty anx ety confus on and frustrat on. Credit 3 hours

335 Engineering Law. Inf uence of contract, property and tort aw on eng neer ng activit es contracts agency partnership corporat ons ıens and expert test mony Cred t 3 hours

362 Industrial Engineering Analysis. Ana ys s of man mach ne systems us ng methods of ndustrial eng neer ng App cat ons to manu factur ng service, c er cal and techn ca f e ds Cred t 3 hours

411 Engineering Economy. Cash f ow mode pr c ng econom c product on charts econom c ba ance ana ys s prof tab ty mode s Prereq u s te ES 300 Credit 3 hours

422 Information Acquisition. Des gn of systems to co ect nformat on for use n manager a dec s on mak ng human nformation process ng methods f nformat on gather ng, mp ementa- t on and eva uation of ınformat on systems Cred t, 3 h urs

425 Environmental Bioengineering. Exp anat ons of bod ly responses to ndustr a aerospace and other manmade hab tats A so ntroductory bı o ogy of dec s ons how a human body detects externa nformation and processes t nto actions Cred t 3 hours

431 Engineering Administration. Eng neer ng or gan zat ı n and adm n strat on ntroduction to dec s on n ak ng and quant tat ve approaches to management qua tat ve approaches to manage ment qua ıtat ve approaches to management and eng neer ng adm n strat on Cred t, 3 hours

437 Job Evaluation and Compensation. Ana ys s and evaluat on of work ass gnments, determina- t on of compensat n. Cred t 3 hours

461 Planning, Scheduling and Control of Resources. P ann ng ana yz ng contro l ng and evaluating operat ng systems Emphas zing the systems approach, t me ser es forecast ng, net work p ann ng schedul ng and contro Typica operat ng systems nc ude transportat on, hos p ta and product on systems Cred t, 3 hours

463 Control Computer Application. Ana og and control d g ta computers n the ndustr a pro cess Aut mat on, dıg ta computer og c as- sembly anguage programm ng real time computer operat on computer nterfaced opera- t on Laboratory ass gnments Prerequ s te. ES 122 r equ va ent Cred t, 3 hours

473 Foundations of Linear Programming. Ap p cat on of near a gebra to near program m ng Prerequ s te MA 121 Cred t, 3 hours

474 Acceptance Sampling. Stat stıca des gn of samp ng p ans and procedures for attr butes and varıab es data operat ng character stıc curves federa spec fıcat ons and stan dards of qua ty Prerequ site· ES 340 Cred t 3 h urs

475 Computing Systems and Techniques. C n epts f d g ta comp ıters modes of operat on pr gramm ng systems and anguages ntro du t on t t me shar ng concepts search ng and sorting nput output programm ng, sts and str ng process ng Prerequis te FORTRAN know edge Cred t 3 h urs

476 Operations Research Models. Operat ons research methodo ogy deve pment of mode s and techniques for s v ng prob ems such as q eue ng nventory and rep acement Pre requ s tes ES 340 and MA 212. Cred t 3 hours

478 Advanced Computing Concepts for Industrial Systems. Solut on of ndustr a systems problems us ng d g ta computers Top cs cov ered wı nclude data structures data base management and graphic display systems. Pre requ s te FORTRAN know edge Cred t 3 hours

480 Biosystems. Analys s and exp anatıon of muscular cardıac sensory resp ratory and neuro og ca systems as they re ate to eng neer ıng Credit, 3 hours

500 Systems Research Methods. Forma zat on of the systems approach as related to the f e d of ndustr al and systems eng neer ng Cred t, 3 hours

510 Engineering Economic Analysis. Eng neer ng econom c aud t breakeven po nt ana ysis variable budget contro of manufactur ng costs cost ana ys s and product pr c ng Prerequ s te ES 340 Cred t 3 hours.

511 Analysis of Decision Processes. Methods of mak ng econom c dec s ons stat stıca dec s on theory; effects of r sk, uncertainty and strategy on manager a econom c dec s ons Pre requ site ES 340 Cred t 3 hours

514, 515 Analysis of System Operations. Linear programmıng ınventory mode s queue ng theory sequencıng dynam c programm ng com putationa methods Part of graduate ntegrated systems eng neer ng program Integrates w th EE 512 513. Cred t 3 hours each semester

520 Topics in Human Engineering. Ana ys s design and contro of human performance n man mach ne env ronments cons derat ons of phys - o ogıca and psycho ogıca factors as re ated to system performance Laboratory ass gnments Cred t, 3 hours

521 Applied Synecology. Systemat zed so ut on of superv sory and persona prob ems ar sing from nterpersona fr ctıon Cred t 3 hours

531 Topics in Engineering Administration. Con s derat on given to ph losoph cal, psycho og ca pol t cal and soc a mpl cat ons of adm n stra t ve dec s ons Cred t, 3 hours

533 Network Analysis. Network ana ysis te h- n ques, nc ud ng CPM, PERT, GERT, and max mum f ow prob ems Prerequis tes ES 441 and E 473. Cred t 3 hours

562 Discrete System Control. App cat on of automat c control methodology to d screte pro cesses Samp ed data systems Des gn and syn- thes s by d g ta computer stat st ca ana y

sis and opt m zation Prerequisite MA 212 or equivalent Credit 3 hours

563 Scheduling of Resources. Intens ve ana y s s of schedu ng procedures to attain ptimum ut zat on of resources Measures for eva ua t on, n m job shop schedu ng network schedu ng; queue ng theory concepts app ed to schedu ing Prerequ s te ES 340 Cred t, 3 hours

564 System Optimization Techniques. Methods for determ n ng the max mum and m n mum for funct ons of many var ab es Methods nc ude search procedures branch and bound techn ques calculus of variat ons geometr c and dynam c programm ng Cred t, 3 hours

567 System Simulation with Digital Computers. App cat on of computer s mu ation methods to arge sca e comp ex systems Review of s mulat on anguages Prerequ s tes ES 322 or 425 and 340. Cred t 3 hours.

569 Nonparametric Statistical Inference. Non parametr c prob ems assoc ated w th categorica and noncategor ca data Procedures based on ranks, runs s gns, percent les ranking methods in the ana ys s of var ance Ko mogorov Sm rnov test to erance regions Prerequ s te ES 442 Cred t 3 hours

571 Probability for Engineers. Cont nuat on of ES 441 Spec a topics n advanced probabi ty theory app cab e to engineer ng Prerequi s te ES 441 or equ va ent. Cred t, 3 hours

572 Engineering Statistics. Top cs nclude incomp ete b ocks confound ng fract onal rep cat on response surface methodo ogy, evo u t nary operat on Prerequ s te ES 442 Cred t 3 hours

573 Reliability Models. Probabilist c fa ure mode s measurement, apportionment est mat on and pred ction of re iability, ife test proce dures redundancy opt m zat on ma nta nab ty and ava ab ty Prerequis tes ES 441 and 442 Credit 3 hours

574 Mathematical Programming-Linear. Ad vanced near programming Top cs nc ude s m plex techn ques revised s mplex techn que, dual ty and the pr ma dua techn que and de-compos t on theory Prerequ s te IE 473. Credit 3 hours

575 Mathematical Programming-Nonlinear. Meth-ods for determ n ng the max mum and m n mum for funct ons of many var ab es subject to con-stra nts Methods nclude c ass ca ca culus, Lagrange mu tip ers, l near approx mat ons Kuhn-Tucker cond t ons quadratic and integer programm ng. Prerequ s te E 574 Credit, 3 hours

576 Queueing Theory. Analysis of queues us ng ana ytica and Monte Carlo methods Prerequ s te ES 441 Credit 3 hours

577 Information Systems Methodology. Systems approach to the ana ysis des gn and im plementation of management nformat on sys-tems Cred t 3 hours

578 Inventory Theory. Mathemat cal and sta-t st ca ana ysis of nventory and warehous ng systems Prerequ sites ES 441 and E 476 Cred t 3 hours

579 Time Series Analysis and Forecasting. Ana ys s of advanced forecasting techn ques by t me series and probab lity mode s smooth ng techniques autocorre ation and error ana ys s Prerequ s te ES 442. Cred t 3 hours

580 Current Trends in Industrial Engineering. Evaluation of current trends n the theory and practice f ndustr al eng neering Cred t 3 ho irs

Special Graduate Courses: 590 591 592 593, 784 790, 792, 799 See pages 46 47)

Mechanical Engineering

Professors:
R CE (EC G 120D), BEAKLEY
BREGAR CH LTON D TSWORTH LOGAN
METZGER PR CE STAFFORD
Associate Professors:
BACKUS EVANS FLORSCHUETZ
FRY JANKOWSKI, WOOLDR DGE
Assistant Professors:
AUTORE HEDRICK JACOBSON WOOD
Instructor:
HAWLEY

ME 201 Technology and Social Change. Theor es of soc a change, technology as re ated to social change contemporary and poss ble future mpacts of techno ogy on soc ety Credit 2 hours.

300 Man and Machine. Mechanica nvent on and techn ca progress and the evolution of soc a forms and nst tut ons Cred t 2 hours

301, 302 Science and Technology in History. History of sc ence and techno ogy. Rec proca re ations w th the soc o econom c processes and inst tut ons ME 301 s not a prerequ site for ME 302 Credit, 3 hours each semester

321 Kinematics. Motions, ve oc ties and ac celerations of mach ne parts cams gears, flexi b e connectors ro ng contact and synthesis of mechan sms Prerequis te. ES 104 Corequ s te MA 121 Cred t 3 hours

332 Production Processes. Product on tech-niques and equ pment Cast ng and mo ding pres sure forming mater a remova , join ng and as semb y processes, automat on and mater a hand ling Cred t 3 hours

372 Fluid Mechanics. App cation of basic pr nc ples of f u d mechan cs to prob ems n viscous and compress ble flow Prerequ s te ES 371 Credit 3 hours

380, 381 Applied Thermodynamics. Thermody nam cs of eng nes turb nes and compressors,

vapor cyc es gas m xtures, and gas and vapor m xtures Not open to engineering students Prerequis tes MA 118, PH 112 Credit 3 hours each semester

382 Thermodynamics. Appl ed thermodynamics gas m xtures power cycles and react ve sys tems Prerequ s te ES 381 Cred t 3 hours

401 Theory, Prediction and Social Effects of Invention. nvent on as an nstrument of change n c v zat on evo ut onary nature of nvent ons cyc e of growth and dec ine caus at on and soc al effects Cred t, 3 hours

411 Nuclear Engineering. Nuclear chain re act ons, nuclear reactor systems and their con tro hea th phys cs rad ation sh eld ng and app ication ons of nuclear energy Credit 3 hours

412 Nucleonics Laboratory. Laboratory charac ter t cs of nuc ear rad ations and the r inter act on w th matter detection and measurement of nuclear radiat on Two ectures, 3 hours lab oratory Cred t 3 hours

413 Nuclear Reactor Engineering. Nu lear re- actor des gn reactor contro and nstrumenta t on reactor mater ais power reactor econom cs power reactor systems ana ys s of hazards Pre requ s te ME 411 Cred t 3 hours

415 Nuclear System Design. Eng neer ng des gn of nuc ear reactors w th emphas s on heat trans fer and heat remova Prerequ s te ME 411 c requ s te ME 488 Cred t 3 hours

417 Nuclear Engineering Laboratory. Experi ments n nuc ear engineer ng nc ud ng neutron act vation ana ys s neutron d str but on and dynam cs of a subcr t ca assemb y, s mu ation of n c ea reactor k net cs using analog computer techn ques Corequis te ME 413 Two lectures, 3 hours aboratory Cred t 3 hours

441 Principles of Design I. Des gn procedures fa ure modes stress and deflect on analysis stress concentrat on fat gue, se ected compo nents Prerequ s tes EM 422 and ES 35 Cred t 3 h urs

442 Principles of Design II. Continuat on of ME 441 w th appl cat on of the pr nc p es and er ip r c ms f eng neer ng to the creat ve de s gn of mach ne components and subsystems. Prereq i s te ME 441 Cred t 3 hours

445 Engineering Design. Confrontation of en g neering des gn prob ems at the profess ona eve , appl cat on of princ p es and ana yt cal techn ques from eng neering d sc p nes to the creat ve des gn synthes s of selected engineer ing systems, concepts of formu at on s mp fy- ng assumpt ons optim zat on techn ques, con s derat on of performance, fe cost Prereq- u s te ME 441. One lecture 2 hours d scussion, 3 hours aboratory Cred t, 3 hours

450 Aerodynamics. A rfo theory viscous effects compress b lity effects performance ca cula t ons Prerequis te ME 372 Cred t 3 hours

451 Automatic Control of Aerospace Vehicles. Stat c and dynam c stability of a rcraft auto pi ot des gn; act ve and passive contro of sate tes Cred t 3 hours

453 Propulsion. Performance ana ysis of pro- pu s on systems nclud ng turbojet fanjet and turboprop eng nes so d and qu d fue ed rock ets and n propuls on dev ces Prerequ s tes ME 3 2 and 382 Cred t 3 hours

455 Turbomachinery. Analys s of f ow n tur b nes and dy am c pumps and compressors, b ade osses design considerations Prerequ s te ME 382. Cred t 3 hours

456 Combustion. Thermodynam cs aerodynam cs and chem cal k net cs of combust on Structure propagat on and stab ty of flames Pol tant format on Prerequ s te ME 382 Cred t, 3 hours

465 Automatic Controls. Theory of control systems nclud ng open- oop and closed loop emphas z ng mechan cal hydrau c, therma and pneumat c systems, app cat on of the ana og computer to the so ut on of d fferent a equa t ons Prereq isite MA 212 Cred t 3 hours

471 Numerical Fluid Mechanics. Numer cal solu t ons for se ected prob ems n flu d mechan cs P erequ s te ME 372 Cred t 3 hours

483 Internal Combustion Engines. Perform ance character stics combust on carburet on coo ng and contro of nterna combust on en g nes Prerequ s te ME 382 Cred t 3 hours

486 Air Conditioning and Refrigeration. Re fr gerat on cyc es, refrigerant propert es heat ng coo ng loads, psychrometry pur f cation, temperat re and hum dity contro Prerequis te ME 382 Cred t 3 hours

487 Direct Energy Conversion. Unconvent ona methods of energy convers on fue ce s thermo e ectrics thermionics photovo ta cs and magnetohydrodynamics Prerequ s tes ES 350 381 Cred t 3 hours

488 Heat Transfer. Steady and unsteady heat co duction nc ud ng numer ca so ut ons, therma boundary ayer concepts and app cat ons to free and forced convect on Therma rad at on con cepts Mass transfer ana og es Coreq s te ME 372 Credit 3 hours

489 Statistical Thermodynamics. Stat st ca approach to thermodynam c concepts laws and methods f ana ys s Genera zed p v T data Spec al systems Prerequ s te ES 381 Credit, 3 hours

491 Experimental Mechanical Engineering. Ex- perimenta and ana yt ca stud es of phenomena and performance of f u d f ow, heat transfer thermodynam cs refrigerat on and mechan ca power systems Prerequ s tes ME 382, ES 331 or 361 corequ s te ME 488 One hour ecture 6 hours aboratory Cred t, 3 hours

492 Mechanical Engineering Projects. Sma group projects in fundamental or app ed as pects of mechan ca eng neering emphas s on exper menta so uti ns to comp ex pr b ems Prerequis tes ME 441 491 S x ho irs abora- tory Cred t 2 ho irs

493 Experimental System Analysis. Pract ca approach to a thorough eva uat on of an eng neer ing system Parametr c mapp ng data acqu sition data ana ysis and system performance Prerequ s te ES 361 ME 491 S x ho rs laboratory Cred t 2 hours

512 Reactor Theory. Neutron moderat on Ferm Age theory diffusion theory and app cat ons ref ected reactors mu ti gro p d ffus on equa t ons Prerequ site. ME 411 Cred t 3 hours

513 Reactor Kinetics and Control. Lap ace transform so ut on of the reactor k net c equa

t ons and reactor transfer funct ons reactor stab l ty ana ys s· nonl near reactor dynam cs Credit 3 hours

514 Reactor Design. Heterogeneous reactor systems, perturbation theory fuel burn up, ntroduct on to neutron transport theory. Pre requ s te ME 512 Cred t 3 hours

527 Aeroelasticity. Mutua nteraction be tween aerodynam c and e ast c forces and de f ect on nduced n the structures, contro mech an sms and propu s on systems of f ght veh cles. Prerequ s tes EM 415 and 427 Cred t, 3 hours

544 Mechanical Design and Failure Analysis. Modes of mechan ca fa ure· app cat on of prnc p es of e ast c ty and p ast c ty n mu t ax a state of stress to des gn synthes s fa ure theor es fatigue creep, mpact Pre req ı s te ME 445 Credit 3 hours.

545 Mechanical Design and Failure Analysis. Pr nc ples concepts phenomenolog cal theor es and techn ques of ana ys s associated with fa - ure prevent on n mechan ca des gn emphas s on fat gue, creep, comb ned fat gue and creep and mpact Prerequisite ME 544 Cred t 3 hours

548 Kinematic Synthesis and Analysis. Syn- thes s and analys s of d sp acements, veloc t es, and acce erat ons n mechan ca devices. Prereq uis te ME 321 Credit 3 hours.

549 Advanced Engineering Design Problems. Com plex eng neer ng des gn prob ems, prob em formu- lat on des gn of mathemat ca mode s ana ys s of assumpt ons presentat on of engineer ng solu t on Prob ems se ected from ndustr al sources Prerequ s te ME 544 Cred t 3 hours

551 Aerodynamics. Interna and external gas flows n subson c through hyperson c reg mes perturbat on methods, method of character st cs s m ar ty ru es three d mens ona w ngs op t mızat on of w ngs and bod es nterference, unsteady f ow Prerequ s te ME 450 Cred t 3 ho ırs

552 Physical Gas Dynamics. Mo ecu ar theor es of gases Boltzmann equat on, Chapman Enskog so ut on app cat ons to transport phenomena and ow density f ows atom c and mo ecu ar structure elements of stat stıca thermodynam- cs properties of high temperature gases Cred t, 3 hours

553 Mechanics of Reacting Fluids. Mo ecu ar and cont nuum deas appl ed to gas dynam cs of reacting m xtures, chem cal thermodynam cs and k net cs, frozen and equ lıbr um f ows, trans port propert es and flames and detonat ons Pre req ıs te ME 552 Cred t 3 hours

554 Propulsion. Thermodynam cs of a rcraft en- g nes aerothermodynam cs of nlets combustors and nozz es turbomachinery performance of ro ket veh c es chem ca rockets nuc ear rock ets e ectr c rocket propu s on Cred t 3 hours

555 Turbomachinery. Performance characteris- t cs, energy transfer n rotors cascade me chan cs thın a rfoı theory ax symmetr c poten tıa f ow oss mechan sms cav tat on surge Cred t, 3 hours.

561 Modern Control Theory. Opt mal contro determın st c and stochast c) App cat on of opt ma contro n trajectory opt m zat on and ın the des gn of contro systems subject to sto- chast c d sturbances Credit 3 hours.

562 Fluid Control Systems. Hydrau c and pneumat c control system ana ys s Character st cs of pumps motors and contro va ves Open and c osed loop ana ysis F u d cs and f uıd og c devices Cred t, 3 hours.

571 Fluid Mechanics. Bas c kınemat c dynam c and thermodynamic equat ons of the flu d con t nuum and the r appl cat on to some basic mode s Cred t 3 hours

572 Fluid Mechanics. Cont nuation of unıf ed treatment of ME 571 emphas z ng compress ble and turbu ent f ows Prerequ site ME 571 Cred t 3 hours

573 Turbulence. Deve opment of Reyno ds and turbu ence energy equat ons App cation to sotrop c and an strop c f ow fie ds Introduc- t on to research methods and s rvey of current research act v ty Corequ s te ME 574 Cred t 3 hours

574 Mechanics of Viscous Fluids. Lam nar and turbu ent v scous f ows Pert ırbation theory, s m lar ty solutions and numerica so ut ons for the various f ow reg mes Prerequ s te ME 571 Cred t 3 hours

575 Mechanics of Viscous Fluids. Lam nar and turbulent boundary layer f ows other v scous flows having boundary ayer character st cs Prerequ s te ME 574 Cred t 3 hours

576 Two-Phase Flow and Boiling Heat Trans- fer. Heat transfer and pressure drop charac ter st cs f two phase f u d systems bo ng and condensat phen mena; f ow and nonf w systems se ected top cs C ed t 3 hours

577 Hydrodynamic Stability. L near and non ınear theor es of hydrodynam c stab ty ana yt cal and numer ca so ut on methods compar son of theoret ca resu ts w th exper ments Co requ s te ME 574 Cred t 3 hours

581 Thermodynamics. Bas c concepts aws and theorems of equ l brium thermodynam cs ava ab ty cr ter a of equ ıbrium app cat ons to compress b e electrostat c electromagnet c and chemıca systems Cred t 3 hours

582 Thermodynamics. Stat st cs of ensembles App cat on f thermodynam c con epts and aws to rrevers b e processes Prerequ s te ME 581 Credit 3 ho rs

583 Thermodynamics of Energy Conversion. Advanced theory f d rect energy convers on n- vo v ng the thermodynam cs of rrevers b e pro cesses transport theory quantum statist ca me chan cs and app ıed e ectr ca thermal and magnet c phen mena Prereq s te· ME 487 Cred t 3 hours

585 Heat Transfer. Bas c equations and concepts of heat transfer appl cations to conduct ve, co vect ve and rad at ve heat transfer. Pre requ s te ME 488 Cred t 3 hours

586 Heat Transfer. Cont nuat on of ME 585 emphasızing convect on heat transfer Prereq uisite ME 585 Cred t, 3 hours

587 Heat Transfer. Cont nuation of ME 585 em phas zıng rad at on heat transfer Prerequıs te ME 585 Cred t 3 ho rs

591 Seminar. Cred t, 1 3 hours Top cs may be ffered n the areas of

(a) Aerospace
(b Contro s
c Des gn
(d Nuc ear
e) Thermosc ences

594 Graduate Research Conference. Top cs n contemporary research Requ red every semester of a Mechan ca Eng neer ng graduate students registered for 9 or more semester hours. Not for degree cred t Cred t, 1 hour

Special Graduate Courses: 500 590 591 592 593 594 799 See pages 46 47)

Mechanics, Materials and Measurement Engineering

Professors:
WALLACE (EC G 120B , ALLEN
AVERY STE N L P THOMPSON
TURNBOW

Associate Professors:
B CKFORD CHEN, NELSON STANLEY

Assistant Professors:
HENDRICKSON RANKIN S J RUSSELL

Engineering Communications

Professor:
WILCOX

Associate Professor:
STADM LLER

Assistant Professor:
LAWLER

EM 351 Materials Engineering. Sc entif c and eng neer ng pr nc p es mportant n the se ect o ı and des gn of eng neer ng materials Var ables nf enc ng mater a propert es and behav- or Prereq ı s tes CH 114 or ES 118 202 wo e tures 3 h ırs aboratory Cred t 3 ho ırs

355 Metallurgy. Meta urgy of ron, steel and nonferrous a ys atom c and crystal struct re weld ng braz ng and so der ng For nonengineer ng majors. Prerequ s te CH 114 or equ valent. Two lectures 3 hours aboratory Cred t 3 hours

410 Acoustics of the Environment. Princi ples of aco ıst ca ana ys s and des gn empha s z ng current env ronmenta prob ems Prereq- s tes MA 141 r 121 PH 111 or ES 203 Lec ture and demonstrations Cred t 2 hours

411 Acoustics. Pr nc p es underlying the gen eration tran m ss on and recept on of acoust c waves App cat ons to noise contro and arch tectura acoustics Prerequisites ES 312, 346 or MA 362 Lecture and demonstrations Cred t, 3 hours

413 Vehicle Dynamics. agrange s and Eu er s eq ıat ons gyroscop c mot on Trans ent and steady state mot on and stabil ty of automo b es, a rcraft and a r cush on and magnet c sus pens on veh c es Ride cr ter a. Prerequ s te· ES 312 Cred t 3 hours

414 Space Mechanics. Dynam s w th appl ca tions to aeronaut ca and astronaut ca prob ems orb ts and trajector es mot on ın res st ng med ım performance and opt m zat on of mult stage rockets Prerequ s te. ES 312 Cred t 3 hours

415 Vibration Analysis. Undamped and damped v brat ns of s ng e degree of freedom systems F ed v brat on trans ent response Many degrees of freedom systems norma modes v bration of e ast c bod es Prerequ s te ES 313 Cred t 3 hours

422 Mechanics of Materials. Theor es of fa ure tors on of nonc rcu ar members th k wa ed pressure vessels curved beams· unsymmetr ca bend ng shear f ow shear center circu ar p ates Prerequ s te ES 313 Cred t 2 hours

424 Continuum Mechanics C nt nuum concepts stre s deformat on and ve oc ty f e ds const tut ve equat ons mechan ca propert es of so ds and f u ds f e d equat ons app ıcat ons Prereq s tes ES 313 371 Cred t 3 hours

425 Experimental Mechanics. Exper menta meth ds n n echan cs mechan ca e ectr ca , and opt ca tra sdu ers phot e a t c and br tt e coat ng techn ques model ng corre at on and error analyses Prerequ site EM 422 Lecture and laboratory Credit, 3 hours

427 Vehicle Structures. F ıght veh c e and ground veh cle structures des gn cr teria oad fact rs fat gue fa ure theory, component ar a ys s of rings, shear panels mu t ce beams n bend ng shear and tors on beam co ı mns pressure vesse s sandw h pane s matr x methods for system and subsy tem ana ys s Pre requ s te EM 422 Credit 3 hours

450 Mechanical Properties of Solids. Effects of env ronmental and m crostructural var ab es on mechanica prope t es p astic deforma- t on, fat g ıe creep britt e fracture nterna fr ction Prerequis te ES 350 Cred t 3 hours

451 X-Ray Diffraction and Crystallography. F ndamenta s of diffract on and crysta ography Bas c experimenta techn ques for X ray d f fract on Fundamenta s of X ray fluorescent spectrometry Prerequ s te ES 350 Two ec tures 2 hours abo atory Cred t 3 hours

452 Theory of Solids. Electron c structure of so ds e ectr ca cond ct on n meta s and sem conductors, d electric a d magnet c proper t es of o ds att ce v brat ons Prerequ s tes ES 350 381 Cred t 3 hours

453 Metallurgical Thermodynamics and Kinetics. Thermodynam cs of a oy systems d ffus on n so ds k net cs of prec p tat on and phase transformat ons n so ıds Prerequ s tes ES 350 381 Cred t 3 hours

455 Physical Metallurgy I. Crysta structure and defects Phase d agrams meta ography, so d f cat on and casting deformat on and an nea ng Prerequ s te ES 50 Three hours ec ture 3 hours aboratory Cred t 4 hours

456 Physical Metallurgy II. Nonequ brium transformat ons heat treat ng of stee s prec p tat on harden ng so d so ut on strengthening we d ng surface react ons Prerequis te EM 455. Three hours ecture 3 hours aboratory Cred t 4 hours

462 Measurement Systems. Cont nuat on of ES 361 Emphas s on transdu er behav or as t af fects system character st cs Emphasis on sys tem dynam cs Problems of s gna enhancement

and noise suppress on Prerequ's te ES 361 or EM 565 Two hours lecture, 1 hour common aboratory ecture 2 hours aboratory or d s cuss on Credit 3 hours

463 Transducer Physical Principles. Trans ducers as format n and energy process ng de v ces Character stics se ect on cr ter a, and app cat ons Prerequ s te ES 361 or EM 565 Two hours ecture 1 h ur comn on aboratory ecture 2 hours aboratory or disc ssion Cred t 3 hours

471 Geophysical Fluid Mechanics. Phys ca oceanography and dynam c meteoro ogy empha s z ng f u d mechan ca aspects Prerequ s te ES 371. Cred t 3 hours

513 Advanced Dynamics. Dynam cs of part c es syster s f part c es Genera zed coord nates D A en bert s and Ham to s pr nc p es Lagra ge s equat or s k nemat cs and k net cs of r g d bod es Prerequ s te: ES 346 or MA 460 Cred t 3 hours

514 Space Vehicle Dynamics. Gyrodynam cs and gyr sc p c nstruments m ss e and space veh c e mot on inert a navigat on term na gu d ance f ght trajectory opt m zat on Prerequ s te: EM 513 Cred t 3 hours

515 Dynamics of Elastic Systems. Free v bra t on and forced response of d screte e ast c systems F n te e ements Ana ytica and com puter methods of so ut on Random v brat ons. Prereq s te EM 415 Cred t 3 hours

516 Dynamics of Elastic Systems. Free v bra t on and fo ced resp nse of cont nuous e ast sy ten s Var at o a n ethod f f mu at n Exact and appr x mate methods of so it on Wave propa gat on Prereq s te EM 415 Cred t 3 hours

517 Nonlinear Vibrations. Qua tat ve and q ant tat ve methods of ana yz ng the free and f ced response of on near mechan ca sys ten s Cred t 3 hours

522 Variational Principles of Mechanics. Fundame ta var at na pr nc ples v rtua w rk, m n mum a d comp ementary potent a en ergy Re ssner s and Ham to s pr nc p es Ap p cat on to the formu at on of govern ng d ffer ent a equat ons and b ndary cond t ons D rect methods of the ca cu us of variations treat ng prob ems n stabi ty, v brat ons e ast c ty Cred t 3 hours

523 Theory of Plates and Shells. Bend ng of rectang ar and c rcu a p ates P ates on e ast c foundat on Large def ections of p ates Membrane theory of she s Bend ng theory of she s f revo ut on Asymptotic ntegrat on. Spe a and approximate methods Prerequ s te ES 446 MA 462 Cred t 3 ho irs

524 Theory of Elasticity. Ana ys s of stress and stra n n three d mens ons genera zed H ke s aw genera theorems P ane e ast stat c prob ems n rectangular and po ar coor d ates Bod es of rev ut on gene a bend ng and tors ona prob en s and app cat ons Prereq u s te ES 346 or MA 460 Cred t 3 hours

527 Theory of Plasticity. Ine ast c behav or of meta c and nonmeta c structura mater a s Mechan cs f perfect y p ast c so ds and stra n ha den ng so ds Y e d c d t ons and f ow aws M nimum pr nc p es Cred t 3 ho irs

529 Theory of Elastic Stability. Genera sta b ty concepts stab ty of d screte systems bars frames arches and r ngs Tor ona and at era buck ng Buck ng of th n p ates and she s Dynam c stab ty Prereq s te ES 346 r MA 460 Cred t 3 hours

530 Methods of Continuum Mechanics. Topics n mathemat cs necessary f r app cat ons to con t nu im me ha cs part c e mechan cs and e ec tromagnet c theory Top cs nc ude near a - gebra tensor ana ys s on Euc dean spaces and d fferent a geometry as app ed to the above red t 3 ho irs

532 Methods of Analysis. Asymptot c methods n ud ng sums Lap ace s method stat onary phase steepest de cent Se e ted top cs n spec a funct ons rthogona po ynomia s Cred t 3 ours

534 Topics in Nonl near Analysis. terat ve and d rect techn ques for non near operator eq at ons and funct ona equat ons App ca t ons to some non near tegra eq iat ons and d fferent a eq iat ons wh ch are of spec a n terest n eng eer ng Cred t 3 hours

550 Theory of Crystalline Solids I. An so trop c properties of crysta s tensor treatment of e astic magnet c, e ectr c and therma propert es crysta ography of Martens t c trans format ons Credit 3 hours

551 Theory of Crystalline Solids II. Latt ce v brat s poi t defects rad ation damage elec tro c structure of a oys Cred t 3 hours

552 Dislocation Theory. F ndamenta proper t es of d s ocat ns n crysta s D s ocat n r t p cat on r t on and nteract ons App at on of d s cat on theory to behav or f so ds Prerequ s te EM 550 Cred t 3 h urs

553 Physical Metal urgy. Advanced research tec n ques n phys ca meta rgy ternary and quarternary p ase d agrams therma ana y s s magnet c ana ys s meta graphy frac t e ai a ys s w h urs ect ire 3 hours ab iat ry Cred t 3 ho irs

563 Measurement Engineering Theory. D s cuss n f nf rmat pr ess ng methods n eas ir ng syste s Effects of e e gy f w un ba a ice refere e ba a ce and compar son sys ter s Effects of nf rmat on f ow DC s n is da ai d p i e carr ers Separat n of s gna from o se N se suppress n Prerequ s te ES 361 or EM 565 wo hours ecture 1 hour comm n aboratory ecture 2 hours aboratory or d s cuss n Cred t 3 hours

564 Experimental Stress Analysis. Measure i ent of stat c and dynam c stresses n m de s and pr totypes. Br tt e a a ogs a d coat ngs ph toe ast ana gs and coat ngs membrane and e ec c ana g es terat n method stra n gages of n ecl an ca and e ectr ca ature Two ectures, 1 con n on abo atory 2 hours abora t ry Cred t 3 hours

565 Measurement Systems Engineering Theory. nformat on and energy f ow through a sys tem stru tured of components Prob ems n data va dat n s gna enhancement no se sup- press on for ana og measurands Cred t, 3 hours

572 Geophysical Fluid Mechanics. Mechan cs ai d energet cs of the ocean and the earth s atr sphere F u d mechan ca mode ng of the earth s ant e Cred t 3 hours

574 Dynamic Meteorology. App cat ons of meteoro og c phenomena Lam nar turbu ence and boundary ayer f ows of the atmosphere atmospher c d ff s on processes as app ed to p it on contro Cred t 3 hours

Special Graduate Courses: 500 590 591 592 593 594 99

Division of Technology

WALTER F. BURDETTE, Ph.D. *Director*

Purpose

The Division of Technology serves three major functions. One is the preparation of engineering and industrial technologists as members of the total technological team comprised of scientists, engineers, technologists and technicians. A second function is the preparation of other specialists who are not properly categorized as technologists, although their preparation is intensively industrially oriented. This function embraces the preparation of such specialists as industrial designers, graphic and printing management personnel, industrial supervisors, technical managers, and technical communicators. A third function is the preparation of teachers of industrial and technical education in the elementary and secondary schools, technical institutes, community colleges, universities and in industry.

Each four year Bachelor of Science degree technology curriculum prepares supporting and specialist personnel in the major areas of research and development, design 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 industrial and technical education curricula prepare graduates for positions as industrial arts and technical teachers, department heads, supervisors or directors, consultants and industrial training directors. It is the purpose of the Division of Technology to meet these needs through offerings leading to the completion of the Bachelor of Arts in Education, the Bachelor of Science, the Master of Arts in Education, the Master of Science in Technology, the Education Specialist, the Doctor of Philosophy, and the Doctor of Education degrees with specialization in industrial education. (See *Graduate Catalog*.)

A student may select that particular field of specialization which conforms to his interests or plans. For convenience, the fields of specialization are shown in the following list.

Aeronautical Technology
Electronic Technology
Graphic Communications
Industrial Design
Technical Management
Industrial Technical Education
Aeronautical Engineering Technology
Electronic Engineering Technology
Manufacturing Engineering Technology
Mechanical Engineering Technology

Organization

All Division offerings have been organized into four functional programs of study as follows:

Engineering Technology
Industrial Technology
Industrial Design
Industrial Technical Education

Because each program of study has its own unique educational mission, each is organized around its own structured core of required courses. These respective program cores provide the unifying elements of mathematics, science, graphics, communications, and technical sciences which are appropriate to that particular program of study.

All fields of specialization which are provided through this Division are organized and defined under the four programs of study presented above.

Degrees

Bachelor of Science. Division programs of study require the satisfactory completion of not less than 126 semester hours, or more where indicated by the specific program or by student entrance deficiencies. Included are the General Studies courses, courses of the selected program of studies core, required courses in the field of specialization, supporting field courses and electives.

Specific details regarding purposes of these programs and their requirements are presented in the appropriate program of studies section.

Bachelor of Arts in Education (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.

Graduate Degrees. The Division of Technology offers programs leading to the degree Master of Science in Technology. 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 Industrial Education. Consult the *Graduate Catalog* for requirements.

Engineering Technology

Baccalaureate engineering technology programs are intimately related to engineering education as engineering technologists are prepared to serve with and in close support of engineers as a part of the total technological enterprise that extends from planning to production and the continuing service.

The essential program content is therefore mathematics, basic science, technical science, and field of specialization related to a particular area of engineering practice. Provisions for these elements are presented below in the form of the engineering technology core together with the requirements specified in the field of specialization. The latter consists of aeronautical engineering technology, electronic engineering technology, manufacturing engineering technology and mechanical engineering technology. In each case a minimum of 130 semester hours of satisfactory credits are required.

Engineering Technology Core
(Minimum 57 Hours)

			Semester Hours
TE	100	Electricity Electronics	3
TE	201	Applied Electrical Science	3
ME	332	Production Processes	3
ID	111	Technical Graphics	2
ID	121	Analytical Techniques	3
CT	420	Technical Writing	3
EC	201	Principles of Economics	3
PH	1	and 13 Lab General Physics	4
CH	113	General Chemistry	4
	or	PH 112 and 14 General Physics	
CH	115	and 116 Lab General Chemistry	4
	or	PH 460 Elements of Atomic Physics	
MA	117	College Algebra	3
MA	118	Plane Trigonometry	2
MA	261	Mathematical Analysis for Technology	3
TA	362	Engineering Technology Mathematics	5
ES	122	Computer Programming	2
ID	310	Applied Mechanics Statics	3
	or	TE 400 Network Analysis I	
ID	311	Applied Mechanics Materials	3
	or	TE 405 System Dynamics and Control	
ME	380	Applied Thermodynamics	3
	or	TE 315 Electro Physical Processes	
ES	360	Measuring Systems	3
	or	PH 463 Physical Measurements	

Beyond the engineering technology core and the further requirements of General Studies, the requirements for the fields of specialization are as follows:

Aeronautical Engineering Technology

The aeronautical engineering technology program is designed to prepare the technologist for technical support of engineering activities throughout the aerospace field. Area of responsibilities includes the application of applied engineering practice related to: aircraft and aerospace vehicle design, internal combustion engines, combustion processes, turbomachinery, systems analysis and environmental control.

The following courses are required in addition to the engineering technology core courses and General Studies requirements:

Required courses CH 113, 115, 116, PH 112, 114, ID 310, 311, 360; ME 380, 381; MG 301, TA 180, 181, 287, 288, 300, 301, 306, 307, 308, 310 (in lieu of ES 360), 388, 390, 487, 490, 498, EM 355.

Electronic Engineering Technology

The electronic engineering technology program is available to those students primarily interested in activities relating to engineering practice and state-of-the art technology related to such areas as electronic computers, electrical power systems and distribution, and industrial controls and measurement.

In addition to completion of General Studies requirements, the following courses are required of all electronic engineering technology majors.

Required courses: PH 112, 114, 460, 463 (2 credits), TE 210, 300, 301, 310, 315, 320, 322, 330, 400, 406.

An additional 36 hours in an approved program of one of the following areas of emphasis:

Electrical Power Systems Emphasis 36

Required. TE 340, 342, 401, 404, 407, 410, 433, 450, 460, plus 12 credits from Group I or II.

GROUP I. 12 credits minimum selected from the following: TE 326, 432, 470, 472, 476, FS 360, ID 310, 360, MT 380, and 6 credits of approved electives.

GROUP II. 12 credits minimum selected from the following: TE 420, 421, 432, 452, 454, 456, 462, and 6 credits of approved electives.

Electronic Computers Emphasis 36

Required. TE 404, 407, 420, 42 , 450, 454, 456, 460, plus 12 credits from Group I or II.

GROUP I. 12 credits minimum selected from the following: TE 326, 40 , 410, 433, 470, 472, 476, and 6 credits of approved electives.

GROUP II 2 credits minimum selected from the following: IE 340, 342, 432, 462, ID 303, MT 400, 403, and 6 credits of approved electives

Industrial Control and Measurement Emphasis 36

Required. IE 340, 342, 404 407, 420, 421 or 433, 450, 460, 462, plus 12 credits from Group I or Group II.

GROUP I 12 credits minimum selected from the following: IE 362, 401 432, 470, 472, 476, ES 360, ID 303, 340, ME 380, MT 400, 403, and 6 credits of approved electives.

GROUP II IE 432, 452, 454, 456, 476, ID 303, and 6 credits of approved electives

Manufacturing Engineering Technology

Increased technological complexity and sophistication has created great industrial demand for the services of those individuals who possess working knowledge of the technical phases of production Manufacturing engineering technologists perform a vital function in the follow through and completion of engineering decisions and the solving of manufacturing problems Accordingly, this field of specialization 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 Areas of emphasis in manufacturing engineering technology are machine tool technology and welding technology.

Required courses CH 113, 115, 116, PH 112; ID 310, 311, ME 380, ES 360, MT 200, 201, 400 404 Complete one of two options as follows:

Machine Tool Technology

This area of emphasis is designed to prepare technologists with both conceptual and practical applications of processes materials, and products related to metalworking industries. Emphasis is focused on the roles of personnel in the automated manufacturing systems

Required courses. ID 370, MT 300, 301, 302, 303, 401, 402, 403, 405, plus 14 hours of approved electives.

Welding Technology

An area of emphasis designed to meet the needs of industry for those individuals trained specifically as technologists, supervisors, or consultants in welding and related fields Opportunities are offered for students to gain both conceptual and practical knowledge of the techniques and applications of the principal welding processes and materials Emphasis is focused on applied weldment design, metallurgy, weld analysis and testing as related to current techniques used by manufacturing industries.

Required courses: MT 110, 210, 310, 311, 312, 410, 411, 412, plus 16 hours of approved electives

Mechanical Engineering Technology

The mechanical engineering technologist is concerned with applications within the broad and diversified field of mechanical engineering. Among the responsibilities which may be assigned to such technologists are development and evaluation of machines, power generation, transmission, instrumentation and testing He may be required to lay out, develop details or supervise the development of a machine or process. In addition, he may test, evaluate performance and make such alterations as to make that machine or process operable and competitive

The following courses are intended to provide a broad, fundamental base in technical science and skill development in mechanical technology at the baccalaureate level.

Required courses: ID 1 2, 60, 161, 215, 306, 307, 310, 3 1, 340 360, 403, ES 200, 360, MF 380, 381; CH 113, 1 5, 116, PH 112; EM 355.

The remainder of 16 semester hours (minimum) of required courses will constitute an area of emphasis and shall be selected by the student in consultation with his advisor, in either design or management. Those students planning careers in the design area shall include: ID 406, 450 Those students planning careers in the management area shall include: AC 300 MG 301; MK 300

Industrial Technology

The employment objective of the industrial technologist is properly defined as that of production management Program and employment emphasis is upon applied aspects of industrial processes and upon personnel leadership. To assist in understanding the interfaces it is appropriate to describe the industrial technologist as occupying the mid-ground between engineering, engineering technology and business administration Programmatically, then, industrial technology requires selected courses in mathematics, basic science, technical science, technical specialties and in business and personnel management

Variations of the industrial technology programs which permit a high degree of technical emphasis with a field of specialization have been demonstrated by employers to be highly desirable These areas of emphasis are presented in the fields of specialization requirements where appropriate. All programs in industrial technology are organized around the industrial technology core with the remaining requirements specified in the fields of specialization

Industrial Technology Core

			Semester Hours
IE	0	Electricity Electronics .	3
MT	0	Manufacturing Processes and Materials . . .	3

ID	111	Technical Graphics	2
ID	121	Analytical Techniques	3
CI	420	Technical Writing	3
PH	111 113	General Physics	4
CH	3	General Chemistry	4
MA	260	Mathematical Analysis for Technology	3
EC	201	Principles of Economics	3
MG	301	Principles of Management	3
IE	443	Industrial Safety	3
IS	22	Computer Programming	2
		TOTAL	36

Aeronautical Technology

Instruction combines thorough technical training with a general university education. The curricula are designed to prepare both aeronautical technologists and industrial technologists with theoretical and practical applications in the area of structures, internal combustion, turbomachinery, design, management, general and commercial aviation, systems analysis, and environmental control.

Three separate areas of emphasis are available in this degree program. They are as follows: *Emphasis I,* Aerospace Technology; *Emphasis II* Air Transportation Technology (Flight) and *Emphasis III,* Air Transportation Management Technology (Non Flight).

Each of the three areas of emphasis requires a common aeronautical technology core, in addition to the required industrial technology core, to insure a sound foundation.

Aeronautical Technology Core

		Semester Hours
CH	5 and 116 General Chemistry	4
PH	112 and 114 General Physics	4
MT	380 Applied Thermodynamics	3
MG	30 Principles of Management	3
IA	180 Aircraft and Aerospace Aerodynamics and Systems	3
IA	81 Aircraft and Aerospace Structures and Materials	3
IA	287 Aircraft and Aerospace Powerplants	3
IA	288 Gas Turbines and Turbomachinery	3
IA	300 Aircraft Design	3
IA	305 Aircraft and Aerospace Design	2
IA	306 Aircraft Electrical and Electronic Systems	3
IA	308 Combustion Analysis	2
IA	310 Instrumentation	3
IA	384 Airport Planning	2
IA	388 Propulsion	3
IA	390 Systems Analysis	3
IA	487 Aircraft and Aerospace Design	3
IA	488 Airline and Flight Operations Management	3
IA	498 Pro Seminar	3
	TOTAL	56

Aerospace

The aerospace area of emphasis is designed to prepare technologists with a broad theoretical and practical background for a wide variety of careers in the aerospace industry. This emphasis is especially suited for such fields as aircraft maintenance engineering, testing and quality assurance, product reliability, liaison engineering, design and manufacturing, and related areas. The curriculum is designed to provide the student with a balance of technical, general education and science courses.

Required courses IA 301, 307, 309, 490, IM 355, ME 38 , MT 116. An additional 5 credits are required in the supporting field.

Air Transportation

The air transportation technology (flight) area of emphasis encompasses academic and technical studies with flight training to qualify a student for positions requiring professional piloting ability in general aviation. All phases of training are available to enable the student to complete the private pilot, glider pilot, commercial pilot, and flight instructor certificates, as well as the instrument and multi-engine rating requirements of the Federal Aviation Administration.

Required courses TA 182, 185, 284, 302, 303, 311, 381, 382, 383, 385, 386, 387, 391, 491, 492, 493.

Air Transportation Management

The management area of emphasis is designed to prepare graduates for managerial and supervisory positions with both the air transport industry and general aviation. It encompasses areas leading to jobs with manufacturers, fixed base operations, airports and government service. Included is a depth of technical training as well as a broad exposure to business management curriculum.

Required courses: TA 303, 391, 491, 493, AC 101, 102, EC 202; FI 300, AS 305, MG 311, MK 300.

Electronics

A field of specialization in electronics is offered to provide men and women an opportunity to prepare for employment in many areas of modern industry. Studies include practical as well as theoretical training in a broad field of electronics. The offering allows for a great variety of individual selection. It permits the student to specialize in major electronic areas of emphasis such as broadcast communications, electronic computers, industrial electronics, instrumentation and control, microwave electronics, power systems and distribu-

tion and video systems. A student may decide that it is more advisable to choose still other areas of emphasis associated with electronics and may do so with the aid of his advisor.

Students in other fields of specialization may select one or more courses in electronics to strengthen their particular area of concentration. They may, if they choose, take a minor, consisting of 18-30 hours in electronics.

The electronics core is required as a minimum preparation required of all majors. It is as follows:

Electronics Core

			Semester Hours
IE	0	Electricity-Electronics	3
IE	20	Applied Electrical Science	3
TE	2 0	Active Devices	3
TE	300	Circuits I	3
TE	301	Circuits II	3
TE	310	Electronic Circuits	3
E	315	Electr Physical Processes	3
IE	320	Integrated Electronics	3
E	322	Switching and Waveshaping	3
TE	330	Electronic Measurements	3
ES	122	Computer Programming	2
ID	21	Analytical Techniques	3
MA	117	College Algebra	3
MA	118	Plane Trigonometry	2
MA	260	Mathematical Analysis for Technology	3
PH	111	Physics	3
PH	1 3	Physics Laboratory	1
PH	112	Physics (in lieu of CH 113)	3
PH	114	Physics Laboratory	1
		TOTAL	51

The electronics field of specialization in industrial technology provides various areas of emphasis. In addition to completion of the General Studies requirements, the industrial technology core and the electronics core, a minimum of 40 semester hours in an approved area of emphasis must be completed. Three typical areas of emphasis follow:

Communication Electronics Emphasis 40
IE 326, 342, 404, 4 0, 420, 450, 460, 470, 472, 476 and 3 credits of approved electives.

Industrial Electronics Emphasis 40
IE 340 or 342, 404 or 406, 420, 421, 450, 454, 460, 462 or 470, and 14 credits of approved electives.

Electro Technology Emphasis 40
This emphasis is made up of approved specialty programs directed towards industrial management, medical electronics, technical education, technical writing and others as may be appropriate.

GROUP I: 12 credits minimum selected from the following courses: MI 400, IE 326, 420, 432, 450, 454, 460, 470, 476.

GROUP II: 6 credits minimum selected from the following courses: TE 340, 342, 400, 404, 406.

GROUP III: 22 credits minimum are to be selected within and or related to the particular emphasis being pursued by the individual student.

Graphic Communications

The graphic communications field of specialization provides a diversified approach for individuals interested in communication techniques. The impact of written and printed business and industrial communications, such as newspapers, magazines, manuals, books, package printing and other visual materials is of great social significance.

The graphic communications core is required of all communications graphic arts majors.

Graphic Communications Core

			Semester Hour
CT	220	Communications Processes	3
GA	135	General Graphic Arts	3
GA	339	Estimating and Cost Analysis	3
GA	438	Graphic Arts Techniques and Processes	3
MG	311	Personnel Administration	3
		TOTAL	15

Communications

The communications field of specialization offers students preparation for careers in technical writing, graphics, technical journalism, technical editing and publishing. Supporting studies in mathematics, science, business, and mass communications provide the student with a varied background of experience to prepare him for growing employment opportunities in technical communications.

Required courses: CT 221, 320, 321, 421, IT 346, MG 311, LS 471, EN 3 3; MC 110, 312. An additional 12 hours are required in a field of technical specialization.

Graphic Arts

This field of specialization 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, marketing, advertising, photography and research. The needs of each student are reviewed and program flexibility beyond required courses is reflected in the selection of supporting field courses as well as technical electives.

Required courses. GA 136, 236, 237, 238, 333, 334, 336, 337, 435, 436. A minimum of an additional 12 hours are required in a supporting field of study.

Industrial Design

The dynamic profession of industrial design is concerned with the integration of esthetics, materials, manufacturing, human factors, merchandising and creativity, for the primary purpose of developing solutions to three dimensional problems. Originally associated almost exclusively with product styling, industrial design has matured to include total planning and development. Products such as the telephone, typewriter, and parking meter, including their associated packaging and graphics and large systems including modular components for industrialized housing or mass transit systems are now considered legitimate concerns of the industrial designer. *While the field of specialization maintains a strong content in esthetics and art, a foundation in technology is provided in the core*

Industrial Design Core
(Minimum 53 hours)

			Semester Hour
IE	100	Electricity Electronics	3
ID	1	Technical Graphics	2
ID	112	Surface Definition	2
ID	121	Analytical Techniques	3
ID	160	Sketching and Drawing	2
ID	161	Advanced Sketching and Drawing	2
ID	25	Materials	3
ID	310	Applied Mechanics Statics	3
ID	31	Applied Mechanics Materials	3
ID	403	Product Liability	2
CT	420	Technical Writing	3
EC	201	Principles of Economics	3
ES	22	Computer Programming	2
ES	200	Engineering Drawing	2
MA	117	College Algebra	3
MA	18	Plane Trigonometry	2
MA	260	Mathematics Analysis for Technology	3
ME	332	Production Processes	3
PH	111	General Physics	3
PH	113	Physics Laboratory	1
PH	112	General Physics	3
	or	CH 113 General Chemistry	

With the growing diversity of industrial design interests, there has been need to differentiate between central problem solving abilities within the profession The industrial designer's academic requirements are determined primarily by the nature of problems he or she will solve. For this reason the industrial design program of study contains two identifiable fields of specialization: industrial design and mechanical design to allow for specialized educational development in specific areas of emphasis.

Industrial Design

Industrial design embraces most human aspects of machine-made consumer and industrial products, and the graphics which attend their esthetics, packaging and merchandizing The product designer is generally involved in the entire development process from initial ideation, sketching and modeling, through production; including product planning, marketing and packaging, to the ultimate use of that product Esthetics and human factors are of primary concern to the product designer as well as how the product he develops relates to and affects human activities the man machine environment relationship. The graphic designer addresses the visual and esthetic requirements of the two dimensional aspects of products, packages, displays, signage and posters.

Required courses: ID 100, 201, 250, 260, 261, 301, 302, 303, 305, 350, 351, 400, IT 121, 18 credits of Art courses including AR 114, 141, 142, 191, 241; Industrial Design Core; PH 112.

The remainder of 14 semester hours (minimum) of required courses shall be selected by the student in consultation with his advisor, in either product design or graphic design Those students planning careers in product design shall include: ID 430, 431, 450, 451. Those students planning careers in graphic design shall select from ID 471, Graphic Arts, Advertising Art

Mechanical Design

The mechanical designer is primarily concerned with the function of the product, its components and their manufacturing considerations His prime objective in product development is to develop shape principally from considerations of function, cost, kinematic or structural dictates In addition, he improves efficiency, reduces costs and prepares layouts, working drawings, and material and operating 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: ID 201, 303, 306, 307, 360, 406, 407, 450, 451; EM 355, PH 112; CH 113, 115, 116; Industrial Design core.

The remainder of 16 semester hours (minimum) of required courses shall be selected by the student in consultation with his advisor, in either mechanical design-general or mechanical design agricultural Those students planning careers in general design shall include: ID 100, 260, 261, 305, 340, IT 121; ME 380. Those students interested in the design of agricultural production and processing equipment shall include AI 236, 300, 325, 440, EA 325

Technical Management

The primary purpose of technical management is to prepare students for positions of responsibility in the areas which interface between the business and the technical communi

ties The program is designed to provide (1) a basic background in math, science, engineering technology and design, (2) a mastery of basic business tools and skills and an understanding of business procedures, and (3) a specialized knowledge of either design or management These skills will be applicable to such career objectives as product planning, product cost analysis and reduction, industrial sales, product service administration, budget administration, industrial purchasing, etc To attain these objectives, the program has been structured with 25 % of the student's work in the College of Business Administration, 30% in the College of Engineering Sciences and 15% selected from either area as specialization The remaining 30% is devoted to math, science and General Studies. The technical management program of study is not a specialization of industrial design, but does require the industrial design core.

Required courses· Industrial Design core, ID 306, 307; AC 101, 102, AS 233, 305, EC 202, FI 300, MG 301, 463, MK 300; QS 221, SC 100, 211 or 300 or 411; CH 113.

The remainder of 21 semester hours (minimum) of required courses shall be selected by the student in consultation with his advisor, in either industrial design or management. Those students planning careers in the product area shall include ID 303, 402, 450, 451 Those students planning careers in the management area shall include: AC 331· MG 331, 355, 368, 451

Industrial Technical Education

Combining courses in technology, General Studies and professional education, students may prepare for educational careers in industrial arts, technical teacher education and industrial training and supervision Fields of specialization in a variety of technical areas are provided

The following common core is required for all majors in industrial technical education:

Industrial Technical Education Core

			Semester Hours
IE	00	Electricity Electronics	3
ID	11	Technical Graphics	2
IT	402	Analysis and Course Development	3
IT	442	Facility Planning and Management	3
IT	480	Teaching Industrial Technical Subjects	3
CH	113	General Chemistry	4
PH	11	General Physics	4
MA	117	College Algebra	3
MA	118	Plane Trigonometry	2
		TOTAL	27

Industrial Arts Education

The specific objective of this program is to prepare students for the requirements of industrial arts teaching 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 of this catalog

There are two plans available for industrial arts education majors (1) an extended major of 60 hours, and (2) a 36 42 hour major with a 24 hour minor. Minors available include· drafting, electronics, graphic arts, metal, transportation and power and wood. An industrial arts minor of 24 hours is available to majors from other departments.

Required courses. GA 135; IT 250, 346. An additional 3 hours of professional electives and 31 hours are required in a field of specialization or supporting field.

Technical Teacher Education

The purpose of this program is to develop competency in one of the technologies and in professional industrial technical education. This four year Bachelor of Science degree technology curriculum prepares personnel for teaching positions in technology programs offered in higher education institutions

Required courses. IT 401, 443, 444, 446, 485, 491, CT 420, EC 201; MG 301, 451; MA 260, ES 226. A minimum of 40 credits, approved by the advisor, is required in a field of specialization or supporting field, of which IT 445, Industrial Internship, may be a part

Industrial Training and Supervision

The purpose of this program is to prepare instructors, training personnel, and supervisors for industry Leading to a Bachelor of Science degree, this program provides for a general education background with a field of specialization in industrial technical training and supervisory studies.

Required courses. IT 443, 444, 445, 450, 452, 485; CT 420, MG 301, 311, 451; EC 201; ES 226 A minimum of 40 credits, approved by the advisor is required in training and supervision and a technology field of specialization such as business, safety, fire science, health, industrial technology, or engineering technology.

Technology

Professors:
BURDETTE TC 201) BARTEL
BROWN K GIN L TRELL,
PRUST THOMASON

Associate Professors:
BENZINGER BURK
KANNEMAN PARD NI

Assistant Professors:
ADAMS, ANDERSON, B EKERT,
BOURGO N CAVALL ERE DUNLAP
EDWARDS H GBEE KE TH N ELSEN
ROOK ROPER SPURR

Instructor:
BAGLEY

Lecturers:
COX MART NS, M NTER
REED SCHOEN SPERSTAD

AERONAUTICAL TECHNOLOGY

F ght nstruct on costs are not inc uded n Un vers ty tu t on

TA 180 Aircraft and Aerospace Aerodynamics and Systems. Bas c aerodynam cs a rcraft we g t and ba ance aerospace veh c e systems l yd au cs p eumat cs a x ary and n str ment systems Two ectures 4 hours ab oratory Cred t 3 hours

181 Aircraft and Aerospace Structures and Materials. Aerospace veh c e structura design a d mater a s Construct on, manufactur ng and repa r techn ques hardware se ect on assemb y and nspect on req rements Prerequ s te TA 180 Two ectures 4 hours ab ratory Cred t 3 ho rs

182 Basic Ground School. Ground schoo n preparat o f r the FAA Pr vate P ot Cert f cate Sat sfactory c mp et on of FAA exan s re q red Three ectures 3 hours rec tat on t Cred t 4 hours

183 Glider Pilot Rating. Sc ence of soar ng Bas c f ght pr nc p es, g der nstrumentat on and performance Soar ng techniques cross country. Prepares the student for a FAA G der P t rat ng Sat sfactory comp etion of FAA tests required Cred t, 2 hours

185 Private Pilot Certificate. F ght tra n ng for the FAA Pr vate P ot Cert f cate Sat sfac tory completion of FAA tests s requ red Pre requis te or corequ's te TA 182 Cred t 1 ho r

284 Intermediate Ground School. Ground schoo n preparation for the FAA Commerc a P ot Cert f cate Sat sfactory comp et on of FAA exams requ red One ecture 3 hours rec tat on P erequ s tes A 182 185 corequ s te TA 385 Cred t 2 ho rs

287 Aircraft and Aerospace Powerplants. Theory of nterna ombust on eng nes, compo nents performance ana ys s engine accessor es, systems and env r nmental contro Two ectures 4 hours aboratory Credit 3 hours

288 Gas Turbines and Turbomachinery. H story deve pment and theory of gas turb ne eng nes Thrust and performance ana ys s Eng ne compo nents systems meta urgy aerodynam c prob em app cat ons a d env ronmental contro Prerequ s te TA 287 Two ectures 4 hours aboratory Cred t 3 hours

300 Aircraft Design. Cons derat ons theory and concepts a rfo and w g theory perform ar ce ana ys s, c rre at on of des g require r e ts w th manufact r ng pract ce Prerequ s tes TA 181 88 MA 120 r 26 ME 380 PH 111 113 Cred t 3 ho rs

301 Applied Aerodynamics. Propert es of a r a f t heory w nd t nne test ng techn q es a rf ow measurements wind tunne mode deve pment Prereq s te TA 300 Two ectures 3 h urs aboratory Cred t 3 hours

302 Meteorology. Eva uat on ana ys s nter pretat on of atmospher c phenon ena Charac ter st cs of nepho ogy ow and h gh a t tude weather fr m the p ot s v ewpo nt Prerequ s tes PH 111 113 Cred t 3 hours

303 Aviation Law and Regulations. System def n t on mp ementat on, eg s at ve and adm n strat ve u e mak g procedures concept of sovere gnty statutory prov s ons and resu t ng regu at ons, enforcement methods and def n t on f terms A rcraft and a rmen certif cat on req ren ents Cred t 2 ho rs

305 Aircraft and Aerospace Design. Vect r ana ys and top cs n str ct ra ana ys s a app ed t a rcraft a d aerospace veh es Prerequ s t s MA 120 or 260 PH 112 114 Cred t 2 h ou s

306 Aerospace Electrical and Electronic Systems Theory des gn, re ab ty requ rements app at o s f c mp ex e ectr ca and e ec tro c systems nstruments c n m n cat ons and nav gat n equ pment sed n a rc aft a d aerospace ve c es Pre eq s tes TE 1 0 MA 120 o 60 PH 112 114 Cred t 3 h rs

307 Aerospace Systems Design. Ana y s and des g f a rcraft and spacec aft s stem per forman e eva at n for ro kets and n s es Pre eq s te PH 11 C ed t 3 h rs

308 Combustion Analysis. Pr nc p es of bust on ystems compo er ts chem a and phys ca perf r ance ana ys s of fue s an b r cants s g standard ASTM Test ng Methods Prerequ s tes TA 288 MA 120 or 260 ME 3 0. PH 11 114 CH 115 116 Cred t 2 ho rs

309 Quality Assurance and Inspection Methods. Purpose of spect on express ve qua ty stan dards samp g methods equ pn ent app cat on mater a test ng and pr ce es Prereq s tes A 181 288 Cred t h rs

310 Instrumentation. C ncept a d p r p es of nstr mentat n behav r f ate a s en ergy and for e system Pre ure te perat re and f ow meas reme ts by e e t a f ne an ca tra sd cers The ry c rd ated w th pra t ca app cat o s of tr e ntat r an measuren ents to aerospa e sy te Pr equ s tes TE 100 A 306 MA 12 r 6 PH 1 2 114 Two ectures 3 h s ab rat ry Cred t 3 hours

311 Air Traffic Control. H story and deve op ment of procedures nvo ved n c tro of a r borne traff c dur ng VFR and FR c nd t ons Govern ng regu at ons and safety requ rements Cred t 2 hours

362 Engineering Technology Mathematics. S ution of po ynom a s by nu er ca methods near a gebra d fferentia and ntegra cal

culus nf nite and tr gonometr c ser es ord nary d fferentia equations as related to eng neer ng technology, bas c methods and concepts n probab ty and stat st cs Prerequ s te: MA 120 or 260 Cred t, 5 hours

381 Advanced Ground School. Ground course n preparat on for the FAA nstrument rat ng. Ter to twentv hours of s mu ator t me requ red based on p ot prof c ency Sat sfactory com p et n of FAA exams requ red Prereq i s tes TA 284 or equivalent Tw ectures 3 hours rec tat on Cred t 3 hours

382 Air Navigation. Advanced nav gat on metn ods and under y ng pr nc p es Dead reckon ing ce est a pressure different a techn ques, gr d nav gation and integrated nav gationa systems Prerequ s te TA 284 Credit 2 hours

383 Instrument Pilot Rating. F ght tra n ng for the FAA nstrument pilot rat ng Sat sfac tory comp et on of FAA tests requ red. Prerequ - s te or corequ s te TA 381 Cred t 1 hour

384 Airport Planning. Commun ty and a rport relat onsh ps s te select on f nanc ng, navi- gat on a ds geometr c des gn of a rport ter- m na bu d ngs, ght ng and p ann ng cons der- ations Cred t 2 hours

385 Commercial Pilot Certificate. F ght train- ng for the FAA Commercial P ot Cert f cate. Sat stactory comp et on of FAA test requ red Prerequ s te or corequ site TA 284 or equiva ent Cred t, 2 hours

386 Flight Instructor Rating. Prepares the commerc al p ot for a FAA Fl ght nstructor Cert f cate Sat sfactory comp etion of FAA test required Prerequ s te TA 385 or equ va ent Cred t 2 hours

387 Multi-Engine Rating. Prepares the Com mer ca P ot for a FAA Mu t Eng ne Rat ng Sat sfactory complet on of FAA test requ red Prerequ s te TA 385 or equ va ent Credit 1 hour

388 Propulsion. Princip es thrust, perform ance combust on systems meta lurgy, gas tur bines ram jets rockets and combustor design considerat ons Prerequ s te TA 308 Two ec- tures 3 hours aboratory Cred t 3 hours

390 Aerospace Systems Analysis. Theory, re search and deve opment methods, parameters ana ys s of product f ow p anning control, methods tota system concept, organ zation, deve opment and eva uat on Prerequ site TA 388. Cred t 3 hours

391 Airport Operation. Operat ona funct ons, commerc a a r nes general av at on opera t ons term na bu ld ng ut zat ons, support fac ties commun ty re at onsh ps and airport f nanc ng Prerequ site TA 384 Cred t 2 hours

487 Aircraft and Aerospace Design. Analys s of des gn data for a rcraft and aerospace ve hic es va ue analys s product on requ rements and manufacturing techn ques Prerequisites TA 300, 305 388 Cred t 3 hours

488 Elements of Air Transportation. A r com merce re ated to transportat on system, regu- atory cl mate of a rline and fixed base oper ations, career p ann ng Prerequ s tes EC 201; MG 301 Cred t, 3 hours.

490 Aerospace Systems Analysis. Research and deve opment methods, feas b lity costs and needs of present and future space systems cost reduct on value ana ys s and methodo ogy Pre requ sites. TA 300 390 Cred t, 3 hours

491 Aviation Safety. Cr t ca ana ys s of a r craft accidents, acc dent prevent on, deve op ment and eva uat on of av at on safety programs Cred t 2 hours

492 Aircraft Accident Investigation. Deve op ment and analys s of data eva uat on and recom mendat ons for preventat ve pract ces. Prerequ - site TA 491 Credit 3 hours

493 Airline Administration. Adm nistrat ve organ zat ons econom cs of air ine adm n stra t on operat ona structure cost analys s relationsh p with federa government agencies Prerequisite TA 488. Cred t 2 hours

COMMUNICATIONS

CT 220, 221 Communication Processes. Compo s t on presentation, speech and technica read ng Credit, 3 hours each semester.

320, 321 Industrial Documentation. ntegrates use of techn ca i ustrat on use of specif cat ons with industr a practices and produc t on processes of handbooks and manua s Cred t 3 hours each semester.

420 Technical Writing. Writ ng techn ques organ zat on of mater a research methods for techn cal wr ters Cred t 3 hours

421 Technical Editing. Edit ng proposals handbooks manuals and reports Credit 3 hours

ELECTRONIC TECHNOLOGY

TE 100 Electricity/Electronics. Phys cal and c rcu t propert es of active and passive com ponents for e ectronics and e ectr ca power d rect and alternat ng current components nc ud ng transformers Vacuum and so d state dev ces Two lectures, 3 hours aboratory Credit 3 hours

201 Applied Electrical Science. Physical and mathematical concepts of bas c c rcu t e ements and the r l near and p ece w se near nter connect ons Prerequis tes TE 100 MA 117. Credit 3 hours.

210 Active Devices. Phys ca propert es mode s and basic circu t des gn pr nc p es of vacuum and so d state devices nc ud ng mu t -element vacuum tubes, b polar and un po ar sem conduc tor dev ces Prerequ site TE 201 Two lectures, 3 hours aboratory. Cred t 3 hours

300 Circuits I. Theory and app cat ons of c r cuit analysis Res st ve networks c rcu t theorems magnet c and electr c c rcu ts Prerequis tes TE 201 MA 117 Two ectures 3 hours abora tory Credit 3 hours.

301 Circuits II. Ana ys s and app ication ons of circu ts under steady state s nuso da exc tation Transformer operat on s ng e and three phase power and RLC trans ents Prerequ s tes: TE 300 MA 118 Two ectures 3 hours abo- ratory Cred t, 3 hours

310 Electronic Circuits. Des gn and app ca t ons Emp oying vacuum and so d state dev ces Amp fier frequency response Prerequisites TE 210 300 Two lectures 3 hours aboratory Credit, 3 hours

315 Electro-Physical Processes. Circu try ay out documentat on breadboard ng, packaging and construct on E ectromagnetic, mechanica , thermodynamic human engineer ng princ p es

and pract es Prerequ s tes TE 320 PH 112 Two ectures 3 hours aboratory Cred t 3 h urs

320 Integrated Electronics. Frequency response and feedback des gn of e ectr n c circu ts Circuit and phys ca character st cs of nte grated c rcu ts near and d g ta C c rcu try Prerequ s tes TE 3 1 31 Cred t 3 hours

322 Switching and Waveshaping Circuits. De- s gn and analys s of pass ve and act ve c r cu ts operat ng n a sw tch ng mode Waveshap ng t m ng and og c Prerequ s te TE 320 Two hours ecture 3 hours aboratory Cred t 3 h urs

326 Audio Systems. Pr nc p es and app cat ons of amp f ers c rcu ts acoust ca measure me ts o se and ecord ng systems Prerequ site TE 320 Two ectures 3 ho rs aboratory Cred t 3 hours

330 Electronic Measurements. Pr nc p es c r cu ts and nstruments br dges meters osc scope recorders and s gnal sources. Prereq s te TE 320 Two ectures 3 ho rs abora tory Cred t 3 ho rs

340 Electrical Machines. Rotat ng equ pment transformers and re ated power and contro compone ts and eq pment Prerequ site TE 301 Two ectures 3 hours aboratory Cred t, 3 hours

342 Power Distribution and Lighting. Indus tr a c rcu ts equ pment des gn and nsta at on pract ces Power generat o equ pment se ect on and oad a location Prerequ site TE 301 Cred t 3 hours

380 Applied Electronics. Survey Vacuum and so d state e ectron cs, e ectr c power c rcuits for the nonma or Prerequ s te TE 100 Two ectures, 3 ho rs aboratory Cred t, 3 hours

400 Network Analysis I. E ectr ca networks and app cat ons of network theorems Transient and frequency response operat onal ca cu us and transfer funct on ana ys s pole zero con cepts LaPlace transform Prerequisites MA 260, TE 301 Credit 3 hours

401 Network Analysis II. Two port networks and matrix n ethods, coup ed networks f ter design theory and act ve networks Four er ana ys s discrete networks, computer solution of network prob ems Prerequ s tes TE 400, TA 362 Cred t, 3 hours

404 Transmission Lines and Waveguides. Propa- gation of e ectromagnetic energy, trave ng waves and ref ect ons mpedance propert es and ana ys s using Sm th chart Wavegu de theory operation and components. Prerequ s te TE 301 Cred t 3 hours

406 System Dynamics and Control. Differential equations for phys cal systems, electric ana ogs analog s mu at on system parameters and response characterist cs, open- oop *vs* closed oop b ock d agram and operationa transfer funct on ana ys s bas c contro act ons and system types des g and mpensat n Prereq u s te TE 400 Credit 3 h urs

407 Analog Simulation. Laboratory study of system dynam cs and feedback des gn Program m ng methods for s mulat on, state var ab e simu lat on, sca ng techn ques non near and hy- br d simu at on. Prerequisite· TE 400 Three hours aboratory. Credit 1 hour

410 Microwave Electronics. Dev ces compo nents and systems inc ud ng antennas p wer sources sem conductor and vacuum m crowave dev ces optica e ectron cs and radar Prereq- u s te TE 404 Cred t, 3 hours.

420 Operational Electronics. Different a and operat ona amp fier c rcuitry feedback con- f gurat ons op amp errors and compensation ear and non near c rcuitry. App cat ons n measurement nstrumentat on computat on switching act ve f ters, commun cation c r- cu ts. Prerequ s te TE 320 Cred t, 3 hours

421 Operational Electronics. Laboratory study of inear ntegrated c rcu ts and op-amp app i- cat ons. Concurrent registrat on in TE 420 Three hours aboratory Cred t 1 hour

432 Instrumentation Systems. Measurement pr nc p es near and dig tal ntegrated c r cu ts and systems nstrumentat on ampi fiers h gh speed d gita techniques ground ng shie d ing term nat ons and match ng for prec s on n strumentation Prerequis tes TE 330 420 450 Credit, 3 hours

433 Microwave Measurements. Laboratory study of h gh frequency transm ss on l nes and waveguides power sources measurement tech n ques and instrumentat on Prerequ s te TE 404 Three hours aboratory Cred t 1 hour

450 Digital Electronics. Log c dev ces, charac ter stics comb nat ona design Darnaugh map s mp f cat on contro log c, b nary arithmet c, f p f ops sequent al c rcu ts, app cation of registers counters b nary rate mu tip ers Prerequ s te TE 322 Two ectures 3 hours aboratory Cred t, 3 hours

452 Logic Design. Design of complex combina t ona and sequent a og c c rcu ts and dig tal hardware for contro , computation and nforma t on man pu ation. nterfac ng memory pro gramm ng systems and ana og equ pment Pre- requ s te TE 450 Three hours ecture, 3 hours laboratory. Cred t, 3 or 4 hours

454 Digital Computer Systems. Design organ zat on and representat on of nformation, com puter bu ld ng blocks memory dev ces d gita machine character st cs Computer arch tecture var at ons nformat on processors machine programm ng assemb ers Prerequ s te TE 450 Two hours ecture 3 hours laboratory Cred t 3 hours

456 Digital Systems Programming. M nicom puters and their app cat ons, computer program m ng language mach ne programming assemb y language programming ntroduct on to compilers Prerequ s te TE 450 Three hours ecture 3 hours aboratory Cred t 3 or 4 hours

460 Industrial Electronics. ndustr a e ec- tron c dev ces c rcu ts and systems Contro relays t mers SCR TRIAC UJT's and the r applicat ons, dig ta contro sequencers power c rcuit control and power supp es Prerequ site TE 322 Three hours ecture 3 hours laboratory Cred t, 3 or 4 hours.

462 Control Components. Contro devices de s gn and app cat on of circu ts and systems Transducers measurement and detect on, power transm ssion devices for control, servo motors rate ge erators synchros gear tra ns, f uid cs system performance model ng, des gn and mea s irements env ronmental test ng Prerequ s tes. TE 406, 460 Credit 3 hours

470 Communication Circuits. Amplitude modula tion angle modu at on, coupling networks, trans mitter and rece ver pr nc p es Prerequis te TE 320 Two ectures, 3 hours laboratory Cred t, 3 hours

472 Communication Systems. Commun cat on systems antennas, space communicat ons and te emetry princ p es Prerequisite· TE 470 Cred t 3 hours

476 Video Circuits. Synchron zing c rcu ts, v deo amplif ers and cathode ray tubes n systems app ıcat ons Prerequ s te. TE 322 Two ectures 3 hours aboratory. Credit 3 hours.

GRAPHIC ARTS

GA 135 General Graphic Arts. Type composit on str ke-on compos t on presswork bookb nd ng porous pr nt ng f exography app cat on and dup cat on One lecture, 5 hours aboratory Credit 3 hours

136 Graphic Arts Processes. Letterpress press work, photo offset ıthography, photo screen ntag o and production techn ques One ecture, 5 ho rs aboratory Credit 3 hours

236 Layout and Printing Design. Specif cation nterpretat on princ p es of typograph c layout Preparat on of rough work ng ayouts and com prehens ves Cred t 3 hours

237 Image Preparation and Carrier Assembly. Prepar ng copy for reproduct n Typograph c p ann ng for graph c arts p ocesses Cred t 3 hours

238 Instruments and Controls. Purposes and var ous ses of measur ng ınstruments useful for qua ty contro Cred t 3 hours

333 Offset Lithography (Presswork). P anography and operation of the offset press. Etches, gums so vents One ecture, 5 hours aboratory Credit 3 hours

334 Offset Lithography (Camerawork). Materıa s methods and equ pment used ı the product on of photograph c negatives and posit ves for offset thography ıne and ha ftones One ecture 5 hours aboratory Cred t 3 hours

336 Color Separation. Methods of producıng separation negatives Prerequ s te GA 334 One ecture, 5 hours aboratory. Cred t 3 hours

337 Production Management. Various systems used in the graph c arts ındustry for p ann ng and control ng work f ow Credit 3 hours

339 Estimating and Cost Analysis. Est mat ng pr ntıng operatıons and mater als elements of cost f ndıng us ng se ected systems Cred t 3 hours

435 Plant Management. ndependent documen tary research, prob ems n equ pment and person ne select on, plant s te se ect on and ayout and recent deve opments n product on manage ment. Cred t 3 ho rs

436 Technical and Research Problems. nd v dua act vit es invo vıng nvest gat on and experi-mentatıon Two ectures 4 hours aboratory Cred t 3 hours.

438 Graphic Arts Techniques and Processes. Graphic arts production Comp ex techno ogy of paper nk and related mater a s w th reference to pr nt ng processes. Two ectures 4 hours aboratory. Cred t 3 hours

INDUSTRIAL DESIGN

ID 100 Introduction to Design. Presentat on of history ph osophy pr nc ples and nfluence of ndustrıa des gn The designer s past and present ro e ın soc ety. Credit 2 hours.

111 Technical Graphics. E ements of ortho graph c and axonometr c project on charts and graphs graph ca mathemat cs bas c descr ptıve geometry S x hours ecture and aboratory Credit, 2 hours

112 Surface Definition. Descript ve spatıa relat onsh ps between po nts, l nes and planes Techniques presented for deve op ng comp ex double curved surfaces and ntersections Pre requ s te D 111 One ecture 3 hours abora-tory Cred t 2 hours

121 Analytical Techniques. Methods for def n ng organ z ng, deve op ng deas and solut ons to prob ems of a technıca nature. Use of graph ca commun catıon techn ques, the s de ru e and t me sharıng computer applıcable to prob em solv ng are emphas zed. Prerequ s te MA 118 Two ectures three hours aboratory Cred t 3 hours

160 Sketching and Drawing. Free hand sketch ng and drawıng ght and shade pen and penc techn ques; two po nt perspect ve Emphas s ıs on quıck, v sua presentations of objects and concepts Four hours lecture and aboratory. Cred t 2 hours

161 Advanced Sketching and Drawing. Re nforce ment of qu ck draw ng Fundamenta s of perspec tıve ntroductıon of color n var ous media Em phasıs on th rd d mension Prerequ s te D 160 Four hours ecture and aboratory Credit 2 hours

201 Engineering Layout Drawing. Use of ortho graph c and surface def n t on sk s ın the funct ona arrangement of components to form a comp ete design concept or system Prerequ s te ES 200. Four hours ecture and aboratory. Cred t 2 hours

215 Materials. Mater a s app cat on n des gn Character st cs and propert es of ferrous and non ferrous meta s p ast cs and e astomers Cred t, 3 h urs

250 Rendering. Use of current med a to com-mun cate des gn concepts and represent com mon y used mater a s Rap d proposa sketches and f nal presentatıon qua ty rend t ons. Pre requ s te ID 161 Four hours ecture and ab oratory Cred t 2 hours

260 Design and Modeling I. Mode construct on us ng f berg ass p ast cs meta s and wood Ex-per mentat on w th vo ume and shape n plaster and c ay P erequ s tes D 112 160 T 121 Four hours ecture and ab ratory Cred t 2 hours

261 Design and Modeling II. Mode design and construct on from concept to f nal presentat on dea sketch ng mockups mode draw ng con struct o and presentat o techn ques Pre requ s te D 260 Four hours ecture and abo rat ry Cred t 2 hours

301 Product Design I. Des gn of mass produced consumer products Pre m nary des gn sketches through f ı a so ut ns nc d ng render ngs and mode s Prereq ıs tes AR 142 D 201 E ght hours ecture and aboratory Credit 4 hours

302 Product Design II. n reased comp ex ty of prob ems Market ng cons derat ons human factors en phas zed Prerequ s tes ID 250

or concurrent reg strat on) and ID 301 E ght hours ecture and laboratory Cred t, 4 hours

303 Human Factors in Design. Emphas s on man-machine env ronment systems human charac ter st cs and behav or app ied to des gn of prod cts and systems and their operating env ronment and the methods of the r use Cred t 3 hours

305 Plastics Design. Mo d design for part re quirements mo ded holes and undercuts threads, nserts fasten ng and jo n ng decorat ng, ex trus on des gn, reinforced plast cs. Prerequ site D 215 One ecture 3 hours laboratory Cred t, 2 hours

306 Mechanical Design I. L nkages; cams d men sions determ nation, stress concentration fas teners· springs screws Prerequ site: ID 201 Three ectures 3 hours aboratory Credit 4 hours

307 Mechanical Design II. Coup ngs c utches brakes gears bear ngs ubr cation Prerequ site D 306 Three ectures 3 hours aboratory Cred t 4 hours

310 Applied Mechanics-Statics. Vectors force systems fr ction equ br um centroids and mo ment of inert a Prerequ s tes PH 111 MA 260 Cred t 3 hours

311 Applied Mechanics Materials. Deformation of members and bodies under stress Prereq u s te D 310 Four hours ecture and aboratory Cred t, 3 hours

340 Fluid Mechanics. Static and dynam c prop ert es of f u ds Flow measurement and f uid con tro des gn Prerequis tes. MA 260 PH 111 Four hours ect ire and aboratory Cred t 3 hours

350 Graphic Design. V sua des gn as it re ates to products packages, d splays signage and posters Mixed med a Prerequ s te ID 250 Six hours ecture and aboratory Cred t, 3 hours

351 Package Design I. Esthet c and structural cons derat ons of conta n ng protecting and promot ng a product through packag ng Prerequ - s te ID 350 Six hours ecture and aboratory Cred t 3 hours

360 Applied Mechanics-Dynamics. Masses n ot on k nemat cs dynam cs of machinery Pre req is te D 310 Cred t 3 hours

370 Tool Design. J g and f xture des gn. Pre requis te ID 201 Two lectures, 3 hours labora tory Credit 3 hours

400 Professional Practice. Bus ness procedures management techn ques account ng systems eth cal and ega responsibi it es of the design profess ons Jun or or sen or stand ng Cred t, 2 hours.

402 Value Analysis. Cr t ca investigation of funct ons, cost, and design manufactur ng nter face in component deve opment Case h stor es Cred t 2 hours

403 Product Liability. Manufacturer s liab ity Statutes regu ations and common aw ru es, role of expert witnesses nsurance and product safety programs Cred t 2 hours

406 Mechanical Design III. Integrat on of k nemat cs, human factors mater als and layout of components into total des gn concept. Pre requ site D 307 Three ectures 3 hours ab oratory Cred t 4 hours.

407 Mechanical Design IV. Cont nuation of ID 406 nnovative design n broad area of product development. Prob ems selected from power transm ssion, transportat on b o med cine etc Prerequisite ID 406 Three ectures 3 hours laboratory Credit 4 hours

430 Product Design III. Explorat on of des gn ideas and form coup ed w th ana ysis and com prehens ve eng neer ng ayout des gn draw ng ead ng towards the presentat on of a new pro duct n drawing and mode form Prerequ s tes D 302, 311 E ght hours ecture and labo ratory Cred t 4 hours

431 Product Design IV. Product design project with accent on nd v dual approach and student interest Objective To use a l one s exper ence n an ndiv dua manner to produce a new product Prerequ site D 430 E ght hours ecture and aboratory. Credit 4 hours

450 Design Project. Large scale interd sc pl n ary class project nvolv ng s gnif cant efforts of project p ann ng and contro des gn proto type development feas bi ty study and report ng Prerequ site sen or stand ng Six hours lecture and aboratory Cred t, 3 hours

451 Design Project. Des gn final zation model f na technica and summary reports graphics, ora presentat on of results Prerequ s te D 450 S x hours ecture and aboratory Credit 3 hours

471 Package Design II. Structura package de sign test ng cushioning, ndustr al standards· mater als in packag ng Credit 2 hours

MANUFACTURING ENGINEERING TECHNOLOGY

MT 101 Manufacturing Processes and Materials. Manufactur ng operat ons procedures proces-ses and mater a s emphas zing the r ndustr al appl cations Two ectures 3 hours aboratory Cred t 3 hours

110 Welding Survey. Oxy acetylene, arc, braz ng and tungsten inert gas (TIG) weld ng procedures for ferrous and nonferrous meta s ow tempera-ture al oys S x hours lecture and aboratory Cred t, 3 hours

116 Aeronautical Welding. Oxy-acety ene and nert gas weld ng chrome molybdenum, sta n ess and a um num Low temperature brazing, adhes ve bonding S x hours lecture and aboratory. Credit 3 hours

200 Manufacturing Processes. Meta remova processes and procedures emphasizing the ca cu lat on of speeds and feeds as related to lathe m ing and dr ll ng operations S x hours ecture and aboratory Cred t, 3 hours

201 Manufacturing Processes. Phys cal and ther mal propert es of ferrous and nonferrous meta s as re ated to m ll ng, gr nd ng and shap ng oper at ons, too geometry and des gn Prerequ s te. MT 200 Six hours ecture and aboratory Cred t 3 hours

210 Inert Gas Welding Procedures. Inert gas we ding procedures meta c nert gas (M G) and tungsten nert gas T G we ding procedures used on onferrous metals and a loys Prereq u s te: MT 110 S x hours ecture and abora tory Cred t 3 hours

300 Production Tooling Fabrication. Fabrication and des gn of j gs f xtures and special ndus tr a tooling re ated to manufactur ng methods

emphas z ng mi ling shaping and gr nding problems Prerequ s te MT 200 Six hours lec t re and laboratory Cred t 3 hours

301 Manufacturing Analysis. Econom cs and productiv ty of manufactur ng methods and mach nes Tota manufactur ng system stud es with emphas s on computer control as an automat c manufactur ng system Cred t 2 hours

302 Abrasive Machining Processes. Meta re moval emphas z ng surface too and cutter and cy ndr ca gr nd ng methods Prerequ site MT 200 S x hours ecture and aboratory Cred t 3 ho rs

303 Manufacturing Systems. Manua sem auto mat c, numer ca control and computer control systems, app icat ons n manufacturing systems w th emphas s on trends Cred t 3 hours.

304 Finishing Processes for Metals. ndustr a f n sh ng methods sed on ferrous and nonfer rous metals emphasizing anod z ng and p ating operations and new f n shes used n ndustr a app cat ons. One ecture 3 hours aboratory Cred t, 2 hours

310 Advanced Welding Procedures. Theory and app cat on of we d ng fabr cat on E ectron beam therm c, aser beam and ultrason c equ p ment and weld design. Prerequ s te. MT 110 S x hours ecture and aboratory. Cred t 3 hours

311 Non-Destructive Testing. Testing procedures used n the we d ng ndustry rad ography, X ray d ffraction and magnet c part c e u trason c and fluorescent part c e nspect on S x hours ecture and aboratory Cred t, 3 hours

312 Welding Circuitry Analysis. E ectr cal e ectron c we d ng equ pment power systems for T G M G and automat c we d ng equ pment S x hours ecture and aboratory Cred t 3 hours

400 N/C Manual Programming. Concepts of numer ca control as related to po nt to po nt and cont nuous path systems Methods of pro gram m ng set up and operat on of two and three ax s mach nes. S x hours ecture and aboratory Cred t 3 hours

401 Metrology and Quality Control. Prec s on measurement methods and qua ty contro app ca t ons re ated to product on gaging equ pment surface roughness therma expans on stress, stra n and destruct ve and nondestruct ve test- ing S x hours ecture and aboratory Cred t, 3 hours

402 New Production Processes. ndustr a pro cesses used n the meta work ng ndustry, ch p ess mach n ng processes of electr ca d scharge mach nery EDM e ectrochem ca mach n ng ECM , chem cal m ng and etch ng S x hours ect re and aboratory Cred t 3 hours

403 N C Computer Programming. App cat ons of computer a ded programm ng for point to po nt and continuous path methods of numer ca contr l APT AD APT a d AUTOSPOT computer anguages S x hours ecture and aboratory Cred t 3 hours

404 Manufacturing Material Properties. Ferrous and nonferrous mater a s emphasis on crysta ne structures. S x hours ecture and laboratory Credit 3 hours

405 N/C Continuous Path Programming. Linear and c rcu ar nterre at on app cat ons S x hours lecture and aboratory Cred t, 3 hours.

410 Metallurgy of Welded Metals. M croscop c and macroscop c examination of meta s dur ng and after we ding, emphas z ng meta urg cal changes dt e to temperature cha ges c oling, and a y ng e ements n ferrous and nonferrous metals S x hours ecture and aboratory Cred t 3 hours

411 Welding High Temperature Alloys. Equip ment mater als and methods for we ding h gh temperature a loys such as coba t mo ybdenum, tungsten, t tan um and co umbium Prerequ site MT 110 S x hours ecture and aboratory. Cred t 3 hours

412 Design of Weldments. Static and dynam c oading strength cons derations of ferrous and nonferrous we dments Credit 3 hours

INDUSTRIAL TECHNICAL EDUCATION

IT 121 Industrial Wood Processes. Wood fabr ca t n processes mater a s of c nstruct n c n struct o techno ogy product deve opment One ecture 3 hours aboratory Cred t 2 hours

174 Basic Automotives. Historica deve opment design and funct on of automob le systems, use of hand too s and safety pr nc p es S x hours ecture and aboratory. Cred t, 3 hours

222 Wood Technology. Forestry products con struct on processes, test ng strength of mater a s am nat ons ndustr al appl cations Pre requ s te T 121 S x hours ecture and abo ratory Cred t, 3 hours

250 Integrated Industrial Studies. Prepares ndustr a arts teachers in career educat on and nterd sc p nary programs; nd v dua and group activit es prob em appl cat ons des gn pr nc p es fabr cat on processes free enterpr se Com- b nes essent a s of des gn meta wood power mechan cs and re ated techn ca subjects Four hours ecture 4 hours rec tat n 12 hours ab oratory Cred t, 10 hours

270 Fluid Power. Demonstrat on and operat on of hydrau and pneumatic circu ts and compo- nents basic aws and pr ncip es nc ud ng modern a r cond t on ng. S x hours ecture and aboratory Credit, 3 hours

273 Automotive Electrical Equipment. Princi- p es spec f cat ons and c rcu try S x hours ecture and aboratory Cred t 3 hours

326 Cellulose Materials. Form ng am nat ng adhes on bend a owances structura des gn and test ng S x hours lecture and aboratory Credit, 3 hours

346 Modern Technology and Civilization. Forces lead ng to growth of American ndustries, pro- duct on systems, un ons occupat ons, prob ems of technolog ca change, nterre ationsh ps of men mater a s, and processes Cred t 2 hours

361 Industrial Crafts. Des gn and act vities n p ast c, eather apidary, ost wax process wood and meta . One lecture 3 hours aboratory Credit 2 hours

371 Automotive Construction Materials. Coat ng f n sh ng form ng and shap ng to measurements sty ng modern p ast cs and meta s, e ectro p at ng anod z ng effects of heat wear and corros on S x hours ecture and aboratory Cred t 3 hours.

377 Internal Combustion Engines. Pr ncip es cyl nder pressures engine des gn flame temperature combustion phenomena machine processes. S x hours ecture and laboratory Cred t 3 hours.

401 Vocational Education in American Schools. Bas c princip es and ph osoph es f vocat ona education Re at onship between vocat ona , career a d genera educat on Trends and eg s at on Cred t 3 hours

402 Analysis and Course Development. Se ect ng earn ng and teaching un ts through task ana ys s technique ndustr a techn cal c urse deve opn ent Cred t 3 hours

405 Improving Instruction in Drafting. Meth ods eva uat on ndustr a pract ces draft ng prob em seq ences and equ pment Cred t 3 hours

421 Production Wood Technology. Product and process design, mater a hand ng, gs and fix tures work env ronment personne , qual ty con tro assemb y f n sh ng n wood technology. One ecture 5 ho irs laboratory Credit 3 hours

423 Industrial Arts for Elementary Teachers. Too and mater a centered act v t es re ated to teach ng ch dre about techno ogy c ass r om pr b ems ntegrated nstruct on nstr ic tiona a ds One ecture 5 hours laboratory Cred t, 3 hours

424 Techniques of Construction. Bu d ngs non bu d ngs p ann ng s te preparat on str icture construct n materia s, personne One ecture 5 ho irs aboratory. Cred t, 3 hours

427 Industrial Plastics. Fabr cat on tech ques physica qua t es manufactur ng proces ses, inject on mo d ng vacuum form ng, weld ng, am nat on cast ng S x hours lecture and laboratory Cred t 3 hours.

442 Facility Planning and Management. P an n ng organ z ng and manag ng ndustr a techni ca educat on aborator es, eq pment a d supp y se ect on fac ty arrangement Cred t 3 hours

443 Industrial Safety. Accident prevent on acc dent factors methods of record ng and report ng, analys s, psycholog ca aspects, attitudes recent eg slat on safety consc ousness and a b ty Cred t 3 hours

444 Modern Industries. Aspects of management, abor, p ant and product for interpreta t on of nd istry n secondary schoo ndustria ed icat on pr gram Credit 3 hours

445 Industrial Internship. Ass gnment commen surate w th student s nstruct ona program Manufactur ng processes technica nformat on, instruct o a techn ques management exper ences spec a zed instruction by ndustry Pre req site approva of department chairman Cred t 1 10 hours.

446 Instructional Aids and Materials. Se ect on, preparat n construct on and methods of use n ind istr a techn ca educat on Credit 3 hours

450 Industrial Training. Tra n ng technique and learn ng processes P anning deve oping, and eva uat ng tra n ng programs n ndustry and governmenta agencies Cred t 3 hours

452 Industrial Supervision. Superv sory pr n- c p es as applied to ndustria and governmenta agenc es. Superv sor emp oyee relat ons, group morale eadership techn ques po cy nterpre tat n and tra n ng Cred t 3 hours

455 Industrial Technical Programs. Industria governmenta , factory and spec al schoo programs Prerequis te departmenta approva Credit 1 12 hours

461 Hot Metals Techniques. Properties of met a s nonferrous cast ng patternmak ng meta f n sh ng S x hours ecture and aboratory. Cred t 3 hours

465 General Metals. Numer ca contro e ectro p at ng, meta sp nn ng chip ess mach ning study n areas of spec a nterest Six hours ecture and aboratory Cred t 3 h urs

478 Engine Analysis. Eva uat on power, nstru mentat on fue s and fue m xtures Prerequis tes T 1 4 2 3 or equ va ent S x hours ecture a d ab ratory Cred t 3 hours

480 Teaching Industrial Technical Subjects. Teach ng techniques ph osophy organ zat on, p ann ng eva uation of teach ng eff c ency Credit, 3 hours

485 Teaching Internship. App icat on of theory to nstruction and or tra n ng in post second ary inst tut ons, ndustry and governmenta agenc es. C assroom laboratory and train ng sess on management procedures Prerequ s tes. T 402 480 (or 450 , sen or status and depart menta approval Credit 1 6 hours

491 Organization and Management of Cooperative Programs Work study programs for ndus tr a techn ca occupat ons n high schoo s and jun or co eges Deve op ng and coord nating programs Instruct ona mater als Cred t 3 hours

513 Experimental Activities. nvest gation and s lut on of se ected industr a arts act v t es and proje ts nvo ving mater a design and analy s s Cred t, 3 hours

540 Evaluation in Industrial Technical Education. Eva uat ve factors such as att tudes behav ora factors, sk s techn cal nformat on nstru ment c nstruct on eva uat on of program effec t veness Credit 3 hours

541 Adult Vocational Programs. Organ z ng and adm n ster ng even ng and adult ndustr al techn ca programs. Forma and nforma school and ndustry ffer ngs Cred t 3 hours

542 Philosophy of Industrial Technical Education. C irrent concepts ant c pated po c es pract ces and ob ect ves n pract ca arts and vocat ona techn ca educat on Cred t 3 hours

544 History of Industrial Technical Education. Factors mot vat ng evolut on of modern programs mp icat on of future trends Cred t 3 hours

546 Technical Education. Trends commun ty surveys need curr cu a nstruct on eva ua t o of techn ca pr grams f nanc ng emphas s on 13th and 14th years Cred t 3 hours

548 Administration of Industrial Technical Education. mprov ng nstruct on fund and ma teria contro student personne prob ems cur r cu ar patterns Cred t 3 hours

549 Current Literature and Research. Ana ysis of l terature ndiv dua nvest gat ons trends n ndustry, oca state and federa programs Cred t, 3 hours

College of Architecture

JAMES W. ELMORE, M.S. IN ARCH.
Dean

Purpose and Program

Architecture and the other disciplines of environmental design seek to anticipate, accommodate and express, in three dimensional reality, the most basic needs and the most soaring aspirations of the societies in which they act. Mindful of the interconnectedness of social and environmental concerns, the College of Architecture seeks to expose its students to an extensive array of disciplines and processes, with emphasis on those that give form to buildings and cities. To do this, it offers a single program providing abundant elective opportunities and leading to the five year professional degree, Bachelor of Architecture. Its purpose is to provide each graduate with the academic foundation that will enable him to develop:

- a thorough and intimate comprehension of the nature of architecture
- the competence needed to acquire professional registration
- the high ideals necessary for responsible and creative functioning as an individual and as an architect in our changing society

The professional content of the five-year Bachelor of Architecture degree program is organized into a four year sequence that can begin only after the student has completed at least one year of college work. The admissions requirements may be completed at another institution or in one of the other colleges at ASU, normally the College of Liberal Arts. Information on this is given on page 55 and in an announcement issued by that College.

The four year professional program consists of sequences of courses in architectural philosophies, architectural technologies, and architectural design, with emphasis on the latter. Through the process of solving a variety of architectural and other problems, in design studio, with faculty guidance and in competition or association with his peers, the student synthesizes the content of general, professional and elective studies. In this way he lays an academic foundation for those personal techniques and philosophies which he will develop through perhaps 45 years of apprenticeship and practice in a rapidly changing profession.

Master of Architecture Requests for program information should be addressed to the Dean.

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. 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.

Admission

Admission to the College of Architecture is separate and distinct from admission to ASU.

Admission to ASU employs a form obtained from and submitted to the ASU Director of Admissions, with procedures and dates as prescribed on pages 6 and 2 of this *Catalog*. All students desiring to study Architecture, including transfer students, will be routinely first admitted to the College of Liberal Arts —Pre Architecture.

Admission to the College of Architecture employs a form obtained from and submitted to

the Dean's Office, College of Architecture, with requirements, procedures, documents and dates as prescribed in the following sections.

Applicants are responsible for initiating both actions at the proper time.

Admission Requirements. Beyond meeting requirements for regular admission to the University the student must have met two further requirements before his application to the College of Architecture will be considered. They are:

a. Completion of at least one year of college level work including the following courses at ASU or their equivalents elsewhere:

			Semester Hours
ENG	101, 102	First Year English	6
MAT	142	Math Analysis II	3
PHY	111, 113	General Physics and Lab	4
DAR		Beginning Drawing	3
DAR	4	Introduction to Studio Art I	3
		Other	11
		Minimum Total	30

The minimum total may not include courses at a lower level than those shown above.

The minimum requirements may be completed at any other accredited institution with courses of equivalent content. If completed in another College at ASU, the 30 semester hours minimum should include:

SAP		Introduction to Architecture 2
SAP	0	Fundamentals of Environmental Design 2

otherwise they must be completed after transfer.

b. Attainment of scholarship index at a level of achievement giving the applicant reasonable prospect for success in the professional program and in no case less than 2.00 on a scale of A 4.00.

Application Procedures. Deadline for completion of all admission requirements and receipt of completed applications in the Dean's Office is 1 July.

Those whose applications are complete by the 1 July deadline will be advised by about 15 July as to whether or not they are admitted. Qualified students submitting applications after 1 July may be admitted if positions remain available. Late applicants should allow at least one month from completion of their applications to notification of their status.

A transfer student (one who is seeking admission to the College from an institution other than ASU), whose transcripts show completion of all course requirements, may receive consideration for tentative admission to the College even though he has not yet been admitted to ASU. However, this will become valid only after the student is in fact, admitted to ASU and only if his complete transcripts confirm his qualification for selection in the College. Tentative admission to the College implies no commitment to or assurance of later admission to the College or University.

Application Documents. To be considered for admission the prospective student must submit to the Dean's Office, College of Architecture the following application documents:

a. Completed College of Architecture Application Form, which is available upon request from the Dean's Office.

b. Portfolio of examples of the applicant's own work showing work completed in the required Beginning Drawing and Studio Art Courses, and whatever else he believes will best characterize his creative interests, aptitudes and development beyond drafting skills. Examples should be photographed, photocopied, or otherwise reproduced as they will not be returned. A dozen examples are considered to be sufficient, but more may be submitted. Rolled or loose drawings, slides or three dimensional items will not be accepted.

c. Transcripts of previously completed work, from each institution, if completed at institutions other than ASU. These are *in addition* to those furnished to the Director of Admissions for regular university admission by transfer. For students seeking admission from another college at ASU, the transcript is not required.

The application form, portfolio and transcripts (if required) are to be regarded as a single document and bound together in 8 ½" x 11" format. The application documents will not be returned.

Selection Procedures

Program limitations exist because the College believes that it can provide the highest quality of architectural education only if it remains relatively small and limits the number of students working with each critic in each design studio. The new Architecture Building, first occupied in 1970, can accommodate approximately 300 students in its 16 studios.

Because of these limitations not all applicants normally can be admitted, and the College must pursue a selective admission policy. Within the capability of available faculty space and resources, the College seeks to provide opportunity for the maximum number of qualified students. Its Admissions Committee evaluates all aspects of all applications with the object of selecting those who have a reasonable prospect for success in the rigorous and demanding course of study.

A transfer student who is seeking advanced

standing (above the first professional year) may not be considered qualified for admission or for the level he has requested. It is important for applicants to understand this, especially those transferring from other than accredited architectural programs. The College Admissions Committee will determine the appropriate level by evaluating the portfolio and the content of design and other professional and related courses completed. An applicant should make no assumptions regarding the Committee's funding, until it is reported to him.

An applicant who is qualified for admission to ASU, but who is not approved for admission to the College of Architecture, may seek admission to another college of the University in order to heighten his qualifications for later consideration to pursue a different program.

Advancement and Retention

Advancement from one course to the next in the design synthesis sequence requires a) cumulative index of 2.0 or above, b) satisfactory completion of all prerequisite courses. Completion of the design synthesis sequence requires a design synthesis index of 2.00 or above. A student may advance with the minimum passing grade of "D" and is allowed a maximum of ten semesters in studio to achieve a "C" average on the eight semester sequence. If he receives a third "D", or if he receives two consecutive "Ds" is disqualified from the professional program.

It is intended that all professional courses (AP, AT and AD) be taken during the years indicated by their course numbers. However, it is permitted that a student be a maximum of one year out of "phase," a fourth year AP and AT courses may be taken if AD 222 has been completed, and individual prerequisites have been met. A student wishing to pursue professional courses *excluding* design may do so for one year on approval of his application for studio leave.

Scholarships

Apart from those given by the University generally, scholarships are awarded only on the basis of work done while enrolled 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.

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. Selected here the requirements in the major categories of course work are recapitulated as follows:

Communications. The University requirement for Freshman English is on page 29.

English [EN ... or ... (4 and elective)]	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. The University requirements in General Studies, as further described on pages 28-29, are:

Humanities and Fine Arts	8
Social and Behavioral Sciences	8
Science and Mathematics	7
Electives (humanities)	3
	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:

Introductory [..., 101, 201, 222, 223]	11
3rd level [323, 333, 334]	8
4th level [Electives]	6
	25

Architectural Technologies (AT) develop knowledge of the technical determinants, resources and processes of architecture. The required courses are:

CAR [Beginning Drawing]	3
Architectural Communication [..., 241, 242, 334]	6
Research Methods 342	2
Materials and techniques 375, 451	6
Contract documents 452	3
Structures 361, 362, 463 (3 hrs.)	12
Mechanical and Electrical systems 445, 446	6
Professional Practice 555, 556	4
	42

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:

CAR 141 Introduction to Studio Art I	3
Design Synthesis 222, 322, 323, 421, 422, 521, 522	36
Field Study 350	1
	40

Electives enable the student to fortify weaknesses, exploit strengths and pursue special interests. Choices are made by the student with his advisor with the objective of increasing both his appreciation of the numerous

areas of general and professional studies and h s depth of understanding n several of them E lective opportun t es provided bevond those in the General Studies program are

E ect ves 9
Total of n rma. ter sen ester c rriculu .. 7)

Architecture

Professors:
ELMORE (ARCH 134) COOK,
ELLNER STRAUB WH FFEN

Associate Professors:
BOYLE FLYNN HERSHBERGER
HINSHAW, JAKOB OL VER,
PETERSON, RAPP

Assistant Professors:
BA LEW BERTELSEN BR TZ,
LARSON, SEABLOM

Lecturers:
CHR STENSEN CLARK
FA RBURN FELLOWS JONES
LORT PERRELL SHEYDAYI YELLOTT

ARCHITECTURAL PHILOSOPHIES

Unless otherw se ind cated, these co rses are open to any student meet ng the stated pre or co requis tes and are rec ognized in the Univers ty s program of Genera Stud es

AP 100 Introduction to Architecture. Under stand ng of our phys ca env ronment through the forms funct ons a d determ nants of today s arch tecture ts cont nu ty w th the past and ts re at on to the deve op ng present Brief exam nation of arch tecture as a profession. Cred t 2 hours.

101 Fundamentals of Environmental Design. Interact on of the eco ogica soc eta and human determinants of the designed env ron ment Pre arch tecture students only Prerequis te AP 100 Credit 2 hours

201 Formal Systems. Form in env ronmenta des gn nclud ng gravity space, c rculat on growth and esthetic systems for structur ng form Corequ site AD 221 or 222 Cred t 2 hours

202 Environmental Systems. Environmental control systems in des gn nc ud ng water d s tr bution waste d sposal climate control, acoust cs l ght ng and communicat ons Coreq uis te AD 221 or 222 Cred t, 2 hours

203 Introduction to Landscape Architecture. Land and s te p ann ng eco ogy as the basis of outdoor des gn theory techn ques and mate r a vocabulary Corequ s te AD 221 or 222 Cred t 3 hours

303 Introduction to Planning. Pr nc ples and techn ques of p ann ng contemporary urban prob ems redeve opment programs new commun ties federal programs comprehens ve p ans Prerequ s te AD 221 or 222 Credit 2 hours

304 American Architecture. Arch tecture n the U S from earliest co onia times to the present Not for B Arch degree credit Credit 3 hours

311 Evolution of Human Settlements. Land use and urban development as ev denced n p an n ng and des gn from anc ent to modern t mes. Cred t 3 hours

312 The Man-made Environment. Esthet c, soc a econom c po tica and other factors shaping the des gned env ronment of the 20th ce tury Not for B Arch degree cred t Credit 3 hours

313, 314 History of Architecture. An ntroduc tory survey of representat ve works of Western arch tecture Anc ent through med eval n 313 Renaissance through the present day in 314 Cred t 3 hours each semester.

315 Topics in Architectural Philosophies. Developments theories or ach evements of current or spec al nterest Prerequisites junior standing and approval of nstructor Credit 1 3 hours

401 Arid Region Architecture Theory. Prob ems and so ut ons ar s ng from partic pat on in a desert ecology. Prerequ s tes sen or stand ng and approva of instructor Cred t 2 hours

403 Oriental Architecture. M ddle East, Ind a Southeast Asia China and Japan from anc ent times to the present Prerequis te. AP 100 or any AP 300 evel course Cred t, 3 hours

404 Discussion Leadership. Exper ence of ead ing smal groups in d scuss on of architectura subjects Prerequ s tes: AP 101 AD 321, and approva of Dean Cred t, 1 hour. May be repeated for a maximum of 3 cred t hours

405 Seminar. Discussion and reports as aspects of contemporary arch tecture theory pract ce, crit c sm. Prerequ sites: AD 321 and 322 Credit, 2 hours

411 Ancient Architecture. The anc ent Medi terranean wor d, emphas zing major h stor ca comp exes and monumenta sty es Prerequ site AP 313 Cred t 3 hours

412 Medieval Architecture. Europe and the Near East from the re gn of Constant ne to the end of the M dd e Ages Prerequ s te AP 313 Credit, 3 hours

413 Renaissance Architecture. Eur pe and Amer ca n the 15th and 16th centur es Prereq u site AP 313 or 314 Cred t 3 hours

414 Baroque Architecture. Europe and America from the ate 16th to the m dd e 18th century Prerequisite AP 314 Cred t 3 hours

415 19th Century Architecture. Europe and Amer ca from the neo class cism to art nouveau Prerequis te AP 314 Cred t, 3 hours

416 20th Century Architecture I. Europe and Amer ca from the foundat ons of the modern movement to the cu m nat on of the nter nat onal sty e Prerequ s te AP 314 Cred t 3 hours

417 20th Century Architecture II. Developments n architecture s nce the nternat ona sty e Prerequ s te AP 314 Cred t, 3 hour

471 History of Landscape Architecture. Phys cal record of man s attitude toward the and Anc ent through contemporary and des gn for h man

use and enjoyment Prerequ s te· AP 100 or any AP 300 eve course Cred t 3 hours

481 History of the City. The city from ts ancient or g ns to the present day emphas z ng the cit es of Europe and Amer ca dur ng the ast f ve centur es Prerequis te AP 100 or any AP 300 eve course Credit 3 hours.

ARCHITECTURAL TECHNOLOGIES

Unless otherwise ndicated these courses are open only to students admitted to the profess onal program of the College of Arch tecture

AT 240 Introduction to Architectural Drafting. Bas c draftng sk s and re ated techn ques requ red for effect ve part c pat on n the work of an arch tectural off ce Credit 2 hours

241 Design Communications I. Theory of perception and des gn commun cations, perspec t ve shades and shadows techn ques of sketch ng and render ng bas c des gn pr nc p es One half day n stud o Cred t 2 hours

242 Design Communications II. Advanced techn ques of des gn s mu ation inc uding photographic 3 D mode ng e ectronic and other techn ques· graph c commun cat ons basic des gn pr nc p es One ha f day n stud o Cred t 2 hours

251 Materials and Construction. ntroduct on to mater als and the r use n construct on Credit 3 hours

341 Computers in Environmental Design. Use and potent al in such areas as programm ng, ca culations contro des gn and graph cs Credit 2 hours

342 Research Methods. Theory of sc ence, problem def n t on research design techniques of observat on and quest on ng samp ing pro cedures experimenta des gn methods of anal ys s and nterpretat on of data Credit 2 hours

343 Architectural Rendering Techniques. Del neat on techniques and the use of various med a for des gn stud es and presentations Four hours studio Cred t 2 hours.

344 Watercolor. Painting in transparent water color. Emphas s on techn ques composition and color as they relate to arch tectura subjects and the r env ronment Four hours studio Cred t 2 hours

361 Theory of Structures I. Elastic ty of structura materia s propert es of sect ons elastic stress ana ysis of determinate structures; flow d agramm ng for computer programming (BASIC) Credit 3 hours

362 Theory of Structures II. ndeterminate struc tures, use of ex st ng structural (computer) programs, structural eng neer ng properties of wood steel and concrete Prerequis te AT 361 Cred t, 3 hours.

445, 446 Mechanical and Electrical Systems. Techn ca problems of c mate control, acoustics ighting commun cations and other mechanica and e ectr ca systems Credit 3 hours each semester

451 Construction Systems. Se ect on and employ ment of mater als and systems accord ng to their nature and the techn ques of the r use Prereq u s te AT 251 Cred t 3 hours

452 Contract Documents. Developing systems used n the preparation of contract draw ngs, spec fica t ons and documents Use of bu d ng codes and zon ng ord nances Prerequ s te AD 321 Cred t, 3 hours.

463 Structures of Wood and Masonry. Structura des gn and analys s of wood and masonry bu d ings; ntroduct on to lateral (w nd and seism c) analys s Prerequ s tes AT 341 361 362 Cred t, 3 hours

464 Structures of Steel. Structural des gn of mu t -story stee frame bu d ngs ncluding continuity connect ons and atera ana ys s Prerequ sites AT 341 361 362 Cred t, 3 hours.

465 Structures of Concrete. Materia character st cs, reinforced concrete mechanics deve opment of f ow d agrams and computer programs for beams, slabs and columns Prel minary des gn of mu ti-story bu d ngs Prerequ s tes AT 341 361 362 Cred t, 3 hours.

473 Landscape Construction and Materials. Design, construct on mater a s and s te eng neering aspects of andscape arch tecture. Prerequ s te· AP 203 Credit 3 hours.

483 Introduction to Urban Statistical Analysis. Quantitative analysis in the urban context, demographic ana ys s, data processing, p ann ng applications and urban systems Prerequ s tes AD 222 and QS 221 Cred t 3 hours

484 Introduction to Land Economics. Econom c determ nants for urban and reg ona planning ana ytica techniques, elementary market stud es and feasib ty analys s econom c ncentives in urban planning. Prerequis tes AD 222 and EC 202 Cred t 3 hours.

555 Professional Practice I. Lega and ethica aspects of professiona pract ce nc ud ng partnerships, corporate pract ce, nsurance tax aw codes ordinances and contract documents Prerequ site fifth-year stand ng Cred t, 2 hours.

556 Professional Practice II. Econom c and or gan zat'onal aspects of profess ona pract ce nc ud ng off ce management, f eld operations and contro , f nanc ng and organ zat on of bu ding operat ons nature and organ zation of the construction ndustry. Prerequ site f fth year stand ng Cred t 2 hours

561 Soil Mechanics and Foundations. Soil character st cs elementary so mechan cs, deve op ment of f ow d agrams and computer programs for prel m nary foundat on des gn Prerequ s te AT 465 Credit 3 hours

562 Structural Materials and Systems Research. Emp r cal analysis of arch tectura and struc tura mater als and systems ndividua or team research. Prerequ s tes n ne hours of structures and approval of instructor N ne hours of n laboratory work per week Cred t 3 hours.

563 Experimental Constructional and Mechanical Systems. App cat on of human needs to extreme climat c s tuations and energy con sumpt on Ind vidua or team research Prerequ s tes n ne hours of 400 or 500 evel structures and approval of instructor. N ne hours of n ab work per week Credit, 3 hours

ARCHITECTURAL DESIGN/SYNTHESIS

Unless otherwise indicated, these courses are open only to students admitted to the professional program of the College of Architecture.

AD 221 Design/Synthesis—Ecological Determinants. Ecological, climatic, site and landscape determinants of design. Emphasis on methods of analysis. Three afternoons in studio. Credit, 4 hours.

222 Design/Synthesis—Human Determinants. Biological, psychological, cultural and functional determinants of design. Emphasis on methods of research and programming. Prerequisite: AD 221. Three afternoons in studio. Credit, 4 hours.

320 Field Study. Organized study of architecture in and out-of-state setting. Corequisite: AD 321 or 322. Credit, 1 hour.

321 Design/Synthesis—Systems Determinants. Structural and environmental control determinants of design. Emphasis on methods of synthesis. Prerequisites: AD 221 and 222. Four afternoons in studio. Credit, 4 hours.

322 Design/Synthesis—Societal Determinants. The social, economic, and political determinants of design. Emphasis on methods of evaluation. Prerequisite: AD 321. Four afternoons in studio. Credit, 4 hours.

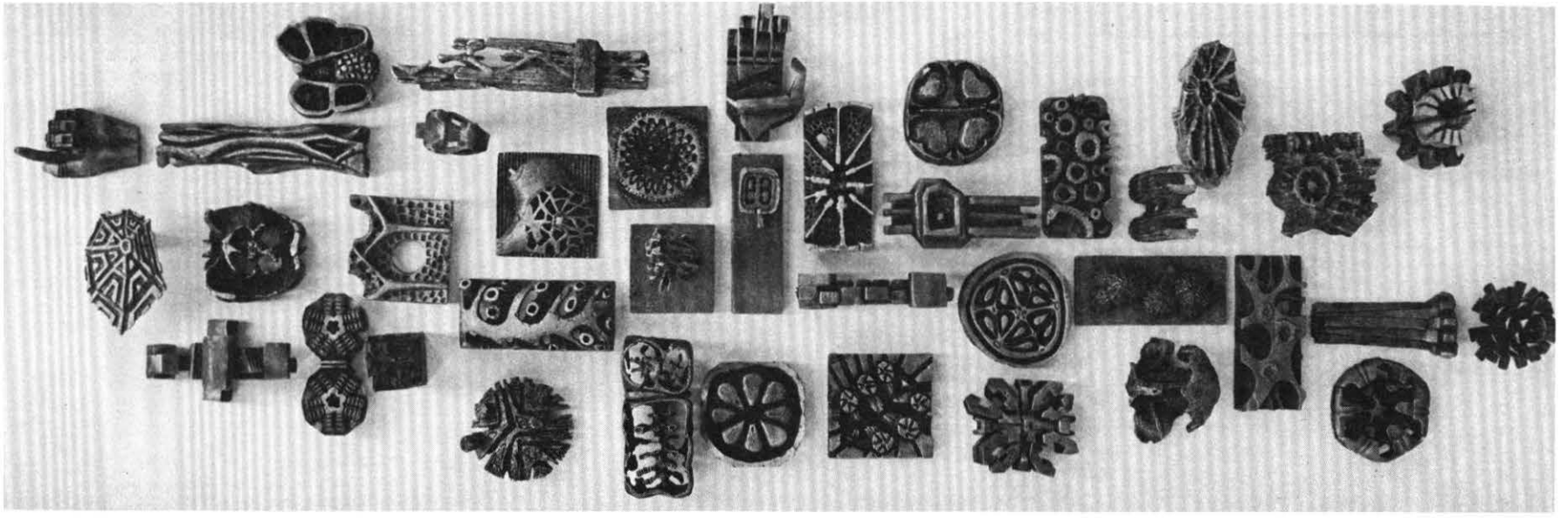
421, 422 Design/Synthesis. Advanced studio problems with emphases in various disciplines of environmental design. Prerequisites: AD 321 and 322. Five afternoons in studio. Credit, 5 hours each semester.

423 Interdisciplinary Studio. Studio course for senior non-architecture students. Problems structured in accordance with the needs and capabilities of the students enrolled. Prerequisites: senior standing and approval of the Dean, College of Architecture. Credit, 3 hours.

424 Community Design Workshop. Approved program of design work with a local community workshop. May be taken as a fourth-year elective. Prerequisite: AD 322. Five afternoons a week. Credit, 5 hours.

521, 522 Design/Synthesis. Extension of AD 421, 422 in the final design experience of the B.Arch. program. Prerequisites: AD 421, 422. Five afternoons in studio. Credit, 5 hours each semester.

523, 524 Architecture Studio. Extension of studio work in the Design/Synthesis Sequence. Prerequisites: AD 521 and 522 and approval of the Dean. Credit, 5 hours each semester.



College of Nursing

JUANITA F. MURPHY, PH.D.
Dean

Purpose

The faculty of the College of Nursing acknowledges its responsibility to Arizona and the world community for the preparation of individuals who will provide nursing care of professional quality through teaching, research and service. The purpose of the College is to provide an educational program which prepares practitioners to give nursing care which considers emotional, bio-physical, socio cultural and ecological needs in the prevention and treatment of human ills. 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 should have the opportunity 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 knowledge and skills to help other human beings achieve and maintain well being. In addition, the professional nurse acts as a change agent in a rapidly changing environment.

Organization

The College of Nursing is organized as follows:

BACCALAUREATE PROGRAM

GRADUATE PROGRAM

Community Mental Health Psychiatric Nursing

Family Child Nursing

Medical-Surgical Nursing

Community Health Nursing

CONTINUING EDUCATION ACTIVITIES

Presents a variety of course offerings both on and off campus, some of which are for academic credit, and all of which are designed to assist Registered Nurses to increase the knowledges and skills needed in their professional roles.

Degrees

Bachelor of Science in Nursing. The completion of a four-year curriculum in nursing leads to the degree of Bachelor of Science in Nursing. The purpose of the baccalaureate program in nursing at Arizona State University is to graduate a nurse who possesses general clinical competence to perform as a beginning professional nurse practitioner in the areas of primary care, acute care and long term care. The graduate is prepared: 1) to give enlightened patient care to individuals and families, using the skills of observation, assessment, decision making and evaluation; 2) to apply the teaching-learning process in order to promote health and prevent illness with individuals and groups; 3) to function as a contributing member of the health team and be able to assume leadership as appropriate, 4) to collaborate with other health professionals in planning and implementing patient care; and 5) to be self directed in his professional and personal growth through continued education and participation in professional and community organizations.

The first two years of the four year baccalaureate program consist of required pre nursing and elective non-nursing courses. See section on baccalaureate degree requirements in this catalog, page 29. The nursing major is composed of at least 48 upper division nursing credits and usually begins with the junior year. The nursing major is usually completed within two academic years.

CONTINUOUS PROGRESS CONCEPT The nursing courses are based on the concept of continuous progress. This concept is defined as a sequential learning process which provides the student the opportunity to progress according to individual ability, provides materials and facilities for independent study, and provides freedom to utilize individual initiative and pacing in his learning. Students without previous nursing course work usually can complete the total program of study leading to the Bachelor of Science Degree in Nursing in four academic years. However, students with previous nursing course work may complete the nursing courses more quickly because of the individualization of instruction according to the student's learning needs.

Some students may find it advantageous or necessary to devote more than the usual time to the baccalaureate nursing program of study by pursuing fewer studies in any one semester than are regularly prescribed. In cases such as inadequate secondary preparation or financial necessity requiring time for outside work, the time for completing the course work would be extended. In addition a student may wish to strengthen his general educational base through taking more than the required liberal arts credits and therefore extend the length of time required for his undergraduate education in this way.

Master of Science. The College of Nursing offers a four-semester program leading to a Master of Science degree with specialization in Community Mental Health Psychiatric Nursing, Family Child Nursing, Medical Surgical Nursing and Community Health Nursing. Requirements for these programs are given in the *Graduate Catalog*. Persons interested in applying for admission to the program should write to the Arizona State University Graduate College for a catalog and application form.

Requirements for Admission and Retention

Bachelor of Science Program

The program is designed to meet the academic needs of freshmen and transfer students from other programs within the University or from other educational institutions. Persons interested in applying for admission should write to the Director of Admissions, Arizona State University, for an application form. In order to enter the nursing major, applicants must have achieved a cumulative grade point average of 2.25 in the prerequisite courses as well as a cumulative grade point average of 2.25 in each of the four categories required for the nursing major. In order to maintain a quality nursing education program, the number of applicants may be limited.

1. Freshman students should have enrolled in the college preparatory program in high school. Freshman students must meet the University standards and should refer to the Admission section of the current *General Catalog*. In addition to the high school courses required by the University for admission, the student planning to register in nursing must include:

Mathematics (algebra, advanced algebra and advanced college preparatory mathematics)	2 units
Biology	1 unit
Chemistry	1 unit
Physics	Recommended

Students who have not met the additional high school course requirements should consult with their faculty advisor for guidance in selecting an appropriate college course to complete these requirements.

2. Transfer students must have a grade point average of 2.25 (C) or higher for all work completed at previous institutions of higher education and be in good standing and eligible to return to those institutions. Admission of out of state students is limited. All students who are transferring should request that their previous institution(s) send two transcripts of their previous college work, one directly to the Registrar and one to the Dean, College of Nursing. After the Dean of the College of Nursing has received all transcripts, the student should make an appointment with the Dean, or the Chairman of the Baccalaureate Program, or a faculty member for an evaluation of previous course work. Transfer credits which are accepted by the Registrar, including successfully completed nontraditionally graded courses (e.g. pass fail courses) will be evaluated by the College of Nursing Standards Committee to determine their application toward fulfilling the requirements of the Baccalaureate Program in Nursing.

Transfer from Community College. Students who have completed course prerequisites to the nursing major in a community college may be admitted to the nursing major. Credits transferred from accredited community colleges will be accepted up to a maximum of 64 semester hours. Students planning to complete the prerequisite courses in other educational institutions should consult a faculty advisor in the College of Nursing at Arizona State University to be certain that courses selected do meet the prerequisite course requirements.

Transfer with Previous Nursing Education (including graduates of diploma programs and associate degree programs): Students who have completed nursing course work in a school of nursing and/or college should follow the procedure described in the previous section concerning transfer students. Because of the continuous progress concept, it may be possible for students with previous nursing knowledge to complete the nursing courses in less than two academic years.

3. Credit by Examination: Students may earn University credit by examination. Students

interested in obtaining credit in this manner should consult the sections in the current *General Catalog* on College Level Examinations, Comprehensive Examinations, and Proficiency Examinations

Curriculum

In order to enter the nursing major, a cumulative grade point average of at least 2.25 in each of the categories of prerequisite courses, as well as an overall cumulative grade point average of 2.25 is required of all students entering the University Fall Semester, 1973, and thereafter. All students must complete the following prerequisite requirements in order to enter the nursing major

	Semester Hours
ENGLISH	
EN 101 and 102, or 104	3-6
HUMANITIES	
Including Speech as outlined under General Studies program, pages 28-29	8
SOCIAL STUDIES	
Introduction to Psychology (PX courses only)	3
Introduction to Sociology	3
Introduction to Anthropology	3
Human Development or Child Development	3
Family Relationships	3
Nutrition	2
SCIENCE AND MATHEMATICS	
Inorganic Chemistry	4
Organic Chemistry	4
Anatomy	4
Physiology	4
Microbiology	4
Genetics	3
Statistics (required course, not prerequisite to the nursing major)	3

Upon successful completion of lower division studies, students are eligible to enroll in the nursing major providing they meet all academic and health requirements. Prior to entering the nursing major all students must complete the form "Application for Admission to the Nursing Major" (F 86A). This should be completed during preregistration advisement period prior to the semester in which entrance is desired. The physical examination must be completed and reports returned to the College of Nursing by registration week of the semester the student is entering the nursing major. All forms may be obtained from the College of Nursing office or faculty advisors

A student must achieve a minimum grade of "C" in all nursing courses in order to remain in the nursing program. A student may repeat a course only once

General Information

Accreditation. The Baccalaureate and Master's programs of the College of Nursing are accredited 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 also approved by the military services so that qualified students may apply for their student nurse programs

Colloquia. Colloquia will be scheduled upon request from students who wish orientation to the nursing major

Scholarships and Financial Aid. For information regarding scholarships and loans, see page 34. 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, and selects and participates in those campus activities which are of interest to him. Students are represented on University and College of Nursing committees

Baccalaureate students of the College of Nursing are eligible for membership in ASASU, Arizona Association of Student Nurses, and the National Student Nurses Association. Students are represented in the Student Senate of ASASU

Student Health. In addition to the health policies of the University, the student enrolled in the nursing major is responsible for fulfilling the requirements outlined in the Current Health Policies of the College of Nursing (P-1) which is available from advisors and the College office.

Learning Resources. The College of Nursing offers learning resources which include the University's Hayden Library; the Multi-Media Independent Study Laboratory housing audio-visual teaching materials; and federal, state, county and private health agencies used for selected clinical experiences with patients and families.

Student Transportation. Students will provide their own transportation to the health agencies and other selected experiences, such as home visits to patients and families.

Honors Program. The Honors Program is designed for nursing students of exceptional ability who are interested in scholarly attainment. A student may apply to the Honors Council for admission after the completion of one semester of full-time study at Arizona State University with a grade point index of 3.25. The Honors student may leave the Honors Program at any time he desires. However, he

must notify, in writing, the Chairman of the Honors Program, Standards and Student Affairs, that he wishes to leave the program. An Honors student must complete at least 12 semester hours of study in Honors courses of which 3 semester hours are in an Honors nursing course, NU 499. Students who are interested in the Honors Program should consult with their advisors.

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, 38 hours in related non-nursing courses and electives, and 48 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.

Master of Science Degree Curriculum. The program of study is a four-semester sequence of 50 semester hours. Consult the *Graduate Catalog* for requirements.

Nursing

Professors:
MURPHY (Nurs 459), BARDEWYCK, BRANSTETTER, JOHNSON, McLEOD, ROSE

Associate Professors:
BRUNER, HOLMES, STEFFL, STUMPF, TAYLOR, THEOBALD

Assistant Professors:
BALDWIN, BLEWETT, CHAFEY, ECHEVESTE, ELLIS, FINCH, HUHNKE, KASSELMAN, LENDLE, McCLELLAN, MONNINGER, MURPHY, RICCI, RIEKE, SANTORA, SEGALL, SEHESTED, STAPLETON, STENGEL, TICE, WEITZEL, WURZELL, ZORNOW

Instructors:
ABBOTT, BURT, FELLER, FIGGS, FOOTE, GAFFNEY, GARRISON, OSBORN, PORTER, SANDLING, SCHMIDT, SHEA

NURSING

NU 301 Foundations of Nursing I. Concepts from human development and adaptation provide a framework from which to view the individual and his response to his environment. Provides knowledge of a systematic approach including observation, assessment, decision-making and evaluation in providing nursing care to the individual. Taken concurrently with NU 311. Prerequisite: admission to the nursing major. Credit, 6 hours.

302 Foundations of Nursing II. Knowledge of bio-psycho-social components considered in the nursing process with a focus on assessment. Emphasis on development of professional characteristics within the individual nurse. Taken concurrently with NU 312. Prerequisites: NU 301, 311. Credit, 4 hours.

311 Clinical Nursing I. Applies the nursing care process to clinical practice. Examines relationship between environment and health status of the individuals in community settings. Taken concurrently with NU 301. Prerequisite: admission to the nursing major. One hour lecture, 4 hours conference, 9 hours laboratory. Credit, 6 hours.

312 Clinical Nursing II. Basic concepts of pathophysiology, crisis intervention, and the impact of illness on the patient and his family. Application of the nursing process to a short-term, acutely ill patient. Taken concurrently with NU 302. Prerequisites: NU 301, 311. Two hours lecture, 4 hours conference, 12 hours laboratory. Credit, 8 hours.

401 Foundations of Nursing III. Knowledge of bio-psycho-social components considered in the nursing process emphasizing decision-making and the collaborative role of the nurse as a member of the health team. Taken concurrently with NU 411. Prerequisites: NU 302, 312. Credit, 3 hours.

411 Clinical Nursing III. Basic concepts of pathogenicity related to the individual with chronic health problems and acute exacerbations of the problems; impact of chronic long-term illness on individual's life style, family and community. Application of the nursing process to critically ill and/or long-term chronically ill patients in the hospital and community. 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. Synthesizes learning in delivering individualized nursing care to groups of patients in the hospital and in the community. Emphasis on the leadership role and analysis of the health care delivery system. Prerequisites: NU 401, 411. Two hours lecture, 4 hours conference, 15 hours laboratory. Credit, 9 hours.

460 Recent Advances in Nursing. Advanced study and/or supervised practice in an area of nursing. Credit in different areas of study may be accumulated to 5 hours. Prerequisites: senior standing and/or approval of the instructor. Credit, 1-5 hours.

Examples: Physical Health Assessment. Increases knowledge and skills of history taking and physical examination. Role of the nurse

practitioner functioning in primary care is examined Clinical practicum arranged w th medical preceptor n the student's area of clinical interest *Issues in Gerontology.* Examines the character and needs of the aging population and identifies implications for nursing. Focus is on the bio psycho-social aspects of aging. Emphasizes the multidisci plinary and epidemiological approach to identifying and meeting needs of the elderly

498 Pro-Seminar. Small group or individual study and research re ated to a nursing care problem Evaluates effects of nursing inter vention on patient care. Prerequisites NU 302 312 Credit, 3 hours

499 Independent Study (Honors). Student may formulate and execute an independent study based on a nursing care problem ndependent study courses are Honors courses and may be taken only by outstanding senior students. Student must have a cumulative scholarsh p index of 3 25 or better n the nursing major. Appl cation form #FL-38 must be completed eight weeks before the student wishes to beg n this course Prerequisites: NU 401 411 Credit 3 hours

580 Advanced Theory and Practice I. Eco ogica approach to hea th and Illness behavior Em phasis on family competencies, dynam cs, and available health care in the community. Practi cum: community and family settings. Prerequi site: approval of instructor. Credit, 3 hours.

581 Advanced Theory and Practice II. Theory related to individual and family cop ng and adaptive behavior in crisis, long term illness and disability Practicum in a variety of health care settings. Prerequisite completion of NU 580 and/or approval of instructor. Credit 3 hours.

592 Research I. Investigative methods. Pur poses, aims of research Review of research in nursing Credit, 1 hour.

592 Research II. Research design. Role of theory, methods of data collection Develops thesis proposal. Credit 2 hours.

592 Research III. Individual research. Data collect on and analysis. Credit, 3 hours.

593 Research IV. Thesis Individual research. Complet on of thesis requ rement. Credit, 2 hours

681 Advanced Theory and Practice III. Ad vanced specialized theory and practice Sect 1 Family-Child Nursing. Sect 2 Community Mental Health Psychiatric Nursing. Sect 3 Medica Surgical Nurs ng. Sect 4 Community Health Nursing Prerequisite. approval of instructor Credit, 4 hours.

682 Advanced Theory and Practice IV. Advanced specialized theory and practice Includes area of special interest option Sect. 1—Family-Child Nursing Sect 2 Community Mental Health-Psychiatric Nursing. Sect. 3—Medical Surgical Nursing. Sect. 4—Community Health Nursing. Prerequisite approval of instructor. Credit, 4 hours.

Special Graduate Courses: 590 591 594, 680, 684. (See pages 46-47.)

HUMAN DEVELOPMENT

HD 510 Origins of Human Behavior. Critical examination of theories issues and research in the developmental period of infancy through ado escence Biolog cal social, psychologica and cognitive factors considered Prerequi site CD 232 or equivalent. Credit, 3 hours.

511 Development in Adulthood and Aging. Deve opmental changes in adu thood and aging Bio og cal, social, psycholog ca nfluences as re ated to adu t roles life sty e health status and problems of aging. Cred t, 3 hours

College of Fine Arts

HENRY A. BRUINSMA, PH.D.
Dean

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 theatre, and in the interdisciplinary humanities, reflects the wide range of challenges facing the communicative artist and scholar in the twentieth century. As an integral part of a University 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 a broad variety of art exhibitions, the operation of the University Art Collections, the Boulton Collection of Ethnic Music and Musical Instruments, and several series of concerts and recitals, dramatic productions, musical theatre, lectures, and various diagnostic and clinical services.

Special Programs

Pass-Fail Courses. The College of Fine Arts does not accept Pass Fail grades in fulfillment of requirements for any degree. In the case of transfer of Pass-Fail credits, the student may petition the College Standards Committee for exception. In such cases, appropriate official evaluative information must be attached in support of the petition.

Transfer of Junior College Credits. Credits transferred from accredited junior or community colleges will 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. 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

Courses transferred from junior colleges will not be accepted as upper division credit at Arizona State University. Students are urged to choose their junior college courses carefully, in view of the fact that a minimum of 50 semester hours of work taken at the University must be upper division credits It is therefore suggested that they elect General Studies courses and lower division courses in their major field while attending a junior college.

Religious Studies Program. Although religion oriented courses are offered in several departments of the University, the program of religious studies is offered through the Center for the Humanities.

A major in religious studies is not offered, but it is possible for a student to develop a related field program of religious studies, including 15 hours of credit in his major area, if religious studies are considered appro-

priately related to the major field of specialization. Courses in religious studies may also be elected to meet General Studies requirements in the Humanities and Fine Arts, or as free electives in those curricula where the hours are available. Students in the interdisciplinary Humanities degree program may select the field of religious studies as one of their primary fields of interest in the Humanities, up to a total of 21 credit hours

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 Fine Arts extend to seniors, with a grade point index of at least 2.50, 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 instructor of the class, the student's advisor, and by the chairman of the department in which the course is offered.

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 29 of this catalog.

Pre-Professional Programs. The College of Fine Arts offers, through its regular major degree programs, the opportunity to prepare for admission to graduate professional programs in law, medicine, dentistry, theology, social service administration, and occupational and physical therapy. Students seeking to follow a pre professional program should enroll in either a Bachelor of Arts or Bachelor of Science degree program. For special advisement and assistance in developing the appropriate program of study, such students should consult with the Coordinator of Advisement in the College of Fine Arts office.

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

Secondary Education Programs. In cooperation with the College of Education, a student majoring in the College of Fine Arts may obtain a baccalaureate degree from the College of Fine Arts and meet the requirements for a secondary education certificate. The student must meet all the 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 Fine Arts.

Degrees

Bachelor's Degrees. The College of Fine Arts offers work leading to four baccalaureate degrees. Bachelor of Arts, Bachelor of Science, Bachelor of Fine Arts, and 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, theatre, and humanities for the public schools.

Bachelor's degrees are offered in the following fields

Bachelor of Arts:
- Art
- Art History
- Humanities (Interdisciplinary)
- Music
- Speech
- Theatre

Bachelor of Science:
- Art (Ceramics, Crafts, Advertising Design)
- Communication Disorders
- Speech Communication

Bachelor of Music.
- Choral Music
- General Music
- Instrumental Music
- Music Performance
- Music Theatre
- Music Therapy
- Theory and Composition

Bachelor of Fine Arts:
- Advertising Design
- Ceramics
- Crafts
- Dance
- Interior Design
- Painting and Drawing
- Photography
- Printmaking
- Sculpture
- Space Design

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:

Master of Arts.
- Art Education
- Art History
- Humanities (Interdisciplinary)
- Music History and Literature
- Speech Communication
- Theatre

Master of Fine Arts:
- Ceramics
- Crafts
- Interior Design
- Painting and Drawing
- Photography
- Printmaking
- Sculpture
- Space Design

Master of Music:
- Choral Music
- Composition
- Conducting
- General Music
- Instrumental Music
- Music Theatre
- Performance
- Performance Pedagogy
- Theory

Master of Science:
- Communication Disorders

Master of Arts in Education
(offered by the College of Education):
- Art Education
- Music Education
- Speech
- Theatre

Doctor of Education Degrees. In cooperation with the College of Education, the Departments of Art and Music offer special curricula leading to the Doctor of Education degree with majors in Art Education or Music Education

Degree Requirements

General Degree Requirements. There are certain requirements that pertain to *each* baccalaureate degree program in the College of Fine Arts.

GENERAL STUDIES REQUIREMENTS. 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 Bachelor of Music degree programs must meet the University minimum requirement of 36 hours of credit in General Studies In addition, students must meet the University requirement of the equivalent of two semesters of English composition At least 8 hours of course work must be taken in each of the areas of humanities and fine arts, social and behavioral sciences, and science 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 in cluded See pages 28-29 for complete description of the University General Studies program

GRADUATION REQUIREMENTS. At least 126 semester hours and a cumulative scholarship index of 2.00 are required for graduation. (See exception to this grade point requirement in the Humanities major and the Communication Disorders programs.)

UPPER DIVISION COURSES: Of the total of 126 hours required for graduation, at least 50 credit hours must consist of upper division courses. 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".

Specific Degree Requirements. In addition to the above general degree requirements, each of the degree programs offered in the College of Fine Arts have specific requirements.

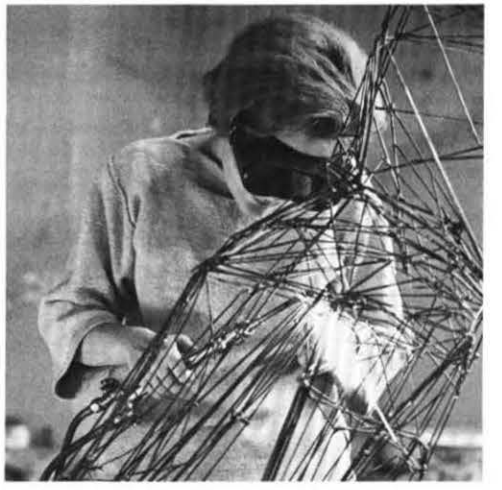
BACHELOR OF ARTS DEGREE: The curriculum for the degree Bachelor of Arts is designed to give the student a broad, general background in the principal fields of human knowledge and a reasonable amount of specialized training in a selected area. This degree is offered in the Departments of Art, Music, Speech and Theatre, 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.

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 his advisor under the rules and regulations of the department concerned.

General Studies Requirement In the field of science and mathematics, the student must elect at least one course in a laboratory science

Foreign Language Requirement Knowledge in one foreign language equivalent to the level obtained through 16 hours of instruction in the elementary and intermediate courses on the college level is required. 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.

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, Communication Disorders, and Speech Communication.



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 his advisor under the rules and regulations of the department concerned.

General Studies Requirements 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.

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.

Major Requirements -A major in one of the areas of Art consists of 75 semester hours of credit, divided between the core curriculum and the area of specialization. A major in Dance consists of a minimum of 70 semester hours of course work in Dance and related fields. See pages 83-84 of the catalog for detailed requirements in the Dance program.

General Studies Requirement In the field of sciences and mathematics the student must take at least one course in a laboratory science.

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 human knowledge and training of a professional caliber in music performance, music theory, music theatre, composition, music therapy, and the teaching of choral music, general music, and instrumental music.

Placement tests in theory, piano and a major performing medium are required of all freshmen 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 his advisor under the rules and regulations of the Department of Musi

Foreign Language Requirement Students specializing in Voice Performance must earn 16 semester 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 advisor. For other means by which the student can meet this requirement see the statement above pertaining to foreign languages in the Bachelor of Arts degree program.

There is no foreign language requirement in any other major leading to the Bachelor of Music degree.

Art

Professors:
ART 102)
BRECKENR DGE BROADLEY, F NK GOO
HALE HARTER JACOBSON
L NDERMAN SCHAUMBURG TAYLOR,
WOOD

Associate Professors:
GRIGSBY, STULER TURK
WAGNER WOODS

Assistant Professors:
BROUCH FARNESS, GASOWSK
G BBS GULLY HAHN HAYDEN SCHMIDT
SCHRIEBER SH PP, WATSON ZIMMERMAN

Instructors:
ECKERT, KRONENGOLD PILE

Departmental Major Requirements

For advisement purposes, all students regis tering in an art major program will enroll through the College of Fine Arts.

Bachelor of Arts Degree Curriculum

ART Consists of 45 semester hours of credit, with a concentration in one area of spec alization, with at least 15 hours in closely related fields to be approved by the advisor n consultation with the student. Courses AR 111, 141, 142 223, AH 101, 102 are required. At least 18 semester hours must be in upper division courses

ART HISTORY Consists of 45 semester hours of credit, no less than 27 of which shall be in Art History. At least 18 hours in Art History must be in upper division courses, including at least one AH 498 Pro Seminar. The areas Ancient, Medieval, Renaissance and Modern must each be represented with at least one course. A minimum of 18 hours shall be in approved related fields. Satisfactory comple tion of AA 456, Methodology and Bibliography, is required of Art History ma ors before the sen or year Required courses are AH 101 and 102; AA 456; AR 111 and 141 with at least one additional course chosen from AR 214, 223, 231 and 351.

Bachelor of Science Degree Curriculum

AR Consists of 50 semester hours of credit, with a concentration n one area of spe c al zation to be approved by the advisor in consult at on with the student. Courses AR 111, 141 214, 223· AH 101, 102 are required At least 20 semester hours must be in upper division courses

Bachelor of Fine Arts Degree Curriculum

ART Consists of 75 semester hours of credit, with a concentration in one area of specialization selected on the basis of the student's interests and professional intentions. The following areas of specialization are available to the student: Advertising design, ceramics, crafts, design (interior or space), painting and drawing, photography, printmaking and sculpture.

A core curriculum for the degree shall in clude courses in the following areas of study Design fundamentals (6 credit hours), drawing (6 hours), painting (3 hours), sculpture (3 hours), ceramics or crafts (3 hours), and art history (12 hours). These requirements are normally met by courses AR 111, 141, 142, 214, 223, 231, 261 or 271; AH 101, 102, and six hours of upper division art history electives. Where exceptions are requested, the level of courses in the core curriculum will be determined by the advisor n consultation w th area facu ty, and s based upon the student's demonstrated aptitude and previous accomplishments.

In addition to the core curriculum, the student will select a minimum of 42 credit hours in consultation with his advisor. A minimum of 12 upper division credit hours must be included within the area of specialization. At least 30 upper division cred t hours must be earned within the major Courses from other departments or colleges may apply to the major, when it is determined they make a special contribution to the student's program of study Courses in other Colleges or Departments of the University form an important segment of the f elds of specialization in Advertising Design, Space Design and Interior Design Special advisement check sheets are available for each degree program in the Department of Art office

Departmental Major Teaching Field Requirements

Bachelor of Arts in Education Degree Curriculum

ART Consists of 60 semester hours of credit in art Courses AR 111, 141, 142, 214, 223, 231 and 261; AH 101, 102; AE 301, 412, and 480 are required. Additional hours to complete the major will be approved by the advisor in consu tation with the student At least 18 semester hours must be in upper div sion c urses, one of which must be in art history

Departmental Minor Teaching Field Requirements

ELEMENTARY EDU C ATION MAJOR Consists of 24 semester hours including AR 141; AE 301, 420 which are required. The remaining 15 semester hours are to be selected in consulta tion with an art education advisor

SECONDARY EDUCATION MAJOR Consists of 24 semester hours including AR 141, AE 480 which are required. The remaining 18 semester hours are to be selected in consultation with an art education advisor.

SECONDARY EDUCATION MAJOR, MINOR IN PHOTOGRAPHY Consists of 24 semester hours including AR 141, 291, 391, 392, 491, 492, one additional course chosen from AR 393, 394, 493, or 491 repeated, and AE 480.

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 FOUNDATIONS

AR 111 Beginning Drawing I. Fundamental technical and perceptual skills using common drawing media and their application to pictorial organization Directed toward the student with no previous college art experience Six hours a week Credit, 3 hours

141 Introduction to Studio Art I. Two dimensional media visual organization and contemporary art concepts Development of perceptual imaginative, and expressive responses through problem solving discussion and critical evaluation Emphasis on individual creative solutions. Six hours a week Credit 3 hours

142 Introduction to Studio Art II. Continued development of intellectual and intuitive responses to form in time and space Constructions, assemblage, kinetics serial imagery events or theater pieces, as approaches to three and four dimensional concepts Prerequisite AR 141 Six hours a week. Credit 3 hours

ADVERTISING DESIGN

AR 181 Advertising Design. Six major graphic advertising media one comprehensive design problem in each Six hours a week. Credit, 3 hours

182 Beginning Lettering. Design, construction and spacing of basic Gothic, Roman and italic alphabets Exercises in design and arrangement in relation to space. Collection and classification of lettering and type proofs Six hours a week Credit, 3 hours

281 Fundamentals of Graphic Design. Exercises in technique systematic intellectual approach to graphic design Elements involved in the effective use of typography 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 Intermediate 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

381 Graphic Design. Further exploration of the communicative potential of visual images Use of various media and techniques in their development as related to technology capabilities 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 basic form. Prerequisite AR 282 Six hours a week Credit 3 hours.

383 Graphic Illustration. Rough and comprehensive black and white and limited color illustrations Relation of illustration to type and other elements in brochures books. Prerequisites: AR 141 142 181 Six hours a week Credit 3 hours

481 Techniques of Advertising Production. Preparation of finished art and mechanicals for reproduction of offset lithography or letterpress printing Preparation of a professional portfolio Coordinated with GA 438 which must be taken the same semester May be repeated for credit Prerequisite: AR 383 Six hours a week Credit 3 hours

CERAMICS

AR 261 Beginning Ceramics I. Nature of clay and glazes handforming methods, throwing on the wheel decorative processes, glaze application Prerequisite. AR 141 Six hours a week Credit 3 hours

262 Beginning Ceramics II. Design analysis and production of functional pottery Emphasis on throwing techniques surface enrichment and glaze application Prerequisites: AR 142 and 261 Six hours a week Credit 3 hours

361 Intermediate Ceramics I. Search for form and personal expression through clay Emphasis on hand building techniques Kilning and related problems. Prerequisite AR 262 Six hours a week Credit, 3 hours

362 Intermediate Ceramics II. Continued exploration for form and personal expression through clay. Glaze formulation with experimentation in the use of glaze materials and colorants Prerequisites: AR 361 and approval of instructor. Six hours a week. Credit 3 hours

461 Advanced Ceramics I. Studio problems and instruction adapted to meet individual needs. Emphasis on search for personal direction Professional methods of presentation and documentation of work Prerequisites: AR 362 and approval of instructor Six hours a week Credit, 3 hours

462 Advanced Ceramics II. Continued studio problems with emphasis on individual research and expression through clay. May be repeated for credit. Prerequisites AR 461 and approval of instructor Six hours a week Credit 3 hours

CRAFTS

AR 271 Introduction to Crafts. Studio survey of contemporary crafts Assigned problems in a variety of media including fabric fiber, metal wood and plastics Stress on the development of professional disciplines and attitudes Prerequisite AR 141. Six hours a week. Credit 3 hours.

272 Beginning Jewelry. Design and execution of so dered, cast, and forged jewelry. Emphas s on or g na contemporary statements Prerequ s te AR 271 S x hours a week Cred t 3 hours

273 Beginning Textiles. Text le arts w th ex tensive studio exper ence n a var ety of app ed and structura processes us ng fabrics and f bers Prerequ s te AR 271 S x hours a week Credit 3 hours

372 Jewelry and Metalworking. nd v dua proj- ects n meta working Deve opment of profes s ona sk ls and d vers ty of expression Rais ng cast ng forg ng and ename ing techn ques are used s ng y and n comb nat on Prerequisite: AR 272 Six hours a week Cred t, 3 hours

373 Intermediate Textiles. Continuing nves tigat on of text e processes w th attent on cen tered on profess ona development Prerequ s te AR 273 S x hours a week Credit 3 hours

374 Wood. Bas c woodwork ng techn ques as appl ed to creat ve expression. Prerequ s te AR 271 S x hours a week Cred t, 3 hours

375 Plastics. Exp oratory stud o n fabricat ing and forming processes Studies n the con temporary use of p ast cs as an art form Pre requ s te. approva of nstructor S x hours a week Credit 3 hours

472 Advanced Jewelry. Development and exe cut on of advanced prob ems, emphas z ng exper menta elements 'n jewe ry mak ng May be repeated for cred t Prerequ sites: AR 372 and approval of nstructor Six hours a week Credit, 3 hours

473 Advanced Textiles. Prob ems n text e de s gn a ow ng the student to comb ne and explore at his own n t at ve Stress on clar ty of ex press on and execut on May be repeated for cred t Prerequ s tes AR 373 and approva of in structor S x hours a week. Credit 3 hours

474 Advanced Wood. Exp oration of advanced techn ques inc ud ng design and construct'on of furniture and mus cal nstruments May be repeated for cred t Prerequisites AR 374 and approva of instructor S x hours a week Cred t 3 hours.

475 Advanced Plastics. Advanced techniques in p ast cs emphasiz'ng nvest gative and ex per mental approaches May be repeated for cred t Prerequ sites: AR 375 and approva of nstructor S x hours a week Credit, 3 hours

DESIGN: INTERIOR AND SPACE

AR 243 Interior Design. Princ p es and con- cepts of env ronmenta des gn. H storica and theoretica procedures of nter ors and the re- at on to the env ronment n general S x hours a week Credit, 3 hours

341 Space Design I. Deve opment of funct onal and esthet c structures w th a var ety of meth- ods and materia s Emphas s on the art cu at on and ana ys s of vo ume and space re at onships Visionary construct ons Prerequ site AR 142 S x hours a week. Cred t, 3 hours.

344 Visual Environment. Development of an awareness of the elements of env ronment that affect percept ons preferences and phys ca sen sat on Projects n var ous leve s of comp exity and st mu ation that nh bit or encourage be hav or Prerequ s te AR 142. S x hours a week Credit 3 hours

345 Design Communication. V sua and verbal commun cat on of deas and techniques used in presentations Exp orat on of design processes methods and systems; arch tectura draw ng Pre requis te AR 142 S x hours a week Cred t 3 hours

346 Design Workshop. Use of hand and power too s through the manipu at on of var ous ma ter a s Emphas s on articu at on and analysis of vo ume-space relat onsh p n form ng struc tures re ated to furn ture exh b tions and prod- ucts. *Section S* structure Structura deve op ment through var ed form ng processes n wood p ast c and meta *Sect on F* f rn ture Esthet c functiona and psycho og cal factors n the de sign and construct on of furn ture products and exh bit structures Prerequ s te: AR 345 Six hours a week Cred t, 3 hours

347 Color Workshop. Color sens t v ty through research and study into the interaction of co or l ght and surface Exp orat ons nto visua phenomena co or-space re ationship and psycho og cal awareness. Prerequ site: AR 345 S x hours a week Cred t, 3 hours

441 Space Design II. Interrelat onsh p of esthet c functional and psycho ogica factors n the shap ng of space. The articulat on of space, structure and movement n exh b t and d splay des gn Prerequis te AR 341 S x hours a week Credit 3 hours

442 Space Design III. Des gn methodo ogy and construct on of env ronmental spaces related to exh b t ons she ters products and nteriors Prerequ s te AR 441 S x hours a week Credit 3 hours.

443 Advanced Interior Design. Princip es and techn ques of p anning methods of research and bus ness procedures Integration of form ght, co or texture, nter or mater a s and components Prerequ sites: AR 243 and 345 Six hours a week Cred t, 3 hours

444 Design Special Studies. A ows the student to pursue a personal nvo vement which may be the deve opment of a professiona spec a iza tion or a commun ty serv ce project May be re peated for credit Prerequis te. approva of nstructor S x hours a week Cred t 3 hours.

446 Professional Workshop. Ana ys s of profes s na env ronments Des gn and nstruct n f an actua env r nment Des gn p rtfo o preparat on Prerequ s te AR 442 S x hours a week Cred t 3 hours

DRAWING

AR 211 Beginning Drawing II. Cont nued deve op- ment of techn ca and perceptua sk ls beyond foundat ons course AR 111 Prerequ s te AR 111 Six hours a week Cred t 3 hours

214 Beginning Life Drawing. Development of sk and express ve ess n draw ng the bas c form construct'on and gesture from the human f gure Prerequ s te: AR 111 Six hours a week Cred t 3 hours

311 Intermediate Drawing. Emphas s on compos t on exp orat on of drawing med a Prerequ s te: AR 211. Six h urs a week Cred t 3 hours

314 Intermediate Life Drawing I. Add tional pract ce n draw ng from the model w th greater reference to anatomica graph c and composit ona concerns Prerequis te: AR 214 S x hours a week Credit 3 hours

315 Intermediate Life Drawing II. Continued study of the human figure as the subject for drawing Emphas s on conceptual alternat ves and management of mater als Prerequisite. AR 314 S x hours a week. Cred t, 3 hours

411 Advanced Drawing. Exp oration and deve opment of v sua and nte lectua concepts through prob em so ving and ndependent study. Emphas s on the nd v dual creat ve statement May be repeated for credit Prerequ s te AR 311 S x hours a week Credit 3 hours.

412 Drawing Techniques of the Old Masters. H storica techn ques of draw ng from ear y Rena ssance to the present The mak ng and use of mater als and too s including s lver po nt b stre nk qu' pen paste s and ch ar-oscuro draw ngs, as used by M che angelo, Rembrandt, T epo o and other masters May be repeated for cred t. Prerequis te approval of nstructor S x hours a week Credit, 3 hours

414 Advanced Life Drawing. Emphasizes various med a and techniques on an advanced leve Cons deration of the human f gure as an expressive veh c e n var ous contexts. En couragement of nnovat ve approaches May be repeated for cred t Prerequisite: AR 315. Six hours a week Credit, 3 hours.

PAINTING

AR 223 Beginning Painting. Composition color and techn cal mastery of paint ng media Pre requ sites AR 111, 141 and 214. S x hours a week Cred t, 3 hours

227 Beginning Watercolor. Pa nt ng n a l water solub e med a. Emphas s on techn ques, compos t on and co or Prerequ s tes AR 111 141 and 214 Six hours a week Credit 3 hours

323 Intermediate Painting I. Advanced problems n pa nt ng. Prerequ s te. AR 223 Six hours a week Cred t, 3 hours

324 Intermediate Painting II. Continuat on of AR 323. Advanced problems d rected toward develop ment of a persona sty e. Prerequ site· AR 323 Six hours a week Cred t 3 hours

325 Figure Painting. The human figure c othed and nude as the subject for pa nting n selected media Prerequ s tes AR 314 323. S x hours a week Cred t 3 hours

327 Intermediate Watercolor. Exp orations us ng a variety of surfaces a comb nat on of med a and mater a s in a cont nued search for creat ve form Prerequ s te AR 227 S x hours a week. Credit 3 hours

421 Painting Mediums and Techniques. Des gned to acquaint the student w th materia s and a l var'et es of pa nt ng Exper menta prob ems in trad tiona and modern synthet c media S x hours a week. Cred t, 3 hours.

423 Advanced Painting. Prob ems for those with a ser ous nterest n painting. May be repeated for cred t. Prerequisite: AR 324. S x hours a week Cred t, 3 hours

425 Advanced Figure Painting. Cont nued use of the human figure n various env ronmenta and conceptua situations May be repeated for cred t Prerequ sites. AR 315 324 or 325 S x hours a week Credit 3 hours

427 Advanced Watercolor. Exper mentat on toward a more personal express on May be re-peated for cred t. Prerequis te AR 327. Six hours a week Credit 3 hours

PHOTOGRAPHY

AR 290 Photography as an Art Form Past and Present. Selected photographers the r photo graphs esthetic phi osoph'es and photograph c processes. Three ectures. Cred t 3 hours.

291 Beginning Photographic Art. Photography as an art medium Prerequ s te AR 141 Two lectures, 3 hours laboratory Cred t 3 hours

391 Intermediate Photographic Art. Develop-ment of the discipl nes and att tudes of the creat ve art st photographer Prerequ s tes: AR 291 and approval of nstructor S x hours a week Cred t, 3 hours.

392 Advanced Photography. nterpretation and manipu ation of ght as a too in the perform ance of express ve photography Prerequ s tes AR 391 and approva of nstructor Six hours a week Cred t 3 hours

393 Photographics. nnovat ve photograph c techn ques. Emphas s on experimentat on out side the bounds of trad t ona photography. Prerequ sites: AR 392 and approva of nstruc tor S x hours a week Cred t 3 hours

394 Photography Workshop. Deve opment of perceptual awareness. Construct on of v sua magery exp ored along w th poss b ties of re at ng persona deas to photograph c form Prerequ s tes AR 392 and approva of nstruc-tor S x hours a week Cred t 3 hours.

491 Black and White Photography. Advanced exp orat on of experimenta nterpret ve, and stra ght photography May be repeated for cred t. Prerequisites AR 392 and approva of instructor Six hours a week Credit 3 hours

492 Introduction to Color Photography. App i cat on of co or transparenc es and pr nts to photograph c art Prerequ s tes AR 392 and approva of nstructor S x hours a week Cred t 3 hours

493 Advanced Color Photography. ntensive use of subtract ve color process in photograph c print ng Prerequis tes AR 492 and approva of instructor May be repeated for cred t Six hours a week. Credit 3 hours

495 Directed Experiences in Photographic Education for the MFA Candidate. Pract cal exper ence in maintain ng a photograph c labor-atory and teaching photograph c stud o courses May be repeated once for credit Prerequ s tes AR 491 and adm ttance to the MFA program. Credit, 3 hours

496 Cinematography. An exp oratory aboratory course nto the bas c aspects of f m mak ng as an art form Emphasis on c nemat c tech niques n re at'on to bas c art foundations May be repeated for cred t Prerequ s te AR 392 Six hours a week Credit 3 hours

PRINTMAKING

AR 351 Intaglio-Printmaking. Process using etching, engraving, aquatint and other incising techniques Prerequis te: approval of instruc tor. Six hours a week. Credit, 3 hours

352 Lithography-Printmaking. Process using stone, plates, and incorporating drawings, transfer, photo-transfer and color techniques Prerequisite: approval of instructor. Six hours a week Credit, 3 hours.

353 Relief-Printmaking. Process us ng wood, masonite, color and other relief techn ques Prerequisite approval of nstructor. Six hours a week. Cred t 3 hours.

354 Serigraphy-Printmaking. Process using silk screen Various methods and appl cations are used including the photographic, stencil and transfer techniques. Prerequisite. approval of instructor Six hours a week. Credit, 3 hours

451 Advanced Intaglio-Printmaking. Continuat on of AR 351 May be repeated for cred t. Prerequisite approval of instructor. Six hours a week Cred t, 3 hours.

452 Advanced Lithography-Printmaking. Con t nuation of AR 352. May be repeated for credit Prerequisite. approval of nstructor Six hours a week Credit 3 hours

453 Advanced Relief-Printmaking. Continuation of AR 353 May be repeated for credit Pre requ s te approval of instructor. S x hours a week Credit, 3 hours

454 Advanced Serigraphy-Printmaking. Continuation of AR 354 May be repeated for credit Prerequ site: approva of instructor. S x hours a week. Credit 3 hours

SCULPTURE

AR 231 Beginning Sculpture. Exploration and express on of scu ptural form through deas and concepts related to basic mater als Emphasis on form relationsh ps, volume, movement and space Introduction to the means of sculpture, studio safety Prerequ sites AR 111 and 141 S x hours a week Cred t 3 hours

331 Intermediate Sculpture. Continued search for form and personal expression through all media with emphasis on des gn and individual instruction. Prerequisite: AR 231. Six hours a week. Credit, 3 hours.

332 Advanced Sculpture. Sculptural problems related to architecture and man's environment Exploration in all media and ntroduction to color relationships as applied to sculpture. Prerequisite AR 331. Six hours a week Credit 3 hours.

431 Special Problems in Sculpture. Development of a personal approach to sculpture, emphasis on form, individual problems and re ated color technology Professional practices and presentation. May be repeated for credit. Prerequisite· AR 332. Six hours a week Credit, 3 hours

432 Experimental Sculpture. Extending the awareness of man's total environment as resource for images and deas for any art form Experimentation in nontradit onal methods Emphasis on ind vidual exploratory process n search for a persona direction Use of natura and synthetic materials n an nterrelating of disciplines (e g , photography, pa nt ng) May be repeated for credit Prerequ s te AR 332 or approva of instructor S x hours a week Credit, 3 hours.

433 Materials and Techniques in Sculpture. Broad approach to the form-material relat on sh p in sculpture Use of natural and synthetic materia s and atmospheric, kinetic, audio and electron c art forms May be repeated for credit. Prerequis te: AR 332 Six hours a week Credit, 3 hours

434 Figure Sculpture. The human form as a means of contemporary express on n scu pture. Freedom toward an innovative anatom cal reconstruct on of the f gure ead ng to a personal statement May be repeated for credit Pre requ site AR 332 S x hours a week. Cred t, 3 hours

435 Color Sculpture. Creat ve conceptual and esthet c development in co or form context reat onships Exp orat on nto the a tering of nherent co ors of mater al to the applica tion of colors through synthetic and industrial technology. Emphasis on understand ng psychological visual mpact of color as a means of achiev ng personal expression. May be repeated for credit. Prerequisite AR 332. Six hours a week Credit, 3 hours.

SPECIAL COURSES

AR 521 Studio Problems and Techniques. Advanced study n the fields of ceramics, crafts, design, drawing, painting, photography, print making and sculpture. May be repeated for cred t. Six or twelve hours a week Credit, 3 or 6 hours.

580 Terminal Exhibition. Must be done in one of the seven 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 wr tten and documented report A pub ic exh bit on approved by the student's committee must precede the final examination. Se ected mater als from the exh bit may be re tained by the University on ndefinite loan. Cred t, 1-15 hours

ART EDUCATION

AE 301, 302 Art in the Elementary School. Self-understand ng through the use of art, concur rent w th the study of the art work of ch ldren of a ages from early chi dhood to mid-adolescence. One lecture, 4 hours laboratory. Credit, 3 hours each semester

412 Art Curriculum and Supervision. Theory, mater a s, organizat on methods and curriculum for the art educator or consultant, art educa tor's responsibility in human re at ons and commun cations Requ red of a art education majors. Prerequisite: AE 480 or concurrently. Credit, 3 hours

420 Crafts for the Elementary School Teacher. Practical laboratory exper ences stress ng in expensive and sa vage materials that ch dren can use Comb nat ons of materia s and specific knowledges n mosaic, pap er mâché c ay wood,

wire, etc. One ecture, 4 hours aboratory Cred t 3 hours.

480 Art in the High School. Mater als, theory and organ zat on for present ng art activ t es and deve opments in the arts on the secondary leve Requ red of a l art education majors Prerequ s tes. AE 301, SE 311 or concurrently. One ecture 4 hours aboratory Credit 3 hours.

510 Art in the Self-Contained and Open Classroom. A ternate teach ng learn ng strat eg es, art concepts sk l s and express ve objec- t ves re evant to e ementary school art experi ences for teachers Deve opmenta aspects of art behav or among elementary ch dren in var ous learn ng env ronments. Credit 3 hours.

511 History of Art Education. H storica and theoret cal ana ys s of contemporary trends in Amer can art education Cred t 3 hours

515 Foundations of Art Education. Behaviora foundat ons of education as related to art educat on Emphas s on psycho og cal and ph osophica frame of reference. Credit 3 hours

520 Creativity in Art Education. Research in to the nature of creat ve behav or espec ally as t appl es to the v sua arts. nformation about creativ ty and ts relat on to student growth and performance for contemporary teach ng Cred t 3 hours.

525 Art and Society. nterre at onship of art and society and s gn ficance of art educat on in socia change Emphasis on art as a cul- tura commun cation system and its relation ship to urban renewa the soc a ly deprived increased eisure, effects of automation Credit, 3 hours

530 Research in Art Education. Recent research in art educat on A crit cal examination of research methodo ogy and 'mp cat ons for prac tice Credit 3 hours

610 Issues and Trends in Art Education. Recent prob ems and d rections n contemporary art educat on Cred t, 3 hours

611 Curriculum Development in Art Education. Deve opment of curr cu um in terms of phi o- soph cal psycho ogical and soc olog cal foun- dations Relat onsh p of object ves to pract ce Credit, 3 hours

Special Graduate Courses: 590 591 592, 690, 691, 692 790 791, 792

ART HISTORY

AH 100 Introduction to Art. Development of understand ng and enjoyment of art and its re lationsh p to everyday life through the study of pa nt ng sculpture, architecture and design May not be taken for credit by student who has comp eted AH 300, nor used as art history cred t by art majors or minors Credit, 3 hours

101 History of Art from the Dawn of Civilization to the Renaissance. Anc ent Near Eastern, Egyptian Greek, Roman and med eva European art to the Renaissance Credit 3 hours

102 History of Art from Renaissance to the Present Day. Occ denta art dur ng the Rena ssance, manner st, baroque rococo neo c assic romant c and modern epochs Credit 3 hours

103 Introduction to Oriental Art. Scu pture pa nt- ng and arch tecture of Asia Cred t 3 hours

300 Introduction to Art. Course content same as AH 100 but requ res a h gher eve of accom p ishment and comprehens on May not be taken for credit by student who has comp eted AH 100 nor used as art history cred t by art majors or minors Cred t 3 hours.

400 American Art I. History of art n the United States from European sett ement of the New Wor d to the Co umb an Exposition of 1893 Prerequ sites AH 101 and 102 or approva of nstructor Credit 3 hours

401 American Art II. History of the United States from the ast decade of the 19th century to World War I Prerequ s tes· AH 101 and 102 or approva of nstructor Credit 3 hours.

402 Mexican Art. Art of Mex co and related Centra Amer can cu tures from the preh stor c to the contemporary schoo s Prerequ sites AH 101 and 102 or approva of nstructor Cred t 3 hours.

403 Primitive Art. Art forms and express on of paleol th c neo thic and ear y meta age cu - tures from prehistory to the present Prerequ sites AH 101 and 102 or approval of instructor. Credit 3 hours.

404 African Art. Art forms of west and centra Africa from preh stor c times to the present Scu pture arch tecture and crafts are con s dered in re ation to soc et es wh ch produced them, and the r nfluence on other cu tures. Prerequis tes· AH 101 and 102 or approva of nstructor Cred t, 3 hours.

405 Southwest Indian Art. Arts and crafts of the southwestern Amer can Ind ans from prehistoric times as related to the r h stor ca back ground and soc al customs Prerequis tes· AH 101 and 102 or approval of instructor Credit 3 hours

406 Oriental Art I. Pa nting scu pture and arch - tecture of nd a and Southeast Asia Prerequ sites AH 103 or 101 and 102 or approva of nstructor Credit 3 hours.

407 Oriental Art II. Arts of Ch na Korea and Japan. Prerequ s tes AH 103 or 406 or ap- prova of nstructor Credit 3 hours

408 History of Printmaking. H story of the pr nt as an art form and its re at on to other modes and forms of artistic expression Prerequ s tes AH 101 and 102 or approva of nstructor Cred t 3 hours

410 Ancient Art. H story of pa nt ng sculpture and architecture n Mesopotam a Egypt, the Aegean and Greece Prerequ s tes AH 101 and 102 or approva of instructor. Cred t 3 hours

412 Roman and Early Christian Art. Art and architecture of Etrur a Rome, the Roman Empire, and the ear y Christ an Church Prerequisites AH 101 and 102 or approva of instructor Cred t 3 hours

414 Byzantine Art. Arch tecture mosa cs, manu scr pt llum nation, and decorat ve arts of the Byzantine Empire from the 4th to the 15th cen tury Prerequisites AH 101 and 102 or approval of nstructor Cred t, 3 hours.

420 Medieval Art to 1000 A.D. Architecture scu pture and pa nt ng in the Lat n West from the 7th century to the end of the Otton an Per od Prerequ s tes AH 101 and 102 or approva of instructor Cred t, 3 hours

422 Romanesque Art. History of sculpture paint ng architecture and m nor arts n western Europe dur ng the Romanesque period Prerequ sites: AH 101 and 102 or approva of n structor Cred t, 3 hours

424 Gothic Art. Painting, sculpture and arch - tecture n western Europe during the Gothic per od Prerequ s tes AH 101 and 102 or approval of instructor Cred t, 3 hours

430 Renaissance Art in Northern Europe. H s tory of pa nting scu pture and architecture north of the Alps n the 15th and 16th centur es Prerequ sites AH 101 and 102 or approval of nstructor Credit 3 hours.

432 Early Renaissance Art in Italy. H story of pa nt ng, scu pture and arch tecture in Italy from 1300 to 1500 Prerequ sites AH 101 and 102 or approva of nstructor Credit 3 hours.

434 Art of the Italian High Renaissance and Mannerism. History of art dur ng the 16th cen tury w th specia cons'derat on of the ach evements and nf uence of Leonardo da V nci Raphael and Michelangelo Prerequ sites. AH 101 and 102 or approval of instructor Cred t 3 hours.

440 Art of the 17th Century in Southern Europe. History of paint ng, sculpture and architecture n 17th century Italy Spain and Portugal Prerequ sites AH 101 and 102 or approva of instructor. Credit 3 hours

442 Art of the 17th Century in Northern Europe. History of paint ng, sculpture and architecture in 17th century Flanders Holland, France Germany and Eng and Prerequ s tes: AH 101 and 102 or approva of instructor Credit, 3 hours.

444 Art of the 18th Century. H story of Euro pean painting scu pture and arch tecture between 1700 and 1800 with emphasis on the rococo Prerequ s tes AH 101 and 102 or ap proval of nstructor Cred t 3 hours.

450 Art of the Early 19th Century. H'story of art from the eve of the French Revo ution to the Par s Wor d s Fair of 1855 Spec al emphas s on the neo-c assic romantic and real st movements. Prerequ sites AH 101 and 102 or approval of nstructor Cred t, 3 hours

452 Art of the Late 19th Century. History of art from the mid century to 1900 Special empha s s on the pre-Raphaelite, impression st, post mpress on st symbo st, and art nouveau movements. Prerequ s tes: AH 101 and 102 or approva of instructor Cred t 3 hours

454 Art of the 20th Century. Deve opments and d rections n art between 1900 and 1940. Prerequis tes· AH 101 and 102 or approva of instructor Cred t, 3 hours

456 Contemporary Art. Recent and current trends in art s nce 1940 with spec al cons dera tion of new concepts and exper mentat on with med a and modes of presentat on Prerequisites AH 101, 102 and 454 or approval of nstructor. Credit 3 hours

498 Pro-Seminar. Credit 3 hours. Top cs se ected from the fo low ng

(a) Problems n Orienta Art
(b) Problems n Anc ent Art
(c) Problems n Med eval Art
(d) Prob ems in Renaissance Art
(e) Prob ems n Baroque Art
(f) Prob ems in Modern Art
(g) Prob ems in Prim tive Art

591 Seminar. Cred t, 3 hours Topics selected from the fo ow ng

(a) Problems in Oriental Art
(b) Problems in Ancient Art
(c) Prob ems n Med eval Art
(d) Prob ems n Renaissance Art
(e) Prob ems n Baroque Art
f) Prob ems n Modern Art
(g) Prob ems in Prim tive Art

AUXILIARY COURSES

AA 221 Materials Workshop. Princip es of build- ing and preparing pa nting supports of trad - t ona and experimenta mater a s, invo v ng techn ques of fram ng matt ng g ass cutt ng and other aspects of f na izing the two- d mens onal work for exhib tions Four hours a week Credit 2 hours.

450, 451 Structure, Expressiveness and Symbolism of Art. Mature appreciat on of the arts, em phasiz ng the re ationsh ps of art mus c, phi osophy and literature Intended to integrate and give mean ng to stud o sk lls for majors in art or music and for teachers and all who wish to ncrease understand ng of modern arts Prerequisite· approva of nstructor. Cred t 3 hours

452 Museology I. H story of art collecting con- no sseurship and techn ques of conservat on and restorat on Prerequ site approval of n structor Credit 3 hours

454 Museology II. Exh bit on p ann ng, methods of record ng and cataloging works of art adm n strat on and organ zat on of art museums Prerequ s tes approva of nstructor Cred t 3 hours

456 Methodology and Bibliography. Materials and methods of art h stor ca research Credit 3 hours

Special Graduate Courses: 590, 591 593, 690, 691, 693 (see pages 46 47

Humanities
(Center for the Humanities)

Professor:
LAMM (KRAUSE 104)

Associate Professors:
DOEBLER, WENTZ

Assistant Professor:
YODER

Instructors:
DONNELL HORWITCH, WE NSTE N

Lecturer:
FRAZ ER

Major Requirements

Bachelor of Arts Degree Curriculum.

The Interdisciplinary Humanities program con sists of 45 semester hours of credit selected from the fields of art, architecture, literature (English and foreign language), music, philos- ophy, religious studies, theatre (and other performing arts). In addition there is a re quired core program of 28 semester hours. Three fields of study 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 and Comparative Arts courses and suggested elective courses are selected in consultation with the advisor *Minimum* grade point index for retention in the Humanities curriculum: 0 29 hours, 2.00, 30 59 hours, 2.25; 60 89 hours, 2 50; 90 hours or more, 2.75.

Major Teaching Field Requirements

Bachelor of Arts in Humanities Degree Curriculum (Secondary Humanities)

C onsists of 60 hours of credit in Humanities plus professional ed ication courses and a foreign lan guage Individualized course of study worked out in consultation with the advisor

Bachelor of Arts in Education Degree Curriculum (Secondary Humanities)

Requirements the same as in the B A in Human ities c rriculum with one exception a foreign language is not required This will allow the student greater latitude in the selection of e ectives

Minor Teaching Field Requirements

A 24-semester hour teaching minor in Human ities in Secondary Education (Bachelor of Arts in Education) is offered in cooperation with the College of Ed ication. This program nor mally includes 8 semester hours of lower divi- sion Humanities courses plus 12 hours of upper division Humanities courses No more than 12 hours may be taken outside the course offerings of the Humanities Center An acceptable alternative program consists of 20 ho rs of upper division Humanities courses with no more than 12 hours outside the course offerings of the Humanities Center. Electives may include applied, studio, techni- cal, and laboratory work in the arts and humanities but may not include courses in the teaching ma or

Graduate Program

Consult the *Graduate Catal* for requirements in the Interdisciplinary Humanities program leading to the degree of Master of Arts.

**Denotes an Interdisciplinary Humanities course in the General Studies program*

***HU 101, 102 Ideas and Values in the Humanities.** nterre at on of art arch tecture terature, mus c, ph osophy re g ons, theatre (and other performing arts) n the modern wor d. C ass projects nc ud ng attendance of cultural events are requ red Credit, 4 hours each semester

***121, 122 Religion in World Cultures.** Or g n and funct on of rel g on in the ind v dua and cu ture spec a attent on to pr m t ve re g ons and thought H ndu sm Juda sm Chr st an ty Buddh sm and s am Second semester deals with the relationsh p between re g ons and such cultura forms as art l terature and music Cred t 3 hours each semester

***301, 302 Humanities in the Western World.** n- terre at on of art, arch tecture literature, mus c ph osophy rel gions, theatre (and other perform- ng arts w th n the context of the major sty s t'c per ods of Western cu ture Emphas s on cu tura achievements of the past as they re ate to contemporary ife C ass projects inc ud ng at- tendance of cultura events are requ red Cred t 4 hours each semester

***303, 304 Humanities in the Eastern World.** In terre at on of arts arch tecture terature mus c, ph osophy re g ons theatre and other perform- ng arts) n Midd e and Far Eastern c v izations Emphasis on cu tura ach evements of the past as they re ate to contemporary fe C ass projects, in- c ud ng attendance of cultura events are required Cred t 4 hours each semester.

***320 Religion and Current Ethical Issues.** Rev ew and crit ca analysis of the re g ous eth cs of the Judeo Chr st an trad t ns Re evance of these ethi s n relat on to representat ve soc a ssues Cred t 3 hours

***321 Contemporary Religious Thought.** Key f gures trends and developments n Western rel gious

thought wh ch nf uence, and are inf uenced by, contemporary culture Credit 3 hours

***322 Religion in American Life and Thought.** Funct ons, contr but ons tens ons and per spect ves of rel g on n American cu ture Credit 3 hours.

***401 Humanities in World Cultures.** A human t es study program of fore gn trave . Emphasis on the f ne and perform ng arts of the various wor d cultures Art gal er es museums, drama, dance and musica events constitute a bas c part of the t nerary Term paper required May be repeated for cred t. Prerequ s te HU 301, 302 or 303, 304 or permiss on of the nstructor Credit 6 hours.

***402 Technology, Society and Human Values.** Exam nation of those va ues wh ch motivate man- k nd to create techno ogy Areas of conflict and reso ut on between bas c human va ues and tech no og cal soc ety Read ng and discuss on w th vis t ng ecturers Prerequisite jun or stand ing or above Cred t, 3 hours (A so listed under 4ES 402)

403, 404 Comparative Arts in the Western World I, II. Arts I terature re ig ons and the perform ing arts w thin the context of soc al nstitutions and philosoph c perspect ves Ear y c v zation through the Rena ssance. May be taken concurrent y w th HU 405, 406 Prerequ s tes HU 301, 302 or approva of nstructor Cred t, 3 hours each semester

405, 406 Comparative Arts in the Western World III, IV. Arts terature re g ons and the per forming arts w thin the context of soc al inst tutions and ph osoph c perspectives From the Age of Reason to the present day. May be taken concurrently w th HU 403 404 Prerequisites: HU 301 302 or approva of instructor Credit 3 hours each semester

407, 408 Comparative Arts in the Eastern World I, II. Arts literature relig ons and the performing arts with n the context of social institutions and ph osophic perspectives Ear y c vi zat on through the 12th century May be taken concurrently with HU 409 410 Prerequ s tes HU 303 304 or approval of instructor Cred t 3 hours each semester

409, 410 Comparative Arts in the Eastern World III, IV. Arts, terature rel gions and the performing arts with n the context of soc a nstitu t ons and philosophic perspect ves 13th century to the present day May be taken concurrent y w th HU 407 408 Prerequ s tes HU 303, 304 or approval of nstructor. Cred t 3 hours each semester

417, 418 Theory and Criticism of the Arts I, II. Theor es and cr ter a of cr t cism; ana ysis of esthet c exper ence and the art work (art, arch tec ture, l terature music theatre and other perform ing arts. dance cinema etc.) Soc a and psycho og ca funct ons of the arts Concepts of crea- t vity sty e and art st c truth Art forms as cons of concepts of exper ent a rea ty Deve opment of object ve cr t cal va ues Cred t 3 hours each semester

419 Theory and Criticism of 20th Century Arts. Ap p cation of esthet c theory to the cr t cism of the 20th century w th emphasis on the concept of the avant-garde and the crit cism of contemporary arts ncluding the so ca ed popu ar arts) Pre requ site HU 417 and or 418 or approva of instructor Cred t, 3 hours.

***420, 421 The Shaping of American Religious Traditions I, II.** H storica perspect ve of move ments, nstitut ons and rel g ous thought in Amer ica Prerequ site jun or standing Cred t, 3 hours each semester

***422, 423 Religious Literature of the West I, II.** Se ected re gious class cs and texts from Judaism and Chr st an ty Prerequisite. jun or standing Cred t 3 hours each semester

***424, 425 Western Religious Traditions I, II.** Perspectives patterns of worship mora ty, histor cal roots and inst tut ons of pr mary re gious trad - tions of Western history. Prerequ s te. jun or stand ng. Credit, 3 hours each semester

***426, 427 Religions of the Near and Middle East I, II.** The ancient rel g ous trad tions of Mesopotamia Egypt, Pers a a further invest gat on of Graeco Roman deve opments and of slam Prerequisite jun or stand ng Cred t, 3 hours each semester.

***428, 429 Religions of the Far East I, II.** Major religious traditions of the East, re g ous experi ence thought patterns of worship mora s, and n st tut ons n re at on to Eastern cu ture, empha s s on H nduism Buddh sm, Tao sm and Confu c an sm Cred t 3 hours each semester

480 Methods of Teaching Humanities. Methods of nstruct on organ zat on and presentat on of the courses n the nterd sc pl nary Humanit es Credit 3 hours

***497 Selected Topics in the Humanities.** Open to all students Cred t, 3 hours Top cs may be se ected from the fo ow ng.

a) Hist or cal or Contemporary Cultures
(b) Cu tures of Ethn c M nor ties
c Re ig ous Studies

498 Pro-Seminar in the Humanities. For stu dents w th a major or minor n Humanities. Other students adm tted w th approva of nstructor Cred t 3 hours Topics may be se ected from the fo owing

(a) Western C vi zation
(b) Near and M dd e Eastern Civ izations
c Far Eastern Civ izat ons
d) American Ind an Afr can or Ocean c C v zat ons
(e Relig ous Studies
f Ana ys s and Crit cism n the Re ated Arts,
(g) Mu t Med a Teaching Techn ques

500 Research Methods. Cred t 3 hours

591 Seminar. Cred t, 3 hours. Prerequ s te Human t es graduate student or approval of nstructor Top cs may be se ected from the fo ow ng

(a) Western C v zat on
b) Near and M ddle Eastern C v izations
c) Far Eastern C vilizat ons
(d) Amer can nd an, Afr can or Ocean c C v zat ons
(e) Re g ous Stud es
(f) Ana ys s and Cr tic sm in the Related Arts

601 Philosophical Foundations of Humanities Education. Basic ssues in nte lectua trad t ons of the Western wor d wh ch are founda- t ona to the ph osoph es of human t es education.

Prerequis te Humanit es graduate student or approva of instructor. Credit 3 hours.

602 Experimentation and Recent Trends in Humanities Education. A crit cal ana ys s and eval uation of current and n process deve op ments n human ties educat on Prerequisite· Human t es graduate student or approval of instructor Credit 3 hours

603 Curriculum Development in Humanities Education. Issues, patterns and procedures in human t es curr cu a Prerequis te Human t es graduate student or approva of nstructor. Cred t 3 hours

Add tiona courses may be se ected from Cu - tura Anthropo ogy Arch tecture Art Cu tura History Dance, Fore gn Language (L terature), L terature (Eng sh), Mus c Ph osophy, Speech and Theatre

Special Graduate Courses: 590 592, 593, 594, 690 691, 692 see pages 46 47

Music

Professors:
BROEKEMA MUS 183A) BRU NSMA
BULLOCK DRESSKELL ENGL SH
FLETCHER JOHNSON LOMBARD SCOULAR
SEIPP SNAPP, SP NOSA STELLHORN

Associate Professors:
ANDRESS, BOWERS, BRITTON CARROLL,
COHEN, DALES, D ANDREA HANNA,
HEFFERNAN H NES KEATING LoPREST
McEWEN PRIDONOFF, PUTN K REYNOLDS
R CKEL, ROB NSON STALZER

Assistant Professors:
ATSUM CASTLE HOFFER
HOLDEN, LOCKWOOD MAGERS MILLER,
RATTERREE, RAUSCH, RAVE, MARGO SM TH
MAR ON SMITH WARNER

Instructors:
BLOEMENDAAL GRUBER,
HANSEN W LSON

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 the Association The following statement of Basic Musicianship is endorsed by the Department of Music:

All musicians, whether performers, com posers, scholars or teachers, share common professional needs. Every musician must to some extent be a performer, a listener, an historian, a composer, a theorist and a teacher. For this reason, certain subject mat ter areas and learning processes are common to all baccalaureate degrees in music.

Basic musicianship is developed in studies which prepare the student to function in a variety of musical roles which are suppor tive of his major concentration. All under graduate curricula, therefore, provide the following

1 A conceptual understanding of such musi ca properties as *sound, rhythm, melody, harmony, texture* and *form*, and opportunities for developing a comprehensive grasp of their interrelationships as they form the cognitive affective basis for listening, com posing and performing

2 Repeated opportunities for enacting in a variety of ways the roles of listener (analysis), performer (interpretation), composer (creation) and scholar (research).

3 A repertory for study that embraces all c ultures and historical periods.

Departmental Major Requirements

For adv sement purposes, all students regis tering in a music major program will enroll through the College of Fine Arts All music degree programs require a minimum of 126 hours for graduation In addition to the major re quirements l sted below, General Studies and other academic requirements are listed on pages 28 29 of this catalog.

Placement Examinations. All students enrolled in an undergraduate music degree program are required to take placement tests in theory, piano and a major performing medium at the time they enter the university Transfer students who have completed four semesters of theory at another institution, must reach a minimum level of achievement on the Theory Placement Exam. Those who fail to reach the minimum level must take and pass one course from the MU 200 level theory courses. Students are urged to write the Department of Music for suggestions for auditions in applied music

Bachelor of Arts Degree Curriculum

MUSIC Consists of 45 semester hours of credit. The following courses are required:

Music Theory: MU 125, 320, 322, 427 and three courses selected from MU 220, 221, 222 and 223

Music History and Literature· MU 241 and 242

Major Performing Medium. 8 semester hours (MP 111 311)

Class Piano. MP 131, 132, 231, 232 (unless waived by proficiency examination)

Recital Attendance· 6 semesters of MP 100

The remaining hours in music will be se lected by the student in consultation with his advisor At least 18 semester hours of music must be in upper division credit.

Bachelor of Music Degree Curriculum

MAJOR Consists of 84 semester hours of credit. This curriculum offers fields of specialization

in choral music, general music, instrumental music, music performance, music theatre, music therapy, and theory and composition. Choral music, general music and instrumental music majors are provided for students wishing to meet certification requirements for teaching in the public schools.

The following requirements are included in each major:

MAJOR IN CHORAL OR GENERAL MUSIC

(Note: These degree programs may include a teaching minor in instrumental music.)

Music Theory. MU 125, 322, 427, 431 and three courses selected from MU 220, 221, 222 and 223

Music History and Literature: MU 241 and 242

Conducting: MP 209, 339

Music Education: ME 313, 480, and, for general music majors, 314

Major Performing Medium. 8 semesters of study of keyboard or voice (MP 111-311) attaining a proficiency level necessary to meet the graduating recital requirements. A half recital is required.

Minor Performing Medium: 8 semester hours of keyboard or voice (whichever is not the major performing medium)

Ensemble: 8 different semesters of participation including at least 4 semesters of MP 352 and at least 2 semesters of MP 351

Recital Attendance: 6 semesters of MP 100

MAJOR IN INSTRUMENTAL MUSIC

(Note: It is strongly recommended that the degree program include a minor in choral music.)

Music Theory: MU 125, 322, 427 and three courses selected from MU 220, 221, 222 and 223

Music History and Literature: MU 241 and 242

Conducting. MP 209

Music Education: ME 325, 326, 327, 328, 336, 337, 338, 481 and 482

Class Piano: MP 131, 132, 231, 232 (unless waived by proficiency examination)

Major Performing Medium: 8 semesters of study (MP 111-311) attaining a proficiency level necessary to meet the graduating recital requirements. A half recital is required.

Ensemble: 8 different semesters of participation including at least 6 semesters of MP 361 and/or MP 345

Recital Attendance: 6 semesters of MP 100

Recommended Minor: ME 480, MU 431, MP 339, 351 or 352 (2 semesters) and voice (4 hours)

MAJOR IN PERFORMANCE (KEYBOARD)

Music Theory. MU 125, 322, 320 or 321, 325 or 428, 427 and 3 semesters selected from MU 220, 221, 222 and 223

Music History and Literature: MU 241, 242, 445 or 446, 451 and 481

Conducting. MP 209

Major Performing Medium: 8 semesters of study (MP 127-327) attaining a proficiency level necessary to meet the graduating recital requirements. A half recital and a full recital are required

Ensemble: 8 hours within a minimum of 6 different semesters, of which 2 semesters of accompanying and 2 semesters of chamber music are required.

Recital Attendance: 6 semesters of MP 100

MAJOR IN PERFORMANCE (ORCHESTRAL INSTRUMENT)

Music Theory: MU 125, 320, 322, 325, 427 and 3 semesters selected from MU 220, 221, 222 and 223

Music History and Literature. MU 241, 242, 445 or 446, 451 or 481

Conducting: MP 209, 340

Major Performing Medium: 8 semesters of study (MP 127-327) attaining a proficiency level necessary to meet the graduating recital requirements. A half recital and a full recital are required

Class Piano: MP 131, 132, 231, 232 (unless waived by proficiency examination)

Ensemble. 8 semesters in large ensembles within a minimum of 6 different semesters; plus 4 hours of small ensembles within a minimum of 4 different semesters.

Recital Attendance: 6 semesters of MP 100

MAJOR IN PERFORMANCE (VOICE)

Music Theory. MU 125, 320, 322, 325, 427 and 3 semesters selected from MU 220, 221, 222 and 223

Music History and Literature. MU 241, 242, 445 or 446, 451, 481

Conducting: MP 209

Major Performing Medium: 8 semesters of study (MP 127-327) attaining a proficiency level necessary to meet the graduating recital requirements. A half recital and a full recital are required.

Class Piano: MP 131, 132, 231, 232 (unless waived by proficiency examination)

Ensemble: 4 different semesters of large ensembles, plus 8 hours of ensembles within a minimum of 6 different semesters to be selected from large and/or small ensembles.

Recital Attendance. 6 semesters of MP 100

Additional Requirements: 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 advisor.

MAJOR IN MUSIC THEATRE (VOICE)

Music Theory. MU 125, 322, 427 and 3 semesters selected from MU 220, 221, 222 and 223

Music History and Literature. MU 241, 242, 446 and 2 hours elected by the student

Conducting: MP 209

Major Performing Medium. 8 semesters of study (MP 111-311) attaining a proficiency level necessary to meet the graduating requirement of a public performance of two roles, one of which must be of major proportion.

Class Piano: MP 131, 132, 231, 232 (unless waived by proficiency examination)

Ensemble. 8 semesters of MP 371 (Music Theatre Workshop) and 8 semesters of MP 373 (Music Theatre Production)

Recital Attendance: 6 semesters of MP 100

Additional requirements: Minimum of 6 credit hours each in theatre and dance

MAJOR IN MUSIC THERAPY

Music Theory: MU 125, 322, 427, 431 and 3 semesters selected from MU 220, 221, 222 and 223

Music History and Literature: MU 241 and 242

Conducting: MP 209, 339

Music Education: ME 313, 480, 483

Music Therapy. 10 credit hours in Psychology of Music, Music in Therapy and Hospital Orientation

Applied Music: 8 hours of piano; 2 hours of organ; 4 hours of voice (class), and ME 325, 326, 327, 328, 335, 336, 337 and 338

Ensemble: 8 semesters of participation, including 4 hours of large groups and 4 hours of small groups

Recital Attendance. 6 semesters of MP 100

Additional requirements. 4 credit hours of dance; specified courses in Social and Behavioral Sciences

MAJOR IN MUSIC THEORY AND COMPOSITION

Music Theory: MU 125, 320, 321, 322, 323 (4 semesters), 325, 427, 428, 429, 430, 433, 434, 482 and 3 semesters selected from MU 220, 221, 222 and 223

Music History and Literature: MU 241, 242, 445, 446 and 3 hours elected by the student

Conducting. MP 209, 339-340

Applied Music. 8 semesters of study (4 semesters may be for instruments other than the major performing medium)

Class Piano: MP 131, 132, 231, 232 (unless waived by proficiency examination)

Ensemble: 8 semesters of participation

Recital Attendance: 6 semesters of MP 100

In each area of specialization, electives to reach the minimum hours for graduation will be selected by the student in conference with his advisor.

Bachelor of Arts in Education Degree Curriculum

MUSIC Consists of a minimum of 66-70 hours of music credit. This curriculum offers fields of specialization in choral music, general music and instrumental music for those wishing to teach music in the public schools. Each field of specialization requires the following courses

MAJOR IN CHORAL OR GENERAL MUSIC

Music Theory: MU 125, 322, 427, 431 and 3 courses selected from MU 220, 221, 222 and 223

Music History and Literature: MU 241 and 242

Conducting: MP 209, 339

Music Education: ME 313, 480, and, for general music majors, 314

Major Performing Medium. 8 semesters of study of keyboard or voice attaining a proficiency level necessary to meet the graduating recital requirements. A half recital is required.

Minor Performing Medium: 8 semester hours of keyboard or voice (whichever is not the major performing medium)

Ensemble. 8 different semesters of participation including at least 4 semesters of MP 352 and at least 2 semesters of MP 351

Recital Attendance. 6 semesters of MP 100

MAJOR IN INSTRUMENTAL MUSIC

Music Theory: MU 125, 322, 427 and 3 courses selected from MU 220, 221, 222 and 223

Music History and Literature: MU 241 and 242

Conducting: MP 209

Music Education: ME 325, 326, 327, 328, 336, 337, 338, 481, and 482

Class Piano. MP 131, 132, 231, 232 (unless waived by proficiency examination)

Major Performing Medium. 8 semesters of study (MP 111-311) attaining a proficiency level necessary to meet the graduating recital requirement. A half recital is required.

Ensemble. 8 different semesters of participation including at least 6 semesters of MP 361 and/or MP 345

Recital Attendance. 6 semesters of MP 100

Recommended Minor: ME 480, MU 431, MP

339, 351 or 352 (2 semesters) and voice (4 hours)

MUSIC MINOR FOR AN ELEMENTARY EDUCATION MAJOR

Music Theory. MU 100, 101

Music History and Literature. MU 340

Music Education: ME 313

Piano: 4 semesters

Electives. 2 semester hours

Minors for students in Secondary Education and students in Liberal Arts are available through the Department of Music. Consult with the music department office for advisement sheets and advisors

Departmental Graduate Programs

The Department of Music offers the following graduate programs. the Master of Arts degree provides advanced studies in history and literature of music; the Master of Music degree with majors in the fields of theory, composition, performance, performance pedagogy, choral music, general music, instrumental music, music theatre performance or direction, and conducting The Master of Arts in Education degree, with majors in choral, general, or instrumental music, and the Doctor of Education degree in Music are offered in cooperation with the College of Education. Consult the *Graduate Catalog* for specific requirements. A document on graduate degree programs in music is available by writing to the Department of Music.

MUSIC

MU 100 Fundamentals of Music Notation. To provide nonmusic majors with sufficient symbolic literacy to begin work in the field of music caring No credit for music majors Three hours a week Credit, 3 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 3 hours

107 Introduction to Music. Correlation of music with literature, science and art A nontechnical course in the humanities for nonmusic majors Credit, 2 hours

125 Introduction to Musical Styles. Designed to develop musical skills and general musicianship in the context of a study of musical styles Two lectures 3 discussion periods Credit, 3 hours

220 Music Theory—16th Century. Significant compositions and theories from 1400 to 1600 Basic theories of Tinctoris Ramos Gafurius and Zarlino will be surveyed as they apply to the music under consideration. Development of related aural visual and keyboard skills Prerequisite MU 125 Credit 3 hours

221 Music Theory—18th Century. Music from the 18th century with a view toward developing students abilities to analyze, theorize, perform and create examples within the style Development of related aural visual and keyboard skills Prerequisite MU 125 Credit 3 hours

222 Music Theory—19th Century. Musical compositions chosen from the late 18th and the 19th centuries. Harmonic progressions melodic construction and rhythmic developments development of related aural, visual and keyboard skills Prerequisite MU 125 Credit 3 hours

223 Music Theory—20th Century. Representative 20th century compositions with particular emphasis on those elements of melodic harmonic and rhythmic treatment which break with past conventions Development of related aural visual and keyboard skills Prerequisite MU 125 Credit, 3 hours

241, 242 Music History and Literature. Western music from the Greeks to the present day Prerequisites: MU 125 and one semester from MU 220 221, 222 223 Need not be taken in sequence. Credit 3 hours.

250 Diction for Singers. The use of phonetics in the study of song and opera literature May be repeated for credit Credit, 1 hour

320, 321 Counterpoint. First semester strict counterpoint in modal style, second semester strict and free tonal counterpoint. Prerequisites: MU 125 and one semester from MU 220 221 222, 223 Need not be taken in sequence. Credit 2 hours

322 Musical Acoustics. A physics of sound' course primarily for musicians. The nature of sound its behavior in general, as applied to musical instruments, the human voice the ear, and to auditoriums Musical scales and temperament and the physics of harmony in music history and modern practice analyzers and synthesizers. Credit 4 hours See cross listing PH 320)

323 Composition. Creative writing in the smaller forms including the use of harmonic textures and contrapuntal devices Prerequisites MU 125 and three semesters from MU 220 221 222 223 May be repeated for credit Credit, 2 hours

325 20th Century Theory. Analytical methods and analytical techniques for 20th century music. Prerequisites MU 125 and three semesters from 220, 221 222 223 Meets daily. Credit 3 hours

340 Survey of Music History and Literature. 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

351 Service Playing and Improvisation. Basic principles of hymn playing and accompanying fundamentals of improvisation for the church organist Credit 2 hours

355 Survey of American Music. Growth and development of American music A humanities course in the General Studies program Credit 2 hours

356 Survey of the Musical Theatre. Music's place in the theatre, viewed in terms of its historical importance and relative function A humanities course in the General Studies program Credit, 2 hours

427 Form and Analysis. The organizing elements n the most mportant contrapuntal and homo phon c mus cal forms from the Renaissance through the 19th century Prerequ s tes MU 125 and 3 semesters from MU 220 221, 222 223 Cred t 2 hours

428 Form and Analysis. In depth study of organ izing pr nc ples of the large forms of mus ca compos t on n the 19th and 20th centur es Pre requ s te MU 427. Credit 2 hours

429, 430 Canon and Fugue. Po yphon c stud es n form and technique. Prerequ s te MU 321 Cred t 2 hours each semester

431 Choral Arranging. Practica stud es in ed t- ng and arrang ng for chora organ zat ons Prep arat on of suitab e materia s for young choirs as we as for advanced groups Study of accompa- niments Prerequ s tes MU 125 and 3 semesters from MU 220 221 222, 223. Credit 2 hours

433, 434 Orchestration. Theoret ca and pract cal study of scor ng for orchestra nstruments n var- ous combinations ranging from sma ensemb es to symphonic orchestra and concert band Prereq u sites MU 125 and 3 semesters from MU 220, 221 222 223 Cred t 2 hours each semester

436 Electronic Studio Techniques. Pr nc p es of electronic music systems and the r applicat on n the compos tion and recording of e ectronic mus c May be repeated for cred t Credit 2 hours.

438 Music in the Classic Era. Deve opment of the c assic sty e of the 18th century· major works of Haydn Mozart and Beethoven Prerequ sites MU 241 242 427 the atter may be taken concurrently Credit 3 hours

439 Music in the 19th Century. European art mus c after Beethoven Prerequis tes: MU 241 242 427, the atter may be taken concurrent y Credit 3 hours

441 Music of the Baroque Era. Works of major composers the sal ent styl st c tendencies of the period Prerequ s'tes: MU 241 242 427 the atter may be taken concurrent y Cred t, 3 hours

445 20th Century European Music. Ind v dua id oms and styl stic currents among major com- posers. Prerequ s tes MU 241, 242, 427 the latter may be taken concurrently Cred t, 2 hours

446 20th Century American Music. Amer can re sponse to European tradit ons individua ty in composit on and jazz Prerequisites MU 241 242, 427· the latter may be taken concurrently Cred t 2 hours

447 Choral Literature for the Church. Select on and study of mus c terature appropriate for ch dren s, youth and adu t church choirs Credit 2 hours.

449 Worship, Liturgy and Hymnody. Various worsh p concepts and the consequent develop ments n liturgy and hymnody Cred t, 2 hours

451 Repertoire. Literature availab e for per formance n all perform ng med a Prerequ s te junior stand ng n major performance fie d. May be repeated for credit Cred t, 2 hours

453 Performance Practices of Early Music. Man- ners of performance of ear er times, nclud ng rhythm c express on, ornamentat on and tech- n que Credit 3 hours

458 Church Music Administration. Form and content of the un fied and ntegrated church mus c program Cred t, 2 hours

459 History of Organ Design. H stor cal survey and pract cal app icat on of the princ ples of organ construct on and total des gn Credit 2 hours

481 Performance Pedagogy and Materials. Pr nc p es and methods of performance techn ques for each performance fie d. Prerequ site· sen or stand- ng or approval of instructor May be repeated for credit Cred t 2 hours

482 Theory of Rhythm. An ntegration of mus ca organ zation through phys o og ca and psycho og ca pr ncip es based upon rhythm c percept on Prerequisites MU 428, 445 MP 339 or 340 Cred t, 2 hours.

484 Voice Clinic and Master Class in Voice Pedagogy. Examinat on of the s nger s vocal production mechan sm and study of techn ques for retrain ng voices May be repeated for cred t Credit 2 hours

501 Theory Techniques. Theory techniques re qu red of graduate students Two hours a week Credit 2 hours (Cred t n th s course w ll not app y towards meeting graduate degree requirements.)

502 History of Musical Style. Periods of music h story treated from a stylistic v ewpo nt Two hours a week Credit 2 hours Cred t in this course w l not app y towards meeting graduate degree requirements.)

510 Introduction to Graduate Study. Acqua nts the graduate student with bas c research mate ria s n music B b ograph c and techn ca mater a s w be ncorporated into the preparation and writ ng of research papers Credit 2 hours

520 Advanced Analytical Techniques. Ana ytical techn ques systemat ca ly app ed to music Con centrat on on structural and composit ona proce dures Cred t 2 hours.

523 Advanced Composition. Creative wr ting n the arger forms for chorus orchestra and band Prerequisites· MU 323, 428 445 or equivalent May be repeated for cred t Cred t 2 hours.

525, 526 Pedagogy of Theory. Practices and prin- cip es of teach ng music theory Emphas s directed toward sett ng up the most des rab e and pract - ca offer ngs possib e Comparative stud es of existing practices Credit 3 hours each semester

527, 528 Evolution of Musical Theory. Theory from Pythagoras to the present Need not be taken n sequence Cred t 3 hours each semester

532 Music Bibliography. The major h stor ca and ana yt cal wr tings, systematic and histor ca co lections of music. Read ng know edge of a fore gn anguage recommended Cred t 3 hours

536 Music of the Renaissance. Musica thought n Europe, with emphas s on sty st c concepts and changes c 1430 1580 Cred t 3 hours.

541 The Art Song. Solo song from ts beg nn ng to the present day Cred t 3 hours

542 Keyboard Literature. From the Rena ssance to the present day Cred t 3 hours

544 Music of Non-Western Cultures. A survey of mus c in non terate soc eties and of art and folk musics of the near and far East Cred t 3 hours

550 Psychology of Music. The nature of mus ca ty and its eva uation A review of recent re search Cred t 3 hours

553 Advanced Choral Arranging. Choral tech n ques n composit on and arranging Vocal writ ng through ana ysis of choral works Projects n both arrang ng and composit on. Credit 2 hours

554 Advanced Scoring Problems. Instrumenta tion Further study of the play ng characterist cs of each nstrument in order to write and arrange d omat c music for the nstrument. Projects n both scoring and composit on Credit 2 hours

575 History of Choral Music. Major choral works written s nce 1600 Cred t 3 hours

591 Seminar. Cred t 3 hours Topics may be se lected from the fie ds of mus c history and music theory·

(a Ancient and Med eva Mus c
(b) Ethnomus co ogy
c Symphon c Literature
(d) Chamber Music L terature
e) B ograph cal Stud es

Special Graduate Courses: 500 580 590, 592, 593 594 680 790, 791 792 See pages 46 47

MUSIC EDUCATION

ME 310 Music in Early Childhood Education. Identify ng and understanding mus cal needs of young ch dren Methods and mater als for pro gram development for classroom teachers Cred t 3 hours

311 Music for the Classroom Teacher. Develop ment of the classroom mus c program n the elementary school. No prev ous mus c exper ence or course work requ red. Not for music majors or m nors Three hours each week Cred t, 3 hours

313 Music in the Elementary School. Methods of instruction organ zat on and presentat on of ap propriate content n mus'c. For mus c majors and m nors on y. Credit 3 hours

314 Music in the Elementary School. Se ected prob ems n e ementary schoo c assroom mus c The elementary schoo chora program Observa t on and partic pat on in school mus c c assrooms Prerequis te ME 313 Credit 3 hours

325, 326 Educational Methods for Strings. Str ng nstrument teach ng and playing sk lls for schoo music teachers Three hours a week Cred t, 1 hour

327, 328 Educational Methods for Brass. Brass nstrument teach ng and p ay ng sk lls for school music teachers. Three hours a week Cred t, 1 hour

335 Educational Methods for Guitar. Guitar teach ng and playing sk ls for schoo music teachers. Three hours a week Cred t 1 hour.

336 Educational Methods for Percussion. Percuss on nstrument teaching and p aying sk l s for schoo mus c teachers. Three hours a week Credit 1 hour

337, 338 Educational Methods for Woodwinds. Woodwind nstrument teach ng and p aying sk ls for school mus c teachers Three hours a week Cred t, 1 hour

480 Choral Music Practicum. Methods of nstruc t on organ zation and presentation of appropr ate content in chora mus c c asses Cred t, 3 hours

481, 482 Instrumental Music Practicum. nstru mental music as a means of deve op ng mus c sk l s understand ngs and att tudes n e ementary and secondary schoo students Cred t, 5 hours

550 Studies in Music Curricula. Scope and sequence of mus ca exper ences Deve opment of cr ter a for the eva uat on of mus c curr cu a n terms of growth and nterest Cred t 3 hours

551 Advanced Studies in Elementary School Music. For experienced teachers organ zation and content of the genera mus c classes in k ndergar ten and the f rst s x grades of e ementary schoo Emphasis on teach ng mus c reading and ear train ing to young chi dren Credit 3 hours.

552 General Music, Music Theory and Music History Classes in the Junior and Senior High School. Organizat on and content of schoo mus c c asses wh ch are not performance or ented Cred t, 3 hours

564 Instrumental Music, Advanced Rehearsal Techniques. Formu at on of va d mus cal, educa t ona and esthet c rehearsal objectives Obser vat on and rev ew of current pract ces and mate ria s Development of nd v dua methods of teach ng n a rehearsa s tuation Cred t 3 hours

566 Instrumental Literature for Schools. Com prehensive study and analys s of a l types of nstrumenta mus c Cred t, 3 hours.

568 Choral Music, Advanced Rehearsal Techniques. Musical and vocal techn ques necessary for presentation of choral 'terature. Ana ysis and experimentat on w th psycho og cal, acoust ca and other prob ems of rehearsal and perform ance Cred t, 3 hours

570 Choral Literature for Schools. Comprehen s ve study and analysis of a l types of chora mus c. Cred t 3 hours

733 Experimental Projects and Recent Trends in Music Education. Recent trends and research deve opments wh ch challenge trad tiona prac t ces Credit 3 hours

744 Major Problems in the Education of Music Teachers. Ex st ng patterns of music teacher educat on and a pro ection of course out nes de s gned to accommodate the most comprehens ve demands of the chang ng schoo mus'c curr cu um. Cred t, 3 hours

755 Philosophies of Music Education. History of music educat on and the psycho og es and phi os oph es nfluencing changes n curr culum content and teach ng procedures Credit, 3 hours

Special Graduate Courses: 580 590 591 592 593 594 6 0 790 791 792. See pages 46 47

MUSIC PERFORMANCE

MP 100 Concert Attendance. Requ red of a mus c majors for s x semesters in each degree program w th a minimum of seven (7) concerts attended each semester. No cred t.

111, 311, 511 Applied Music—Private Instruction. Mus c majors only Piano organ harp, harpsi chord, voice v olin v o a v olonce o contra bass f ute oboe clar net bassoon saxophone trumpet cornet French horn bar tone trombone tuba percuss on P acement exam nat on re qu red Two half-hour essons a week May be re peated for cred t Credit 2 hours each semester

121, 321, 521 Applied Music—Private Instruction. P ano organ harp, harps chord vo ce v o n v ola v olonce o contrabass f ute oboe, c ar net bassoon saxophone trumpet, cornet French horn, bar tone, trombone tuba percuss on. P acement exam nation requ red One half-hour

lesson a week May be repeated for cred t Cred t, 1 hour

127, 327, 527 Applied Music—Private Instruction. Performance majors only P ano organ, harp harpsichord vo ce v o n v ola v olonce o contrabass f ute oboe c ar net, bassoon sax ophone, trumpet cornet, French horn, bar tone trombone tuba percuss on Placement exam na tion requ red Two ha f hour essons a week May be repeated for cred t Cred t, 4 hours 2 or 4 hours each semester for MP 527

131, 132, 231, 232 Class Piano. A four-semester sequence of courses des gned for those acking p ano experience and those who need piano as a classroom too Emphasis on keyboard techn que, s ght reading s mp e accompan ments and m prov sat on Two hours a week Credit 1 hour each semester

133, 134, 233, 234 Class Voice. Open to a stu dents interested in the deve opment of basic s ng ng techn ques Two hours a week Credit 1 hour each semester.

209 Elements of Conducting. Essent als of con duct ng techn ques used by both choral and instru menta conductors Two hours a week Cred t 1 hour

339 Choral Conducting. E ements of chora con duct ng technique and nterpretation Prerequ s te MP 209 Three hours a week. Cred t 2 hours

340 Instrumental Conducting. Fundamenta s of score read ng and interpretation of nstrumen ta mus c Prerequisite MP 209 Three hours a week. Credit 2 hours

345 Symphony Orchestra. Open to a students who can qualify on the basis of aud t ons w th the director Over a four year per od the stu dent s introduced to the masterp eces of sym phony orchestra terature. F ve hours a week May be repeated for cred t Cred t, 1 hour.

351 Choral Union. Open to all students in the Un vers ty and to nterested singers n the com mun ty T me devoted to preparat on and perform ance of the arger chora works May be repeated for credit Cred t 1 hour

352 Choir. Membersh p chosen by aud t on May be repeated for cred t Sect on 1 Concert Cho r, Sect on 2 Univers ty Cho r Four hours a week Cred t 1 hour

355 Men's Glee Club. Open to all ma e students n the Un versity who can qual fy on the bas s of audit ons with the d rector Rehearsal and perform ance of music for ma e voices. Three hours a week May be repeated for cred t Credit 1 hour

357 Women's Chorus. Membersh p chosen by aud t on Three hours a week May be repeated for cred t Credit 1 hour

361 Symphonic and Marching Band. Open to a students who can qual fy on the basis of audi t ons w th the d rector Staging of format ons and dr lls for footba l games and other events, masterp eces of symphonic band terature Meets da y May be repeated for cred t Cred t, 1 hour

371 Music Theatre Workshop. Open to al stu dents who can qua fy on the basis of aud t ons w th the instructor May be repeated for credit Section 1 nterpretat on) Exerc ses, m provisat ons and musica dramat c in terpretat on for the s ng ng actor One ecture demonstrat on 1 aboratory per week Sect on 2 Opera Scenes) Rehearsal and production of opera scenes One ecture demonstrat on, 1 laboratory per week. Sect on 3 Mus c Comedy). Musica dramat c interpretat on of mus cal mate r a s One lecture demonstrat on 1 ab oratory per week Cred t 1 hour

372 Music Theatre Orchestra. Open to a stu dents who can qua ify on the bas s of aud t ons with the instructor Part c pation n Lyr c Opera Theatre product ons May be repeated for credit Sect on 1 (Opera Orchestra 2' hours per week Section 2 (Chamber Opera Orchestra) 4 hours per week Credit 1 hour

373 Music Theatre Production. Open to all stu dents who can qual fy on the basis of aud tions w th the nstructor. Part c pat on n Lyr c Opera Theatre productions Sect on 1 Vocal Perform ance); Sect on 2 Te hn cal Mus c Theatre) Sect on 3 Prob ems n Production to be taken concurrent y with MP 373 Sect on 2 May be repeated for credit Cred t, 1 hour.

381 Chamber Music Ensembles. Str ng brass woodwind, percussion keyboard, vocal and m xed ensemb es Prerequisite: approval of in structor Two hours a week May be repeated for cred t Credit, 1 hour

382 Collegium Musicum. Singers and instrumen tal sts spec a z ng n the performance of early and unusua mus c Prerequ site approva of n structor Two hours a week May be repeated for credit Credit 1 hour

383 University Singers. Sma chora ensemble chosen by audit on Two hours a week. May be re peated for cred t Cred t, 1 hour

384 Brass Choir. Special zing n publ c per formance of music wr tten for brass instruments Prerequ s te: approval of nstructor Two hours a week May be repeated for cred t Cred t 1 hour.

385 Percussion Ensemble. Rehearsal and perform ance of standard and or g na reperto re for the percuss on ensemble and related nstruments Membersh p by approval of the instructor Two hours a week Credit, 1 hour

386 Stage Band. Rehearsa and performance of terature for the stage band Membersh p by ap proval of the nstructor Two hours a week Cred t 1 hour.

387 Accompanying. P ano accompan ments found in voca and instrumental terature dis cuss on of sty es and performance practices experience n public performance May be repeated for cred t Two hours a week (May be used for en semble requ rement) Credit 1 hour

539 Advanced Conducting. Advanced baton tech n que for band and orchestra. Score reading, me chan cs of conduct ng ind v dua cr tic sm of sty e Prerequ s tes MP 339 340 or equiva ent Cred t 2 hours

595, 596 Solo Performance. For Master of Music cand dates n appl ed mus c on y May be full re cita major operat c role, so o performance with orchestra or an ensemb e or lecture recita Cred t, 1 hour each semester.

Speech and Theatre

Professors:
RICHARDS (Stauf 413) DAV S
ST TES YEATER
Associate Professors:
CLUFF DOYLE, MOWRER
PERR LL W TT
Assistant Professors:
BARTZ, CASE, CHUBRICH DOBKIN,
ELSEA, GOHEEN HETHER NGTON
NGL S RICE SM TH, SNELL NG
SORV G, WILLSON

Departmental Major Requirements

Bachelor of Arts Degree Curriculum

SPEECH Consists of 45 semester hours, of which at least 24 hours must be in speech communication courses and 15 in one or more related areas At least 18 hours must be in upper division courses. The ma or should include courses in public speaking, oral interpretation, argumentation or persuasion, group communication, and history and criticism of public address; specific courses are selected by the student in conference with his advisor to provide emphasis in theory, practice and criticism of oral discourse This program is designed to provide preparation for such fields as law, politics, college teaching and the ministry.

THEATRE Consists of 45 semester hours of credit selected in consultation with an advisor to provide a balanced representat on of courses within areas of theatre specialization. The selected program m st include TH 100, 110, 213, 214, 315, 316 plus at least two additional courses in theatre history or criticism and one course in each of the three different as pects of technical theatre and design. In addition, at least 2 hours, but no more than 4 hours are required in TH 301, chosen from at least two different production options. The theatre ma or normally will include 15 semester hours of course work in such related studies as speech, English, dance, music, art, and mass communication.

Bachelor of Science Degree Curr culum

COMMUNICATION DISORDERS Consists of 45 55 semester hours of credit and provides areas of emphasis in speech pathology and in audiology. The speech pathology emphasis requires 27 semester hours in speech pathology and three in audiology, with the remainder in related fields such as psychology and special education. The audiology emphasis consists of a core of 14 semester hours in audiology and 10 in speech pathology, with the remainder selected from courses in physics, mathematics, psychology and electronics. Students pursuing either emphasis would plan the program of studies carefully with an academic advisor in speech pathology or audiology Since this is a professional program which assumes the com pletion of a master's degree for certification, a student will normally be expected to have achieved a 2.5 grade point average by the time he reaches junior standing.

SPEECH COMMUNICATION Consists of 45-55 semester hours, of which at least 24 must be in speech communication courses and a minimum of 15 in one or more related areas approved by the advisor in consultation with the student At least 18 semester hours must be in upper division courses. The major must include courses in public speaking, oral interpretation, group communication, argumentation or persuasion, and communication theory or public address; specific courses are selected by the student in conference with his advisor to provide specialization in speech communication behavior. This program intends to provide preparation for such fields as business and organization communication, public service, law, or college teaching

Departmental Major Teaching Field Requirements

Bachelor of Arts in Education Degree Curr'culum

SPEECH COMMUNICATION Consists of 36 semester hours and anticipates the addition of a minor (24 hours) Speech communication majors should complete at least one course in each of the following areas: public speaking, oral interpretation, argumentation or debate, discussion or persuasion or history and criticism of public address The student will normally elect at least one course in communication disorders At least 2 semester hours must be earned in speech activities (SC 301) but not more than 4 hours may be counted toward the major Specific courses to complete the major are selected by the student in conference with his academic advisor.

THEATRE Consists of 42 semester hours of credit which will include TH 100, 110, 113, 213, 214, 315, 316, 320, 321, 330, 345, 415. In addition, the major is required to accumulate at least 3 hours credit in TH 301 and give evidence of having participated in the production areas of lighting, costume, make-up, properties and scenery construction for University Theatre productions, under faculty supervision. Each major will also stage one production with high school students A teaching minor is strongly recommended to accompany this major.

COMMUNICATION ARTS Consists of 60 semester hours and is designed to provide basic preparation for teaching in three fields. A communication arts major must complete a minimum of 24 semester hours in speech communication or

theatre and at least 18 hours in each of two other related subject fields. (For example, 24 hours in speech communication, 18 hours in theatre, and 18 hours in mass communication. or, 24 hours in theatre, 18 hours in speech communication, and 18 hours in English). Other combinations are possible in this major pattern Students will be expected to elect a minimum of 2 hours in appropriate activities courses (SC 301 and or TH 301), but not more than 4 hours will be counted toward the major. Specific courses normally will be drawn from the minor requirements in each subject field and are selected by the student in conference with the academic advisor

MINOR IN SPEECH COMMUNICATION Consists of 24 semester hours and will normally include the following SC 20, 480, and one course in public speaking, oral interpretation, argumentation or debate, and discussion, persuasion, or history and criticism of public address, plus six hours of electives. At least 9 hours must be in upper division courses.

MINOR IN THEATRE Consists of 24 semester hours in theatre courses. TH 100, 110, 213, 214, 315 are required; plus one additional course in theatre history and two additional courses in technical theatre.

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.

THEATRE

TH 100 Introduction to Theatre. A elements of the theatre p aywrit ng d recting act ng design and arch tecture Cred t, 3 hours

110 Acting: Introduction. Lectures exercises and projects n act ng Two hours lecture-demonstrat on 4 hours laboratory Credit 3 hours

113 Make-Up. Techniques of theatr cal make up laboratory projects Prerequisite TH 110 or approval of nstructor Credit 2 hours

200 Introduction to Film as Theatre. All e e-ments of the theatr cal film c nematography sound edit ng directing acting, scriptwr ting producing and cr ticism Three hours ectures 2 hours aboratory Cred t, 3 hours

212 Acting: Expression. Bodily and vocal express on for act ng through exercises and per formances Prerequis te: TH 110 or approva of nstructor. Cred t, 3 hours.

213 Introduction to Technical Theatre. Des gn and construct on of scenery l ght ng and properties Cred t, 2 hours

214 Technical Theatre Practicum. Demonstrat ons and laboratory projects in procedures of techn cal theatre product on. Three hours laboratory Prerequ s te TH 213 or approva of nstruc tor May be taken concurrently w th TH 213 Credit 2 hours

215 Technical Drawing for the Theatre. Stud o projects n techn ca draw ngs and scen graphic techniques Prerequis te TH 213 Credit 2 hours

301 Theatre Production. Part cipat'on n Un ver s ty Theatre product ons Prerequisite wr tten approval of instructor May be repeated for cred t Credit 1 hour

311 Creative Drama. Theor es, procedures and mater a s for creative drama in the e ementary and junior h gh schoo s Consideration of re-ated drama act v t es such as storyte ng, chora speak ng and puppetry Not open to fresh men. Cred t, 3 hours

312 Acting: Stage Techniques. Standard stage speech and d a ects through phonet c pract ce and techn ques for spec al problems of stage movement Prerequis te TH 212 or approva of nstructor Cred t 3 hours

313 Make-Up: Special Problems. Spec a prob ems sty es and mater a s for stage make up Prerequis te TH 113 or approva of instructor Cred t 2 hours.

314 Acting: Characterization. Techn ques and methods of nterpreting and project ng a ro e through study and performance Prerequisites: TH 110 and 212 or approva of 'nstructor. Cred t 3 hours

315 Directing. Techniques of nterpreting and direct ng p ays Prerequisites TH 100, 110 and 213 Cred t, 2 hours

316 Directing Projects. Practice in d recting scenes with student actors Prerequ site TH 315 or approva of nstructor Two hours laboratory. Credit 1 hour

318 Theatre for Children. Act ng d rect'ng and produc ng techn ques for child aud ences nc udes participation n a product on Cred t 3 hours.

320, 321 History of the Theatre. First semester traces major deve opments in theatre production from ts beg nning through the 17th century sec ond semester cont nues the survey to modern t mes Cred t, 3 hours each semester

330 Introduction to Costuming. History of the-atrica costume Laboratory experience n con-struct on of costumes Three hours lecture, 2 hours aboratory Credit 3 hours

331 Costume Construction. Uses of mater a s and techniques for stage costumes w th actual con struct on of per od appare Prerequisite. TH 330 Credit, 3 hours

335 Technical Theatre: Stagecraft. Practices n mater a se ect on draft ng of work ng draw ngs too operat on and construct on techn ques n modern stagecraft Two hours ecture 3 hours aboratory Prerequ s te TH 213 or approva of nstructor. Cred t, 3 hours

340 Scene Design. Stud o projects n des gn ng real st c scenery for the contemporary proscenium stage Prerequisite TH 213 Credit 3 hours

345 Technical Theatre: Lighting. Electr ca and des gn pr nc ples of modern stage ght ng de s gn and operation of sound effects Two ho rs ecture, 3 hours laboratory Prerequis te TH 213 or approva of nstructor Credit 3 hours.

411 Advanced Studies in Creative Drama. App cat on of theories techn ques and mater a s for dramat zation Regular part c pat on with chi dren. Prerequisite TH 311 or approva of nstructor Cred t 3 hours

414 Acting: Styles. Techn ques of act ng in ma jor nonrea stic styles through scene study and performance. Two hours lecture demonstrat on, 2 hours aboratory. Prerequ s te· TH 312 and or approval of nstructor Cred t 3 hours.

415 Directing: Theories and Styles. Theories of play d rect on and laboratory projects n var ous per ods, yr c and exper menta p ays with student actors Two hours ecture demonstrat on 2 hours laboratory Prerequ s te: TH 315 or approval of instructor. Cred t, 3 hours

417 Scene Study. Ana ys s and presentation of scenes from masterpieces of theatre iterature Prerequ s te TH 414 or 415 or approva of n structor Cred t, 2 hours

420 History of the American Theatre. H story of the p ays art sts and events in the develop ment of the Amer can theatre from co on al to modern t mes Credit, 3 hours

425 History of the Oriental Theatre. H story and product on techn ques of theatre forms n ndia Southeast As a China and Japan w th exercises n the var ous act ng sty es of these countries Prerequ site s x hours of theatre h story or ap prova of nstructor Cred t, 3 hours.

430 Costume Design. Pr nc p es of costume de s gn w th spec a projects n per od and modern sty es Prerequ s te TH 330 Cred t 3 hours

440 Advanced Scene Design. Advanced studio projects n des gn ng nonreal st c scenery for a var ety of stage forms Prerequis te TH 340 Credit 3 hours.

441 Scene Painting. Stud o projects in pa nt ng stage scenery Prerequ s te TH 340 Credit 3 hours

445 Technical Theatre: Advanced Lighting. Spe c a zed techn ques 'n stage ight ng 'nc ud ng des gn pract ces for arena a d thrust stages Prerequ site TH 345 or approval of nstructor Credit 3 hours

450 Theatre Organization and Management. Pr n c p es of adm nistering professiona and non profess onal theatre production organ zat on Cred t 2 hours.

460 Dramatic Composition for the Stage and Screen. Fundamenta s and pract ce of wr t ng for the theatre the mot on p cture and te ev s on Credit, 3 hours

465 Play Analysis. A systematic method of p ay ana ys s for the actor, director and designer Cred t 3 hours

503 Studies in Theatre History. Resources ideas and trends in major era of theatre h story w th applicat on to modern theatre production Cred t 3 hours

504 Studies in Dramatic Theory and Literature. Major dramatic themes from the c assica period to the present nc uding related readings in dramat c terature Credit 3 hours

505 Studies in the Theory and Practice of Acting and Directing. Wide read ngs and discussions of major theor es and actua pract ces n wor d theatre. Cred t 3 hours

506 Studies in Scenic Environments. Coordi nated stud es in conceptua z ng the scen'c en v ronment w th emphas s on innovat ve v sua statements appropr ate to actua product on Cred t 3 hours

510 Studies in Theatre Literature. Ass gned read ngs n standard sources and masterpieces n theatre terature. Cred t, 3 hours

570 Creative Research Project. Project n eu of thes s n one area of theatre product on Cred t, 3 hours.

591 Seminar. Cred t, 3 hours. Top cs may be se- ected from the fo owing·

a) Theatre History Renaissance
b Theatre History 17th century
(c Theatre H story 19th century
(d Theatre H story Contemporary Per od
e Dramat c Theory and Cr ticism
f Act ng
(g D recting
h) H story of Scene Des gn
Techn ca Theatre P ann ng and Product on
(j) Children s Theatre and Creat ve Dynamics
k) H story of the Orienta Theatre

SPEECH COMMUNICATION

SC 100 Elements of Speech Communication. Basic theory and pr nc p es of the speech communica tion process ndividual and group experiences such as pub c speak ng discussion and oral reading Cred t 3 hours.

120 Survey of Speech Communication. Or enta- t on to the f e d of speech communicat on as an academ c disc p ne. Theory and imited pract ce in group commun cat on, pub ic speak ng, speech sc ence oral interpretation h story and cr ti c sm of pub c address. Credit 3 hours

200 Introduction to Human Communication. Human commun cat on processes and systems Or entat on to the communication experience and the sc entif c bases of speech behav or Cred t 3 hours

211 Public Speaking. Preparat on and de ivery of various forms of pub c speeches: nforma t ona , persuas ve po t cal eu ogist c Cur- rent speakers on the Amer can scene as examples of exce ence Prerequ s te SC 100 or 120 or ap- prova of instructor Credit 3 hours

214 Introduction to Forensics. Examinat on of pract cal problems invo ved n the development and presentation of argument inc uding particpa- t on n interco eg ate debate Credit 3 hours.

221 Voice Improvement. ntens ve personal and group exper ence to improve normal voca usage ncluding articu ation and pronunciation for p atform stage or mass media Cred t, 3 hours

241 Oral Interpretation of Literature. Under standing and apprec ation of iterature through awareness of the ora processes Ana ys s and com- mun cation of the wr tten text as thought fee ng sound, and act on. Cred t, 3 hours

300 Principles and Methods of Group Communi- cation. Development of attitudes and sk lls for effective part c pation and eadership in group commun cation act v t es Practice in smal group pane s symposiums and conferences Not open to freshmen. Credit 3 hours

301 Speech Communication Activities. Partic pa t on n speech commun cat on act v ties such as forens cs and readers theatre May be repeated for

credit. Prerequ s te approva of the nstructor Credit 1 hour.

310 Parliamentary Procedure. Theory of par ia mentary aw. Practice in organ z ng and conduct- ng par iamentary proceed ngs Cred t 2 hours

312 Principles of Argumentation. Ph iosoph cal and theoretica foundations of argumentat on w th emphas s on prob ems n argun entat on and debate Prerequ s te SC 214 or approva of nstructor Cred t 3 h s

341 Oral Interpretation of Dramatic Literature. Ana ys s and ora commun cat on of p ays appro pr ate for oral nterpretat on, such as verse drama, deo og cal drama and c assica drama Problems of content, structure and sty e Pre requ s te SC 241 or approval of nstructor Cred t 3 hours

400 Leadership in Group Communication. Group communication process and procedure w th emphas s on the phi osophy and behav ora nature of eadersh p n group s tuat ons Pre requ site SC 300 or approva of instructor Cred t, 3 hours

410 Forms of Public Address. Advanced theory of the composit on presentat on, and evaluation of types of pub c address. campa gn speak ng courtroom speak ng, ceremonia speeches, and leg s at ve addresses Pract ce in the prepara t on and del very of such speeches Prerequ s te SC 100 or 211 or the equ va ent Cred t 3 hours

411 Speech Communication in Business and Profession. App cat on of pr nc p es of ora com- mun cation to specif c business and professiona commun cat on s tuat ons Pract ce n using the forms of persuas on conference speak ng tech- n ques and group part c pat on methods Cred t, 3 hours

415 Speech Communication Practices and Techniques for the Classroom Teacher. Improvement of the ora sk lls of the c assroom teacher Tech niques games and methodo ogy for the utiliza- t on or oral communicat on pract ces in the public schoo c assroom. Not ava lab e to majors Cred t 3 hours

441 Oral Interpretation of Prose. Ana ysis and ora commun cat on of prose terature, such as essays journals, etters biography, and f c t on Prob ems of content, structure and style Prerequ site SC 241 or approva of the nstruc- tor Cred t 3 hours

442 Oral Interpretation of Poetry. Ana ys s and ora commun cat on of yr c, narrative and dramat c poetry Prob ems of content structure, and sty e. Prerequ s te SC 241 or approva of the instructor Cred t, 3 hours.

443 Theory and Practice in Readers Theatre. H story cr t c sm esthet cs, and practice n readers theatre Problems of textual ana ys s ed t ng adapt ng and stag ng Prerequis te. SC 241 or approva of the nstructor Credit, 3 hours

444 Oral Traditions in Literature. L terary forms evo ving from ora myths egends folk ta es, and fab es Prerequ site: SC 241 or ap prova of nstructor Cred t 3 hours

450 Contemporary Public Address. Lead ng con temporary pub c speakers and the r inf uence on soc a and po it ca fe Cred t 3 hours

460 American Public Address. Survey and rhetor ica eva uation of outstand ng Amer can speakers from the 17th to 20th century Cred t 3 hours

470 British Public Address. Survey and rhetor- ca eva uat on of outstand ng Br t sh orators. Cred t, 3 hours.

473 Persuasion. Pract ce of persuas ve pr nc p es that nf uence and modify the be ef and ac tion of an aud ence Prerequ s te SC 100 or 312 Cred t 3 hours

480 Methods of Teaching Speech Communication and Theatre. Ana ys s organ zat on and presentat on of textua and other classroom mater a s Cred t 3 hours.

481 Teaching Practicum. Teaching high schoo students the fundamenta s of forens'cs. Offered n Summer Sess n on y. Credit, 2 hours

514 Administration of the Forensic Program. Theoretica and pract cal problems of forens'c programs on the col ege and secondary eve Cred t, 3 hours

570 Research Project in Speech Communication. Project in l eu of thes's in one area of commun cat on arts Cred t 3 hours

591 Seminar. Cred t, 3 hours Top cs may be se ected from the fo low ng

a) C assica Rhetor ca Theory
b Modern Rhetor cal Theory
c Contemp rary Rhetor ca Theory
(d Rhetorica Cr tic sm
e) Persuas on
f Ora nterpretat on H story and Crit c sm
g Ora nterpretat on Poet c Theory
h Group Commun cation
) Quant tat ve Stud es in Ora Commun cat on
j Communicat on Theory
k Organ zat on Con mun cat on
l Speech Education

Special Graduate Courses: 590 592 593
See pages 46 47)

COMMUNICATION DISORDERS

SA 167 Speech and Language Behavior in Early Childhood. Process of anguage deve opment n the norma ch d Credit 2 hours

215 Acoustics in Communication. Physica character st cs and behav or of acoust c energy n commun cation Prerequ sites. MA 141, PH 111. Credit 3 hours

300 Developmental Psycholinguistics. Lan- guage deve opment n ch dren based on current theoret ca models of modern ngu sts and psycho ngu sts. Cred t, 3 hours.

305 Survey of Communication Disorders. De scr pt ve study of evaluation and treatment of commun cation disorders Emphas s on ro e of parent, teacher and others n develop ng child s env ronment w th attent on to adu t and geron tolog cal prob ems n communication d sorders Not pen to Commun cation D sorders majors Cred t, 3 hours

310 Anatomy and Physiology of Speech. Anatomy and phys ology of the neura , muscular and ske eta systems wh ch subserve human speech behav or Cred t 3 hours

311 Anatomy and Physiology of Hearing. Anat

omy and physio ogy of the peripheral and central systems wh ch subserve hear ng Credit 2 hours

320 Introduction to Audiology. Norma process of hear ng and the nature and causes of auditory patho ogy. Prerequ s te SA 311 Credit 3 hours.

350 Phonetics. Speech sounds and the applica t on of the Internat ona Phonet c Alphabet to Amer can Speech Cred t 3 hours

370 Psychology of Language. Acqua nts the stu dent w th the nature of anguage Relat onsh p between anguage and thought s stressed Cred t 3 hours

380 Introduction to Communication Disorders. Or entat on to d sorders of commun cation. Pre requ site SA 310 Credit 3 hours

390 Problems of Articulation. Detai ed ana - ysis of d sorders of art cu ation. Prerequisite: SA 380 or approva of nstructor Cred t 2 hours

395 Methods in Modification of Communication Disorders. Pr nc ples and techn ques of mod fy ing speech and anguage behav or Two ectures 4 hours laboratory. Prerequ site approval of n structor. Credit 4 hours

400 Methods of Audiometry. Techn ques and n strumentat on used in measuring aud tory thresh- o d and aud ogram nterpretat on Prerequisites SA 215 and 320 Three hours lecture one hour laboratory Cred t 4 hours

402 Hearing Conservation in the Public Schools. Partic pat on in public school audiometric test ng programs w th classroom d scussion. Prereq- u sites. SA 167 215, 310 350 May be taken con current y w th SA 320. Cred t 2 hours.

427 Practicum in Audiometric Testing. Pract cal app cat on of techniques n audiometry Two hours d scussion, 6 hours laboratory Prerequ s te approva of nstructor Cred t, 3 hours.

432 Auditory Rehabilitation. Theory and appli cation of techn ques involved n the hab l ta t on and rehab litation of the hear ng impaired ind v dua . Prerequisite SA 320 or approval of the instructor Cred t 3 hours.

433 Practicum in Auditory Rehabilitation. Prac t ca app ication of techniques of habi tation and rehabi tat on of the aud tor y mpa red Prerequ s te approva of instructor May be taken concurrently w th SA 432 Cred t, 3 hours.

434 Pediatric Audiology. Measurement of hear- ng and pr nc p es of rehabil tat on of the hear ng d sadvantaged ch d. Credit 3 hours.

435 Industrial Audiology. Hear ng problems pro- duced by an adverse isten ng env ronment. Pre requ s te SA 400 Cred t 3 hours.

444 Psychology of Hearing Handicap. D scuss on of the ntel ectua , persona ty and educational problems that confront the hear ng hand capped nd vidua Cred t, 3 hours

451 Practicum in Communication Disorders. Treat ment of speech d sorders n the Un vers ty Center Prerequ s te SA 467 May be repeated for credit Cred t 2 3 hours

464 Internship Practicum in the Public Schools. Treatment of speech d sorders with n the pub c school sett ng Prerequ s te SA 451. Credit, 3 hours

467 Evaluation of Communication Disorders. Methods of evaluating speech and anguage dis orders One hour ecture 3 hours aboratory Pre- requ s tes SA 167, 310 350 380. May be repeated for cred t Credit 2 hours

491 Stuttering. Causes therap es and current research trends. Credit 3 hours

502 Advanced Audiology. Procedures in differ- entia d agnos s of auditory patholog es Pre- requ site SA 427 Credit 2 hours

504 Auditory Prosthetics. Discussion and ap- p ication of var ous methods of hear ng amplif ca- t on The measurement and evaluat on of amp if ca t on systems as they app y to the hearing impaired nd v dual Prerequ s te SA 400 Credit, 3 hours.

519 Experimental Procedures in Communication Disorders. Exper menta model in research, design of experimental procedures and research appl cat on of e ectronic nstrumentat on n the area of commun cation d sorders Cred t 3 hours

527 Advanced Practicum in Audiometric Testing. Supervised cl n ca aspects n hearing test ng and evaluat on of aud tory patho ogy One hour d scussion, 5 hours aboratory. May be taken con currently with SA 502. Prerequ s tes SA 427 502 and approval of instructor. May be repeated for cred t Credit 3 hours

551 Advanced Clinical Practicum in Communication Disorders. Treatment of communication d s orders n speech c nic and rehabilitation center settings Prerequisite: SA 451 or equ va ent. Cred t 3 hours

567 Advanced Evaluation of Communication Disorders. Advanced practicum n the evaluat on of commun cat on d sorders Prerequ s te SA 467 or approval of the nstructor Credit 3 hours

575 Neurological Disorders of Speech—Aphasia. Communicat on disorders related to damage to the central nervous system assessment and treatment Cred t 2 hours

576 Neurological Disorders of Speech—Cerebral Palsy. Communication d sorders related to cere bra pa sy assessment and treatment. Cred t, 2 hours

577 Oro-facial Disorders of Speech—Cleft Palate. Commun cat on disorders related to anomalies of the oro-fac a structures nc ud ing c eft p and pa ate and dental ma occlusion. Prerequ s te 310 or approva of instructor Credit, 2 hours

578 Disorders of Voice. Commun cation d s orders re ated to dysfunction and the phonatory and resonance systems of vo ce production, assessment and treatment Cred t, 2 hours

591 Seminar. Credit, 3 hours Se ected topics from fie ds of speech patho ogy or aud ology.

(a) Oral Laryngea Speech Disorders
(b) Stutter ng Behavior and Therapy
(c) Adm n stration of Public Schoo Speech Therapy Programs
(d) Neuro og ca D sorders of Speech
(e) Ch dhood Language D sorders
(f) Instrumentation n Speech Science
(g) Theories of Hearing

Special Graduate Courses: 590, 592 593.

College of Law

WILLARD H. PEDRICK, J.D.
Dean

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.

Juris Doctor Degree

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 and careers in government, business, finance, industry and education.

To fulfill the requirements for a J.D. degree, a student must satisfy all of the following: (1) Admittance to the College as a candidate for the degree and satisfaction of any conditions imposed at the time of admission or prior to graduation during the course of his law study; (2) Satisfaction of residency requirements for the College of Law; (3) Successful completion of a minimum of 85 hours of academic credit with a cumulative weighted average of 70 or better; (4) Completion of all required College courses; (5) Completion of Moot Court requirements; (6) Completion of first year writing research program.

Except in the case of the transfer students, a student must be in residence at the College as a full time student for a minimum of six semesters or their equivalent. A semester in residence is earned where a student has been enrolled in a minimum of ten hours of course work. A transfer student must complete the work of at least two semesters in the College immediately preceding the granting of a degree.

Admissions

First-year students are admitted only for the fall semester. The formal requirements for admission to the College of Law 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 centers throughout the country),

both at a level of achievement giving the applicant reasonable prospect for success in law study.

The deadline for completed applications, with college transcripts on all completed course work, the Law School Data Assembly Service Report and the Law School Admission Test score in the hands of the College of Law, is April 1.

Each year many more students apply than can possibly be accommodated within the educational program of the College. Accordingly, the admission process is selective. Basic factors for evaluation are the undergraduate academic record and the score on the Law School Admissions Test, which are given roughly equivalent weight. The higher the GPA and Law School Admission Test score the better. These are not the only factors considered, however. The admission requirements are flexible and other evidences of ability and an applicant's prospect for significant public service will be carefully considered by the Admissions Committee with the object of selecting those who are likely to succeed in law study. As a state institution, the College weighs residency as a factor in admission.

Course of Study

The program of study in the College of Law is designed for full time students. In the first year of the three-year program, the course of study is prescribed and incorporates the time-proven techniques of legal education. This first year gives 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 second year includes both prescribed and elective courses, a student is required to take at least six of twelve designated courses. 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, and participation in the actual rendition of legal services under licensed practitioners through internships with legal aid and other public law offices.

Grading. FIRST AND SECOND YEAR COURSES. Performance in first and second year law courses is graded under the following numerical scale:

95-88 A, Distinction
87-80 B, Excellent
79-70 C, Good
69-60 D, Deficient
59-50 F, Failure

A grade of 60 or above is required to receive credit for any course.

THIRD-YEAR COURSES. Third year courses are graded under the following categories:

Honors
Pass
Fail

"Honors" grades are awarded only for clearly outstanding performance.

Retention Standards. To be eligible to continue in the law school, a student must maintain a cumulative weighted average of 70 or better at the end of the first academic year and at the end of each semester, summer session and quadrant of the second and third years, respectively.

Any student whose average for the first semester falls below the 70 level is automatically placed on probation. Continuation of enrollment shall be upon such terms and conditions as the College may impose. A student whose cumulative average thereafter falls below the 70 level will be dismissed but may petition the faculty through the Office of the Dean for readmission. Where the academic average deficiency is slight and evidence of extenuating circumstances is convincing, readmission may be granted on a probationary status after a review of the reasons contributing to unsatisfactory performance and a finding that there is substantial prospect for acceptable academic performance. Continuation in school thereafter may be conditioned on achieving a level of performance higher than the overall 70 average.

Special Honors at Graduation. At the time of graduation, students with academic distinction in the study of law may be awarded the respective designations *cum laude, magna cum laude* and *summa cum laude*. Recipients of these awards are selected by the Law Faculty on the basis of graded performance in courses for the first two years and "Honors" grades or other evidence of academic achievement in the third year.

Law Building and Law Library

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.

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 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.

Accreditation

The College is fully accredited by the American Bar Association and by the Association of American Law Schools.

Information. 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 Admissions Office, College of Law, Arizona State University, Tempe, Arizona 85281.

Law

Professors:
PEDRICK (AH 102D) BADLER
BERCH, CANBY, CAPLAN, CLEARY,
DAHL EFFLAND FURNISH LA FRANCE,
LEE MATHESON MORRIS, ROSE,
SCHROEDER

Associate Professor:
ALTMAN

Assistant Professors:
BRUFF, SPIVAK, STRONG, VENABLE

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 counse ing Credit 3 hours

502 Contracts. Continuation of 501 Cred t 3 hours

503 Torts. Protection through the jud cial process of personal ty property and re ationa interests aga nst phys cal appropriationa and defamatory harms Doctr nes of trespass, nu sance neg igence, convers on deceit, pr vacy, slander, libel, seduct on alienat on of affect ons, malic ous prosecution, nducement of breach of contract and unfair compet t on are studied n a variety of factua settings Cred t, 3 hours

504 Torts. Cont nuat on of 503 Cred t, 2 hours

505 Procedure. The nature of judic a power, v ewed n the context of histor cal deve op- ment and constitut onal grants and l m tat ons Cred t, 3 hours

506 Legislation. Use and functions of statutes and egislat've mater als. Lawyer's ro e n the legislative process and train ng in leg s ative research bill draft ng and nterpretat on of statutes. Credit 2 hours

507 Property. Law of real and personal prop- erty various legal and equitable estates n land l fe estates remainders, concurrent interests executory interests m tations on creat on of future nterests Modern concepts of property and an introduct on to the modern efforts to def ne the pub c interest in re ation sh p to the use of the property Credit 2 hours.

508 Property. Cont nuat on of 507. Cred t, 3 hours

510 Constitutional Law. Ro e of courts n the federa system, d stribut on of powers between state and federal governments, ro e of pro cedure n litigation of const tutiona questions, fundamental protect on for person, property polit cal and socia rights. Credit 4 hours.

511 Criminal Law and Procedure. Legis at ve and jud c al formu at ons designed to dea with ant socia activ ty, the substantive e ements of part cu ar crimes, prob ems in the adm nistrat on of cr m nal law and the pena system genera ly Crim na procedures as affected by the requirement of the Federa Constitut on are examined. The role and responsib lities of the egal profess on in the admin strat on and mprovement of our system of cr m na just ce Cred t, 2 hours

512 Criminal Law and Procedure. Continuation of 511 Cred t 3 hours.

513 Legal Research and Writing. Techn ques of research use of the law ibrary prepara- tion of lega memoranda Credit, 1 hour.

550 Administrative Law. Admin strative pro cess, emphasizing nature of powers exerc sed by admin strat ve agenc es of government, problems of procedure and scope of judic a review Credit, 3 hours

551 Antitrust Law. Leg s ation and its mp e mentat on to prevent monopoly and bus ness practices in restraint of trade including restrictive agreements nvo ving price fixing trade associat on act v t es and resale price ma ntenance, as wel as concentrat on of ndus- trial and commercia contro through mergers Credit, 3 hours

552 Commercial Law. Law of negot ab e nstru- ments sa e and secured transact ons with emphas s on the Un form Commercia Code Legal problems arising n the d stribut on of goods Credit, 4 hours

553 Conflict of Laws. Problems ar sing when the operative facts of a case are connected w th more than one state or nat on Choice of law, bases of jurisd ction, effect of fore gn judgments, under ying federa and const tut onal issues Cred t 3 hours

554 Corporations. The corporat on as a lega tool for organ zing the business enterpr se in compar son with sole propr etorsh p and partnersh p Relations of stockho ders and man agement var et es of stock ownership prob ems of corporate finance and government regula tions to ach eve investor protect on Cred t, 4 hours.

555 Evidence. Princip es and pract ce govern- ng the competency of w tnesses and presenta tion of evidence, nc ud ng the ru es of exc usion and ro es of lawyer judge and jury under the adversary system Cred t, 3 hours

556 Federal Income Taxation. Federal ncome tax in re at on to concepts of ncome property arrangements business activity and current tax prob ems, with focus upon the process of tax eg slation and administrat on Cred t, 3 hours.

557 Procedure II. Obtaining and exchanging nformation n advance of tr a , so ating the area of controversy, dispos ng of cases or ssues without tr a , def n ng the scope of tigat on in terms of parties and subject matter and the relationsh p between successive lit ga t ons Cred t, 2 hours.

558 Procedure III. Lit gat on through appeal, ncluding jur sd ction, r ght to jury selec t on of jury, w thdrawing case from jury, n- struct ng jury, verdicts judgments, appellate rev ew Credit, 2 hours.

559 Trust and Estates. Substantive concepts involved in transm tting wea th, nclud ng interstate succession, w s and w ll subst tutes the modern trust as a fam y protect ve de vice creation of future interests n a p anned estate, soc a restrict ons of a nontax nature and methods of devoting property to charitab e purposes. Cred t 4 hours.

560 Legal History. Lawyer s contribut on to society emphasiz ng the l ves of em nent awyers, judges ega scho ars and aw- tra ned statesmen and lawmakers. Credit 3 hours.

561 Jurisprudence. Philosophica problems ra sed by applicat on of aws to soc ety; major schools of legal ph losophy as they re ate to tradit ona and contemporary problems. Credit 3 hours

562 Family Law. Legal and non egal problems wh ch an ndividua may encounter because of h s situation as a member of a fam y Credit 3 hours

563 State and Local Taxation and Finance. State and loca government and fiscal federa ism, egal polit cal, economic and socia aspects of property, sa es corporate and per-

sona ncome and other taxes; bonds and governmental ndebtedness soc a problems fac ng state and oca governments and possible f sca so utions tax exemption and tax immun ty prob ems of lit gation Credit 3 hours

564 Corporate Finance. Applicat on of egal mater als, training and judgment to problems of smal and large scale corporate enterprises. Prob ems nclude selection of the capital structure, public offer ngs of corporate securit es, reorganization of solvent corporate enterprises and corporate disso ut on Cred t, 3 hours

565 Corporate Taxation. Problems n taxabi ty of the corporat on corporate distributions and corporate reorganizat ons Credit, 3 hours

566 Indian Law. nqu ry nto legal problems specia to Amer can Indians and tr bes. Credit, 3 hours

567 Advanced Indian Law. Advanced individual and group study n selected problems of adm nistrat on of tr ba just ce economic development, r ghts of nd vidual Indians. Prerequi site LW 566 Cred t, 3 hours.

568 Law in a Technological Society. Impact of techno ogy on aw and society Such develop ments as computer science nuclear energy and h gh speed transportation wi be consid ered Credit, 3 hours.

569 Law and Medicine. Prob ems ra sed by the interact on of law and medicine Credit 3 hours.

570 Natural Resources Development. Lega prob ems relating to the acquis t on, distribution deve opment and conservat on of natural resources federal state and nterstate prob ems env ronmental control; pub c ands Credit 3 hours

571 Insurance. Current trends n the bus ness of insurance, ro e of government in the insur ance f eld. Cred t, 3 hours.

572 Creditor-Debtor Relations. Cred tors remedies n sat sfaction of cla ms and debtors protect on and rel ef under bankruptcy, other aws Cred t 3 hours

573 Legislative Problems. Research methods and the drafting of legislation; awyer s ro e as a leg s ative advocate Cred t, 3 hours

574 Constitutional Litigation. Selected constitut onal cases from inception through judicial decis on Emphas s on spec a problems of framing constitutiona ssues and overcom ng obstacles pecul ar to const tut ona adjudicat on. Credit 3 hours

575 Securities Regulation. Selected prob ems arising under the major statutes concerned w th regu ating the securities market Cred t, 3 hours

576 Professional Sports. Un que ega prob ems re ating to professiona sports, nc ud ng the r re at onsh p to antitrust aws, the nature of the p ayer contracts and associated tax problems Cred t, 3 hours.

579 Selected Problems in Securities Regulation. Development of pr vate r ghts of action under the Secur ties Exchange Act of 1934 Cred t 3 hours

580 Selected Problems in Taxation. Cred t, 3 hours

584 Consumer Protection. Problems of the ndi v dua purchaser n mass markets Fraud breach of warranty, ho der n due course usury and unconsc onability doctrines for voiding contracts, new protect ve eg slation Cred't 3hours

585 Legal Problems of the Poor. Legal prob ems of the poor in such areas as we fare, housing and consumer law Techniques for attack ng these problems through constitut onal provisions and court processes Cred t 3 hours.

587 Education and the Law. Current legal prob ems affect'ng nst'tutions of higher education; relationsh ps with governmenta agencies, facu ty and students, scope of authority pub c liab lity; f nanc al control Cred t, 3 hours

588 Water Law. Acqu s tion of water rights water use controls interstate conf cts. Credit, 3 hours.

590 Environmental Law. Lit gat on, admin stra t ve aw and leg slat on re at'ng to problems of env ronmenta qual ty such as air and water po ution, pestic des and radiation. Cred t, 3 hours

593 Selected Problems in Tort Law. Credit 3 hours

595 Election Law. Right to vote voter registra t on party organ zat ons; arrangement of the ba lot third party cand dates campa gn f nanc ng and spend ng campa gn l terature· broadcasting, part cipation by pub c emp oyees con duct of e ection day recounts distr cting, n t ative referendum and recal presidentia nom nating convent ons the e ectora college, computers and e ections Cred t 3 hours.

601 Organization and Responsibilities of the Profession I. Organ zed bar, d stribution of ega services n modern soc ety, economics of the profession, professional canons of eth cs for the bar and judic ary and problems n pol cing the profession. Cred t, 3 hours

602 Organization and Responsibilities of the Profession II. Advanced work on se ected problems Cred t 3 hours

603 Professional Skills: Interviewing and Counseling. Ski s and techn ques involved n interview ng and counse ng, inc ud ng nterdiscip nary mater a s from other f elds such as psychology and psychiatry Cred t 3 hours

604 Professional Skills: Problems in the Practice of Law. Skills of negotiation in licensing a variety of s tuat ons and drafting of typica lega nstruments. Cred t, 3 hours

605 Lawyers and Leadership in Society. Re search techniques in the soc al sciences skills n the use of mass med a and techn ques of polit cal act on as related to the needs of the modern awyer Cred t 3 hours

606 Professional Responsibility I. The ethical responsibi ties of the ega profession Cred t 1 hour

607 Professional Responsibility II. Continua tion of 606 Credit, 1 hour

608 Selected Problems in the Administration of Justice. Court congestion, ro e of para lega personne judic a se ection methods arbitra t on group egal services, the adversary

process, techn calit es and justice, lawyer's role n society. Cred t 3 hours.

611 Estate Planning I. Tax aws re ating to transfer of wea th both at death and dur ng ıfet me nclud ng federa estate tax gift tax and ncome taxatıon of estates and trusts. Cred t, 3 hours

612 Estate Planning II. Preparat on of actua estate p ans and ımp ementing lega documents for a variety of typica pr vate c ents. Both tax and nontax e ements ın preparat on of the p ans w ll be cons dered Prerequ s te LW 611 Cred t 3 hours

613 Planning for the Business Client. Plan- n ng transactıons ınvo v ng bus ness organıza t ons with spec a emphasis on ncome tax and corporate cons derat ons Cred t 3 hours

614 Planning Private Real Estate Developments. Lega aspects of rea estate deve opment, n cludıng negot ation, ega dev ces for financ ng promotıon of sales leasıng prob ems and compliance with ega controls, as we as creat on of private contro s over and use. Cred t, 3 hours

621 Practice Court. Students act as awyers n conduct ng a case through all stages of tr a from commencement of the act on to fınal judg ment. Cred t, 3 hours

622 Techniques of Advocacy. Des gned to fam ar ze students wıth the sk s of the advocate by observat on ınstruct on and part cıpat on. Cred t 3 hours

623 Problems of Litigation. Current deve op ments n the f elds of practice procedure and ev dence. Credit 3 hours

624 Federal Courts. Federal judic a system; re a tıonsh p of federa and state aw, jur sdict on of federa courts and their re at on to state courts. Cred t, 3 hours

631 Freedom of Speech. Freedom of speech and ts assoc at on n compet t on w th a number of governmenta and nd v dua nterests, nc ud ng those of preserv ng order, moral ty, fa r tr al and pr vacy Credit 3 hours

632 Equality in Modern Society. Discrım na- tıon ts soc al and legal effects and remedies Focus on constitutıona statutory and pr vate organızatıona attacks upon discr mınatıon on the bas s of race, rel gıon, sex or other classif cations Cred t, 3 hours.

633 Freedom of Religion. Prob ems ar s ng under the estab ıshment and free exercise c auses of the First Amendment ıncludıng the separat on of church and state. Theoret ca and pract cal bases of current federa state and oca government policy toward re gious ınstitut ons Cred t 3 hours

634 Protections from Bureaucracy. Proposed and ex st ng mechan sms for protect on of ndı v duals from governmental act on or inaction. Case stud es of the operatıon of the ombudsman, police c v an rev ew boards and other such nstitut ons. Cred t 3 hours

635 The Supreme Court. Intens ve examınatıon of se ected current decis ons of the U S. Supreme Court Credit 3 hours

641 Legal Aspects of Community Renewal. Bas c soc al structure n a community and poss bili tıes of chang ng the structure to achieve a renewa of the commun ty, ega dev ces to make more effect ve the partıc pat on of mınori- tıes n urban affa rs; organ zat on and d str bu t on of lega serv'ces n urban areas Cred t 3 hours

642 Federal and Local Participation in Urban Problems. Federal programs des gned to a d urban areas n so vıng the prob ems of an urban society. Relat onsh p of these programs to local governments, nd v duals and groups w th n the community Cred t 3 hours

643 State and Local Government. Lega prob- ems nvo ved n the organ zatıon and adm n s trat on of governmenta un ts nc ud ng the c ty, county town v age schoo d strıct and spec a d str ct Cred t 3 hours

644 Area Planning. Selected ega prob ems re at ng to reg ona deve opment and to the ro es of pr vate and pub c p ann ng for such develop- ment Emphas s on and use controls ava able to oca state and federa governments such as zon ng, condemnat on deve opment regu a t ons and spec a renewa programs. Federa programs relating to hous ng and urban development are a so covered. Cred t, 3 hours

651 Labor Relations. Col ect ve barga nıng, n clud ng the r ght of emp oyees to organize and to engage ın concerted act v t es, reso utıon of quest ons concerning the representat on of employees duty of employers and un ons to barga n adm n strat on and enforcement of co ect ve bargaın ng agreements Credıt, 3 hours

652 Labor Arbitration and Mediation. Role of the arbıtrator and medıator n the sett ement of abor management d sputes. Enforceabı ty of awards, procedure and the operat on of arb trat on associatıons Cred t, 3 hours.

653 Selected Problems in Labor Law. Advanced quest ons n the col ect ve bargaining area Credıt, 3 hours

654 Modern Social Legislation. S gn fıcant leg slat ve programs of soc a nsurance and governmenta responses to such prob ems as un- employment and disab ty Cred t 3 hours

661 Criminal Behavior and Criminal Law. Lega problems raısed by the var ous systems of soc al contro Objectıves of the cr mına just ce system theor es as to the dynamics of cr m nal behavior and spec f c questıons ra sed by the behav or of c asses of offenders Credıt, 3 hours

662 Administration of Criminal Justice. Ad m n stratıon of the adu t cr m na just ce system ncludıng issues ar s ng ın the ınıt a police stage of the system the trıal process and the sentencıng and correct ona stages Cred t, 3 hours

663 Juvenile Justice Systems. Specıa prob- ems ın the uveni e system Cred t, 3 hours

664 Law and Psychiatry. Menta health system as a companıon to the adu t cr mına system and the juveni e just ce system n contro l ng ant soc a behav or Cred t 3 hours

666 Criminal Appeals Seminar. Actua research and preparatıon of the br ef for a crımınal case on appea n the state courts Cred t, 3 hours

671 Regulated Industries. 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 problems 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.

675 Selected Problems in Antitrust. Private enforcement techniques in antitrust. Review and analysis of the various defenses, procedural problems and damage issues. 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. Comparison of laws and legal institutions of major world legal systems. 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. The effect of law in social change and development through agrarian reform, industrial development, economic integration. Emphasis on Latin America. Credit, 3 hours.

688 International Business Transactions. Problems and policy considerations involved in international trade; tariffs, international monetary controls, development loans, etc. Credit, 3 hours.

700 Internship in Law. Supervised, practical experience with such agencies as Legal Aid, Public Defender Office, 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.

703 Law Journal. Academic credit for successful completion of work by a member of the staff of *Law and the Social Order;* 3 credit hour maximum. Credit, 1 hour.

704 Moot Court. Academic credit for successful completion of work as a member of the Moot Court Board of Directors; 3 credit hour maximum. Credit, 1 hour.

Graduate School of Social Service Administration

HORACE W. LUNDBERG, PH.D.
Dean

The graduate program in social work is a two-year course of study leading to the degree of Master of Social Work (MSW).

The curriculum is designed primarily for full-time study through four semesters, entry is limited to the fall semester. Some part time coursework is available, but no more than ten hours taken as a part time student may be applied to the MSW.

The need for professional social workers is high throughout the United States. The School's program affords the student experience in integrated academic theory and field experiences for professional practice in the ever expanding field of social work. The diverse heritage and cultures to be found in Arizona also offer stimulating educational experiences preparing for service in the Southwest as well as throughout the nation

The admissions requirements are equivalent to and consistent with the University and the Graduate College A well rounded undergraduate background is desirable, including 30 hours in social sciences (e.g., sociology, psychology, economics, anthropology, political science and public administration)

Application is made directly to the Graduate School of Social Service Administration For information regarding the course of study, admissions procedure and application form, write to the office of the Dean

The Graduate School of Social Service Administration employs a modified grading system See the School's *Bulletin* for details.

Social Service Administration

Professors:
LUNDBERG (WEST HALL MECH
Associate Professors:
COUDROGLOU BOWMAN CRANMER ENGELHARDT HILL POLENZ
Assistant Professors:
BANKHEAD BRUTON GALLEGOS GLICKEN HARTJE MANN NICHOLS, RUIZ, WOODMAN
Field Instructors:
BAGLEY BIGPOND BOWER, BOYD BRAND, BRANNON, GRAVELL GREGG HENNEFER, MORGAN

SW 591 Seminar. Topics offered in specialized areas Credit, 1 3 hours

594 Conference and Workshop. Topics offered in specialized areas Credit 1 3 hours.

602 Social Services and Policy I. Historical antecedents and current programs designed to meet social needs Social, political and economic forces affecting development of social services Credit 2 hours

603 Social Services and Policy II. Current social welfare problem policy and provision with in a) network of social services, social work principles and concepts related to Phoenix and Arizona agencies or (b) poverty as a focus to social policy Credit 2 hours each

609 Community Mental Health. Concepts of social psychiatry and their influence on the development of intervention strategies. Credit, 2 hours

610 Human Behavior in the Social Environment I. Family individual behavior continuity through the lifecycle Knowledge of normal growth with contrasts to pathological processes. Content discussed in terms of concepts and

hypotheses derived from ego psychology. Credit, 3 hours.

611 Human Behavior in the Social Environment II. The minority experience: examination of the problems of racial and ethnic minorities and subsequent effects on human behavior. Concepts of culture, subculture, life style, socialization, values, acculturation, racism, and discrimination. Credit, 3 hours.

615 Social Work Methods I. Methodological base of social work practice. Investigations of major areas of knowledge, values and skills basic to social work helping process with individuals, families, nonrelated groups and communities. Credit, 2 hours.

616 Social Work Methods II. Identification of social problem situations and steps leading to resolution. Focus on differential solutions to problems in social functioning. Credit, 4 hours.

620 Basic Group Dynamics. Beginning knowledge of theoretical aspects of group behavior related to the development of the individual. Laboratory experience in discovering influence of group membership on the growth of self. Credit, 2 hours.

621 Group Process in Social Work. Application of small group theory and group dynamics knowledge to the practice of social work. Focus on developing small group theory for use by the student in both roles of worker and of group member. 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 ascribing implications for social work policy and practice. Credit, 2 hours.

640, 641 Field Instruction. Two consecutive semesters in social work practice in a qualified agency. Credit, 4 hours each.

650 Social Services and Policy III. Social services and structure in selected medical, correctional, public school and social welfare agencies. Credit, 2 hours.

651 Social Issues, Problems and Policy. Contemporary social issues, societal problems and policy. Role of social work profession. Credit, 2 hours.

655 Social Welfare Administration. Administrative structure of social agencies and aspects of social worker's job. Administration as a process. Differential administrative role. Credit, 2 hours.

660 Human Behavior III (Pathology). Major disorders within the general concept of pathological processes as attempts to deal with overtaxing stress situation. Interacting physical, psychological and sociocultural factors in the maturation and development processes. Their influence on vulnerability to mental illness or result in deviant personality development. Credit, 2 hours.

661 Human Behavior IV (Specified Aspects of Behavioral Theory). Selection of one or more advanced courses from: 1. Psychopathology in Family Interaction. Family as a social system with focus on normal and pathological interactional processes within the family and between the family and environment. 2. Comparative Personality Theories. 3. Socio-Cultural Perspectives of Human Behavior. Credit, 2 hours each.

665 Social Work Methods III. Advanced application of principles. Practice in context of selected philosophies and theories of change. Credit, 2 hours.

666 Social Work Methods IV. Elective seminars directed toward intensive study of practice areas: (1) Social work supervision, (2) strategies for individual and family change, (3) social work with nonrelated groups, (4) staff development and in-service training, or (5) strategies for environmental and community change. Credit, 2 hours each.

680, 681 Field Research. Concurrent seminar and practicum emphasizing applications of research strategies to social work practice. Completion of practice-related study required. Students participate in cooperative project or elect individual thesis. Credit, 2 hours each semester.

690 Reading and Conference.

693, 694 Field Instruction. Two semesters continuation of 640, 641 in a different agency. Credit, 4 hours each semester.

695, 696 Elective Field Instruction. Field instruction in specialized area. Credit, 1-2 hours each semester.

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.

The primary purposes of the Graduate College are to provide the student with opportunities for advanced study, and to foster the spirit of scholarship and research. The critical analysis of information and the ability to arrive at a level of understanding beyond that already existing plays an integral role in graduate education.

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 Science
Master of Architecture
Master of Arts in Education
Master of Business Administration
Master of Counseling
Master of Fine Arts
Master of Music
Master of Natural Sciences
Master of Public Administration
Master of Social Work
Master of Science in Engineering
Education Specialist
Juris Doctor
Doctor of Education
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, Economics, Engineering, English, French, Geography, Geology, German, History, Home Economics, Humanities, Mathematics, Microbiology, Music, Nursing, Philosophy, Physical Education, Physics, Political Science, Psychology, Sociology, Spanish, Speech Speech Pathology, Technology, Theatre 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 Admissions Office, Graduate College.

At least two months before the first enrollment, the Graduate College should have received the application for admission and two transcripts of all undergraduate and graduate work. The transcripts are to be sent directly to the Admissions Office, Graduate College by the registrar of each college or university which the applicant

previously attended The applicant should wr te to the registrars concerned and then allow them time to process and ma l the transcr pts A qualified applicant, whose applicat on has been filed later than the deadline, may be permitted t > enroll in graduate classes as a nondegree student. He will maintain that status until all of the required forms and transcripts have been rece ved and a decision regarding his admission to a program has been reached by the college or department concerned and by the Graduate College.

A student's official status for a semester is determined by his status at the end of that semester.

A l documents received by the U niversity in connection with such applications for admission become the property of Arizona State University. U nder no circumstances will they be duplicated, returned to the applicant, or forwarded to any agency or other college or un versity

Admission to the Graduate College is granted to applicants who have earned a bachelor's or graduate degree from an accredited college cr university and who present convincing evidence of their ability to pursue successfully a graduate degree program at Arizona State U n versity C ertain departments re quire the submission of scores received on the Graduate Record Examination, or other predictive measures, and letters of recom mendation Applicants will be notified of these requirements by the departments l etters and reports on scores received should be sent directly to the department by the testing service or agency In all instances, the college or department in which the student wishes to study must indicate its will ngness to admit the student. All applications for admission must be approved by the Dean of the Graduate Co lege When faculty or facil ties are limited, a department may set standards h gher than those established by the Graduate College and may recommend denial of a student whose academic record s superior to the minimum requirements described below.

Applicants may be admitted to a graduate program under two classifications.

Regular Admission. Applicants are ordinarily gr nted regular admission to the Graduate Co lege 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 'f his undergraduate overall grade point average is at least 2 5, and in addition his undergraduate ma or average is "B" or his average in the last two years of undergraduate work is "B". Letters of recommendation, test scores, and completed graduate work are also considered in determining admission classification.

Provisional Admission. An applicant may be granted provisional admission to the Gradu ate C ollege if the department or academic unit in which he plans to study requires additional evidence of his qua ification for admission with regular status. No student may maintain provisional status indefinitely Normally, final determination of status will be made by the time the student 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

Non-Degree Status. An applicant who is not pursuing a graduate degree program may be registered in the Graduate College in a non-degree status. The student is referred to the Scholarship section regarding the subsequent use of such courses in a degree program.

Foreign Student Admission. Applicants from foreign countries should write to the Admis sions Office, Graduate College at least one year prior to the date they plan to begin study They will receive the necessary instruc t ons and application blanks which are to be comp eted and returned to that office. Appli cants should make sure that other documents are sent at about the same time, especially transcripts from colleges and universities attended, letters of recommendation, results of the Test of English as a Foreign Lan guage (TOEFL), 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 is sued a passport or visa.

Re-Entry to the Graduate College. Any former graduate student who has not been in attendance at Arizona State U niversity for one or m ore regular semesters must obtain an application for re-entry from the Admissions Office, Graduate College This applica tion 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 directly to the Admissions Office, Graduate College at Arizona State University from the office of the Regis trar at the institution where such credit was earned

Student Responsibility. It is the responsi b lity of the graduate student to become conversant w th and observe all procedures and requirements of the Graduate College as defined in the *Graduate Bulletin* and to be familiar with the U niversity's policy in regard to student conduct as described in the section, "Student Membership in the University,"

of 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 during a summer session or during 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 Univeristy 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 regular admission to the Graduate College, 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 should 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 credit. At the graduate level course work, whether or not formal in nature serves mainly as a guide for independent study. Students are expected to exceed minimum requirements of all kinds and to master subjects rather than simply to pass courses.

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.

A student receiving a grade of "E" must repeat the course in the regular class if he wishes to include it in his program of study. Both the "E" and the new grade are entered on the student's permanent record.

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.

Extension and Transfer Credit. Up to 12 semester hours of credit toward a master's degree may be earned in extension courses offered by Arizona State University. Students who take graduate extension courses with a view to meeting degree requirements should apply for admission to the master's degree program. Extension courses completed through the University of Arizona or Northern Arizona University are eligible for transfer toward a master's degree on the same basis as residence courses. Extension courses offered by other universities may not be included in an approved program of study. It should be remembered that not more than 10 semester hours of graduate credit completed before admission to the degree program will be accepted toward a master's degree. A minimum of 18 semester hours must be completed on campus.

Graduate Credit Courses. Courses carrying graduate credit are numbered 500, 600 and 700. Courses at the 400 level bear graduate credit when taken by graduate students. However, only those courses appearing on the approved program of study may be applied toward a graduate degree.

Foreign Language Requirement. Language requirements for graduate degrees are determined by the departments concerned. If a foreign language is required a student must demonstrate at least a reading knowledge of the language which is recommended by his committee and approved by his department chairman. Normally these will be selected from French, German, Russian or Spanish, although other languages may be recommended when there is adequate justification.

Language competency is certified by the Graduate College. Foreign Language examina

tions (ETS examinations) are administered by the University Testing Service. Examinations in languages other than those available through ETS are administered by the Department of Foreign Languages. Students planning to take the ETS Foreign Language examination must register at the University Testing Service at least three weeks prior to the examination date. Only three attempts will be permitted. Satisfactory ETS scores achieved as an undergraduate will be accepted within a six-year time limit. Students who maintained at least a "B" average in the second full year of language taken at an accredited university and completed within the last six years may petition to be exempt from the test.

The language requirement may be fulfilled by special reading knowledge 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.

Graduation. Students should apply for graduation no later than the date specified in the *Graduate Bulletin* 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 258-259. 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 18 semester hours of approved graduate work taken on the University campus is required.

Foreign Language Requirement. Language requirements are determined by the department concerned. For certification of proficiency, see page 26

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 foreign language requirements. Changes in the planned program after admission to candidacy must be recommended in writing by the student's supervisory committee, department chairman, 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, 134 Mocur Administration Building.

Final Examinations. A final examination, written, oral or both, administered by the department or academic unit, is required. The dates of the written examinations are set by the Graduate College once each semester and once each summer session, as listed in the *Graduate Bulletin* 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 oral examination in defense of the thesis must be conducted at least three weeks before Commencement. A faculty member,

who will be from outside the department, will be appointed by the Graduate Dean for the final oral examination in defense of a thesis. Applications for the final comprehensive examinations are available in the Graduate College office

Transfer of Credits. A maximum of 6 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 an "A" or "B" grade may be transferred. Grades on transferred credit cannot be included in the grade point average

Extension Courses. Up to 12 semester hours of credit toward a master's degree program may be earned in Extension courses, six of which may be transferred credits Extension courses completed through the University of Arizona or Northern Arizona University are eligible for transfer on the same basis as residence courses Only those credits earned in Extension courses taught by the resident faculty of one of the three universities qualify for transfer. Extension courses offered by other universities may not be included in an approved program of study

Maximum Limit. All 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
Counseling and Student Personnel
Curriculum and Instruction
Educational Administration and Supervision
Elementary Education
Secondary Education
Social and Philosophical Foundations of Education
Teaching Specialist Secondary Education Subject Matter Fields

(See list in the *Graduate Bulletin* under Secondary Education Subject Matter Fields)

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 Admission is determined by a variety of criteria in addition to grade point averages. These criteria are specific to particular programs Information is available from departments offering the particular programs

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 A graduate student is considered to be a "full-time student" in a semester if he is enrolled in 10 or more semester hours, not more than four of which may be dissertation credit. Full-time graduate students shall not be employed more than a maximum of one-half time as either a graduate assistant, a graduate associate or in other employment Individual departments may with the approval of the Dean of the College of Education and the Graduate Council, modify this definition in particular cases. 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 department. This examination is scheduled through the chairman of the supervisory committee and department chairman and must be held at least three weeks before the Commencement date as listed on the *Graduate Bulletin* calendar.

Graduation. After the final oral examination has been passed the student is eligible for graduation.

Maximum Time Limit. The Education Specialist degree requirements must be completed within a 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 258-259. Graduate students may apply for admission to the Ph.D. degree program by filing a written application with the Admissions Office, Graduate College.

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 at least 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, his department chairman, and 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 Dean of the Graduate College. Only courses with an "A" or "B" grade may be transferred.

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 study must be spent in continuous full-time residence at Arizona State University, and at least 30 hours of approved graduate credit must be completed at this institution.

Foreign Language Requirements for the Ph.D. Degree. Language requirements are determined by the department concerned. For certification of proficiency see page 260.

Comprehensive Examinations. When a student has essentially completed the course work in an approved program of study and has satisfied any 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 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 in preparation for professional practice. A dissertation based upon this research 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
- Art Education
- Business Education
- Counseling and Student Personnel
- Curriculum and Instruction
- Educational Administration and Supervision
- Educational Technology
- Elementary Education
- Health and Physical Education
- Industrial Education
- Mathematics Education
- Music Education
- Physics Education
- Science Education
- Secondary Education
- Social and Philosophical Foundations of Education

Admission to the Doctor of Education Degree Program. A student who seeks admission normally will 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 258-259. In addition, a variety of criteria are employed to determine admission. Specific information may be received by consulting the appropriate department chairman.

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. At least 59 semester hours of the learning experiences should be at the 500 level or higher.

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 Dean of the Graduate College. Only courses with "A" or "B" grades may be transferred.

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 by completing 30 semester hours within a period of 18 consecutive months. Not more than 10 semester hours of dissertation credit may be included in the course work used to meet the residence requirement. Additional full time residence may be required by certain departments in order to meet special needs. (See "full time student" definition under Education Specialist Degree *Residence*.)

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 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.

Final Examination. The final oral examination in defense of the dissertation will be scheduled by the Dean of the Graduate College This examination will be conducted by the supervisory committee and others appointed by the Dean of the Graduate College. The final oral examination must be held 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. He must apply for graduation through the Office of the Registrar

Maximum Time Limit. All requirements for the Doctor of Education degree must be completed within five years after the first of the comprehensive examinations has been passed.

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 written and oral 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 Admissions Office, Graduate College 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 A student with no previous course work in basic calculus is to take a course incorporating such coverage after admission to the D.B A. program

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 from the student's supplementary fields, and 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 the graduate study in business For most students, the program will consist of 36 to 54 semester hours of course work beyond the master's degree

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 at least 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 and the Dean of the College of Business Administration 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. If a student does not pass a written comprehensive examination, he must file a revised program of study which normally reflects prescribed additional formal course work. He must also complete the course work 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. For either written or oral examinations, only one re-examination is permitted. At least three months must elapse before a re-examination may be scheduled.

Admission to Candidacy. A student applies for candidacy when he has completed his general oral examination and has a dissertation subject submitted to and approved by his dissertation committee. 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 re-admitted 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 Bulletin* 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

DENIS J. KIGIN, ED.D.
Dean and Director

University Extension

The opportunity for continuing education is offered through University Extension. The following services are provided: credit extension classes, correspondence study, community services, instructional television, and assistance in the development and administration of conferences, institutes and other non credit activities.

Extension Classes. Extension classes are organized to provide continuing education for adults who are unable to undertake full-time or regular night classes at ASU. These classes fill a variety of needs such as providing courses leading to undergraduate degrees, offering post baccalaureate studies leading to professional or graduate degrees, providing opportunities for individuals to continue development as citizens and members of the community, and augmenting the general responsibility of the university to give individuals an understanding of the importance of continuing education throughout their lives.

Extension courses may be applied toward a bachelor's or advanced degree requirements. Up to 12 semester hours of credit toward a master's degree program may be earned in Extension courses, six of which may be transferred credits. Extension courses completed through the University of Arizona or Northern Arizona University are eligible for transfer on the same basis as residence courses. Only those credits earned in Extension courses taught by resident faculty of one of the three universities qualify for transfer.

The fee for extension courses is $16.00 per semester hour and is payable at the time of registration. For further information write the Office of University Extension, Arizona State University.

Correspondence Study. The services of teaching faculty and departments are extended through the mails. College credit correspondence courses offered by Arizona State University are specifically designed for the student who cannot attend classes on campus. They are offered for those who are seeking to fulfill degree objectives as well as for those who wish to increase their occupational, professional or intellectual skills.

A correspondence course consists of eight lesson assignments for each semester hour of credit and generally requires the same amount of work as the course taken in residence. Eight to ten hours are normally required in preparing each assignment.

Students who receive a failing grade in an on campus course or in a course offered through University Extension may not use correspondence study to make up the deficiency. 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. Students are limited to a maximum of two courses (six credit hours) taken at one time.

A maximum of 30 semester hours of credit earned in correspondence and or by comprehensive examination may be applied toward the baccalaureate degree at Arizona State University. Correspondence courses are not applicable as graduate credit toward advanced degrees.

The fee for correspondence courses is $16.00 per semester hour of credit and is payable at the time of registration. Persons desiring to enroll in correspondence study should write to the Correspondence Study Office, University Extension, for an enrollment form and a brochure listing the courses available.

Admission to Extension and Correspondence Courses Programs: Registration in an extension or correspondence course does

not constitute admission to a degree candidacy. At Arizona State University, admission as a degree candidate is a separate procedure

Community Services Program. The Community Services Program is an agency of Arizona State University designed to bring the resources of the University its faculty, staff, students and facilities to bear on the problems of the disadvantaged Administered through University Extension, the center is designed to assist other community agencies and individuals in developing and coordinating programs which are dedicated to eliminating poverty and social injustices.

Instructional Television Services. Television is a convenient, effective and available educational delivery system. Through television, it is possible to deliver education to all the adult population of Central Arizona in the places where they live, work and play. Instructional Television Services will advance television as an educational delivery system capable of turning homes, businesses and schools in rural and urban communities into university classrooms.

Instructional Television Services seeks to make the limited resources of higher education more effective in meeting the needs of the poor and the unemployed, in correcting social and environmental debilitation, and in assisting community leaders as they cope with new responsibilities by calling upon university resources to serve the continuing educational needs of all adults in Central Arizona.

Summer Sessions

The Summer Sessions provide an opportunity for students to complete degree requirements in less than the normal four-year period The opportunities for study are much the same as those of the academic year. 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 All classes are held in air conditioned classrooms and laboratories.

The opportunity for the foreign travel and study is available during the summer through selected study tours. The tours are directed by regular faculty members and allow students to earn undergraduate or graduate credit All summer programs are available to the residents of the State of Arizona, as well as those from out of state. Professional conferences, institutes, workshops and seminars are also offered on campus during the summer.

Terms: The Summer Sessions consist of four sessions; two of eight weeks and two of five weeks.

Credit and Residence Requirements. Students are permitted to earn a maximum of 6 semester hours of credit each five week session and 9 semester hours of credit each eight-week session. 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.

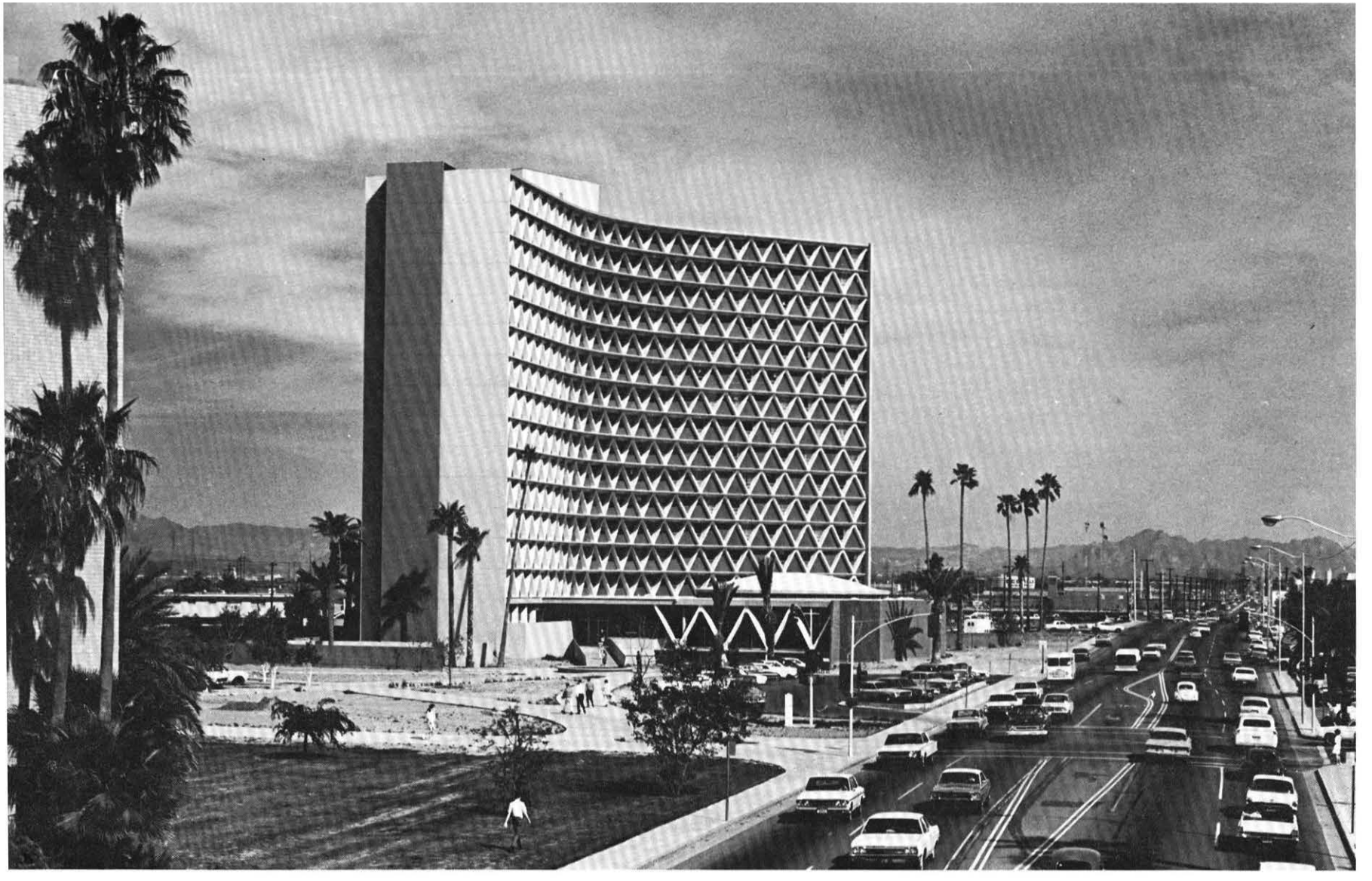
Enrollment. In general, applicants for admission are expected to present evidence of graduation from an approved four-year high school, or evidence of good standing in an accredited college. Mature students, over 21 years of age, are admitted without the above qualifications, but with the understanding that all admission requirements must be satisfied before they can become candidates for the bachelor's degree.

Graduate Study. Summer Sessions offer an excellent opportunity for B.A. or B.S. degree holders to continue their professional development Candidates for graduate degrees should pay particular attention to the requirements for graduate admission and study.

Fees and Expenses. The Summer Sessions fee is $18.00 per semester hour, in addition to a student activity fee. Textbooks and supplies are available for purchase at the University Bookstore on campus. Room and board for the summer are available on campus at the prevailing rates.

Information. Requests for the Summer Sessions *Schedule of Courses* or for other information should be addressed to the Office of Summer Sessions at Arizona State University.

Manzanita Residence Ha



Faculty, University Offices and Services

Arizona Board of Regents

EX OFFICIO

Jack Williams . . . . . *Governor of Arizona*
W. P. Shofstall, B.S. in Ed., M.A., Ph.D. *Superintendent of Public Instruction*

APPOINTED

John A. Lentz, B.S.M.E.	Gordon D. Paris
Norman G. Sharber	James Elliott Dunseath, B.A., J.D.
Margaret M. Christy, B.A.	Kenneth G. Bentson
Paul L. Singer, B.S., M.D., F.A.C.S.	Sidney S. Woods, B.S.

•

Thomas L. Hall, B.A., LL.B. . . . . *Advisor to the Board*
Lawrence E. Woodall, B.S. . . . . *Executive Coordinator*

General Administration

John W. Schwada . . . . . *President of the University, Professor of Political Science*
B.S., Northeast Missouri State College; M.A., University of Missouri, Ph.D., University of Texas

Karl H. Dannenfeldt . . . . . *Academic Vice President, Professor of History*
A.B., Valparaiso University, M.A., Indiana University, Ph.D., University of Chicago

George E. Hamm . . . . . *Vice President, Student Affairs, Professor of Education*
B.S., South Dakota State College; M.A., Ph.D., University of Wyoming

William J. Burke . . . . . *Vice President, Graduate Studies, Dean, Graduate College, Professor of Chemistry*
A.B., Ohio University; Ph.D., Ohio State University

Gilbert L. Cady . . . . . *Vice President, Business Affairs*
B.A. in Ed., Arizona State University

V. Alonzo Metcalf . . . . . *Vice President for Administration, Professor of Economics*
B.S., University of Arkansas, M.S., University of Arkansas, Ph.D., University of Missouri

_____ . . . . . *Dean, College of Liberal Arts*

James W. Elmore . . . . . *Dean, College of Architecture, Professor of Architecture*
A.B., University of Nebraska, M.S. in Architecture, Columbia University

Glenn D Overman . . . . . *Dean, College of Business Administration, Professor of Business Administration*
B S , Central State College, M S Oklahoma State University, D B A Indiana University

Delbert D Weber . . . . . *Dean College of Education· Professor of Education*
B A Midland College, M Ed Ed D , University of Nebraska

Lee P Thompson . . . . . *Dean College of Engineering Sciences Director, School of Engineering Professor of Engineering*
B A , Indiana University, M.S., Ph D , Texas A & M University

Henry A Bruinsma . . . . . *Dean College of Fine Arts, Professor of Music*
B M , M M Ph D , University of Michigan

Willard H Pedrick . . . . . *Dean, College of Law, Professor of Law*
B A , Parsons College, J D , Northwestern University

Horace W Lundberg . . . . . *Dean, Graduate School of Social Service Administration; Professor of Social Work*
B S , M S University of Utah, M S W , University of California, Berkeley, Ph D , University of Minnesota

Denis J. Kigin . . . . . *Dean, University Extension, Director, Summer Sessions; Professor Industrial Technology*
B S , Mankato State Teachers College, M S , The Stout Institute, Ed D , University of Missouri

Troy F. Crowder . . . . . *Assistant to the President· Director University Relations, Associate Professor, Mass Communications*
B A University of South Dakota, M A , University of Iowa

_____ . . . . . *University Librarian*

Resident Faculty

Abbott, John C (1956 . . . . . *Professor Emeritus of Education*
B S , M S in Ed , Ed D , Indiana University

Abbott, Nancy C (1971 . . . . . *Instructor in Nursing*
B S N Arizona State University, M S , University of California, San Francisco

Abdow, Miriam J. (1965) . . . . . *Instructor in French*
M A , University of Paris France

Abrahim, Willard (953) . . . . . *Professor of Education· Chairman Department of Special Education*
B S , Illinois Institute of Technology, M Ed , Chicago Teachers College Ph D , Northwestern University

Abrahamson, Anne M (1971) . . . . . *Instructor in English*
B.A Arizona State University, M A , Western Washington State College

Acevedo, Roberto M (1964) . . . . . *Assistant Professor of Spanish*
B A , University of California, Berkeley, M A , Ph D , University of Arizona

Acker, William J. (1970) . . . . . *Associate Professor of Geography*
B S , Purdue University, M S , University of Kansas, M A., Ph D Syracuse University

Adams, Vaughn P., Jr (1968) . . . . . *Assistant Professor of Industrial Design*
B S , M S , Arizona State University

Adams, Wallace E. 1958 . . . . . *Professor of History Chairman, Department of History*
B S M A , University of Oregon, Ph D., Stanford University

Ahern, Maureen V. (1972) . . . . . *Assistant Professor of Spanish*
B A , University of New Hampshire, Bachiller, Doctor en Letras, Universidad Nacional Mayor de San Marcos

Ahmadzadeh, Akbar (1966) . . . . . *Associate Professor of Physics*
B A., Ph D , University of California, Berkeley

Alarcon, Justo S (1968) . . . . . *Assistant Professor of Spanish*
B A , M A (Theo), Seraf ca Spain), M A (Socia Sc , Lava University (Cordoba , M A Spanish Arizona State University

Alcock, John P (1972) . . . . . *Assistant Professor of Zoology*
B A , Amherst College, Ph D Harvard University

Aldrich, Frank T. (1969) . . . . . *Assistant Professor of Geography*
B A , University of Texas, M S , Ph D Oregon State University

Alisky, Marvin H (1957) . . . . . *Professor of Political Science*
B.A , M J , Ph D , University of Texas

Allen, Theodore, Jr (1959) . . . . . *Professor of Engineering*
B S M E , M S M E , Texas A & M University

Apher, Barry J (1968) . . . . . *Assistant Professor of Anthropology*
B A University of Chicago

Anderson Bruce A (1966) . . . . . *Associate Professor of Mathematics*
B A , M S , Ph.D , University of Nevada

Anderson, Ethel C (1966) . . . . . *Assistant Professor of Education, Counselor University Counseling Service*
B S , Utah State University, M. Ed , Ed.D , University of Wyoming

Anderson, Marlowe R 1972) . . . . . *Assistant Professor of Technology*
B S E E. University of Colorado

Anderson, Melvin S. (1967) . . . . . *Associate Professor of Real Estate*
B S , M S Oklahoma State University, Ed D , University of Arkansas

Anderson, William A (1969) . . . . . *Associate Professor of Sociology*
B A University of Akron, M A , Kent State University, Ph.D Ohio State University

Andress, Barbara L (1972) . . . . . *Associate Professor of Music*
B A , M A , Arizona State University

Apilado, Vincent P. (1969) . . . . . *Associate Professor of Finance*
B S , University of Portland, M B A , University of Oregon, Ph D , University of Michigan

Appleton, Nicholas R (1972) . . . . . *Assistant Professor of Education*
B A , San Francisco State College, M A , San Fernando Valley State College, Ed D , University of Massachusetts

Archer, Jerome W. (1963) . . . . . *Professor of English*
B.A M A , Marquette University Ph D , Northwestern University

Armstrong, Robert L. (1967) .... *Associate Professor of Education*
B A , State Teachers College of Iowa, M S , University of Iowa, Ed.D , University of Ar zona

Arner, Douglas G. (1959) . . .. *Professor of Philosoph*
B S , Creighton U niversity M A , Ph D , Un versity of M ch gan

Aronson, Jerome M. (1966) ..... . *Professor of Botany Microbiology*
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 Cal forn a

Atsumi, Takayori (1968) . ..... *Assistant Professor of Music*
B M A , Kun tachi Mus c Co leg· (Japan M M , New England Conservatory of Music

Ausberger, Carolyn (1972) . ..... *Instructor in Speech and Theatre*
B A , Un versity of Missouri Kansas City, M A , Un versity of Iowa

Autenrieth, Bertha (1946) .... *Professor Emeritus of Music*
B M , New England Conservatory, M M , Un versity 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 M E , M S.E M , Univers ty of Mich gan, Ph.D , Purdue University

Ax, Leland S (1959) . ... *Associate Professor of Engineering*
B S E E , B S R E , Iri State Col ege M S Kansas State Co ege

Axelrod, Morris (1972) . . . . *Professor of Sociology*
B A , Ph D , U niversity of Michigan

Bachmann, Betty J (1969) .... *Assistant Professor of Health Physical Education and Recreation*
B.S (Nursing), M P.H , Univers ty of California, Los Ange es

Backus, Charles E. (1968) .... *Associate Professor of Engineering*
B S.M E Ohio Un versity, M S Ph.D. U niversity of Arizona

Badler, Leland (1970) . . ... . *Professor of Law · Director of Institute of Legal Resources*
A B , N Y.U University Co lege; J D., Columbia University

Bagley, Weldon D (1961) ..... . *Instructor in Technology*
B S , Utah State U nivers ty

Bahr, Donald M (1967) ..... *Assistant Professor of Anthropology*
A B M A , Ph D Harvard U n ver ity

Baker, Donald H (1965) . ... *Instructor in Health, Physical Education and Recreation, Assistant Football Coach*
B S M A , North Texas State University

Baker, Georgianne R (1971) . . . . *Assistant Professor of Home Economics*
B S , Marygrove C l ege, M S , Ohio State U nivers ty, Ph D Mich gan State U niversity

Baker Virgil R (966) . . .. *Professor of Geography*
B S M S U niversity of Nebraska, Ph D , U n versity of Utah

Baldwin, Lucille M. (1971) ..... *Assistant Professor of Nursing*
B S N , M S N , Arizona State University

Baldwin, Mary A (1969) .. .. *Instructor in English*
B A , M A , Arizona State University

Ball, Rachel S. (1947) ..... . *Professor Emeritus of Psychology*
A B , University of Missouri, Ph D , University of Chicago

Bankhead, Marilyn J. (1969) .. .. *Assistant Professor of Social Work*
B A , M.S W Ar zona State University

Bardewyck, Loretta A. (1957) .. .. *Professor of Nursing*
R N , Michael Reese Hospital School of Nursing, P H N , B S , University of Minnesota, M S., Cornell University

Bardrick, Richard A (1956) ..... *Associate Professor of Psychology*
A B Ph D , Un versity of California, Los Angeles

Barkley, Margaret V (1963) . ..... *Professor of Home Economics, Supervisor for State Department of Education*
B S , Mi likin University, M S Ed D , University of Illinois

Barkson, Joseph A (1958) .. .. *Professor of Engineering*
B S E E , University of Michigan; M.S , Ph D University of Illino s

Barlow, Richard B. (1965) ..... . *Professor of History*
B A., M.A , Ph D Un versity of Pennsylvania

Baron, C Dav d (1971) .... *Associate Pr fess r of Accounting, Research Asso iate Bureau of Business and Econ mic Research*
B A , Southwest M ssouri State Co lege· M A , University of M ssouri, Columb a, Ph D , University of Illinois

Baron, Mary A. (1972) .... *Assistant Professor of Education*
B A , M A , Ph D , Arizona State University

Baroody, Wilson G (1957) .... *Assistant Professor of English*
B A , Grand Canyon Co lege, M A., Un versity of Arizona

Barrett, Thomas W (950) .... *Professor of Agriculture*
B S , Br gham Young University, M S., Ph D , Cornell Univers ty

Bartel, Carl R (1968) .... *Professor of Technology*
B S M S , Kansas State Co lege of Pittsburg Ed D University of Missour

Barthels, Katharine M (1972) .... *Assistant Professor of Health Physical Educat n and Recreation*
B S , University of California, Los Ange es, M A , Un versity of Ca fornia, Sa ta Barba a , Ph D W shington State University

Bartz, Donna R (1968) .. .. *Assistant Professor of Speech and Theatre*
B I A , M A , Ur versty f Co orad

Bassford, Gerald L (1969) .... *Assistant Professor of Management*
B S , M S , niversty of Wy ng D B A , Indiana U n versty

Batchelor, Haro d W (1943) . .. *Pr fess r Emeritus of Library Science*
B A U ive s ty of Oregon, B S in L S M S , U n vers ty f Ill is

Bates F Kath een 1964 .....*Assistant Pr fess r of Home Economics*
B S State n v rs ty New York M S , Drex Inst tut echn gy

Baty, Wayne M. (1962) . ... *Professor of Administrative Services*
B.S in Ed , Southwest Miss uri State College, M A , Northwestern U niversty Ph D , Un versity of Southern Ca fo nia

Baumann, Victor H. (1964) .... *Professor of Education*
B A , Crinne l C lege; M A , Northwestern niversity, Ed D , Universit
of Southern Ca forn a

Berkley, George C., Jr. (1956) *Pr fess r f Engineering; Asso iate Dean,*
C ege f Eng neerin S ien es Director, Engineering S ien e Pr gram
B S M E , Texas T nologe C l g M S.M E v s ty f T xas,
Ph D Okl h n Stat Un vers ty

Becker, Walter G (1955) .... *Associate Professor of Finance*
A B M A , Loyola Univers ty, Ph D nive sity of Iowa

Bedient, Jack D (1963) .. . .. *Associate Professor of Mathematics*
A B A bi n Coll ge, M B S , Ed D , nivers ty of Co rado

Bedworth Dav d D (1963) .... *Professor of Engineering*
B S I E an ar C lege of Techno ogy, M S I E Ph D , Purdue Un ver ity

Bell, James W. (1966 .... *Professor of Education*
A B , Washburn University M Ed , Ed D , University of Kansas

Bell, John E. (1965) ... . *Professor of Education*
B S University of Nebraska; M A , Ed.D , University of Wyoming

Bell, Mary E. (1970) ... ... *Associate Professor of Education*
B S Ind ana State eachers College M.S , But er Univers ty,
Ed D , Ind ana Un vers ty

Belok, Michael V. (1959) .... *Professor of Education*
B.S Ind ana Un versity, M A , A zona State nivers ty; Ph D., Un versity of
Southern Calif rnia

Bender, Burt A (1971) . . ... *Assistant Professor of English*
B A nivers ty of Washington, A B D , University of Cal fornia, Irv ne

Bender, Gordon L. (1953) ..... . *Professor of Zoology*
B S , Iowa St te Co lege, M S , Un versity of W sconsin, Ph D , University
f I inois

Benedict, Joel A. (1946) .... *Professor of Education*
Director, Audiovisual Services
B A , M A , Arizona State niversity Ed D Stanfo d Un versity

Benin, David B (1970) .... *Assistant Professor of Physics*
A B , Cornel Un versity, M A , Ph D , University of Rochester

Benn tt, E De n (970 . . . *Assistant Pr fess r of Mass Communications*
B A , Br gham Young University M.A , Ph D , Michigan State University

Benz nger, Robert P (1970) ... .. *Asso iate Professor of Industrial Design*
B S M.E University of W scons n, M A E , Chrysler Inst tute of Eng neering

Berch Michael A. 1969) . . .. *Professor of Law*
B A , LL B , Co umbia Univers ty

Berman David R (1966) . . *Assistant Professor of Political Science*
B A , Rockford Col ege M A , Ph D Ame can University

Berman, Neil S. (1964) . . . . *Professor of Engineering*
B S Un vers ty of W sconsin M S , M A Ph D. Univers ty of Texas

Bertelson, Wendle R 1964) ..... *Assistant Professor of Architecture*
B Arch , University of M higan

Bertke, E dridge M. (1958) .... *Professor of Zoology*
B S , M S., Ph D University of W sconsit , Mad son

Bessom, Richard M (1968) . ..... *Associate Professor of Marketing*
B A , Cornell University, M B A , Stanford University,
Ph D , Univers ty of Washington

Betz, Mathew J , III (1961) . ... *Professor of Engineering;*
B S , M.S. Ph D , Northwestern Un versity *Associate Dean, Graduate College*

Bickford, Wil iam B. (1966) .... . . *Associate Professor of Engineering*
B.S , M S , Kansas State Un versity, Ph D , Un versity f I nois

Bieber, A an L (1963) . .... . *Associate Professor of Chemistry*
B S , M S North Dakota State U ni ersity Ph D , Oregon State Univers ty

Biekert Russe G (1971) .. *Assistant Professor of Technology*
B S , M S , Southern I inos University Ed D , Arizona State Univers ty

Binn ger, Robert J (1962 ..... *Pr fessor of Spanish, Assistant Dean*
B A , M A , Ph D , Ohio State U nvers'ty *College of Liberal Arts*

Birge Edward A (19 2) . . . . *Assistant Professor of Microbiology*
B.A , Ph D U nivers ty of W scon in Madison

Bitter, Gary G (1970) . ... *Assistant Professor of Education*
B S , Kansas State U nivers t M A Kansas State Teach ers Co ege,
Ph D , Univers t f Denver

B ackburn, Jack B. (1972) .. . . *Pr fessor of Engineering*
B S C E , Ok ahoma Univers ty; M S C E Ph D , Purdue Univers ty

Blackham, Garth (1962) ..... . *Professor of Education*
B S M S , Utah State U niversity Ph D., Corne University

Blackledge, Vernon O. (1969) ..... *Assistant Professor of Engineering*
B S E E U niversity of I inois, M S E E Un versity of Santa Clara;
Ph D , Arizona State U nivers ty

Blaesser, Willard W (1968 ... . *Professor of Education*
B S M A Un versity of Wiscons n, Mad son,
Ed D , George Washington University

Blewett, Laura J (1964) . ... *Assistant Professor of Nursing*
B.S Univers ty of Minnesota, M S N , Case Western Reserv Un versity

B oemendaal, Nancy L. (1970) .... *Instructor in Music*
B A , Ar zona State nivers ty M F A., Temp e Univers ty

Boetto, Laurel B. (1956) ..... *Assistant Profess r of Education*
B A in Ed M.A n Ed., Arizona State Un versity

Bogart Quentin J. (1970) .. .. *Associate Professor of Education*
B.A M S , Ft Hays State College, Ph D , U n versity of Texas, Austin

Boggs, L hnie J (1959 65, 966) *Professor of Administrative Services;*
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B S , M A , Ph D., Oh o State U niversity

Bohlmar , Herbert M (1964 *Ass ciate Pr fess r of Adm inistrative Services*
B S in B A , Drake Un vers ty, M.B A , J D , Indiana U nivers ty

Bond M E (1967) ..... *Ass ciate Pr fessor of Ec n mi s; C o rdinator f*
Resear h Direct r of Bureau of Business and Econ mic Resear h
B B A., M A Pl D , U niver ity of Iowa

Bontrager, O R (1962) . ... *Professor Emeritus of Education*
B S M A., Ph.D , University of Iowa

Borgo, Philip E. (1967) ..... *Assistant Professor of Engineering*
B S C E U niversity of Cincinnati, M S , Ohio State University

Bourgoin, Susan L. (1972) . . . . *Assistant Professor of Technology*
B S E E M S E , Arizona State University

Bowers, Charles O. (1948) . . . . . *Associate Professor of Music*
B S in Ed , Southeast Missouri State College,
M M , D M A Eastman School of Music

Bowman, Alikt C (1971) ..... *Associate Professor of Social Work*
B A , College of St Benedict, M S W University of Minnesota

Bowman, Russell K (1956 ..... *Professor of Romance Languages*
A B A M , Ph D , Columbia University

Boyar, Billie T 1971 . . . . *Instructor in English*
B A M A , North Texas State University

Boyd Gertrude A 958) ... *Professor Emeritus of Education*
A B M S , Florida State University, Ed D , Colorado State College

Boyce, Bernard M (1969 . . . *Associate Professor of Architecture*
B Arch , University of Sydney Australia)
M Arch M A , Ph D Yale University

Branstetter, Ellamae 1958 64 1967) .... *Professor of Nursing*
R N , Jewish Hospital B S., St Louis University, M P H., University of
Minnesota Ph D , University of Chicago

Braver, Sanford L (970) . . *Assistant Professor of Psychology*
B A Wayne State University, Ph D , University of Michigan

Breckenridge, Jack D (962) . . . . . *Professor of Art*
B S , Wisconsin State College, M F A , University of Iowa

Bregar, John F (1965) . . . . *Professor of Engineering*
B S , Pennsylvania State University, Ph D , University of Arizona

Bresina, Bertha M. (1960) ..... *Professor of Home Economics*
B S., M.S , Stout State University; Ph D , Iowa State University

Bria, Janet L (1967) ..... *Instructor in English*
B A , Pennsylvania State University, M A., Arizona State University

Britton, Mervin W. (1957) ..... *Associate Professor of Music*
B S , M.S , University of Illinois

Britz, Richard D. (1969) .. .. *Assistant Professor of Architecture*
B.Arch , University of Kansas

Broadley, Hugh T (1969) ..... *Professor of Art*
A B , Park College, M A., Yale University Ph D , New York University

Brock, James L (1971) ..... *Instructor in Health, Physical Education and Recreation; Head Baseball Coach*
B A , M A , Arizona State University

Broekema, Andrew J. (1968) .. .. *Professor of Music, Chairman, Department of Music*
B M , M.M , University of Michigan Ph D , University of Texas

Brock, Weston L (1966) .. . . *Associate Professor of Education, Director Professional Field Experiences*
B.A , M A , Ed.D , University of Wyoming

Brose, Marianna F (1963) .... *Assistant Professor of English*
B A , College of William and Mary, M A., Arizona State University

Brouch, Virginia B. (1965) .... *Assistant Professor of Art*
B A , College of St Francis, M A , Ed D , Arizona State University

Brown, Alan R. (1968) .... *Associate Professor of Education*
B.A , M A , Los Angeles State College, Ph.D , University of Texas

Brown, Brent W (1972) . ... *Assistant Professor of Political Science*
B.A Brigham Young University, M.A , Arizona State University,
Ph D , University of Illinois

Brown, Donald E (1963) .. .. *Professor of Mass Communications*
B A , M A , University of Iowa

Brown, Duane (1951) .... *Professor of Chemistry*
B S , Brigham Young University; Ph D , Cornell University

Brown, Peter (1967) .. .. *Associate Professor of Chemistry*
B S , Ph D., University of Southampton (England)

Brown, Theodore M (1963) .. .. *Associate Professor of Chemistry*
B S M.S University of Toledo, Ph D. Iowa State University

Brown, Walter C. (1966) .... *Professor of Industrial Technical Education, Associate Director, Division of Technology*
B.S , Northwest Missouri State College, M Ed., Ed D University of Missouri Columbia

Bruff, Harold H. (1971) . .. . *Assistant Professor of Law*
B A , Williams College, LL B , Harvard University

Bruinsma, Henry A (1964) .... *Professor of Music*
B M , M M , Ph D , University of Michigan *Dean, College of Fine Arts*

Bruner, May I (1961) . . . . *Associate Professor of Nursing*
B S University of Hawaii, M S University of Colorado

Bruton Helen J. (1972) .... *Assistant Professor of Social Work*
B A , Michigan State University, M S W University of California Berkeley

Bryant, Fred O (1950) ... *Associate Professor of Health, Physical Education and Recreation*
B.S , Springfield College, M S , University of Illinois,
Ed D , Arizona State University

Buckingham, Willis J (1969) .... *Assistant Professor of English*
A.B Harvard College, M S , University of Wisconsin, Madison,
Ph D Indiana University

Buffington, Albert F. (1965) .. .. *Professor of German*
A B Bucknel University, A M., Ph D , Harvard University

Bullock, Arnold H. (1941) ... . *Professor of Music*
B.M , Yale University, M.A in Ed , Arizona State University

Bunt, Lucas N. H. (1968) ... . *Professor of Mathematics*
B S Drs , University of Amsterdam Ph D , University of Groningen (Netherlands)

Burdette, Walter E. (1956) .. .. *Professor of Industrial Technical Education Director Division of Technology*
B S M S Kansas State College of Pittsburg, Ed D University of Missouri Columbia

Burg, B Richard (1967) .... *Associate Professor of History*
B A., University of Colorado, M.A , Western State College of Colorado,
Ph.D , University of Colorado

Burgess, Paul L. (1969) .... *Assistant Professor of Economics*
Research Associate, Bureau of Business
B A., Ph D , University of Colorado *and Economic Research*

Burgoyne, Edward E. (1951) .... *Professor of Chemistry*
B S., Utah State University, M S , Ph D , University of Wisconsin, Madison

Burk, Karl W. (1949) ..... . *Associate Professor of Industrial*
Technical Education
B.A in Ed , M.A in Ed., Arizona State University, Ed D , Bradley University

Burke, William J (1962) .... *Professor of Chemistry, Vice*
President for Graduate Studies, Dean, Graduate College
A B , Ohio University, Ph D , Ohio State University

Burkhard, Samuel (1921) . .. . *Professor Emeritus of Education*
B A. Goshen College, M A., Columbia University, Ph.D , New York University

Bursh, Joshua M , III (1971) .... *Assistant Professor of*
Administrative Services
B A , Grambling College; M N S , J D , Arizona State University

Burt, Karen F. (1972) ... . *Instructor in Nursing*
B S., University of Wisconsin; M.A , California State College, Long Beach

Burton, Arleigh R. (1941) .. . . *Professor of Accounting*
A B , M S , Emporia State Teachers College; Ph D , University of Nebraska, Lincoln;
C P A , Arizona

Burton, Foster M (1969) . . .. *Associate Professor of Construction,*
Acting Director, Division of Construction
B S C E , B S (Industrial Management), Carnegie Institute of Technology,
M.B A , New York University, Ph D , University of Pittsburgh

Buseck, Peter R. (1963) .... *Associate Professor of Chemistry*
B A , Antioch College, M A., Ph.D , Columbia University *and Geology*

Butler, Jay Q (1972) . ... *Assistant Professor of Real Estate*
B.B A , M.B.A , University of New Mexico; Ph D., University of Washington

Cabianca, William A (1967) .... *Associate Professor of Education*
B Ed , Gonzaga University, M Ed , Ph D , Washington State University

Cadien, James D. (1972) .... *Assistant Professor of Anthropology*
B A , M A , Ph.D., University of California, Berkeley

Calkins, Jerry M (1971) .... *Assistant Professor of Engineering*
B S , M.S , University of Wyoming, Ph.D , University of Maryland

Campbell, Bruce L. (1972) .... *Assistant Professor of Home Economics*
B.S , M.S , Brigham Young University, Ph D , University of Minnesota

Campbell, Roy H. (1965) .... *Associate Professor of Marketing*
M B.A., University of Chicago, Ph.D , Columbia University

Canby, William C., Jr (1967) . . .. *Professor of Law*
B.A , Yale University, LL B , University of Minnesota

Canright, James E. (1964) .. .. *Professor of Botany*
B.A , Miami University, A M , Ph D , Harvard University

Caplan, Gerald M (1971) . ... *Professor of Law*
B A., M A , J.D., Northwestern University

Carlson, Ingeborg L. (1965) ..... *Associate Professor of German*
Ph D., University of Erlangen (Germany)

Carney, James D. (1967) .... *Professor of Philosophy, Chairman*
Department of Philosophy
M.A , Roosevelt University; Ph D , University of Nebraska, Lincoln

Carr, Alice Rose (1955) . ..... *Associate Professor Emeritus*
A.B., St. Mary's College; M.A., Ohio University *of Mathematics*

Carroll, Christina (1966) .... *Associate Professor of Music*

Carver, George L. (1965) ... *Associate Professor of Classical Languages*
B A., M.A., University of Texas, S.T B , St Mary's Seminary, Baltimore,
Ph D., St. Louis University

Case, James L (1969) ..... *Assistant Professor of Speech and Theatre*
B.S , Weber State College; M.S., Ph D., University of Utah

Castillo Senon A. (1951) ..... *Instructor in Health, Physical Education*
B S in Ed , Arizona State University *and Recreation; Track Coach*

Castle, Gordon B. (1962) . ... *Professor of Zoology*
B A., Wabash College, M A , Ph.D University of California, Berkeley

Castle, Peggy (1971) ..... *Assistant Professor of Music*
A.R M.C.M , Royal Manchester College of Music

Cauley, Jon T (1972) .... *Assistant Professor of Economics*
B S , Miami University, Ohio; M A , University of Northern Colorado,
Ph.D , University of Colorado

Cavalliere, William A. (1947) .... *Assistant Professor of Technology*
B.A in Ed , M.A. in Ed , Arizona State University

Cazier, Mont A. (1962) . ... *Professor of Zoology*
B S , Ph D., University of California, Berkeley

Chafey, Kathleen H. (1967) .. .. *Assistant Professor of Nursing*
B S , Arizona State University, M.S., University of Minnesota

Chalmers, James A. (1972) ..... *Associate Professor of Economics*
B.A., University of Wyoming, Ph.D., University of Michigan

Chalquest, Richard R (1971) ..... *Professor of Agriculture;*
Director, Division of Agriculture
B S , D.V.S , Washington State University, M.S., Ph D., Cornell University

Chambers, Anthony H. (1971) .... *Assistant Professor of Japanese*
B.A , Pomona College; M A , Stanford University

Chartier, George M. (1970) . ..... *Assistant Professor of Psychology*
B S., University of Illinois, M A., Ph D , University of Oregon

Chasey, Eugene F. (1965) . ... *Associate Professor of Education*
B S., Northwestern State College, M.A , Colorado State College,
Ed D , University of Wyoming

Chen, Stanley S. (1967) ..... *Associate Professor of Engineering*
Diploma, Taipei Institute of Technology (China); M.S , Ohio University,
Ph.D , University of Wisconsin, Madison

Chilton, Ernest G (1969) ... . *Professor of Mechanical Engineering*
S B., Massachusetts Institute of Technology; M.S., California Institute of
Technology, Ph D., Stanford University

Christiansen, Kent M. (1966) ..... *Associate Professor of Education, Director of Student Services*
B S., M S., Brigham Young University; Ph D., Michigan State University

Christine, Ray Orr (1958) ..... *Associate Professor of Education*
A.B , A.M., Colorado State College, Ed.D , Arizona State University

Chubrich, Robert E (1971) ..... *Assistant Professor of Speech and Theatre*
B A , Grinnell College, M A , Indiana University, Ph D , State University of New York, Buffalo

Church, Kathleen K (1969) ..... *Assistant Professor of Zoology*
B.S , M A., University of Utah, Ph D , University of California, Berkeley

Churchill, William D. (1966) ..... *Assistant Professor of Education; Counselor, University Counseling Service*
A B , Colgate University; M.Ed , Alfred University, Ed D , University of Rochester

Cialdini, Robert B. (1971) ..... *Assistant Professor of Psychology*
B S., University of Wisconsin; M A , Ph D., University of North Carolina

Clark, Geoffrey A (1971) ..... *Assistant Professor of Anthropology*
B A., M.A , University of Arizona, Ph D , University of Chicago

Clark, Wilburn O. (1967) ..... *Associate Professor of Engineering*
B S , M S , Ph D , University of Kansas

Cleary, Edward W. (1967) ..... *Professor of Law*
A B., Ill nois Co lege, J.D , University of Illino s, J S D , Yale University

Clements, Sallee M. (1969) ..... *Instructor in English*
B A., M.A , Arizona State University

Clothier, Ronald R. (1955) ..... *Associate Professor of Zoology*
A.B., Fresno State College, M A., University of Montana; Ph.D , University of New Mexico

Cluff, Gordon L (1963) ..... *Associate Professor of Speech and Theatre*
B.A , Arizona State University; M.S , Ph D., Southern Illinois University

Cochran, Douglas L. (1968) ..... *Associate Professor of Management*
B S , Ohio State University, M B.A , Harvard University, D B A , University of Oregon

Cochran, John A. (1962) ..... *Professor of Economics*
A B , Drake University; A M , Ph D , Harvard University

Cohen, David (1967) ..... *Associate Professor of Music*
B S , M S., Juilliard School of Music; D.M A., University of Southern California

Cohen, Naomi W (1968) ..... *Assistant Professor of Secondary Education*
B A., M.A , Ed D , Arizona State University

Colby, Arthur L (1965) ..... *Assistant Professor of English*
B A , University of Massachusetts, M A , Ph.D , University of North Carolina

Cole, Gerald A (1959) ..... *Professor of Zoology*
A.B., Middlebury College; M S , St Lawrence University, Ph D , University of Minnesota

Comeaux, Malcolm L. (1969) ..... *Assistant Professor of Geography*
B.A University of Southwestern Louisiana M A , Southern Illinois University, Ph.D , Louisiana State University

Conlin, David A (1948) ..... *Professor Emeritus of English*
A B , Syracuse University, Ph D , Yale University

Cook, Jeffrey M (1961) ..... *Professor of Architecture*
B Arch , University of Manitoba (Canada , M.Arch , Pratt Institute

Cook, Phil A. (1963) ..... *Professor of Education*
B A , Southwestern State College, M.A , Colorado State College of Education, Ed D. University of Kansas

Corder, Brice W. (1971) ..... *Associate Professor of Health Physical Education and Recreation*
B A , Lynchburg College, M Ed , D Ed , Temple University

Corliss, Charlotte N. (1964) ..... *Assistant Professor of Nursing*
R N. Western Pennsylvania Hospital School of Nursing
B S , in Nur Ed., University of Pittsburgh, M Ed , University of Minnesota

Costa, Nicholas P , Jr , Capt (1972) ..... *Assistant Professor of Aerospace Studies*
B S. in Ed., Ohio State University; M A in Ed , Louisiana Polytechnic Institute

Couch, Sanford C (1962) ..... *Associate Professor of Russian*
B A , M A , Ph D., University of Wisconsin, Madison

Cowley, John M. (1969) ..... *Galvin Professor of Physics*
B S., M S , D.Sc , University of Adelaide (Australia), Ph D Massachusetts Institute of Technology

Cox, John F. (1971) ..... *Instructor in English*
B A , Northern Arizona University, M.A , Stanford University

Cox, Steven R. (1970) ..... *Assistant Professor of Economics*
B S., University of Wisconsin, Madison M.A University of Michigan

Craig Samuel E., Jr 1960) ..... *Professor of Engineering*
B S , Oregon State University, Ph D , University of Utah

Crail, Bonnie W. (1972) ..... *Instructor in French*
B.A , M A , Arizona State University

Cranmer, William H. (1963) ..... *Associate Professor of Social Work*
B A , University of Akron; M.S , Case Western Reserve University

Creighton, Judith M (1967) ..... *Instructor in Home Economics*
B.S., University of Arizona, M.S , Arizona State University

Cronin, John R (1966) ..... *Associate Professor of Chemistry*
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Crouch, Beulah (1953) ..... *Assistant Professor of Education*
B A in Ed , M A in Ed , Arizona State University

Crowder, Troy F (1970) ..... *Associate Professor of Mass Communications; Assistant to the President; Director University Relations*
B A , University of South Dakota; M A , University of Iowa

Cummings, Lawrence T (1970) ..... *Associate Professor of Education, Director, Student Counseling Service*
B A , M A., Arizona State University, Ed.D , University of California, Los Angeles

Cummings, Susan N. (1964) ..... *Assistant Professor of Education*
B S , University of Chicago; M.A in Ed , Ph D , Arizona State University

Curran, Mark J. (1968) ..... *Assistant Professor of Spanish*
B S , Rockhurst College, Ph.D , St. Louis University

Cyoni, Tamaiye R (1968) ..... *Instructor in Japanese*
B A , M.A , University of Utah

Daane, Calvin J (1963) .... *Professor of Education*
B S , University of Wisconsin, M A., Columbia University,
Ed D., Indiana University

Dahl, Richard C (1966) .. . *Professor of Law Director of Law Library*
B A , B L S , University of California, LL B , Catholic University of America

Dales, L. Richard (1966) .... *Associate Professor of Music*
B.M , University of Louisville; M M , Indiana University

Dalgleish, Donald D. (1962) .. . . *Assistant Professor of Political Science*
B A , Carleton College, A M , Columbia University; Ph D University of Colorado

D'Andrea, Frank L (1972) . ... *Associate Professor of Music*
B A , M.A , Ed D , Columbia University

D'Angelo, Frank J (1970) ..... *Assistant Professor of English·*
Director, Freshman English
B A , Loyola University, New Orleans, M A , Tulane University,
Ph.D , University of Nebraska, Lincoln

Daniel, Norman E (1970) .. ..*Associate Professor of Transportation*
B S , M S , University of Tennessee, Knoxville; Ph D , Indiana University

Daniels, Roddie Don (1971) .... *Instructor in English*
B.A , M A , New Mexico State University

Dannenfeldt, Karl H (1956) ....*Professor of History,*
A B., Valparaiso University, M A , Indiana University, *Academic Vice President*
Ph D University of Chicago

Darden, Leatha Anne (1972) . . ..*Assistant Professor of Home Economics*
B.S., M.S , University of Alabama

Dauten, Joel J (1960) .... *Professor of Finance*
B S M S Washington State University, Ph D University of Nebraska

Davis, Keith (1958) . . .. *Professor of Management*
B.B.A , M.B A , University of Texas; Ph D., Ohio State University

Davis, Robert E. (1959) . ... *Professor of Speech and Theatre*
A B , A M , Ph D University of Illinois

Davis, Sandford S. (1953) .... *Professor of Education*
A B , B S Central Missouri State College, A M University of Missouri,
Kansas City, Ed D University of Colorado

Deach, Dorothy F (1967) ..... . *Professor of Health, Physical Education*
B S , M S., University of Illinois, Ph D., University of Michigan *and Recreation*

Dean, Arthur G (1971) .. ..*Assistant Professor of Engineering*
B S., M.S , Texas Technological University, Ph D , Texas A & M University

Decker, John P. (1963) .... *Professor of Engineering*
B.S , University of Idaho; M A., Ph.D , Duke University

Deever, R Merwin (1959) ....*Professor of Education; Director*
Bureau of Educational Research and Services
A B., Southwestern College; Ed M , Ed D , University of Oklahoma

DeMassa, Thomas A. (1966) .... *Associate Professor of Engineering*
B.S E , M S E , M S., Ph D , University of Michigan

Demeke, Howard J. (1962) ..... *Associate Professor of Education*
A B , San Francisco State College, M.S., Ed D., University of Southern California

Dewey, Thomas B. (1971) .. ..*Assistant Professor of English*
B.A , Kansas State Teachers College, M A , Ph D., University of California, Los Angeles

Dezelsky, Thomas L. (1968) .... *Associate Professor of Health,*
Physical Education and Recreation
B S , Central Michigan University, A M , University of Michigan,
H S D , Indiana University

Ditsworth, Richard L (1959) ..... *Professor of Engineering*
B S , M S., Iowa State College, Ph.D., Michigan State University

Dittert, Alfred E , Jr. (1967) .... *Professor of Anthropology*
B.A , M.A , University of New Mexico, Ph.D. University of Arizona

Dobkin, William E (1970) . ..... *Assistant Professor of Speech*
B.A , Eastern Michigan University M A , University of Colorado, *and Theatre*
Ph D Indiana University

Doebler, Bettie Anne (1971) ... .*Associate Professor of Humanities*
B A , M A , Duke University, Ph D , University of Wisconsin, Madison

Doebler, John W (1970) .... *Professor of English*
B A , Duke University M A , Ph D , University of Wisconsin, Madison

Donelson, Kenneth L (1965) .. .. *Professor of English*
B A M A. Ph D., University of Iowa

Donnell, Carol A (1972) ... . *Instructor in Humanities*
B A Pomona College, M.A Ph D , University of California, Los Angeles

Donnelly, Aaron V. (1962) . . .. *Professor of Engineering*
B.S E E , M S , University of Iowa, M A , Columbia University,
Ph D , University of Iowa

Dooley, Janice G. (1972) . ...*Assistant Professor of English*
A B , M A , University of California, Davis

Dorson, William J (1966) .... *Professor of Engineering*
B Ch E , M Ch E , Rensselaer Polytechnic Institute, Ph D , University of Cincinnati

Downing, George D , Jr (1964) .. . . r.... ...*Professor of Marketing*
B S E E , Iowa State College; D.B A , Michigan State University

Doyle, Donald P. (1962) .... *Associate Professor of Speech*
B A Arizona State University, M A , Northwestern University *and Theatre*

Doyle, Roy P. (1959) .... *Professor of Education,*
Associate Dean, College of Education
B A in Ed., Arizona State University, M.A , Ed.D , Columbia University

Dresskell, Nadine (1946) .... *Professor of Music*
B S., Bowling Green State University; M.A , Columbia University

Driscoll, Michael F (1971) ..... *Assistant Professor of Mathematics*
B A , St John's University, M S , Ph D , University of Arizona

Dudek, Leona M (1960) .... *Assistant Professor of Education*
B Ed , National College of Education, M A in Ed , Arizona State University

Dunlap, Glen C. (1972) .. .. *Assistant Professor of Technology*
B.A , M A., Ph.D , Arizona State University

Durrenberger, Robert W (1971) .... *Professor of Geography*
B S , Moorhead State College; B S , California Institute of Technology;
M.S., University of Wisconsin, Madison, Ph D., University of California, Los Angeles

Dycus, Augustus M. (1959) .. .. *Associate Professor of Botany*
B S , Akron University, Ph D , Cornell University *Microbiology*

Echeveste, Dolores W. (1970) ..... *Assistant Professor of Nursing*
B.S Texas Woman's University, M S., University of San Francisco

Eck, Roger D (1970) ... .*Assistant Professor of Quantitative Systems*
B.S Ch E , Clarkson College of Technology, M.B A., University of New Mexico

Eckert, Thomas W. (1971) ... . *Instructor in Art*
B A , M F A , Arizona State University

Edwards, John L. (1964) ..... *Associate Professor of Education*
B S , Ball State University, M A , Ed D , Arizona State University

Edwards, Marvin J. (1959) . . .. *Assistant Professor of Technology*
B S , M A in Ed , Arizona State University

Effland, Richard W. (1967) ..... . *Professor of Law*
B A , LL B., University of Wisconsin, LL M., Columbia University

Ekmanis, Rolf (1963) ..... *Associate Professor of Russian*
B A , M A , University of Wisconsin, Madison; Ph D , Indiana University

Ellis, John C (1957) .. . . *Associate Professor of English*
B A , M A., Ph D , University of Oregon

Ellis, Robert H. (1962) .... . *Associate Professor of Mass Communications; Director, Bureau of Broadcasting*
B A , Arizona State University; M.A , Case Western Reserve University

Ellner, Anthony, Jr. (1960) .. . . *Professor of Architecture*
B A Brooklyn College, B Arch. Yale University, M A Columbia University

Ellsworth, Lola M (1938) .... *Professor Emeritus of Home Economics*
B.S , Brigham Young University, M.A , Columbia University

Elmore, James W (1949) ... . *Professor of Architecture; Dean, College of Architecture*
A B , University of Nebraska, M S in Arch., Columbia University

Elsea, Janet G. (1970) ....*Assistant Professor of Speech and Theatre*
B.A , M A , University of California, Davis, Ph D , University of Iowa

Emery, Raymond C. (1962) . ... *Associate Professor of English*
B.A , M.A , University of Wyoming; Ed.D., Stanford University

Engelhardt, Florence P (1965) . .... *Associate Professor of Social Work; Coordinator of Field Instruction*
B A , College of Mount Saint Vincent, M S.S , Fordham University

Engelhardt, Jon M (1972) ....*Assistant Professor of Education*
B A , M A , Arizona State University; Ph D., University of Texas, Austin

English, William S (1962) .... *Professor of Music*
B.M., Washburn University, M.A , Ph D., George Peabody College

Erno, Richard B (1957 62; 1963) .... *Professor of English*
B.A , Michigan State University, M A , University of Denver, Ph.D., University of Minnesota

Escudero, Mary J. (1948) .... *Professor of Spanish*
A B , San Diego State College, M A , Claremont College; Diplome, Institute de Phonetique University of Paris, Ph D., Cornell University

Evans, Donovan L. (1966) .... *Associate Professor of Engineering*
B S M E , University of Cincinnati; Ph D , Northwestern University

Evans, John X. (1964) ..... *Associate Professor of English*
B A , Holy Cross College, M A., Ph D., Yale University

Eyring, LeRoy (1961) .... *Professor of Chemistry*
B S , University of Arizona, Ph D., University of California, Berkeley

Faas, Larry A (1967) ... ... *Associate Professor of Education*
B S , Iowa State College; M A , Colorado State College; Ed D , Utah State University

Fahlgren, George W. (1966) .... *Assistant Professor of*
B A , University of Iowa, J D., Northwestern University *Administrative Services*

Farber, Bernard (1971) .. . . *Professor of Sociology*
A B , Roosevelt University, A M , Ph D., University of Chicago

Farmer, Frank D. (1970) .. ..*Assistant Professor of Mathematics*
B A , M A , University of California, Riverside; Ph D , University of Washington

Farness, Sherly F. (1969) .. . . *Assistant Professor of Art*
B A M A Michigan State University

Farris, Martin T (1957) . . ..*Professor of Transportation*
B A M A , University of Montana, Ph D , Ohio State University

Fausel, Donald F. (1969) . . .. *Assistant Professor of Sociology*
A.B., S T B., St Mary's University; M.S.W , Fordham University

Fearon, Harold E (1961) . .. . *Professor of Management; Chairman, Department of Management*
B S , M B A , Indiana University, Ph D , Michigan State University

Fehr, Fred S. (1971) . . . . *Associate Professor of Psychology*
B S., University of Wisconsin, M A , Ph D , Washington University

Feldstein, Alan (1970) ... .*Associate Professor of Mathematics*
B A Arizona State University, Ph D University of California Los Angeles

Feller, Carolyn M. (1972) .. . . *Instructor in Nursing*
B S N , M.S , Arizona State University

Ferrell, Wilfred A. (1959) .... *Professor of English; Chairman, Department of English*
B A , M A , Ph D , University of Texas

Fetterhoff, Willard M. (1965) .... *Associate Professor of Education*
B Ed , Illinois State University, M A., University of Arizona Ed D , University of Denver

Finch, Alice J. (1965) .... *Assistant Professor of Nursing*
R.N , Lutheran Hospital School for Nurses, B.N S , Augustana College; M S , University of Colorado

Fink, Raymond R. (1958) . ...*Professor of Art*
B A E , School of Art Institute of Chicago, M S.A E., Illinois Institute of Technology

Firestone, Melvin M. (1968) .....*Associate Professor of Anthropology*
B A , University of New Mexico, M A , Ph.D , University of Washington

Fisher, Marvin M. (1958) .... *Professor of English*
A B , A.M , Wayne State University, Ph D , University of Minnesota

Fletcher, Grant (1956) .... *Professor of Music*
B M , Illinois Wesleyan University; M M , University of Michigan, Ph.D , Eastman School of Music

Florschuetz, Leon W (1964) ..... *Associate Professor of Engineering*
B S , M S , Ph D., Un versity of Illinois

Flynn, James T. (1964) ... . . *Associate Professor of Architecture*
B Arch , Carneg e Institute of Technology, M Arch , Harvard Univers ty

Foote Jean A. (1972) . . .. *Instructor in Nursing*
B S N , M S , Un versity of Minnesota

Foster, David W. (1966) .... *Professor of Spanish*
B A., M.A., Ph D , University of Wash ngton

Fouquette, Martin J., Jr (1965) . *Associate Professor of Zoology*
B A , M A , Ph D , University of Texas

Frame, Terry M. (1968) . . .. *Assistant Professor of Office Administration and Business Education, Coordinator of Office Education*
B S Northern I lino s Un versity, M S U nivers ty of Colorado,
Ed D , Northern I lino s Univers ty

Frasier, James E. (1963) .... *Professor of Education*
B.A , U n versity of Northern Colorado; M A University of Michigan,
Ed.D , Un versity of Northern Co orado

Freund, John E (1957) . ... *Professor Emeritus of Mathematics*
B A M A , University of California, Los Angeles; Ph D., University of Pittsburgh

Frost, Melvin J (1965) .....*Assistant Professor of Geography*
B S Ar zona State University, M S , Brigham Young Univers ty
Ph D , University of F orida

Fritzemeyer, Joe R 1973 . . . *Professor of Accounting, Chairman, Department of Ac ounting*
B B.A Baylor U nivers ty M B A , Ph D , Ind ana U n versity

Fry, Harold (1958) .. . . *Associate Professor of Engineering*
B S Colorado State U n versity, M E niversity of Wyom ng,
M S , U nivers ty of Colorad o

Fry, Maurine A. (1967) .... . . *Associate Professor of Educatic n*
B S , M A n versity of South Dakota, Ph D U niversity of Iowa

Fuchs, Jacob (1951) ..... *Professor of Chemistry; Director, Instruments Laboratory*
B A., New York University, M.S , Ph D , University of Illinois

Fullerton, Bill J. (1958) .. . . *Professor of Education*
B.S , Northwestern State Col ege, Ed M D Ed , Univers ty of Oklahoma

Fullinwider, S Pendleton 1967) .. . . . . *Associate Professor of History*
B.S , U.S Naval Academy, M S., Ph.D , Un versity of Wisconsin, Madison

Furnish, Dale B. (1970) .. . . *Professor of Law*
B A , Grinne l College, J.D , University of Iowa

Gable, William R (1967) . ... *Professor of Political Science, Director, Institute of Public Administration*
A B , A M , L ouisiana State Univers ty, Ph D , Un vers ty of Chicago

Gaffney, Philip D. (1957) .... *Professor of Education*
B.S , Northern Illinois St ate Col ege, M A., Ph D., U niversity of Iowa

Gallegos, Ester S (1972) .... *Assistant Professor of Social Work*
B.A , M.A , University of New Mexico

Gasowski, Ronald E. (1971) .... *Assistant Professor of Art*
B S D , University of Michigan M F A., U niversity of Wash ngton

Gelopulos, Demos P. 1965 . ... *Associate Professor of Engineering*
B.S E.E , Valparaiso t c s t M S E E , University of Notre Dame,
Ph.D , Un versity of Arizona

Gerber, Helmut E. (1971) .... *Professor of English*
B S in Ed., Rutgers, The State niversity, M A , New York U niversity,
Ph D U niversity of Pennsylvan a

Gerking, Shelby D 1967) . ... *Professor of Zoology Chairman, Department of Zoology*
A B , DePauw University Ph D , Indiana Univers ty

Gerlach, Vernon S (1963) . . .. *Professor of Education*
B A , Wayne State U n vers ty M A , Un versity of Minnesota,
Ed D , Arizona State Un vers ty

Gibbs, Robert T (1970) . .. . *Assistant Professor of Art*
B A , Loras C ollege, M.A , M F A Univers ty of Iowa

Gieschen, Donald W (1959) .... *Associate Professor of Philosophy*
B.S , Northwestern University, M A , Ph D , Univers ty of M nnesota

Giffin, Frederick C. (1967) .... *Associate Professor of History*
B A , Denison University, M A Ph D , Em ory Un versity

Gil , George A (1967) .. .. *Assistant Professor of Education*
B.S , M A Arizona State Un vers ty

Gisolo, Margaret (1954) ..... *Associate Professor of Health, Physical Education and Recreation*
B S , Ind ana State Teachers Col ege, M A New York U niversity

Gausinger, William S. (1972) . . *Assistant Pr ofess r of Chemistry*
B S , M ami University

Glicken, Morley D. (1971) .. . . *Assistant Professor of Social Work*
B Ph , niversity of North Dakota, M S W , University of Washington

Goheen, Douglas Scott (1965) .. . . *Assistant Professor of Speech and Theatre*
A B , Co ege of W iam and Mary, M F A Ya e U niversity

Goldstein, Myron (1963) .....*Associate Professor of Mathematics*
B S , M.A , Ph D U niversity of Cal fornia Los Angeles

Goo, Ben amin (1955) . . . . *Professor of Art*
B.F A , Un versity of Iowa, M F A , Cranbrook Academy of Art

Gooding, Elmer R (1967) , . *Asso iate Professor of Economics; Assistant Dean and Director of Graduate Studies, College of Business Administration*
B S. McPherson C ollege M A Ph D Un versity of Kansas

Gordon, Leonard (1967) . ... . . *Associate Professor of Sociology*
B A , Way e State Univers ty, A M , U niversity of M chigan;
Ph D , Wayne State Unive sity

Gourley, David R (1967) . .. . . . *Associate Professor of Marketing*
B S , M ami Univers ty, M B A , University of Toledo, D.B A , Indiana Unive sity

Grace, Edward E (1963) . . .. *Professor of Mathematics*
B S , Ph.D , University of North Carolina

Graves, Philip E (1971) .... *Assistant Professor of Economics*
A B , Ind ana Un versity, M.A., Northwestern University

Greathouse, Betty M. (1972) . *Assistant Professor of Education*
B A., M.A., Ph D , Arizona State Un versity

Green, James L. (1967) . ... *Assistant Professor of English*
B A , M A , University of Kansas; Ph D., University of Nevada

Green, Mary E (1967) .. .. *Assistant Professor of English*
B.A , Queens Co ege, New York, M A , St. John's University, New York,
Ph D , University of Chicago

Greene, Mildred S. (1966) . ... *Assistant Professor of English*
A.B , Wellesley College, M A T , Radcliffe Co ege, M A , University of Massachusetts,
Ph D , University of New Mex co

Greey, George W. (1969) ... . *Professor of Health Physical Education and Recreation; Coordinator, University Recreation*
B A , M A , Purdue University, Ph D , University of Michigan

Grier, Marvin (1957) ..... . *Assistant Professor of Health, Physical Education and Recreation· Supervisor, Swimming Pool*
B S , Wisconsin State Co lege, La Crosse, M A New York University

Griffith, LeRoy H (1958) . ..... *Professor of Education*
B.S in Ed , M S n Ed., Drake University, Ph D., University of Iowa

Grigsby, J Eugene (1966) . . .. . *Associate Professor of Art*
A B , Morehouse College, M A , Oh o State Un versity, Ph.D , New York University

Grimes, John O. (1928) .... *Professor Emeritus of Psychology*
B S. n Ed , Ohio University, M A , Ph D Univers ty of Michigan

Grobe, Edwin P. (1957) .... *Professor of French*
A.B., William Jewell College, M A Ph D , Indiana University

Gross, Douglas R (1968) ..... *Associate Professor of Education*
B S , M A , Western M chigan University; Ph D , University of Wisconsin, Madison

Grossman, Louis H (1966) ... . *Professor of Marketing*
A B., Univers ty of M chigan M B A Ph D , Michigan State Un versity

Gryder, Robert (1959-63; 1964) .. . . *Associate Professor of Administrative Services*
B S , Northwestern State College, M Ed , Lou s ana State University,
Ed D , Univers ty of North Dakota

Guillot, Elizabeth E (1964) ..... *Professor Emeritus of Sociology*
B.S , Simmons College, M.A., Ph.D , University of Pennsylvania

Guinouard, Donald E (1966) .. .. *Associate Professor of Education; Counselor, University Counseling Service*
B.S , M S., Montana State College; Ed.D , Washington State University

Guleserian, Theodore (1971) ..... *Associate Professor of Philosophy*
B.A , Univers ty of California, Ph D., Yale University

Gully, Anthony Lacy (1972) .... *Assistant Professor of Art*
B A., University of California, Riverside; M A , University of California, Berkeley

Gurnee, Herbert (1943) .. .. *Professor Emeritus of Psychology*
A B., M.A., Wesleyan University, Ph.D , Harvard University

Gwinner, Robert F. (1970) .. .. *Professor of Marketing; Chairman, Department of Marketing*
B S , U versity f S uth rn M ssissippi, M B A Ph D , Un ers ty of Arkansas

Haberman, Donald C (1967) .... *Associate Professor of English*
B A , Rutgers, The State University, M.A , Ph.D , Yale Un versity

Haberman, Lidia W (1968) .. . . *Instructor in Latin and Italian*
B A , Bryn Mawr; M A , Ya e University

Hadley, Neil F (1966) . . .. *Associate Professor of Zoology*
B A , Eastern Michigan Un versity, Ph D., University of Col rado

Hagan, Alfred J. (1970) ... . *Assistant Professor of Marketing*
B A , University of Maine, M.B.A , Ind ana University;
Ph D , Un versity of Texas, Aust n

Haggerson, Nelson L (1961 63; 1964) . .. .. *Professor of Education; Chairman, Department of Secondary Education*
B A Vanderbilt University, M S n Ed , New Mex co Western College,
Ph D , C aremont Graduate Schoo

Hahn, Arthur W (1962) .... *Assistant Professor of Art*
B F A California School of Fine Arts, M.A , San Francisco State Co lege

Hakac, John (1966) . ... *Assistant Professor of English*
A B , Centre College M A Ph D , University of Texas

Hale, John Douglas (1956) .... *Professor of Art*
B.F A , M F A , University of Southern Californ a, Ph.D , Oh o State University

Hamm, George F (1962) . ... *Professor of Education; Vice President, Student Affairs*
B S , South Dakota State College, M.A Ph D University of Wyoming

Hanna, Albert L (1967) .. . . *Associate Professor of Music*
B M , College of Music of Cincinnati, Ph D., Indiana University

Hansen, Theodore C (1968) ... . *Instructor in Music*
B.M , University of Co orado, M M , Arizona State University

Hanson, Hugh (1948) .... *Professor of Zoology*
B.S in Ed , Kansas State Teachers College M S , Ph D Univers ty of Illino s

Hanson, Roland C (1966) .... *Associate Professor of Physics*
B S , Michigan College of Mining and Technology; M.S , Ph D , University of Illinois

Hardert, Ronald A. (1966) ... .*Assistant Professor of Sociology*
A B , M A , Un versity of Cincinnati Ph.D , Indiana University

Hardt, Annanelle (1968) ..... *Associate Professor of Education*
B A , Southwestern University; A M , Cornell University,
Ph D , University of Texas

Harned, Andrew A (1969) . ... *Assistant Professor of Accounting*
B.A., Hastings College, M A S , Ph D , University of Il no s
C P A , Illinois North Carolina

Haring, L. Lloyd (1959) . ... *Professor of Geography*
B S n Ed., M S , Kansas State Teachers College; Ph D , Un versity of Iowa

Haroldson, Bruce O (1967) .... *Instructor in Health, Physical Education and Recreation Assistant Basketball Coach*
B S , Augustana College, M.Ed , University of Oregon

Harris, Brice (1962) ..... *Professor Emeritus of English*
B A., Erskine College, M.A , Vanderbilt University, Ph D., Harvard University

Harris, Jerry D. (1972) .... *Assistant Professor of Education*
B.S., Illinois State Univers ty

Harris, Kathryn M. (1965) ..... *Instructor in English*
B A., M A , Arizona State University

Harris, William H. (1960) ..... *Professor of Marketing*
B.S , University of Denver; M B A., Ph.D., Ohio State University

Harter, Tom J. (1937) ..... *Professor of Art*
B.A in Ed , Arizona State University, M F.A , University of Oregon

Hartje, Jack C. (1972) ... . *Assistant Professor of Social Work*
B A., Un versity of Florida, M A., University of Hawaii;
Ph.D , Arizona State University

Harward, Naomi (1956) .... *Professor of Sociology*
B.D., Garrett Biblical Institute, B A , Northwestern University;
M.A. (Rel Ed.), M A. (Social Welfare), University of Chicago

Hasbrouck, Frank F. (1962) ..... *Associate Professor of Zoology*
B A., Ph D., University of Illinois

Haskell, Phyllis Anne (1971) ..... *Instructor in Health, Physical Education*
B.A , University of Arizona; M.A , University of Utah *and Recreation*

Hassett, Matthew J (1966) ..... *Associate Professor of Mathematics*
B A., Fordham University, M S., Ph.D , Rutgers, The State University

Hawkey, Nancy J. (1970) .... *Instructor in English*
B.A , M A , Arizona State University

Hawley, John B. (1957) .... *Instructor in Engineering*
B.S , E M.E T., Colorado School of Mines

Hayden, James E. (1967-70; 1972) ..... *Assistant Professor of Art*
B.A , M A , Michigan State University

Haygood, Robert C (1970) ..... *Professor of Psychology*
B S , University of Illinois, M.S., Ph.D , University of Utah

Heathcotte, James B. (1969) ..... *Assistant Professor of Finance*
A B , M B A , D B.A , Indiana University

Hedrick, John K. (1970) .... *Assistant Professor of Engineering*
B S E M., Univers ty of Michigan, M S , Ph.D , Stanford University

Heffernan, Charles W. (1967) .... *Associate Professor of Music*
B Mus , M Mus , Ph D., University of Michigan

Heier, William D (1966) .... *Professor of Management*
B S , University of Maryland; M A , George Washington University;
Ph D., American University

Heimann, Robert A. (1952) .... *Professor of Education;*
Director of Counselor Training Center
B S , Wisconsin State College, M S , Ph D , University of Wisconsin, Madison

Helmstadter, G C. (1959) ... ... *Professor of Education,*
Director, University Testing Service
B.S , M S , Iowa State University; Ph D., University of Minnesota

Helton, Jon C (1973) .... *Assistant Professor of Mathematics*
B S Southwest Texas State College M A , Ph.D , University of Texas, Austin

Henderson, Glenn V., Jr. (1972) ..... *Assistant Professor of Finance*
B.B.A., Western Michigan University; M.B.A , Florida State University

Hendrickson, Lester E. (1968) ..... *Assistant Professor of Engineering*
B.S , M S , Michigan Technological University, Ph D , University of Illinois

Henkel, Ray 966) . ... *Assistant Professor of Geography*
B S., Arizona State University, M.S., Ph D , University of Wisconsin, Madison

Henze, Lura F. (1966) ....*Assistant Professor of Sociology*
B.S., M.A , Arizona State University

Herman, George R (1956) . ..... *Associate Professor of English*
B S., M A., University of Kansas

Hershauer, James C. (1969) .....*Assistant Professor of Quantitative Systems*
B S., Purdue University; M.B A , D B.A., Indiana University

Hershberger, Robert G. (1969) .... *Associate Professor of Architecture*
A.B , Stanford University, B Arch., University of Utah,
M. Arch , Ph.D., University of Pennsylvania

Hestenes, David O (1966) .... *Associate Professor of Physics*
B A., Pacific Lutheran College; M.A , Ph.D , University of California, Los Angeles

Hetherington, John J. (1970) . ... *Assistant Professor of Speech and Theatre*
B A., University of Missouri; M.A., Ph D., Univers ty of Kansas

Higbee, William W. (1968) . . . . *Assistant Professor of Technology*
B S , Texas A & M University, M B.A , U.S. Air Force, Institute of Technology

Higgins, Norman C (1968) ..... *Associate Professor of Education*
B S , Central Missour State College, M.S , Ph D , Syracuse Univ rsity

Higgins, Walter T. (1967) ..... *Associate Professor of Engineering*
B E E., Manhattan College, M.S , Ph D , Univers ty of Arizona

Hilkert, E. J. (1933) .... *Professor Emeritus of Accounting;*
Dean Emeritus, College of Business Administration
B S in B A , M A , Univers ty of Southern California, LL.B., Univers ty of
Notre Dame, C P A , Arizona and California

Hill, Bernard (1966) ....*Associate Professor of Social Work*
B S S., Co lege of the City of New York, M.S W , Tulane University

Hill, Louis A , Jr (1958) .. .. *Professor of Engineering*
B.A , B S.C E , M.S.C E., Oklahoma State University,
Ph D , Case Institute of Technology

Hines, Harold C (1952) .... *Associate Professor of Music*
B S , M.S , University of Illinois

Hink, Heinz R (1958) . . . . . *Professor of Political Science*
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Hinshaw, Donald A. (1967) . ... *Associate Professor of Architecture*
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Hoffer, Warren W. (1972) ..... .*Assistant Professor of Music*
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Hogan, M Janice (1966) .....*Assistant Professor of Home Economics*
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A B , University of Californ a, Berkeley M A , t (r , Davis,
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Holloway, John R. (1969) ..... *Assistant Professor of Chemistry*
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Holmes, Jack E. (1972) ..... *Professor of Political Science*
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A B , M A., Un vers ty of Wyoming; Ph D., University of Chicago

Hoover, Helene M. (1957) .. *Professor of Home Economics*
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B S., M A , I ouisiana State University; Ed D , Univers ty of Washington

Hora, Stephen C. (1971) ..... *Assistant Professor of Quantitative Systems*
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Horwitch, Arnold M (1970) ..... *Instructor in Humanities*
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Hoult, Thomas F. (1964) ..... *Professor of Sociology*
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Howells, Edmund G (1960) ..... *Assistant Professor of Philosophy*
B A , University of Utah; M A (Phil), University of Michigan,
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Hoyt, Charles D., Jr (1962) ..... *Professor of Engineering*
B S M.S , Ph D , Purdue University

Hubbard, Paul G. (1950) ..... *Professor of History*
A B , Wabash Co ege, M A., Ph D , University of Il ino s

Hudson, John W (1964) ..... *Professor of Sociology*
B S , M A , Ph D , Ohio State University

Huhnke, Frances S. (1964) ..... *Assistant Professor of Nursing*
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Huizingh, William (1959) ..... *Professor of Accounting*
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B S B A , M.B.A , University of Denver, Ph D , University of Michigan,
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Humphrey, Ted B (1966) ..... *Assistant Professor of Philos ph*
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Hunnicutt, Harold B. (1962) ..... *Professor of Education·*
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B A , M.B A , University of Kansas, Ph.D , University of Texas,
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Huston, Gerald D. (1962) ..... *Associate Professor of Quantitative Systems*
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B S , Va ey City State Co lege, M A , University of North Dakota,
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Impson, Wells F. (1960) ..... *Assistant Professor of Physics*
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Inglis, William H. (1972) ..... *Assistant Professor of Speech and Theatre;*
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Inskeep, Gordon C. (1968) ..... *Associate Professor of Management*
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Jacks, Mary L. (1955) ..... *Associate Professor of Administrative Services*
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Jacob, Richard J. (1963) ..... *Associate Professor of Physics*
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Jacobowitz, Ronald (1970) ..... *Professor of Mathematics*
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Jacobson, Arthur (1956) ..... *Professor of Art*
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Jacobson, Daniel J (1971) ..... *Assistant Professor of English*
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B S., M S , Ph D., University of Mich gan

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B A , M A., Marquette University Ph D University of Wisconsin Madison

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Jelsma, Lawrence F (1967) .... *Associate Professor of Engineering*
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Johnson, Alan P. (1967) ..... *Associate Professor of English*
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Johnson, David N (1969) . . . . . *Professor of Music*
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Johnson, James C (1972) ..... *Assistant Professor of Sociology*
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Johnson, John M. (1972) . . . . . *Assistant Professor of Sociology*
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Jones, Daisy M (1963) ..... *Professor Emeritus of Education*
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Jones, Joseph S (1972) . . . . *Assistant Professor of English*
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Jones, Marion K. (1970) ..... *Instructor in Health, Physical*
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Karnes, Thomas L. (1968) .. .. *Professor of History*
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Kelly, Richard W (1965) .... *Professor of Engineering*
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Kentera, Lawrence K. (1966) . . . . *Instructor in Health, Physical Education and Recreation; Assistant Football Coach*
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Kerr, Nancy J. (1968) . . . . . *Professor of Education*
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Kevane, Clement J. (1956) . . . . . *Professor of Physics*
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Kiesow, Milton A. (1957) . . . . . *Associate Professor of Education*
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Kigin, Denis J. (1958-65; 1967) . . . . . *Professor of Industrial Technology; Dean, University Extension, Director Summer Sessions*
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Killeen, Peter R. (1968) . . . . . *Assistant Professor of Psychology*
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Kingsbury, Warren L. (1964) . . . . . *Associate Professor of Education*
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Kleinfeld, Gerald R. (1962) . . . . *Associate Professor of History*
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Klingensmith, John E. (1969) . . . *Associate Professor of Education*
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Knock, John W. (1960) . . . . . *Professor of Engineering*
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Knamiller, Gary W. (1971) *Assistant Professor of Education*
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Knowlton, John F. (1964) . . . . . *Associate Professor of Spanish*
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Knox, Robert L. (1963) . . . . . *Professor of Economics; Chairman Department of Economics*
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Kronengold, Eric A. (1970) . . . . . *Instructor in Art*
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Krueger, H. Calvert (1957) . . . . . *Associate Professor of Accounting*
B.S. in B.A., University of Wichita, M.A., University of North Dakota, C.P.A., Arizona, Kansas, Missouri, and North Dakota

Krylova, Iryna B. (1966) . . . . . *Instructor in Russian*
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Kuester, James L. (1969) . . . . . *Associate Professor of Engineering*
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Kuhlmann, H. Gary (1972) . . . . . *Assistant Professor of Real Estate*
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Kuiper, Hendrik J. (1971) . . . . . *Assistant Professor of Mathematics*
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Kuhavy, Raymond W. (1971) . . . . . *Assistant Professor of Education*
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Kurtz, Lynn C. (1967) . . . . . *Associate Professor of Mathematics*
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Ladman, Jerry R. (1967) . . . . . *Associate Professor of Economics*
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Laetz, Hans G. (1964) . . . . . *Assistant Professor of German*
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LaFrance, Arthur B. (1969) . . . . . *Professor of Law*
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Lake, Robert L. (1958) . . . . . *Instructor in Mathematics*
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Lamberts, Jacob J. (1960) . . . . . *Professor of English*
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Lamm, Robert C. (1959) . . . . . *Professor of Humanities and Music; Director, Center for the Humanities*
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Lance, Robert E. (1960) *Assistant Professor of Mass Communications*
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Landeira, Ricardo L (1962) .... *Professor of Spanish*
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Landers, Lee Jr (1960) .. . . *Professor of Zoology*
A B , M S , University of Wyoming, Ph.D , New York University

Larimer, John W (1969) .. . . *Assistant Professor of Geology*
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Larson, Arlyn J. (1964) . ... *Associate Professor of Economics*
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Laudie, Drew T. (1970) ..... *Assistant Professor of Health,*
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B A , Concordia College, B P E , Springfield College, M A , University of Southern Californ a

Lawler, Eugene D. (1967) .. ..*Assistant Professor of Engineering Communications*
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Lawyer, Gerald J. (1969) .. .. *Assistant Professor of Spanish*
A B , B S , A M , Ind ana University

Leathers, Chester R. (1957) .... *Associate Professor of Botany Microbiology*
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Lee, Idelle B (1962) . .. .. *Assistant Professor of Education*
B A., Univers ty of W sconsin, M A , Arizona State Univers ty

Lee, Stephen E (1969) .... *Professor of Law*
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Leigh, Helen T (1972) .....*Instructor in Administrative Services*
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Lendle, Janet M. (1967) .... *Assistant Professor of Nursing*
B S., St. Scholastica College, M.S , University of Minnesota

Leonard, Philip A (1968) .....*Assistant Professor of Mathematics*
A B , Boston College M A , Ph D , Pennsylvania State University

Leshowitz, Barry H. (1970) .. . . *Assistant Professor of Psychology*
B.S , M.A., Brooklyn Col ege, Ph D , City University of New York

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Levan, Frederick D. (1965) ... ...*Associate Professor of Education*
B S , M Ed , Pennsylvania State Un versity, Ed D , Oklahoma State University

Levine, Gustav (1967) ....*Associate Professor of Psychology*
B A , M A C ty University of New York, Ph D , Columbia University

Levy, Leo B. (1959) .... *Professor of English; Director,*
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Lewis, Joseph Perley (1972) . ...*Assistant Professor of*
B A. University of Arizona, J.D , University of Colorado *Administrative Services*

Lewis, Maurice S. (1954) .. ..*Professor of Education*
B.S n Ed , M S. in Ed , Drake University, Ed D , University of Northern Colorado

Lewis, William E (1965) . ... *Associate Professor of Engineering*
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Leyba, Raul L (1970) .. . . . *Associate Professor of Sociology*
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Lightfoot, Marjorie J. (1964) ..... *Associate Professor of English*
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Lindell, James (1967; 1970) . ... *Instructor in English*
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Linder, Darwyn E (1972) .... *Professor of Psychology*
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Linder, Marie A. (1972) .... *Assistant Professor of Psychology*
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Linderman, Earl W (1966) .... *Professor of Art*
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Lindholm, Ernest (1971) .. .. *Assistant Professor of Psychology*
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Lindsay, John H. (1972) .... *Assistant Professor of Botany*
B S , M S U ive s ty Wy r r g, Ph D , Duke s ty

Lindstrom, Frederick B. (1953) .... *Professor of Sociology*
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Liskovec, Richard F (1958) ..... *Assistant Professor of Mathematics*
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Little, Ronald L (1970) . ...*Assistant Professor of Sociology*
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Littlewood, Mary L. (1965) . . . .*Assistant Professor of Health Physical Education and Recreation*
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Littrell, Joseph J. (1958) .... *Professor of Engineering*
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Liu, Chui H (1965) .... *Professor of Chemistry*
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Livermore, Paul E (1958) *Assistant Professor of Mathematics*
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Lockwood, Ralph G (1972) .. .. *Assistant Professor of Music*
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Loewenberg, Robert J. (1972) . ..... *Assistant Professor of History*
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Logan, Earl, Jr. (1963) ..... *Professor of Engineering*
B S , M S , Texas A & M University; Ph D , Purdue University

Lombardi, Eugene P (1957) . . . . . *Professor of Music*
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LoPresti, Ronald (1964) . . . . . *Associate Professor of Music*
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Lounsbury, John F. (1969) . . . . . *Professor of Geography, Chairman, Department of Geography*
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Lovell, Robert E (1972) . . . . . *Associate Professor of Industrial Engineering*
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Lowe, John W. (1956) . . . . . *Associate Professor of Economics*
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Lowe, Robert W. (1966) . . . . . *Professor of Romance Languages*
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Lundberg, Horace W. (1962) . . . . . *Professor of Social Work· Dean, Graduate School of Social Service Administration*
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Lundgren, Harry R. (1962) . . . . . *Associate Professor of Engineering*
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Lyle, Mary G (1959) . . . . . *Assistant Professor Emeritus of English*
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Lyon, Robert B. (1938) . . . . . *Professor of Mathematics*
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McGaughey, Robert W. (1971) . . . . . *Assistant Professor of Zoology*
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McGrath, Larry W. (1972) . . . . . *Instructor in Education*
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McKenzie, Patrick B (1970) . . . . . *Assistant Professor of Accounting*
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M Ed , Ph.D., Un versity of Oregon

Mackey, Lola A (1970) . . . . . *Assistant Professor of Spanish*
B A , Un versity of Cal fornia, Berkeley M A , Univers ty of New Mexico

MacKinnon, Stephen R. (1971) . . . . . *Assistant Professor of History*
B A , M.A , Yale Univers ty, Ph D , Un versity of California, Davis

Magers, William D (1971 . . . . . *Assistant Professor of Music*
B A Santa Barbara College, M M , Univers ty of Southern California

Malone, Charles F (1966) . . . . . *Professor of Education*
B S , Kansas State Teachers Co lege M Ed , Ed D Univers ty of Kansas

Mamalis, A David (1969) . . . . . *Assistant Professor of Education*
B A Southern Cal fornia Co lege M A , University of Denver

Manera, Elizabeth S. (1967) . . . . . *Assistant Professor of Education*
B.S , M A , Towson State College Ed D , Arizona State Un versity

Manheim, Henry L. (1958) . . . . . *Professor of Sociology*
A B Univ sity Calif a
M A P D Un ers ty S Calif a

Mann, Joe B. (1972) ... *Assistant Professor of Social Work*
B S., Manchester College; M S W , Michigan State Univers ty

Mann, William G. (1961) ... *Instructor in Health, Physical Education and Recreation Freshman Basketball Coach; Varsity Golf Coach*
B S n Ed , M Ed , University of Arizona

Manning, Duane (1951) ... *Professor of Education*
B A M A , Bal State Teachers College, Ed D , Indiana University

Martin, Alice C (1972) ... *Assistant Professor of English*
B.A., M A , Syracuse University

Martin, John F , Jr. (1966) ... *Associate Professor of Anthropology*
B A , Beloit Co lege, M.A. Ph D., University of Ch cago

Martinez, Quino E (1957) ... *Professor of Spanish*
B S , New Mexico Western College, M A , George Peabody Col ege,
Ph D , Un vers ty of North Carolina

Marvin, Bernard D., Capt 1971) ... *Assistant Professor of Aerospace Studies*
B S M E , Arizona State University, M A M E , A r Force Institute of Technology

Marzke, Robert F. (1969) ... *Assistant Professor of Physics*
A B. Princeton Un versity, Ph D , Columbia University

Mason, Bruce B (1960) ... *Professor of Political Science*
B S , North Texas State College, M A , exas Christ an Univers ty;
Ph D , Univers ty of Texas

Matheson, Alan A (1968) ... *Professor of Law*
B.A , M S , J D , University of Utah *Assistant Dean, College of Law*

Matte, Paul J. (1970) ... *Instructor in English*
B A , University of the South, M A., Arizona State University

Matthias, Judson S (1967) ... *Associate Professor of Engineering*
B S , U S M l tary Academy, M S , Oregon State University,
Ph D , Purdue Univers ty

Maxwell, Lawrence E. (1968) ... *Assistant Professor of Geography*
A B , Washington University· M.S , Purdue University,
M.A , Ph D , Univers ty of California, Los Angeles

Mayer, Albert J. (1968) ... *Professor of Sociology*
A B , A M , Ph.D , University of Chicago

Mayhew, Thomas H. (1968) ... *Assistant Professor of Education· Coordinator Southwest Regional Center for Community School Development*
B A , M A , Ed D. Michigan State University

Mazen, S David (1970) ... *Assistant Professor of Education*
B A , Whitworth Co lege, M Ed , Eastern Washington State College,
Ed D , Washington State Univers ty

Mech, Edmund V. (1964) ... *Professor of Social Work*
A B , Florida Southern College, M S S , Bryn Mawr Co lege,
M S in Ed , Ph D , Ind ana University

Meister, Arnold G. (1957) ... *Professor of Physics*
B S , Central YMCA College; Ph D., Illinois Institute of Technology

Mendleson, Jack L. (1967) ... *Associate Professor of Management*
B B A , Butler University, M B A , Ind ana University;
D B A , Mich gan State University

Menke, Robert F (1947) ... *Professor of Education; Director, Career Services*
B.S , Oshkosh State College, M.A n Ed , Ph D , Northwestern University

Merkel, Richard L (1961 63, 1969) ... *Assistant Professor of Administrative Services*
B B A , J D , University of Wisconsin, Mad son

Merrill, Bruce D (1971) ... *Assistant Professor of Political Science· Director for Urban Studies*
B A , Southern Oregon College, M A , Brigham Young University,
Ph D., University of Mich gan

Merrill, H Kent (1971) ... *Assistant Professor of Psychology*
B A , M A , Brigham Young University, Ph D. University of Utah

Metcalf, V Alonzo (1971) ... *Professor of Economics· Vice President for Administration*
B S M.S , University of Arkansas, Ph D , University of Missouri, Columb a

Metos, Thomas H (1965) ... *Professor of Education*
B S. M S , Ph D , University of Utal

Metzger, Darryl E. (1963) ... *Professor of Engineering*
B.S M E , M S M E , Ph D , Stanford University

Meyerson, Lee (1962) ... *Professor of Psychology*
A B , Lafayette College, A M , Univers ty of Cal fornia, Los Angeles,
Ph D Stanford University

Michels, LeMoyne F (1963) ... *Associate Professor of Construction*
B S , U S M tary Academy

Miller, Fred L (1971) ... *Professor of Health Physical Education and Recreation; Director of Athletics*
B A , Un versity of the Pac fic M S in Ed , Un vers ty of Southern Ca fornia,
P E D , Ind ana University

Miller, Glenn A (1969) ... *Associate Professor of Psychology*
B A , M A University of Kentucky, Ph D , Southern Illinois University

Miller, Paul F (1947) ... *Professor of Geology*
B A., Simpson College, M S., Ph D , University of Iowa

Miller, Peter J (1971) ... *Assistant Professor of Quantitative Systems*
B.S M.E , Stanford University, M B A , San Diego State Col ege,
D B A , University of Washington

Miller, Robert W. (1969) ... *Assistant Professor of Music; Assistant Director of Bands*
B A , M A , Arizona State Un versity

Miller, Victor J (1958) ... *Professor of Agriculture*
B S , M S , Ph D , Univers ty of Illino s

Miller, William Edgar (1972) ... *Assistant Professor of Administrative Services*
B S. University of Nebraska, M A , Ar zona State University

Miller, William Edward (1966) ... *Assistant Professor of Education· Counselor, University Counseling Service*
B M E Ed D , University of Kansas

Mi ner, Joe W. (1967) ... *Professor of Mass Communications, Chairman, Department of Mass Communications*
B.S , East Texas State University, M A , University of Oklahoma;
Ed D , University of Wyoming

Minckley, Wendell L. (1963) ..... *Associate Professor of Zoology*
B S , Kansas State University, M A., University of Kansas;
Ph D , University of Louisville

Mings, Robert C (1971) ..... *Assistant Professor of Geography*
B S , M A L., Indiana University, Ph D Ohio State University

Mitchell, Frederic F. (1961) ..... *Professor of Education*
B A , M A , University of Arizona, Ph D , Columbia University

Moeller, Therald (1969) ..... *Professor of Chemistry; Chairman, Department of Chemistry*
B S , Oregon State College, Ph D , University of Wisconsin Madison

Moffit, Inez (1953) ..... *Assistant Professor of Education*
B A , Iowa State Teachers College, B I S , University of Minnesota,
M A University of Denver

Monczka, Robert M (1970) ..... *Assistant Professor of Management*
B A , M B A , Ph D , Michigan State University

Monninger, M Elizabeth (1971) ..... *Assistant Professor of Nursing*
B S , Duquesne University, M S , University of California, Davis

Monty, Dewey E Jr. (1969 ..... *Associate Professor of Agriculture, University Veterinarian*
B S [illegible] M S [illegible] D V S,
V M [illegible] State [illegible]

Moody, E Grant (1951) ..... *Professor of Agriculture*
B S , University of Arizona M S , Kansas State University,
Ph D. Purdue University

Moor, William C. (1968) ..... *Assistant Professor of Engineering*
B S , M S , Washington University, Ph D , Northwestern University

Moore, Bryon C (1968) ..... *Associate Professor of Education*
A B , Monmouth College, M Ed , Ed D University of Arizona

Moore, Carleton B (1961) .... *Professor of Chemistry and Geology; Director, Center for Meteorite Studies*
B S , Alfred University, Ph D , California Institute of Technology

Moore, Harold E 1966) ..... *Professor Emeritus of Education*
A B , Indiana State Teachers College A M , Ed D , Indiana University

Moore, J. Douglas (1969) ..... *Assistant Professor of Mathematics*
B.S , M S , Idaho State University, Ph D Syracuse University

Moore, Nadine H (1969) ..... *Assistant Professor of Mathematics*
B S , Idaho State University, M A , Ph D , Syracuse University

Moran, Dennis V. (964) ..... *Associate Professor of English*
A B , University of Notre Dame, B A , M A , Oxford University,
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Morgan, Owen W. (968) ..... *Professor of Home Economics Director Center for Family Life Studies*
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Morris, Donald H (1962) ..... *Associate Professor of Anthropology*
B A , Arizona State University; M.A , Ph D., University of Arizona

Morris, John P (1968) ..... *Professor of Law*
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Morris, Mary Scott (1947) ..... *Assistant Professor of Education*
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Mortensen, Martin (1932) ..... *Associate Professor Emeritus of Physics*
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Moulton, Gerald L. (1967) ..... *Associate Professor of Education*
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Mowrer, Donald E (1965) ..... *Associate Professor of Speech and Theatre*
B A , M A., Florida State University, Ph.D , Arizona State University

Moyer, Joan E. (1971) ..... *Associate Professor of Education*
B S , Kutztown State College; M.Ed., Pennsylvania State University,
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Mullen, Pat T (1971) ..... *Assistant Professor of Education*
B.A , Whittier College, M A , University of Minnesota

Munch, Theodore W. (1959) ..... *Professor of Physics*
B S in Ed , B S (Bacteriology), Ohio State University,
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Munk, Morton E (1961) ..... *Professor of Chemistry*
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Murdock, Gordon R (1970) ..... *Assistant Professor of Zoology*
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Murphy, Elsie L (1968) ..... *Assistant Professor of Nursing*
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Murphy, Juanita F. (1971) ..... *Professor of Nursing; Dean, College of Nursing*
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Murphy, R Paul (1971) ..... *Assistant Professor of English*
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Murra, Richard J , Col (1971) ..... *Professor of Aerospace Studies, Chairman, Department of Aerospace Studies*
B S , B A , University of Florida, M A , Air Force Institute of Technology

Murray, Roger N (1968) ..... *Associate Professor of English*
B A , B S Moorhead State Teachers College,
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Myers, James E. (1972) ..... *Instructor in English*
B A , M A , University of California, Los Angeles

Myers, Louis M (1937) ..... *Professor Emeritus of English*
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Myler, Charles E , Jr (1968) ..... *Associate Professor of Real Estate*
B.B A., Loyola University, M B A., Harvard University,
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Naczki, Margaret V. (1960) ... . *Assistant Professor of Nursing*
R.N., St. Joseph's Hospital School of Nursing, B S , Incarnate Word College, M S , University of Colorado

Nagasawa, Richard H (1969) ... ...*Assistant Professor of Sociology*
B A., University of Hawaii, M A , Ph.D , University of Washington

Nash, Leanne T (1971) ..... *Assistant Professor of Anthropology*
A B , Univers ty of California, Davis;
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Nash, Thomas H., III (1971) .... *Assistant Professor of Botany*
B S , Duke University, M.S., Ph.D , Rutgers, The State University

Navrotsky, Alexandra (1969) . ..... *Assistant Professor of Chemistry*
B S , M.S , Ph.D , University of Chicago

Nebeker, Helen E. (1958) . ... *Associate Professor of English*
B A , M A , Arizona State University

Nelson, Harold D (1967) ..... *Associate Professor of Engineering*
B S , South Dakota School of Mines and Technology,
M S., Kansas State Un versity, Ph.D , Arizona State University

Nelson, John C. (1967) ... . . .*Associate Professor of Education*
B S , M.A , Ar zona State University, Ph D , George Peabody College

Nering, Evar D (1960) .... *Professor of Mathematics*
A B , Indiana University, A.M Ph.D , Princeton University

Neuheisel, Richard G. (1963) . ...*Assistant Professor of*
B B.A , J D., University of Wisconsin, Madison *Administrative Services*

Newburn, Harry K. (1963) .. .. *Professor of Education*
B Ed , Western Illinois State University, M A , Ph D , University of Iowa

Newlin, Charles W (1961) ..... *Professor of Engineering, Chairman, Civil Engineering Faculty*
B S Rose Polytechnic Institute M S , Harvard University;
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Newstrom, John W (1970) . ... *Assistant Professor of Management, Research Associate Bureau of Business and Economic Research*
B A , M B A , Ph D., University of Minnesota

Ney, James W (1969) . ... *Associate Professor of English*
B A , M A , Wheaton College, Ph.D., University of Michigan

Nichols, Ann W. (1970) .. .. *Assistant Professor of Social Work*
A B , Stanford University, M S W., Columbia University

Nichols, Catherine G. (1952) . . .. *Professor of Education*
A B , M A , University of Kentucky, Ph D., Columbia University

Nielander, William A (1958) . ..... *Professor Emeritus of Marketing*
B S , University of Pittsburgh; M.S , Ph.D , Columbia University

Nielsen, Michael S (1969) .... *Assistant Professor of Technology*
B P.D , North Carolina State University; M A , Stanford University

Nielson, Gregory M. (1970) ..... . *Assistant Professor of Mathematics*
B S , M A , Ph.D , University of Utah

Nielson, Thomas P. (1967) .... *Assistant Professor of Chinese*
B.A , Brigham Young University, Ph D , University of Washington

Nigham, Bishan Perkash (1964) .... *Professor of Physics*
B S , M S , University of Delhi (India), Ph.D , University of Rochester

Noble, Frank C (1971) .... *Professor of Education, Chairman Department of Counselor Education*
B S., Northern Illinois University, M Ed., Ed D , University of Illinois

Nordlie, Robert S. (1972) ... . *Instructor in English*
B A , Duke University, M.A , University of California, Berkeley

Northey, William T (1959) .... *Professor of Microbiology*
B.A , University of Minnesota, M A., Ph D , University of Kansas

Nutt, Merle C. (1956) . ... *Professor Emeritus of Engineering*
B.S , Illinois Institute of Technology, M A University of Iowa;
LL D , Illinois Wesleyan University

O'Bannon, Charles E (1964) ... . *Associate Professor of Engineering*
B.S C E., University of New Mex co; M.S , Harvard University,
Ph D , Oklahoma State University

O'Beirne, Donald E (1959) . ... *Professor of Education*
B E , Wh tewater State Teachers College; M A , Ed D., Northwestern University

O'Brien, Carmen A (1959) .. .. *Assistant Professor of Education*
B.A in Ed., M.A in Ed , Ar zona State University

O'Connor, Elinor J (1970) .....*Assistant Professor of Home Economics*
B S , Co ege of St Catherine, M S , University of Iowa

Odenkirk, James E (1967) ..... *Professor of Health, Physical Education and Recreation*
B.S , M.A , Ohio State University, Ed D., Columbia University

Ohmart, Robert D (1970) . . .... *Assistant Professor of Zoology*
B S , M S , New Mexico State University, Ph.D., University of Arizona

Ojala, William T (1971) .. ..*Assistant Professor of English*
B S , M A , Univers ty of Minnesota; Ph D , Flor da State University

O'Keeffe, Michael (1963) . . . . *Professor of Chemistry*
B S , Ph D , University of Bristol (Eng and)

Oliver, Robert S. (1963) .. . . *Associate Professor of Architecture*
A B , M A., University of Ca ifornia, Berke ey

Olmsted, Cameron B (1956) . .. . *Associate Professor of Education*
B.A in Ed , M.A n Ed , Arizona State University,
Ed.D , Un versity of Northern Colorado

Olney, Claude W. (1967) . *Associate Professor of Administrative Services*
B S , J D , Marquette University

O'Malley, Glenn E., (1968) ..... *Professor of English*
B A. M A , Case Western Reserve University; Ph D , Princeton Univers ty

Osborn, Marianne (1972) .... *Instructor in Nursing*
B S N , Arizona State University

Osenburg, Frederic C (1946) . . . . *Professor Emeritus of English*
A B., M A , University of Mich gan, Ph D , Un versity of Illinois

Overman, Glenn D (1956) ... . *Professor of Marketing*
B S , C ntra State C le *Dean, C ege of Business Ad n strat n*
M S Okah ma St te Un ver ity, D B A , Ind ana versity

Owen, John E (1964) . . . . . *Professor of Sociology*
B A , Duke U n versity, A M , Ph D , U niversity of Southern California

Packer, Merle (1959) . . . . . *Associate Professor of Health, Physical Education and Recreation*
B A , M.A., Arizona State University

Page, John B. (1969) . . . . . *Assistant Professor of Physics*
B S , Ph D , Un versity of Utah

Palais, Joseph C. (1964) . . . . . *Associate Professor of Engineering*
B S , University of Arizona· M.S E Ph D , University of Mich gan

Pardini, Louis J (1967) . . . . . *Associate Professor of Industrial Technical Education*
B.A., A M , Idaho State U n versity, Ed D , University of Northern Colorado

Parker, L Mayland (1955) . . . . . *Professor of Geography*
B S , Brigham Young University, M S , University of Utah,
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Parkinson, Stanley R. (1971) . . . . . *Assistant Professor of Psychology*
A.B , University of California, Berkeley;
M.A., Ph.D , Un versity of California, Davis

Parrish, H Wayne (1967) . . . . . *Assistant Professor of Education*
A B San Diego State College, M Ed , Ed D , University of Oregon

Parsons, Michael L (1967) . . . . . *Associate Professor of Chemistry*
B A , M S , Kansas State College, Ph D , University of Florida

Patten, Duncan T. (1965) . . . . . *Associate Professor of Botany, Assistant Academic Vice President*
B A , Amherst College, M S , University of Massachusetts,
Ph D , Duke University

Patterson, John D (1967) . . . . . *Associate Professor of Engineering*
B S , M S , Ph D , University of California, Berkeley

Patterson, Robert A. (1957) . . . . . *Professor of Zoology*
B S , Un versity of Michigan, M S , Ph D , Ohio State Un versity

Paulsen, George E. (1959) . . . . . *Professor of History*
B A , Hobart College, M.A , Rutgers, The State University,
Ph D , Ohio State U niversity

Peck, George B (1957) . . . . . *Assistant Professor of Mathematics*
B S , Ar zona State University, M S , University of Illinois

Pedrick, Willard H (1966) . . . . . *Professor of Law; Dean, College of Law*
B.A , Parsons College, J D , Northwestern University

Peek, George A , Jr. (1964) . . . . . *Professor of Political Science*
B A , M A , Ph D , University of Virginia

Perril, Lester S (1957) . . . . . *Professor of Education*
B.A , Ohio Wesleyan University, M A , Ohio State University,
Ph D , University of North Carolina

Perrill, Norman K. (1966) . . . . . *Associate Professor of Speech and Theatre*
B S , M A , Northwestern U niversity, Ph D , University of Southern Ca ifornia

Peterman, Gordon G (1966) . . . . . *Associate Professor of Construction*
B S.C E , Iowa State University

Peterson, John R (1963) . . . . . *Associate Professor of Architecture*
B A., St Olaf College, B Arch., University of Minnesota;
M.Arch , Harvard University

Peters, Kathleen A (1967) . . . . . *Assistant Professor of Home Economics*
B S., M S , Kansas State University

Pettit, George R. (1965) . . . . . *Professor of Chemistry*
B.S , Washington State University, M S , Ph.D , Wayne State University

Pewe, Troy L (1965) . . . . . *Professor of Geology; Chairman, Department of Geology*
A B , Augustana College, M S , University of Iowa; Ph D , Stanford Univers ty

Pfuhl, Erdwin H , Jr (1968) . . . . . *Associate Professor of Sociology*
A.B , Whitman College, A M , University of Idaho,
Ph D , Washington State University

Philippakis, Andreas S (1967) . . . . . *Associate Professor of Quantitative Systems; Supervisor, Business Computer Laboratory*
B S , Gannon College, M B A., Ph.D , University of Wisconsin, Madison

Phillips, William W. (1958) . . . . . *Associate Professor of History*
Ph B , M.A , University of North Dakota; Ph D., University of Missouri, Columbia

Pian, Richard H. (1959) . . . . . *Professor of Engineering*
B S C E , Kung Shang University (China), M S E , Ph D , Cornell University

Piercey, Dorothy J (1968) . . . . . *Associate Professor of Education*
B A , Col ege of St Francis, M.A , Arizona State University,
Ph D , University of Arizona

Pike, Kenneth V. (1962) . . . . . *Associate Professor of Zoology*
B S., University of Massachusetts, M A , California State College, Long Beach,
Ed D , U niversity of California, Los Angeles

Pike, Norma J (1964) . . . . . *Assistant Professor of Health Physical Education and Recreation*
B.S , M S , University of Southern California

Pile, James (1971) . . . . . *Instructor in Art*
B.F A., M F.A , University of Nebraska, Omaha

Pinkava, Donald J (1964) . . . . . *Associate Professor of Botany*
B.S , M.S , Ph D , Ohio State University

Pittman, Anne M. (1952) . . . . . *Associate Professor of Health, Physical Education and Recreation*
B S in P Ed , Univers ty of Texas, M.A., New York University
Ed D , Stanford University

Plantz, Don V. (1960) . . . . . *Professor of Economics*
B S., M.B A., University of Kansas, Ph D , Indiana University

Plummer, Ramona F. (1957) . . . . . *Associate Professor of Health, Physical Education and Recreation*
B S , M A , University of Alabama

Podlich, William F. (1949) . . . . . *Professor of Education*
B S , Maryland State Teachers College, Ph D., University of Iowa

Polenz, G. Donald (1967) . . . . . *Associate Professor of Social Work*
B A , Wartburg College, M A., University of Iowa,
D S.W , University of Southern California

Porter, Karen K. (1971) . . . . . *Instructor in Nursing*
B S , Montana State University, M S , University of Utah

Portnoff, Collice H. (1945) . . . . . *Professor Emeritus of English*
A B , M A , University of Ca ifornia, Berkeley, F A A.R , M.A , American Academy in Rome (Italy), Ph.D , Stanford University

Powers, Doris C (1960) . . . . . *Associate Professor of English*
B A , Wellesley College, M A , Occ denta Col ege, Ph D University of California, Berkeley

Price, Thornton W (1961) . . . . . *Professor of Engineering*
B S , University of Illinois, M S , Lehigh University, Ph D , University of Illinois

Pridonoff, Eugene (1971) . . . . *Associate Professor of Music*
B M Curtis Institute of Music, M M Temple University

Prust, Zenas A. (1959) . . . . . *Professor of Industrial Technical Education*
B S , Stout State University, M.A , University of Minnesota, Ed D , University of Northern Colorado

Purcell, Richard J , III (1972) . . . . . *Instructor in Health Physical Education and Recreation*
B A , Western State Col ege, M A , Cal fornia State Polytechnic College

Putnik, Edwin V (1962) . . . . . *Associate Professor of Music*
B A , Northwestern University, M M , Eastman School of Music

Quick, James E. (1969) . . . . . *Assistant Professor of English*
B.A., University of Michigan; M.A , Eastern Michigan University

Quirk, Daniel (1959) . . . . *Assistant Professor Emeritus of English*
B.A., B S., Arizona State University, M A , New York State

Radke, Judith J. (1960) . . . . . *Associate Professor of French*
B S , M A , University of Wisconsin, Madison, Ph.D , University of Colorado

Ragan, Donal M. (1967) . . . . . *Professor of Geology*
B.A., Occidental College, M S , University of Southern California· Ph D , University of Washington

Ralston, Mack A. (1956) . . . . . *Professor of Education*
B.S , M.S Indiana State Teachers College, Ed D , Indiana University

Randall, Virginia F (1962) . . . . . *Assistant Professor of English*
B A., College of New Rochelle, M A , Arizona State University, Ph D , Occidental College

Rankin, Robert L (1971) . . . . . *Assistant Professor of Engineering*
B S , University of Texas, E Paso, Ph D , Rice Un versity

Rannells, Jessie M (1939) . . . . . *Professor of Home Economics*
B S., Iowa State Un versity, M S , Cornell U niversity; Ph D , University of Wisconsin

Rapp, James R (1962) . . . . . *Associate Professor of Architecture*
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Rasmussen, David I (1963) . . . . . *Associate Professor of Zoology*
B S., M.S University of Utah; Ph D , University of Michigan

Rasmussen, Robert D. (1949) . . . . . *Associate Professor of Agriculture*
B S., Iowa State University, M S , Washington State University

Ratliff, John D (1954) . . . . . *Associate Professor of English*
B A. in Ed , Arizona State University, M A , Claremont Graduate School, Ph.D , Stanford University

Ratterree, Jack L (1964) . . . . . *Assistant Professor of Music*
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Rausch, Jack D. (1965) . . . . . *Assistant Professor of Music*
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Rave Wallace J (1967) . . . . . *Assistant Professor of Music*
B S., Illinois State University; M.M , Ph D , University of Illinois

Rawls, William S. (1949) . . . . . *Professor of Physics*
B S , Murray State College, M.S , Tulane University, Ph D , Iowa State University

Ray, William J (1968) . . . . . *Associate Professor of Education*
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Reader, Mark (1967) . . . . . *Associate Professor of Political Science*
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Reeves, Henry C. (1969) . . . . . *Professor of Microbiology Chairman Department of Botany and Microbiology*
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Regan, V. Kathleen (1971) . . . . . *Assistant Professor of Social Work, Counselor, University Counseling Service*
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Reich, John W (1965) . . . . . *Associate Professor of Psychology*
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Reif, William E (1970) . . . . . *Associate Professor of Management*
B B.A M.A Ph D , University of Iowa

Rein'l, Robert L. (1961) . . . . . *Professor of Philosophy*
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Reiser, Castle O. (1958) . . . . . *Professor of Engineering, Chairman Chemical Engineering Faculty*
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Reuter, Vincent G (1961) . . . . . *Associate Professor of Management*
B S C , M A , Ph.D., University of Iowa

Reynolds, Robert S (1970) . . . . . *Associate Professor of Music*
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Ricci, Marilyn A. (1972) . . . . . *Assistant Professor of Nursing*
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Rice, Margaret J. (1968) . . . . . *Assistant Professor of Speech and Theatre*
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Rice, Ross R (1950) . . . . . *Professor of Political Science*
M A Ph D , University of Chicago

Rice, Roy C. (1946) . . . . . *Professor of Education*
B S , University of New Mexico, M S University of Massachusetts; Ph D , University of Texas

Rice, Warren (1958) ..... *Professor of Engineering; Chairman, Mechanical Engineering Faculty*
B S., M.S , Ph D., Texas A & M University

Richards, Gale L (1965) ..... *Professor of Speech and Theatre*
B A , University of Akron, M A , Ph D , University of Iowa

Richardson, Deane E. (1970) ..... *Professor of Health, Physical Education and Recreation, Chairman Department of Health Physical Education and Recreation*
B S , Bradley University, M A., Ed.D , Stanford University

Richardson, Grant L (1953) ..... *Professor of Agriculture*
B S , M S., University of Arizona, Ph.D , Oregon State University

Richardson, H. D (1940) ..... *Professor Emeritus of Education*
Ph B., Ph M , University of Wisconsin, Ph D , Northwestern University, LL D , Arizona State University

Rickel, Harry P (1948) ..... *Associate Professor of Music*
B M , M M , University of Arizona

Rider, Wendell J (1953) ..... *Professor Emeritus of Music*
B S , Iowa State Teachers College, M M Eastman School of Music, Ph D , University of Iowa

Rieke, Eula E (1968) ..... *Assistant Professor of Nursing*
R N , Children's Hospital School of Nursing, B S , University of Colorado, M.S , Boston University

Ripley, Robert E (1967) ..... *Associate Professor of Education*
B A , M A., Ph D , University of Minnesota

Ritterbush, Morris Lee (1968) ..... *Assistant Professor of Speech and Theatre*
B F A , Kearney State College, M A University of California, Davis

Robbins, Earl R (1961) ..... *Associate Professor of Engineering*
B S., Texas Technological College, M S , Ph.D , Arizona State University

Roberts, Leonard G. (1967) ..... *Assistant Professor of Health, Physical Education and Recreation*
A B., San Jose State College, M S , University of Illinois

Roberts, Thomas G (1970) ..... *Assistant Professor of Education*
B.A , Wake Forest University, M A , Ph D , University of North Carolina

Robinson, Daniel O (1950) ..... *Professor of Agriculture*
A B , Brigham Young University, M S , University of Arizona, Ph D., Ohio State University

Robinson, Don R. (1968) ..... *Instructor in Health, Physical Education and Recreation Gymnastics Coach*
B A., Colorado State College, M S , Eastern New Mexico University

Robinson, Helene M. (1967) ..... *Associate Professor of Music*
B A , University of Oregon, M M , Northwestern University

Robison, Ray C (1967) ..... *Instructor in Health Physical Education and Recreation; Trainer*
B S , Morningside College, M S , Indiana University

Rollier, Dwayne A. (1971) ..... *Associate Professor of Engineering*
B S., M.S., Oklahoma State University, Ph D. Florida State University

Rook, Fern H (1969) ..... *Assistant Professor of Technology*
B A , University of Colorado, M A , Arizona State University

Rose, Jonathan (1968) ..... *Professor of Law*
B A , University of Pennsylvania, LL B., University of Minnesota

Rose, Marion H. (1971) ..... *Professor of Nursing*
B S., University of Kansas, A M., Ph D., University of Chicago

Rosner, John C. (1969) ..... *Associate Professor of Civil Engineering*
B S , Purdue University, M.S , Lehigh University, Ph D , Purdue University

Rossi, Patrick J. (1967) ..... *Associate Professor of Psychology*
B S , St. Mary's College; M A , San Fernando Valley State College; Ph D , University of California, Riverside

Rover, R. Craig (1952) ..... *Professor of Education*
B A , Upsala College, M.A , St Lawrence University, Ph D., Cornell University

Rowe, Kenneth L. (1962) ..... *Associate Professor of Administrative Services· Coordinator, Distributive Education*
B A , M A , Iowa State Teachers College, Ph D , Michigan State University

Rowley, C. Stevenson (1970) ..... *Assistant Professor of Accounting*
B A , Trinity College; M B.A., University of Chicago, Ph.D , University of Wisconsin, Madison; C P A , Illinois

Roy, Radha R. (1963) ..... *Professor of Physics*
B Sc , M Sc , Presidency College, University of Calcutta; Ph D , University of London

Ruch, William A (1968) ..... *Assistant Professor of Management*
B.S , M B A , D B A , Indiana University

Rue, Joseph (1972) ..... *Assistant Professor of Quantitative Systems*
M S , D B.A , University of Southern California

Ruff, Paul F. (1958) ..... *Associate Professor of Engineering*
B S C E , M S C E , Case Institute of Technology

Ruiz, Juliette S (1970) ..... *Assistant Professor of Social Work*
B S , University of California, Los Angeles, M S.W , Arizona State University

Ruppe, Reynold J (1960) ..... *Professor of Anthropology*
B A University of New Mexico, Ph D , Harvard University

Russell, Paul E (1967) ..... *Professor of Engineering*
B S., New Mexico State University, M S , Ph D., University of Wisconsin, Madison

Russell, Stanley J. (1969) ..... *Assistant Professor of Engineering*
B S , University of Illinois; M.S., Ph.D , University of Wisconsin, Madison

Sacks, Benjamin (1963) ..... *Professor of History*
B A , University of New Mexico, M.A McGill University, Ph D., Stanford University

St Louis, Robert D (1969) ..... *Assistant Professor of Quantitative Systems, Research Associate Bureau of Business and Economic Research*
A B , Rockhurst College, M S , Ph D , Purdue University

Salerno, Nicholas A (1961) ..... *Professor of English*
B A , Ed , M A., Arizona State University, Ph D , Stanford University

Samuelson, Gary E. 1971) ..... *Assistant Professor of Chemistry*
B S , M S , Ph D , University of Wisconsin, Madison

Sanders, Bevie F (1957) ..... *Associate Professor of Accounting*
B B A., North Texas State University, M.S , Texas A & M University, Ph D , University of Texas, C P A , Texas, Arizona

Sanderson, R. Thomas (1963) . . . . . *Professor of Chemistry*
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Sandler, Todd M. (1971) . . . . . *Assistant Professor of Economics*
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Sandling, Rosemarie C. (1971) . . . . . *Instructor in Nursing*
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Sansone, Fred J. (1965) . . . . . *Associate Professor of Mathematics*
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Sargent, Charles S., Jr. (1971) . . . . . *Assistant Professor of Geography*
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Sater, Vernon E. (1962) . . . . *Associate Professor of Engineering*
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Satterthwaite, Lester L., Jr. (1968) . . . . *Associate Professor of Education*
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Sattler, Howard (1968) . . . . . *Associate Professor of Education*
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Sauck, William A. (1971) . . . . . *Assistant Professor of Geology*
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Savage, Nevin W. (1959) . . . . . *Professor of Mathematics*
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Schabacker, Joseph C. (1963) . . . . . *Professor of Management*
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Schall, Merri H. (1960-66; 1967) . . . . . *Assistant Professor of Education*
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Schamadan, James L. (1967) . . . . . *Professor of Engineering*
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Schaumburg, Donald R. (1953) . . . . . *Professor of Art*
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Schilling, Dorothy C. (1932) . . . . . *Professor Emeritus of English*
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Schimmer, Al P. (1971) . . . . . *Instructor in English*
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Schmidt, Jean M. (1966) . . . . *Associate Professor of Microbiology*
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Schmidt, Randall B. (1968) . . . . . *Assistant Professor of Art*
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Schreiber, Henry H. (1961) . . . . . *Assistant Professor of Art*
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Seipp, Kenneth F. (1963) . . . . . *Professor of Music*
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Servin, Manuel P. (1970) . . . . . *Professor of History,*
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Shapiro, David L. (1969) . . . . . *Associate Professor of Economics*
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Shea, Elizabeth A (1972) . . . . . *Instructor in Nursing*
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Shell, Leon G (1967) . . . . . *Associate Professor of Education, Dean of Students*
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Shelton, Robert B. (1970) . . . . . *Assistant Professor of Economics*
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Sheppard, Douglas C (1971) . . . . . *Professor of Spanish; Chairman, Department of Foreign Languages*
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Sheridan, Michael F. (1967) . . . . . *Associate Professor of Geology*
B A , Amherst Co ege, M S , Ph D , Stanford University

Sherman, Thomas L (1964) . . . . . *Associate Professor of Mathematics*
B A , U nivers ty of California, Los Angeles' M.S , Ph.D , Univers ty of Utah

Shipp, Vernon E. (1966) . . . . . *Assistant Professor of Art*
B.S Grand Canyon College M A., Arizona State Univers ty

Showalter, Anna M (1968) . . . . . *Assistant Professor of Nursing*
R N , St Vincent's Hospital' B S N , Louisiana State U niversity;
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Silvaroli, Nicho as J (1963) *Professor of Education; Director, Reading Education Center*
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Silver, Ben amin (1971) *Assistant Professor of Mass Communications*
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S lver, Burr A. (1972) . . . . . *Assistant Professor of Geology*
B S , M S , Baylor U niversity Ph D University of Washington

Simmons, Douglas J (1963) . . . . . *Assistant Professor of French*
A B , Wabash Co ege, M A T , Harvard nivers ty, Certif cat de francais usue ,
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Sinkov, Abraham (1964) . . . . . *Professor of Mathematics*
B S , Co lege of City of New York, M A , Columbia University,
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S rkis, Murray D. (1969) . . . . . *Professor of Engineering*
B.S , Massachusetts Institute of Technology, M S , Ph D , U niversity of Illinois

Skelton, James W. (1964) . . . . *Associate Professor of Education*
B S , M.A , Ph D , Ohio State University, L L B , Rutgers, The State University

Smith, Arthur B., Jr (1967) . . . . . *Associate Professor of Administrative Services*
B S H l l Simmons U nivers ty, M.B A Ed D , U niversity of Houston

Smith Charles B (1964) . . . . . *Associate Professor of Administrative Services*
B S Drake U nivers ty, M S , New Mex co High ands University;
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Smith, Clyde B. (1952) . . . . . *Professor of Health, Physical Education and Recreation*
A.B., Geneva Co ege, M S in Ed , Indiana Univ rs ty

Smith, Lehi T (1959) . . . . . *Professor of Mathematics*
B S M A in Ed., Arizona State University; Ed D., Stanford University

Smith, L. Christian (1971) . . . . . *Assistant Professor of History*
B A , Union Col ege, M A , Ph D , University of Illinois

Smith, Margo M (1963) . . . . . *Assistant Professor of Music*
B M., Grinnell Colleg M A in Ed Arizona State University

Smith, Marion W (1952) . . . . . *Assistant Professor of Music*
B S in Mus. Ed , Cap tal University, M M , American Conservatory of Mus c

Smith, Ralph E. (1970) . . . . . *Associate Professor of Accounting*
B B.A , Washburn Univers ty, M S , Ph D , Univers ty of Kansas, C P A Kansas

Smith, Richard L (1967) . . . . . *Associate Professor of Engineering*
B S , Wash ngton University, M S , Ohio State University;
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Smith, Ronald D (1963) . . . . . *Associate Professor of History*
A.B , San Diego State College, Ph.D , University of Southern California

Smith, Rose M. (1967) . . . . *Assistant Professor of Speech and Theatre*
B A , Oklahoma College for Women, A M., University of Michigan

Snapp, Kenneth O. (1970) . . . . . *Professor of Music· Director of Bands*
B M University of Miami; M.M , University of Michigan,
Ph D , Indiana University

Snelling, R obert D (1969) . . . . . *Assistant Professor of Speech and Theatre*
B A , Whitman Co lege, M A , Stanford University

Snider, Donald L (1967) . . . . . *Associate Professor of Engineering*
B S , Ca fornia State Polytechnic College; M.S , University of Pennsylvania,
Ph D , Case Institute of Techno ogy

Snow, Robert P. (1970) . . . . . *Assistant Professor of Sociology*
B S. M A , Ph D , University of Minnesota

Snyder, Ernest E , Jr. (1958) . . . . . *Professor of Physics*
A.B , M A , Colorado State University, Ed D , New York Un versity

Snyder, James F. (1970) . . . . . *Assistant Professor of Administrative Services, Research Associate, Bureau of Business and Economic Research*
B S , Bloomsburg State College, M Ed , Montclair State College,
Ph D , Unive s ty of Georgia

Snyder, Lester M. (1967) . . . . *Associate Professor of Education*
B.S , Mil ersville State Co lege, M.Ed , Western Maryland College,
Ph D , University of Michigan

Soderberg, Richard R (1969) . . . . . *Research Professor; Coordinator of Informational Systems; College of Engineering Sciences*
B S , M S , University of Southern California

Sommerfeld, Milton R (1968) . . . . . *Assistant Professor of Botany*
B S , Southwest Texas State Col ege, Ph D , Wash ngton Univers ty

Sorvig, Richard D (1970) . . . *Assistant Professor of Speech and Theatre*
B A , Bethel College, M A Univers ty of Minnesota

Spinosa, Frank M (1965) . . . *Professor of Music*
B M M A , Boston University, D M A , University of Illinois

Sp vak, Susan I (1972) . . . . . *Assistant Professor of Law*
A B , Pembroke Col ege in Brown U niversity, J D , University of Pennsylvania

Spurr, Edward J. (1971) ..... *Assistant Professor of Technology*
B.S.M.E., California State Polytechnic College, M.S.M.E., Stanford University

Stadmiller, Jack E (1963) *Associate Professor of Engineering Communications; Coordinator of Student Advisement College of Engineering Sciences*
B.A. University of Utah, M.A., Arizona State University

Stafford, Alfred B (1958) ..... *Professor of Engineering*
B.S.E.E., Carnegie Institute of Technology, M.A., University of Pittsburgh, Ph.D., University of Chicago

Stafford, Kenneth (1957) ..... *Professor of Education*
B.A., M.Ed.D., Ph.D., University of Oklahoma

Staley, Frederick A. (1970) ..... *Assistant Professor of Education*
B.A., M.A., Western Michigan University, Ph.D., Michigan State University

Stalzer, Frank S. (1955) ..... *Associate Professor of Music*
B.M.Ed., University of Kansas, M.M., Eastman School of Music

Stange, Jean B. (1970) ..... *Associate Professor of Home Economics*
B.S. Iowa State University, M.S., University of Minnesota

Stanley, James T (1968) ..... *Associate Professor of Engineering*
B.S. M.S., Ph.D., University of Illinois

Stapleton, Margaret L. (1969) ..... *Assistant Professor of Nursing*
B.S., Arizona State University, M.S., University of California Los Angeles

Stark, Barbara L. (1972) ..... *Assistant Professor of Anthropology*
B.A., Rice University, M.Phil., Yale University

Starrfield, Sumner G. (1972) ..... *Assistant Professor of Physics*
B.A., University of California, Berkeley, M.A., Ph.D., University of California, Los Angeles

Steadman, Lyle B (1971) ..... *Assistant Professor of Anthropology*
B.A., Occidental College, M.A., University of California, Los Angeles, Ph.D. Australian National University

Steere, Caryl J (1960) ..... *Assistant Professor of Education*
B.A. Albion College, M.A., Arizona State University

Steffl, Bernita M. (1961) ..... *Associate Professor of Nursing*
R.N., Ancker Hospital School of Nursing, B.S. in P.H.N., M.P.H. University of Minnesota

Stein, Peter K 959 ..... *Dean of Engineering*
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Steinmann, Wilbur L. (1959) ..... *Associate Professor of Engineering*
B.E.E., University of Minnesota, M.S.E.E., University of Iowa

Stellhorn, Martin H (1963) ..... *Professor of Music*
Mus.B., St. Louis Institute of Music, Mus.M., Northwestern University, Ph.D. Washington University

Stengel, Jean M (1970) ..... *Assistant Professor of Nursing*
B.S.N., University of Oregon Medical School, M.A., University of Minnesota

Stevenson, Harold W (1967) ..... *Professor of Finance*
B.S., University of Minnesota, M.B.A., Ph.D., University of Michigan

Steverson, Norris J. 1932) ..... *Associate Professor of Health, Physical Education and Recreation*
B.A. in Ed. Arizona State University, M.S. in Ed., University of Southern California

Stewart, Donald G. (1964) ..... *Associate Professor of Mathematics*
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Stewart, Ernest I., Jr (1959) *Professor of Health Education, Assistant Dean, College of Liberal Arts*
B.S., M.S., Utah State University Ph.D., University

Stewart, Kenneth M (1947) ..... *Professor of Anthropology*
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Stiles, Philip G (1969) ..... *Professor of Agriculture*
B.S., University of Arkansas; M.S., University of Kentucky, Ph.D., Michigan State University

Stites, William H. 1954) ..... *Professor of Speech and Theatre*
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Stone, William J. (1967) ..... *Associate Professor of Health, Physical Education and Recreation*
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Stoner, Richard G. 1963 ..... *Professor of Physics*
A.B., A.M., Ph.D., Princeton University

Stout Irving W (1953) ..... *Professor of Education*
B.Ed., Wisconsin State University M.A., Ed.D. Northwestern University

Stout Minard W. (1968) ..... *Professor of Education*
B.A., University of Northern Iowa, M.A., Ph.D., University of Iowa

Stowe, Noel J (1967) ..... *Assistant Professor of History*
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Straub, Calvin C (1961) ..... *Professor of Architecture*
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Streufert, Hildegarde (1961) *Associate Professor of Home Economics*
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Stronik Ales (1969) ..... *Professor of Physics*
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Strom, Robert D (1969) ..... *Professor of Education*
B.S., Macalester College; M.A., University of Minnesota, Ph.D., University of Michigan

Strong, Robert E., Jr. 1969 ..... *Assistant Professor of Law*
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Stuber, John H. (1963) ..... *Associate Professor of Art*
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Stumpf, Angela M. (1959) ..... *Associate Professor of Nursing*
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Sullivan, Howard J (1971) ..... *Professor of Education; Chairman Department of Educational Technology and Library Science*
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Sundwall, Harry W. (1962) ..... *Professor of Education Director, Center for Indian Education*
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Susel, Rudolph M. (1970) ..... *Assistant Professor of History*
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Swagert, S Laird (1971) .. . .. . *Professor of Political Science*
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Swanson, Roger M. (1968) . ..... *Assistant Professor of English; Associate Dean of Student Affairs Admissions Orientation*
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Swanson, Thomas I., Major (1972) ..... *Assistant Professor of Aerospace Studies*
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Swimmer, Alvin (1963) .... . *Associate Professor of Mathematics*
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Tai, Leung Tak (1972) .. . *Assistant Professor of Chemistry*
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Talbert, Elmer G. (1968) . ..... *Associate Professor of Education*
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Tambs Lewis A (1969) ..... *Associate Professor of History, Director, Center for Latin American Studies*
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Tipton, Gary P (1969) . . . .. *Assistant Professor of Chinese*
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Toohey, Jack V 1966) ... . *Professor of Health, Physical Education and Recreation*
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Trost, John C. (1967 ..... *Professor of Administrative Services*
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Trelease, Richard N (1971) . ... .. *Assistant Professor of Biology and Zoology*
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Turk, Rudy H. (1967) . . . . . *Associate Professor of Art; Curator, University Art Collections*
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Turnbow, James W (1959) . . . . . *Professor of Engineering*
B S M E , Texas Technological College, M S E M., Ph D , University of Texas

Turner, Christy G , II (1966) . . . . . *Associate Professor of Anthropology*
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Turner, Katharine C. (1946) . . . . . *Professor of English*
B.Ed , Illinois State Normal University,
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Van Dyke, James E. (19 2 . . . *Assistant Professor of Marketing*
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Van Ornum, James H. (1972) . . . *Assistant Professor of Engineering*
B.S E E , State University of New York, M S E., Ph.D., Arizona State University

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Van Scoy, Herbert A. (1963) . . . . . *Professor of Spanish*
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Van Wagenen, R Keith (1963) . . . . . *Professor of Education; Chairman Department of Educational Psychology*
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Veatch, Jeannette (1968) . . . . . *Professor of Education*
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Verduzco, Roger (1972) . . . . . *Assistant Professor of Education*
B A , M A , Purdue University

Vergis, John P. (1954) . . . . . *Professor of Education*
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Vestre, Norris D. (1972) . . . . . *Professor of Psychology*
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Vichules, Leo D (1961) . . . . *Assistant Professor of Political Science*
A B , M A , University of Michigan

Vickers, Samuel E . . . . . *Professor Emeritus of Political Science*
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Virgillo, Carmelo (1965) . . *Associate Professor of Romance Languages*
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Von Bretzel, Philip K (1967) . . . . *Assistant Professor of Philosophy*
B A , M A , University of Michigan

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Voss, Howard G. (1964) . . . . . *Assistant Professor of Physics*
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Votichenko, T. Alexander (1956) . . . . *Assistant Professor of Philosophy*
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Wagner, Ronald F. (1962) . . . . . *Associate Professor of Art*
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Wagstaff, H Reid (1969) . . . . . *Associate Professor of Geography*
A B , A M , Ph D University of Michigan

Waldron, Edward E. (1972) . . . . . *Instructor in English*
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Walker, Charles Thomas (1971) . . . . . *Professor of Physics*
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Walker, Janet F (1960) . . . . . *Professor Emeritus of Nursing*
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Walker, Stephen G. (1969) . . . . . *Assistant Professor of Political Science*
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Wang, Alan P (1970) . . . . . *Associate Professor of Mathematics*
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Ward, Jack W (1964) . . . . . *Associate Professor of Construction*
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Warnicke, Retha M (1973) . . . . . *Assistant Professor of History*
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Warren, Morrison F. (1968) . . . . . *Associate Professor of Education, Director, I. D Payne Learning Laboratory*
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Waskey, Frank H (1969) . . . . . *Assistant Professor of Home Economics*
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Watson, Clyde W. (1971) . . . . . *Assistant Professor of Art*
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Watson, George L (1969) . . *Assistant Professor of Political Science*
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Weber, Delbert D (1962-66; 1969) . . . . . *Professor of Education· Dean College of Education*
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We s, Dennis G (1971) .. . .. *Assistant Professor of Mathematics*
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Wh tam, Frederick L. (1966) ... . *Associate Professor of Sociology*
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Wurzell, Carol A. (1965) ..... *Assistant Professor of Nursing*
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Yale, Francis G. (1952) ..... *Associate Professor of Science Education and Physics*
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Yamamoto, Kaoru (1972) ..... *Professor of Education*
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Yeater, James W. (1958) ..... *Professor of Speech and Theatre, University Theatre Coordinator*
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Young, Hewitt H (1967) ..... *Professor of Engineering, Chairman, Industrial Engineering Faculty*
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Young, Otis E, Jr (1963) ..... *Professor of History*
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Zacher, Robert V. (1947) ..... *Professor of Advertising*
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Zesbaugh, Joseph P. (1969) ..... *Instructor in Mass Communications*
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Zimmer, Carl R (1959) ..... *Associate Professor of Engineering*
B.E E , Cornell University; M E.E , Ph D , Syracuse University

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A B , M A , Baylor University

Zimmerman, Muriel Ann (1968) ..... *Assistant Professor of Art*
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Zoll, Donald A. (1970) ..... *Professor of Political Science*
B A , Knox College, M A , Northwestern University,
M A , D Litt , University of Saskatchewan

Zornow, Ruth A (1970) ..... *Assistant Professor of Nursing*
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Visiting Professors and Lecturers

Ballew, Thomas ..... *Lecturer in Architecture*
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Bouchard, Anthony ..... *Lecturer in Italian*
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Cain, H. Thomas ..... *Lecturer in Anthropology*
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Canter, Aaron H. ..... *Clinical Professor of Education*
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Christiansen, George W ..... *Lecturer in Architecture*

Clark, Julian H. ..... *Lecturer in Architecture*

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Lindberg, Robert E. ..... *Clinical Professor of Education*
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B S Ed , Youngst own Un versity, M A , University f Ch cag ,
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B S Ar zona State University

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B S C E , University of Ar zona

Smith, Emmett Ray ..... *Lecturer in English*
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Yellott, John I ..... *Lecturer in Ar hitecture*
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University Library

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Al-Hazzam, Ethel Elizabeth (1970) ..... *Head, Map Library*
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Beecher, Mary E (1958) ..... *Catalog Librarian*
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Bissett, Judith I. (1971) ..... *Reference Librarian*
B A., University of Mexico, M A , University of Wisconsin,
M.A , University of Texas, Austin

Blouin, Deborah K. (1971) ..... *Reference Librarian*
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Borovansky, Vladimir T. (1968) ..... *Chief Science Librarian*
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Danaher, Edward M. (1968) ..... *Assistant University Librarian*
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Daubenas, Jean D. (1972) ..... *Reference Librarian*
A B Barnard Co lege, M A., New York University,
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DeFato, Rosalinda (1970) ..... *Reference Librarian*
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Dobbins, Jenny L. (1967) ..... *Assistant Head, Catalog Service*
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Dobkin, Joseph B. (1970) ..... *Associate University Librarian*
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Ferrall, Eleanor J. (1969) ..... *Reference Librarian*
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Fireman, Bert M (1967) ..... *Curator, Arizona Collection*
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Hallisey, Peta L. (1972) ..... *Reference Librarian*
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Henning, Jane C. (1968) ..... *Architecture Librarian*
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Knepp, Kenneth (1968) ..... *Catalog Librarian*
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Kusche, Larry D (1969) ..... *Reference Librarian*
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Lewis, Evelyn E. (1969) ..... *Head Interlibrary Loan*
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Lewis, John P (1972) ..... *Reference Librarian*
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Martin, Thomas C. (1971) ..... *Reference Librarian*
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Muir, Gertrude F (1960-62; 1963) ..... *Reference Librarian*
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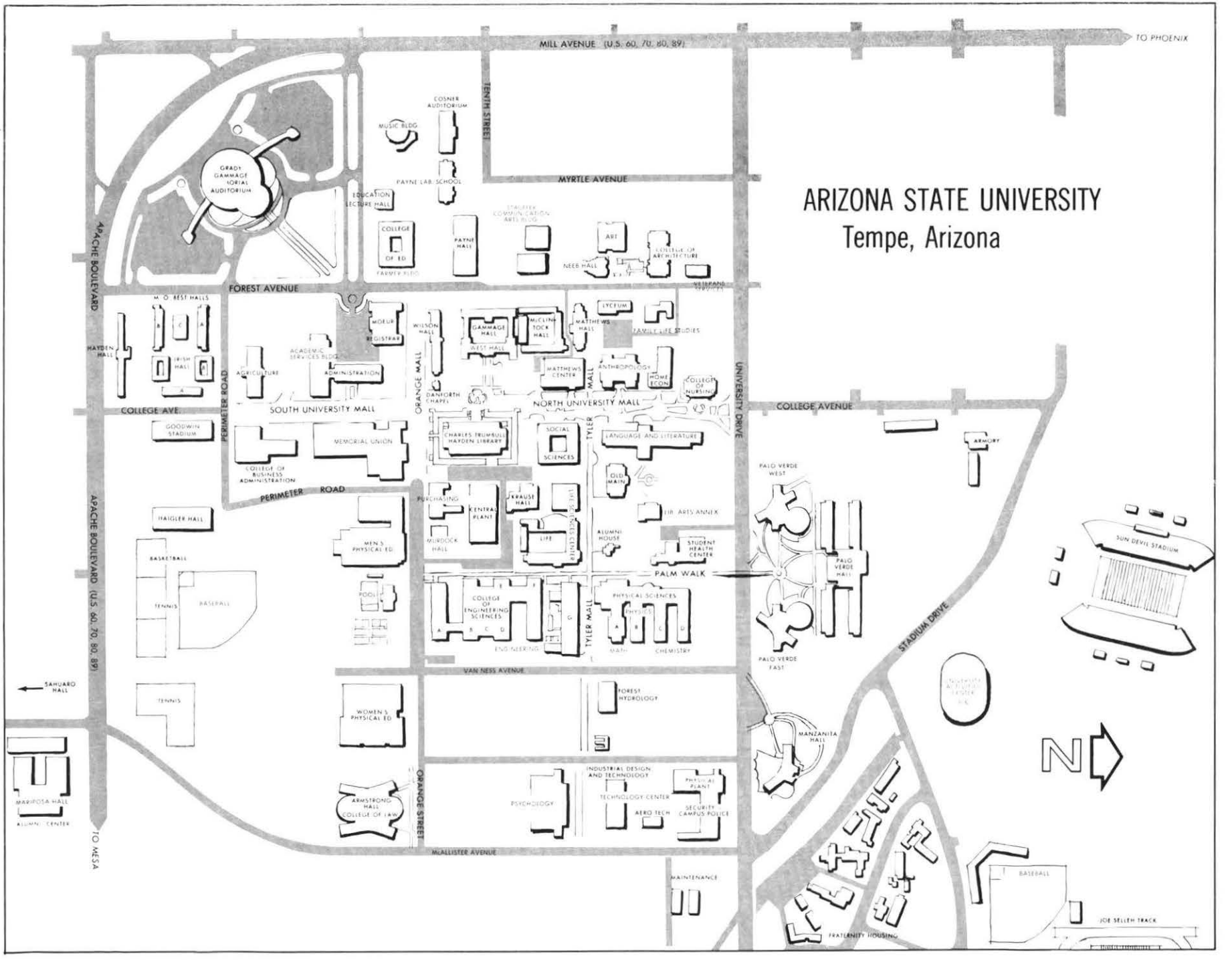
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