IX School of Engineering

Gordon A. Sargent, Dean
James L. McGraw, Associate Dean for Engineering Technology

The School of Engineering has as its purpose the preparation of men and women for professional careers in engineering and in technology in order that they may assume responsible positions of a technical or semi-technical nature in business, industry, education, and government. Of primary concern is the development of professional competencies and philosophies within the various engineering and technology disciplines as well as a broad outlook on the technical and social problems that confront society. Additionally, the engineering and technology programs provide excellent background for other career areas.

The engineering program in each of the fields of chemical, civil, electrical, and mechanical engineering is designed to lead to a bachelor's degree in a four-year period. While students pursue curricula they themselves have chosen according to their fields of interest, they all take certain core courses in mathematics, chemistry, physics, English, computer science, and engineering fundamentals. Each engineering program permits additional concentrations of study in energy conversion, industrial and systems engineering, environmental engineering, aerospace engineering, and materials science. Although emphasis is on fundamental theory, continued attention is paid to the solution of practical problems which the student will encounter in the practice of engineering. As an educational unit of a private university, the School of Engineering strongly emphasizes the counseling of students in order that they may achieve their educational objectives within the engineering program. Each student is assigned a faculty advisor. Academic counseling begins before the students begin their formal course work and continues as they progress toward their objectives.

The engineering technologist is concerned with the application of established scientific and engineering knowledge and methods. Therefore, engineering technology programs consist of courses especially designed to emphasize the use of engineering knowledge. The engineering technologist is usually involved in the design, testing, and sales of products and equipment; the design management of manufacturing systems; or the supervision of other technologists. The Engineering Technology Division of the School of Engineering has as its objective the collegiate education of young men and women to be competent engineering and scientific technologists. It is the philosophy of the Engineering Technology Division that this objective is best accomplished by (1) providing specialized technical courses that emphasize rational thinking and the application of scientific principles to the practical solution of technological problems, (2) providing courses in mathematics and basic science sufficient to support the technical courses and to prepare the student for future growth, and (3) providing education to prepare students to communicate intelligently and to take their places in society as responsible, humane citizens.

The broader responsibilities of the engineering profession demand that the professional training of an engineer include a significant component of humanities, ethics, and social science studies in order that the student will become aware of the urgent problems of society and develop a deeper appreciation of the cultural achievements of humanity. Additionally, such studies provide the proper framework to insure that scientific discoveries and developments by engineers may result in the real advancement of the human race.

TRANSFER STUDENTS

The engineering programs welcome transfer students from both community and senior colleges and work closely with many schools to facilitate transfers from pre-engineering programs. Students may complete the first two years of study in other accredited institutions and transfer to the University of Dayton with little or no loss of credit provided that they have followed programs similar to those prescribed by the University of Dayton School of Engineering.

The School of Engineering has dual degree arrangements with Wilberforce University and the College of Mount St. Joseph (Ohio) as well as curriculum agreements with Thomas More College, Brescia College, and Sinclair Community College.

The engineering technology programs welcome transfer students from associate degree programs in engineering technology who wish to pursue the Bachelor of Science in Engineering Technology. Graduates of two-year associate degree programs in engineering technology should normally expect to undertake at least two additional years of work for the bachelor's degree.

OPTIONAL COOPERATIVE EDUCATION PROGRAM

Students majoring in chemical engineering, civil engineering, electrical engineering, mechanical engineering, chemical technology, electronic engineering technology, and mechanical engineering technology may participate in the Cooperative Education Program. To be eligible, they must have completed three semesters and have a cumulative grade point average of not less than 2.3. Those applying for the program will be accepted on the basis of grade point average, motivation, and attitude. The number of students placed depends on the availability of jobs. The Cooperative Education Program offers the student the opportunity to place classroom work into practical use while still in school, resulting in early career identification and greater motivation as well as providing a source of funds. See also Chapter X.

MINORS IN ENGINEERING

The student majoring in chemical, civil, electrical, or mechanical engineering may choose a minor concentration area of technical study. The minors program in the School of Engineering provides an opportunity to specialize in a particular technical subarea while still pursuing a major program of study in one of the traditional and well recognized engineering disciplines. The minors program was designed in response to the needs of industry and government and to the educational needs and career objectives of students. Election of the minor is optional; it does not add extra courses or degree requirements for graduation.

The minor concentration is defined as 12 semester hours of work. It can be composed of any number of 1- to 3-semester-hour courses selected from the approved list of minor areas of study, which currently includes the following:

Aerospace Engineering
Automatic Control Systems
(Bio-Engineering)[1]
Chemical Processing
Digital Systems
Dynamic Analysis of Mechanical Systems
Energy Conversion
Engineering Mechanics
Environmental Engineering
Industrial and Systems Engineering
Magnetics
Materials Engineering
Mechanics of Engineering Systems
Structures
Thermal Engineering

Students, in consultation with their faculty advisors, normally select the minor concentration in the second semester of the sophomore year. The minor concentration is designated on the student's transcript.

[1]Although the absence of a bio-engineering supporting department or departmental specialty curriculum prevents the offering of a bio-engineering minor, the courses constitute a preparation for bio-engineering graduate work. "Bio-Engineering preparation" will appear on the student's transcript.

ENGINEERING FRESHMAN REQUIREMENTS

Students who are recent high school graduates or who have earned fewer than 15 semester hours of collegiate credit are classified as new freshmen and must meet the common engineering program requirements as detailed below. Such credit requirements may be met in a number of ways, including (1) advanced college-level course work at the University of Dayton or other collegiate institutions; (2) CLEP, CEEB, or other advanced-standing testing; (3) departmental examination during the first term, or work experience equivalent; or (4) taking the prescribed courses as part of the freshman year. Each request for advanced standing by credit must be initiated by the student in consultation with the engineering faculty counselor to the office of the dean of engineering.

Students admitted as undeclared will be accepted into departments of their choice on a space-available basis.

REQUIRED FIRST-YEAR PROGRAM

Dept.	*No.*	*Courses*	*Semester Hours*
CPS	132	Computer Programming for Engineering and Science	3
CHM	123	General Chemistry	4
EGM	101	Statics	3
EGR	103	Introduction to Engineering	2
ENG	101	College Composition I	3
MTH	118-119	Analytic Geometry and Calculus I, II	8
MEE	106L	Engineering Design Graphics I	2
PHY	206	General Physics I	3
HST	101 or 102	History of Western Civilization[1]	3
—	—	Introductory philosophy or religious studies	3
		Total first-year credit requirements	34

[1]Chemical engineering students will take CHM 124 and postpone this general education requirement until the junior year.

DEGREE REQUIREMENTS

A student enrolls in the curriculum prescribed for the academic year in which he or she is registered as a freshman at the University of Dayton or elsewhere. If for any reason it is necessary or desirable to change to a subsequently established curriculum, the student must meet all of the requirements of the new curriculum.

The degree—Bachelor of Chemical, Civil, Electrical, or Mechanical Engineering—is conferred at commencement if the following requirements have been fulfilled:

1. All prescribed courses outlined in the respective curricula must have been passed with grades of D or better. Although courses may be scheduled in terms other than as listed, all prerequisites and corequisites must be met.

2. All students in the School of Engineering must register under Grade Option 1 for all courses in engineering, mathematics, and science except those offered only under Grade Option 2.

3. The cumulative quality-point average in the student's engineering curriculum must be at least 2.0 (C average).

4. The student must have attended the School of Engineering at the University of Dayton during the senior year, carrying at least 30 semester hours.

The semester hours of credit required for graduation in each engineering curriculum administered by the School of Engineering are as follows:

Bachelor of Chemical Engineering 136
Bachelor of Civil Engineering 137
Bachelor of Electrical Engineering 137
Bachelor of Mechanical Engineering 134

5-YEAR COMBINED BACHELOR'S-MASTER'S ENGINEERING PROGRAM

The School of Engineering offers a combined 5-year program leading to both a bachelor's degree in a departmental major (chemical, civil, electrical, or mechanical engineering) and a master's degree. Physics majors (College of Arts and Sciences) may also participate. The program is designed for the qualified student who wishes to pursue either greater specialization in a major area or to complement the undergraduate program with a related graduate-level concentration. Most students who select the program have received some advanced placement upon entry to engineering at the freshman level or take occasional summer courses.

The formal request for entrance into this program is made before the first semester of the student's junior year. Admission requirements include a minimum cumulative grade point average of 2.8 and permission from the chairperson of the department corresponding to the student's undergraduate major. Selection of the graduate (master's) program area is indicated below:

Undergraduate Program	*Graduate Program Selections*
Chemical Engineering	Aerospace Engineering Chemical Engineering Engineering Management Engineering Science Materials Engineering
Civil Engineering	Civil Engineering Engineering Management Engineering Science Materials Engineering
Electrical Engineering	Aerospace Engineering Electrical Engineering Engineering Management Engineering Science Materials Engineering

Mechanical Engineering	Aerospace Engineering Engineering Management Engineering Science Materials Engineering Mechanical Engineering
Physics	Materials Engineering

The department chairperson and the graduate program director serve as an advisory committee to the student in establishing the 5-year combined program requirements. The freshman, sophomore, and junior years follow the curriculum of the student's selected bachelor's program. The guideline curriculum requirements for the 4th and 5th years are given below.

A student who elects the 5-year combined program must satisfy both undergraduate and graduate degree requirements as to required cumulative grade point average for graduation. The graduate of the combined program will receive a bachelor's degree in the undergraduate major (e.g., Bachelor of Mechanical Engineering) and a master's degree in the graduate area (e.g., Master of Science in Materials Engineering). A student in the 5-year combined program who chooses not to complete the program must complete all the undergraduate major program requirements to receive the bachelor's degree.

PROGRAM—EN6: 5-YEAR BACHELOR'S-MASTER'S PROGRAM

Course Area	*Semester Hours*	
Senior Year	1st Term	2nd Term
Undergraduate department major	11	11
Undergraduate department or University requirement or electives	3	3
Graduate major (graduate credit)	3	3
	17	17
Fifth Year		
Graduate major (including thesis or project)	12	12

CHEMICAL ENGINEERING (CME)

Chemical engineering applies the principles of the physical sciences, economics, and human relations to fields that pertain to processes and process equipment in which matter is treated to effect a change in state, energy, or composition.

The first part of the chemical engineering curriculum provides a firm foundation in mathematics, physics, and chemistry. The chemistry background is stressed. Courses include general, organic, and physical chemistry. The second part of the curriculum stresses chemical engineering topics such as transport phenomena, thermodynamics, kinetics, unit operation and processes, process control, materials of construction, and design.

The Chemical Engineering Department offices are in the Kettering Building and the laboratories in Wohlleben Hall. Three stories of the north wing of Wohlleben Hall house the Unit Operations Laboratory. Experimental equipment includes units for the study of fluid flow, heat transfer, distillation, extraction, filtration, evaporation, and drying. The Process Control and Transport Phenomena Laboratories are on the second floor. The Thermal Combustion Laboratory is on the third floor. In addition, the department has a woodworking shop, a pipe-fitting shop, an analytical laboratory, and a darkroom.

The curriculum in chemical engineering serves as basic training for graduate study or for positions in diverse areas of the chemical industry.

Those interested in pursuing careers in medicine or biochemical engineering should contact the department chairperson.

PROGRAM—EN1: BACHELOR OF CHEMICAL ENGINEERING (CME)

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Sophomore Year		
CME	203	Material and Energy Balances	3-0-3	
CME	204	Experimental Methods for Chemical Engineers		3-0-3
CHM	313-314	Organic Chemistry	3-3-4	3-3-4
ENG	102	College Composition II	3-0-3	
MTH	218	Analytic Geometry and Calculus III	4-0-4	
MTH	219	Applied Differential Equations		3-0-3
PHY	207-208	General Physics II, III	3-0-3	3-0-3
—	—	General education requirement[2]		3-0-3
			17	16
		Junior Year		
CME	305	Thermodynamics		3-0-3
CME	324-325	Transport Phenomena	3-0-3	3-0-3
CME	326L	Transport Phenomena Laboratory		0-3-1
CME	381	Applied Mathematics for Chemical Engineers	3-0-3	
CME	408B	Seminar	1-0-0	1-0-0
CHM	303-304	Physical Chemistry	3-3-4	3-0-3
ELE	321	Basic Electric Theory		3-0-3
HST	101 or 102	History of Western Civilization	3-0-3	
SPE	101	Fundamentals of Effective Speaking	3-0-3	
—	—	General education requirement[2]		3-0-3
			16	16

		Senior Year		
CME	306	Kinetics	3-0-3	
CME	408	Seminar	1-0-1	
CME	411-412	Unit Operations I, II	3-0-3	3-0-3
CME	413L-414L	Unit Operations Laboratory	0-5-2	0-5-2
CME	430-431	Chemical Engineering Design I, II	3-0-3	3-0-3
CME	452	Process Control	3-0-3	
CME	453L	Process Control Laboratory		0-3-1
—	—	General education requirements[2]	3-0-3	9-0-9
			18	18

[1]For example: 3-0-3 means 3 class hrs., 0 lab. hrs., 3 sem. hrs. credit.

[2]See General Education Requirements, Chapter V. Some general education requirements are specified in the program (e.g., PHY 208); others are to be chosen from the listing of approved courses. Consult advisor.

FACULTY

Edmund J. Rolinski, *Chairperson*
Professors: Primrose, Rolinski, Servais
Associate Professors: Lu, Sandhu
Assistant Professors: Sandy, Lee
Adjunct Assistant Professors: Kessler, Fasano, Griffin

COURSES OF INSTRUCTION

CME 203. MATERIAL AND ENERGY BALANCES: Introduction to chemical engineering with lectures and problems on material and energy balances as applied to industrial processes. Prerequisites: CHM 123, MTH 118. First term, each year. *3 sem. hrs.*

CME 204. EXPERIMENTAL METHODS IN CHEMICAL ENGINEERING: Introduction to chemical engineering instrumentation, data analysis, experiment design, and report writing with applications in thermofluidmechanics. Prerequisites: CME 203, CHM 124L. Second term, each year. *3 sem. hrs.*

CME 305. THERMODYNAMICS: Development of the fundamental principles of thermodynamics, particularly with respect to chemical engineering processes. Prerequisite: MTH 218. *3 sem hrs.*

CME 306. KINETICS: Reaction kinetics, catalysis, and adsorption. Prerequisite: CME 305. First term, each year. *3 sem. hrs.*

CME 324. TRANSPORT PHENOMENA I: Viscosity, shell momentum balances, isothermal equations of change, thermal conductivity, shell energy balances, nonisothermal equations of change, diffusivity, concentration profiles. Prerequisite: MTH 219. Corequisite: CME 381. *3 sem. hrs.*

CME 325. TRANSPORT PHENOMENA II: Friction factor, dimensionless correlations, isothermal macroscopic balances, Bernoulli's Equation, heat transfer coefficients, heat transfer correlations, heat exchangers, nonisothermal macroscopic balances. Prerequisite: CME 324. Second term, each year. *3 sem. hrs.*

CME 326L. TRANSPORT PHENOMENA LABORATORY: Viscosity, velocity profiles, temperature profiles, heat transfer coefficients, diffusivity, compressibility factors for gases. Prerequisite: CME 324. Corequisite: CME 325. Second term, each year. *1 sem. hr.*

CME 381. ADVANCED MATHEMATICS FOR CHEMICAL ENGINEERS: Study of mathematics to support transport phenomena and process control. Vector calculus, solution of partial differential equations, and Laplace transforms. Prerequisite: MTH 219. First term, each year. *3 sem. hrs.*

CME 408A. SEMINAR: Presentation of lectures on contemporary chemical engineering subjects by students, faculty, and engineers in active practice. Registration required of all students in their last term prior to graduation. *1 sem. hr.*

CME 408B. SEMINAR: Presentation of lectures on contemporary chemical engineering subjects by students, faculty, and engineers in active practice. Registration required of all junior and senior students not registered in CME 408A. *no credit*

CME 411. UNIT OPERATIONS I: Fluid mechanics, transportation of fluids, flow of heat, evaporation, filtration, and mixing. Prerequisites: CME 324-325. First term, each year. *3 sem. hrs.*

CME 412. UNIT OPERATIONS II: Continuation of CME 411. Distillation, extraction, gas phase mass transfer, gas absorption, drying, and crystallization. Prerequisite: CME 411. Second term, each year. *3 sem. hrs.*

CME 413L. UNIT OPERATIONS LABORATORY: Unit operations equipment and its utilization. Prerequisite: CME 324. First term, each year. *2 sem. hrs.*

CME 414L. UNIT OPERATIONS LABORATORY: Continuation of CME 413L. Prerequisite: CME 325. Second term, each year. *2 sem. hrs.*

CME 430. CHEMICAL ENGINEERING DESIGN I: Study of the principles of process development, plant design, and economics. Corequisite: CME 411. First term, each year. *3 sem. hrs.*

CME 431. CHEMICAL ENGINEERING DESIGN II: Application of the principles of process development, plant design, and economics. Prerequisite: CME 430. Second term, each year. *3 sem. hrs.*

CME 440. SYNTHETIC FUELS: Principles of synthetic fuels technology such as pyrolysis, gasification, gas shift and synthesis, and direct liquefaction, with economic and environmental considerations. Departmental elective. Prerequisites: CHM 304, CME 305, 306. Second term, each year. *3 sem. hrs.*

CME 441. LASERS IN ENGINEERING MEASUREMENT: Modern physics, light scattering, introduction to lasers, laser velocimetry, spectroscopy, signal detection and processing, flow visualization, holography, common features of laser diagnostics. Prerequisites: CME 204 or equivalent, MTH 219, PHY 207-208. *3 sem. hrs.*

CME 452. PROCESS CONTROL: Block diagrams, system transfer functions, feedback, transient and steady state response, root locus method, frequency response, Bode diagrams, analog computer. Prerequisite: CME 381. First term, each year. *3 sem. hrs.*

CME 453L. PROCESS CONTROL LABORATORY: Analog computer programming, analog solution of differential equations, frequency response, Bode diagrams, computer simulation, open and closed loop system response. Report writing emphasized. Prerequisite: CME 452. *1 sem. hr.*

CME 499. SPECIAL PROBLEMS IN CHEMICAL ENGINEERING: Particular assignments to be arranged and approved by chairperson of the department. *1-6 sem. hrs.*

CIVIL ENGINEERING (CIE)

Civil engineers, leading users of high technology in wide-ranging applications in both the public and the private sectors, are essential to the continued improvement of society. Civil engineers can enter traditional fields such as construction, bridge and building design and analysis, highway design and traffic control, water treatment and distribution, environmental control, hydraulics, and geotechnics. However, their broad education also prepares them for materials engineering, engineering management, and the aerospace and automotive industries. Civil engineering has applications in conceptual and detail design, field operations, computers, and consulting.

The civil engineering curriculum prepares the graduate to function not only within the civil and aerospace communities but also with other engineering disciplines and nontechnical components of society. The freshman and sophomore years build a sound foundation in mathematics, physics, chemistry, and basic engineering science and mechanics. The junior and senior years focus on technical subjects related primarily to civil engineering, with electives available to permit either specialization or preparation for graduate study.

Members of the student chapter of the American Society of Civil Engineers have the opportunity to meet regularly with practicing engineers in the Dayton community.

PROGRAM—EN2: BACHELOR OF CIVIL ENGINEERING (CIE)

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*	
		Sophomore Year			Summer
CIE	213	Surveying	2-0-2		
EGM	303	Strength of Materials	3-0-3		
ENG	102	College Composition II	3-0-3		
MTH	218	Analytic Geometry and Calculus III	4-0-4		
MEE	227L	Engineering Graphics II	0-3-1		
PHY	207-208	General Physics II, III	3-0-3	3-0-3	
CIE	408	Seminar I	1-0-0	1-0-0	
CIE	214	Highway Geometrics		2-0-2	
EGM	301	Dynamics		3-0-3	
GEO	218	Engineering Geology		3-0-3	
MTH	219	Applied Differential Equations		3-0-3	
SPE	101	Fundamentals of Effective Speaking		3-0-3	
CIE	215L	Surveying Field Practice			0-0-3
			16	17	3
		Junior Year			
CHM	124	General Chemistry	3-3-4		
CIE	313	Hydraulics	3-3-4		
CIE	316	Analysis of Determinate Structures	3-0-3		
CIE	320	Civil Engineering Analysis	3-0-3		
CIE	408	Seminar I	1-0-0	1-0-0	
—	—	General education requirements[2]	3-0-3	6-0-6	
CIE	310L	Civil Engineering Laboratory		0-3-1	
CIE	312	Soil Mechanics		3-3-4	
CIE	317	Analysis of Indeterminate Structures		3-0-3	
CIE	333	Environmental Engineering I		3-0-3	
			17	17	

		Senior Year		
CIE	403	Transportation Engineering	3-0-3	
CIE	408	Seminar I	1-0-0	
CIE	411	Design of Steel Structures	3-3-4	
CIE	434	Environmental Engineering II	3-0-3	
PHL	316	Engineering Ethics	3-0-3	
—	—	Science or engineering elective	3-0-3	
CIE	412	Design of Concrete Structures		3-3-4
CIE	428	Seminar II		1-0-1
CIE	—	Civil engineering electives		6-0-6
—	—	General education requirements[2]		6-0-6
			16	17

[1]For example, 3-0-3 means 3 class hrs., 0 lab. hrs., 3 sem. hrs. credit.

[2]See General Education Requirements, Chapter V. Some general education requirements are specified in the program (e.g. PHY 208); others are to be chosen from the listing of approved courses. Consult advisor.

FACULTY

Fred K. Bogner, *Chairperson, Department of Civil Engineering and Engineering Mechanics*
Professors: Bogner, Ryckman, Thomson
Associate Professors: Payne, Phillips, G. Shaw, Weiss
Assistant Professors: Anessi, Saliba
Adjunct Associate Professor: Palazotto

COURSES OF INSTRUCTION

CIE 211. SURVEYING: Theory of measurements, computation and instrumentation. Boundary and construction surveys, celestial observations, triangulation and level net adjustments, elementary geodesy, and state coordinate systems. Corequisite: MTH 118. First term, each year. *3 sem. hrs.*

CIE 212. HIGHWAY GEOMETRICS: Study of photogrammetry, circular and spiral curves, vertical curves, grade lines, earthwork and mass diagram, slope and grade stakes, contour grading, and use of aerial photographs. Prerequisite: CIE 211. Second term, each year. *3 sem. hrs.*

CIE 213. SURVEYING: Theory of measurements, computation, and instrumentation. Boundary and construction surveys, triangulation, and level net adjustments. Corequisite: MTH 118. First term, each year. *2 sem. hrs.*

CIE 214. HIGHWAY GEOMETRICS: Study of circular and spiral curves, vertical curves, grade lines, earthwork and mass diagram, slope and grade stakes, and contour grading. Prerequisite: CIE 213. Second term, each year. *2 sem. hrs.*

CIE 215L. SURVEYING FIELD PRACTICE: Field work and computation in topography, highway surveying, triangulation, level net, celestial observations, evaluation of errors, and preparation of plans. Five eight-hour days a week for three weeks. Prerequisite: CIE 212 or 214. Summer, each year. *3 sem. hrs.*

CIE 310L. CIVIL ENGINEERING LABORATORY: Experiments and studies relating the engineering properties of certain building materials to their fundamental nature and composition. Prerequisite: EGM 303. Second term, each year. *1 sem. hr.*

CIE 312. SOIL MECHANICS: Principles of soil structures, classification, capillarity, permeability, flow nets, shear strength, consolidation, stress analysis, slope stability, lateral pressure, bearing capacity, and piles. Prerequisites: CIE 316, GEO 218. Corequisite: CIE 312L. Second term, each year. *3 sem. hrs.*

CIE 312L. SOIL MECHANICS LABORATORY: Laboratory tests to evaluate and identify soil properties for engineering purposes. Design problems included. Corequisite: CIE 312. Second term, each year. *1 sem. hr.*

CIE 313. HYDRAULICS: Principles of liquid statics and fluid flow including similitude, measuring devices, channel and pipe flow, turbines, and pumps. Corequisites: CIE 313L, EGM 301. First term, each year. *3 sem. hrs.*

CIE 313L. HYDRAULICS LABORATORY: Laboratory experiments and problems associated with CIE 313. Corequisite: CIE 313. First term, each year. *1 sem. hr.*

CIE 315. THEORY OF STRUCTURES: Analysis of statically determinate trusses, beams, and frames subjected to fixed and moving loads. Prerequisite: EGM 303. Second term, each year. *3 sem. hrs.*

CIE 316. ANALYSIS OF DETERMINATE STRUCTURES: Elastic analysis of statically determinate structures; deflections; moment-area theorems; conjugate-beam; virtual work; influence lines; shear center; unsymmetric bending; stresses and strains at a point; theories of failure. Prerequisite: EGM 303. First term, each year. *3 sem. hrs.*

CIE 317. ANALYSIS OF INDETERMINATE STRUCTURES: Elastic analysis of statically indeterminate structures; virtual work; Castigliano's theorems; slope deflection and moment distribution; development of stiffness matrices for use in computer analysis; influence lines, column analogy, limit analysis. Prerequisite: CIE 316. Second term, each year. *3 sem. hrs.*

CIE 320. CIVIL ENGINEERING ANALYSIS: Mathematical modeling and numerical solution of civil engineering problems: basic concepts of probability with emphasis on applications to structures, transportation, and hydraulics problems; application of numerical computational methods in civil engineering problems. Prerequisites: EGM 301, 303, MTH 219. First term, each year. *3 sem. hrs.*

CIE 333. ENVIRONMENTAL ENGINEERING I: Integrated study of the principles of water sanitation, water supply, stream pollution abatement, and waste water disposal systems. Prerequisites: CIE 313, 313L. Second term, each year. *3 sem. hrs.*

CIE 390. ENVIRONMENTAL POLLUTION CONTROL: Study of environmental pollution problems relating to air, water, and land resources. Causes and effects of pollution; technology for solving the problems. Legal and political considerations. For juniors and seniors other than civil engineering students. Credit may not be applied toward civil engineering degree. Prerequisite: Some knowledge of chemistry. *3 sem. hrs.*

CIE 403. TRANSPORTATION ENGINEERING: Fundamentals of transportation engineering, including design, construction, maintenance, and economics of transportation facilities. Prerequisites: CIE 310L, 313. *3 sem. hrs.*

CIE 406. INDETERMINATE STRUCTURES: Analysis of statically indeterminate trusses, beams, and frames subjected to fixed and moving loads. Prerequisite: CIE 315. Second term, each year. *3 sem. hrs.*

CIE 408. SEMINAR I: Practice in the presentation and discussion of papers; lectures by staff and prominent engineers. Attendance required of all civil engineering sophomores, juniors, and nongraduating seniors. *No credit*

CIE 411. DESIGN OF STEEL STRUCTURES: Design and behavior of structural steel connections, columns, beams, and beams subjected to tension, compression, bending, shear, torsion, and composite action. Prerequisites: CIE 310L, 317. Corequisite: CIE 411L. Alternating first and second terms. *3 sem. hrs.*

CIE 411L. DESIGN OF STEEL STRUCTURES LABORATORY: Applications of design theory to structural steel systems. Corequisite: CIE 411. *1 sem. hr.*

CIE 412. DESIGN OF CONCRETE STRUCTURES: Design and behavior of reinforced concrete slabs, beams, columns, walls, and footings subjected to tension, compression, bending, shear, and torsion. Prerequisites: CIE 310L, 317. Corequisite: CIE 412L. Alternating first and second terms. *3 sem. hrs.*

CIE 412L. DESIGN OF CONCRETE STRUCTURES LABORATORY: Application of design theory to structural concrete systems. Corequisite: CIE 412. *1 sem. hr.*

CIE 415. STEEL STRUCTURE DESIGN: Design and behavior of structural steel connections, columns, beams, and plate girders subjected to tension, compression, bending, shear, torsion, and composite action. Prerequisite: EGM 304. First term, each year. *3 sem. hrs.*

CIE 417. REINFORCED CONCRETE: Design and behavior of reinforced concrete slabs, beams, columns, walls, and footings subjected to tension, compression, bending, shear, and torsion. Prerequisites: CIE 310L, 315. First term, each year. *3 sem. hrs.*

CIE 418. STRUCTURAL DESIGN PROJECTS: Continuation of CIE 415 and 417, where the student applies knowledge of reinforced concrete and structural steel in designing and studying behavior of complete structures. Prerequisites: CIE 415, 417. Corequisite: CIE 406. Second term, each year. *3 sem. hrs.*

CIE 421. CONSTRUCTION ENGINEERING: Organization, planning, and control of construction projects, including a study of the use of machinery, economics of equipment, methods, materials, estimates, cost controls, and fundamentals of CPM and PERT. Departmental elective. Corequisite: CIE 403. *3 sem. hrs.*

CIE 428. SEMINAR II: Practice in the presentation and discussion of papers; lectures by staff and prominent engineers. Attendance required of civil engineering second-term seniors only. First and second terms, each year. *1 sem. hr.*

CIE 434. ENVIRONMENTAL ENGINEERING II: Problems of air, water, and land pollution; development and design of public water supply and waste water disposal systems; legal, political, ethical, and moral considerations. Prerequisites: CHM 124, CIE 333. First term, each year. *3 sem. hrs.*

CIE 470. CIE COMPUTER APPLICATIONS: Applications of mainframe, mini, and micro computers to the solution of selected civil engineering problems, including data analysis, plotting, optimization, and simulation. Prerequisite: FORTRAN. *3 sem. hrs.*

CIE 499. SPECIAL PROBLEMS IN CIVIL ENGINEERING: Particular assignments to be arranged and approved by chairperson of the department. Departmental elective. *1-6 sem. hrs.*

In addition to courses listed above, students may select with departmental approval civil engineering (CIE) and engineering mechanics (EGM) courses in the 500 series listed in the Graduate Issue of the Bulletin.

ELECTRICAL ENGINEERING (ELE)

The curriculum of the Department of Electrical Engineering is planned with the primary objective of providing a thorough knowledge of the fundamental laws of electricity and the application of these laws in electrical engineering.

Courses are arranged to offer students an understanding of basic principles and practices common to the various fields of electrical engineering, so that they are prepared to begin specialization in their chosen fields or to pursue advanced study.

Proper attention is directed to an appreciation of the practical economic factors in the electrical world and to the cultural and social qualities necessary for a successful career in the engineering profession.

PROGRAM—EN3: BACHELOR OF ELECTRICAL ENGINEERING (ELE)

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Sophomore Year		
ELE	231-232	Circuit Theory I, II	3-0-3[1]	3-0-3
ELE	233	Field Theory I		3-0-3
ELE	235	Digital System Design		3-0-3
ENG	102	College Composition II		3-0-3
MTH	218	Analytic Geometry and Calculus III	4-0-4	
MTH	219	Applied Differential Equations		3-0-3
PHY	207-208	General Physics II, III	3-0-3	3-0-3
SPE	101	Fundamentals of Effective Speaking	3-0-3	
—	—	General education requirement[2]	3-0-3	
			16	18
		Junior Year		
ELE	312-313	Electronics I, II	3-0-3	3-0-3
ELE	314	Principles of Microcomputer Design		3-0-3
ELE	331	Circuit Theory III	3-0-3	
ELE	333	Field Theory II	3-0-3	
ELE	335L-336L	Electrical Engineering Laboratory I, II	0-2-1	0-2-1
ELE	338L	Electrical Engineering Laboratory III		0-2-1
ELE	340	Probability and Discrete Systems		3-0-3
ELE	410B	Seminar	1-0-0	1-0-0
EGM	301	Dynamics	3-0-3	
MTH	—	Mathematics elective[3]		3-0-3
—	—	Technical elective		3-0-3
—	—	General education requirements[2]	6-0-6	
			19	17
		Senior Year		
ELE	410B-A	Seminar	1-0-0	1-0-1
ELE	413	Communication Engineering	3-0-3	
ELE	431	Energy Conversion	3-0-3	
ELE	432	Automatic Control Systems		3-0-3
ELE	435L-436L	Electrical Engineering Laboratory IV, V	0-2-1	0-2-1
ELE	437L	Electrical Engineering Laboratory VI		0-2-1
ISE	313	Engineering Law		2-0-2
—	—	Engineering thermodynamics elective	3-0-3	
—	—	Technical electives	3-0-3	3-0-3
—	—	General education requirements[2]	3-0-3	6-0-6
			16	17

[1]For example: 3-0-3 means 3 class hrs., 0 lab. hrs., 3 sem. hrs. credit.
[2]See General Education Requirements, Chapter V. Some general education requirements are specified in the program (e.g., PHY 208); others are to be chosen from the listing of approved courses. Consult advisor.
[3]Selected from list approved by the Department of Electrical Engineering.

FACULTY

Donald L. Moon, *Acting Chairperson*
Distinguished Service Professor: Schmidt
Professors: Moon, Strnat, Thiele
Associate Professors: Evers, Kubach, Rogers
Assistant Professors: Daniels, Gauder, Westerkamp, Williamson
Adjunct Assistant Professor: Mildrum

COURSES OF INSTRUCTION

ELE 231. CIRCUIT THEORY I: Principles of linear circuit theory. Analysis of resistive circuits having constant or time varying sources. Analysis of transient and steady state behavior of simple circuits containing R, L, and C. Introduction to ECAP. Corequisite: MTH 119. *3 sem. hrs.*

ELE 232. CIRCUIT THEORY II: Sinusoidal analysis: sinusoidal forcing function, phasor concept, steady-state response, resonance, average power and rms values, magnetically coupled circuits, polyphase circuits. Prerequisite: ELE 231. *3 sem. hrs.*

ELE 233. FIELD THEORY I: Vector calculus, static electric fields, conductors, dielectric materials, boundary conditions, field mapping, steady electric currents and their magnetic fields, motion of charged particles. Prerequisite: MTH 218. *3 sem. hrs.*

ELE 235. DIGITAL SYSTEM DESIGN: Logical variables and functions, combinational circuits, sequential circuits, controller design, simple computer design, microprocessors, input/output operations. Prerequisite: ELE 231. *3 sem. hrs.*

ELE 312. ENGINEERING ELECTRONICS I: A first course on the terminal behavior of electron devices. Qualitative physical descriptions, volt ampere curves, graphical solutions. Formulation of incremental and piecewise linear models. Analysis of simple amplifier circuits. Prerequisite: ELE 232 or 321. *3 sem. hrs.*

ELE 313. ENGINEERING ELECTRONICS II: Cascaded amplifiers, feedback amplifiers, linear integrated circuits; steady state and transient response. Oscillators. Digital and switching circuits. Prerequisite: ELE 312. Corequisite: ELE 331. *3 sem. hrs.*

ELE 314. PRINCIPLES OF MICROCOMPUTER DESIGN: Fundamentals of computer architecture. Representation of data and instructions. Methods of transforming information. Memory devices and structures. Interfacing to external devices. Applications and practical problems. Prerequisite: ELE 235, 312. *3 sem. hrs.*

ELE 321. BASIC ELECTRIC THEORY: Fundamental methods of analysis in DC and AC circuits. For chemical, civil, and mechanical engineering students. Prerequisites: PHY 207, MTH 218. *3 sem. hrs.*

ELE 331. CIRCUIT THEORY III: Analysis of transient and steady-state behavior of circuits containing R, L, and C. Use of Laplace transform techniques in circuit theory. Introduction to periodic phenomena and Fourier series analysis. Prerequisites: ELE 232, MTH 219. *3 sem. hrs.*

ELE 333. FIELD THEORY II: Magnetic fields, forces, energy storage; theory of magnetic materials, engineering materials, magnetic circuits; inductance, practical inductors; time varying fields; Maxwell's equations. Prerequisite: ELE 233. *3 sem. hrs.*

ELE 335L. ELECTRICAL ENGINEERING LABORATORY I: Experimental situations stressing familiarization with electrical engineering concepts, hardware, devices, instrumentation, and techniques. Corequisite: ELE 232. *1 sem. hr.*

ELE 336L. ELECTRICAL ENGINEERING LABORATORY II: Quantitative experiments dealing with resonance, coupled circuits, magnetic circuits, instrumentation, and measurements. Prerequisite: ELE 335L. *1 sem. hr.*

ELE 338L. ELECTRICAL ENGINEERING LABORATORY III: Electron devices, amplifiers, feedback circuits, switching circuits, power electronics. Prerequisite: ELE 312. *1 sem. hr.*

ELE 340. PROBABILITY AND DISCRETE SYSTEMS: Foundations of probability theory. Conditional probability, random variables, and distribution functions. Discrete system equations, simulation techniques, and difference equations. Discrete signal processing, sampling and reconstruction, digital filtering. Prerequisites: ELE 235, 331. *3 sem. hrs.*

ELE 343. ELECTROMAGNETICS: Device- and design-related electromagnetics for nonmajors who wish to develop significant electrical engineering design competence. Electric and magnetic forces; energy storage; magnetic circuits; transmission lines; radiation; charged particle dynamics; electro-optic, magneto-optic, and acousto-electric devices. Prerequisite: MTH 219. *3 sem. hrs.*

ELE 410A. SEMINAR: Presentation of papers on contemporary electrical engineering by students; lectures by engineers in active practice. Required for second-term seniors. *1 sem. hr.*

ELE 410B. SEMINAR: Presentation of papers on contemporary electrical engineering by students; lectures by engineers in active practice. Required for juniors and first-term seniors. *No credit*

ELE 413. COMMUNICATION ENGINEERING: Amplitude, angle, and pulse modulation systems. Generation, deletion, and analysis of modulated signals. Power and bandwidth considerations. Introduction to information theory. Prerequisite: ELE 340. *3 sem. hrs.*

ELE 415. MICROWAVE ENGINEERING: Design-oriented course in microwave engineering. Communication, radar, industrial, scientific, and measurement applications described. Operating principles and specifications of current building-block subsystems investigated in sufficient depth to enable engineering design of microwave systems. Departmental elective. Prerequisites: ELE 413, 442. *3 sem. hrs.*

ELE 431. ENERGY CONVERSION: Properties and theory of magnetic circuits as applied to electro-mechanical energy conversion. Nonlinear magnetic devices. Introduction to rotating machine analysis. Field and circuit concepts of rotating machines. Rotating fields. Direct current, synchronous, and induction machines. Prerequisites: ELE 331, 333. *3 sem. hrs.*

ELE 432. AUTOMATIC CONTROL SYSTEMS: Open- and closed-loop systems, mathematical models for control systems, representation of feedback control systems, servomechanism characteristics, stability analysis. Prerequisite: ELE 331. Corequisite: ELE 431. *3 sem. hrs.*

ELE 435L. ELECTRICAL ENGINEERING LABORATORY IV: Digital logic, passive and active filters, networks transmission lines. Prerequisites: ELE 313, 338L. *1 sem. hr.*

ELE 436L. ELECTRICAL ENGINEERING LABORATORY V: Modulation, detection, communication electronics, communication subsystems. Prerequisite: ELE 435L. *1 sem. hr.*

ELE 437L. ELECTRICAL ENGINEERING LABORATORY VI: Experiments dealing with operating and performance characteristics of electromechanical energy converters, application of electronic control to power machinery, and operating and performance characteristics of automatic control systems. Corequisite: ELE 431. *1 sem. hr.*

ELE 438L. PROJECTS LABORATORY: Project-oriented laboratory applying engineering skills in the design, development, and demonstration of electrical and electronic devices. Departmental elective. Prerequisite: Permission of project advisor. *1-3 sem. hrs.*

ELE 440. PHYSICAL ELECTRONICS: Introduction to wave mechanics; electron ballistics; theory of metals and semiconductors; electron emission, space charge flow; modern electron devices. Departmental elective. Prerequisite: MTH 219. *3 sem. hrs.*

ELE 441. PULSE AND DIGITAL CIRCUITS: Transmission networks, differentiating circuits, clippers, comparators, clampers, the transistor as a switch, logic circuits, multivibrators, time base generators, and pulse amplification. Emphasis on application of modern semiconductor devices. Departmental elective. Prerequisite: ELE 313. *3 sem. hrs.*

ELE 442. ENGINEERING ELECTROMAGNETICS: Processing Maxwell's equations and applying the predictions to the analysis and design of engineering systems that make use of electromagnetic energy. ELF through optical frequencies; propagation, radiation, interactions with matter, guided waves, antenna fundamentals. Departmental elective. Prerequisite: ELE 333. *3 sem. hrs.*

ELE 443. INTRODUCTION TO ELECTRO-OPTICS: Introductory overview of the field, starting with Maxwell's equations and leading to lasers, holography, and other timely applications. Departmental elective. Prerequisite: ELE 333. *3 sem. hrs.*

ELE 444. ADVANCED DIGITAL DESIGN: Systems approach to digital design. Structured top-down development process using simple and complex logic modules from various logic families. Application of microcomputer or controller as a flexible logic device. Practical design problems with team and individual projects. Departmental elective. Prerequisites: ELE 314, 340. *3 sem. hrs.*

ELE 499. SPECIAL PROBLEMS IN ELECTRICAL ENGINEERING: Particular assignments to be arranged and approved by chairperson of department. Departmental elective. *1-6 sem. hrs.*

MECHANICAL ENGINEERING (MEE)

Mechanical engineering is an active, versatile branch of engineering. Mechanical engineers conceive, plan, design, and direct the manufacture of a wide variety of devices, machines, and systems used for purposes such as energy conversion, power generation, environmental control, transportation, and materials handling and processing. They are engaged in all of the engineering functions, including design, theoretical and applied research, development, sales engineering, and management.

The curriculum of the Department of Mechanical Engineering introduces the student to fundamental scientific and engineering theories and to the humanities, and provides training and practice in problem-solving techniques. It prepares the graduate engineer to apply these principles and methods to the solution of technological, social, and economic problems. The curriculum also provides the opportunity to continue study at the graduate level to complete the requirement for a master's degree in one additional year. The broad background provided by the mechanical engineering curriculum is often used as a basis for training in other fields, such as law, medicine, bio-engineering, and business management.

PROGRAM—EN4: BACHELOR OF MECHANICAL ENGINEERING (MEE)

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Sophomore Year		
EGM	301	Dynamics	3-0-3[1]	
ENG	102	College Composition II	3-0-3	
MTH	218	Analytic Geometry and Calculus III	4-0-4	
MEE	227L	Engineering Graphics II	0-3-1	
PHY	207-208	General Physics II, III	3-0-3	3-0-3
SPE	101	Fundamentals of Effective Speaking	3-0-3	
EGM	303	Strength of Materials		3-0-3
MTH	219	Applied Differential Equations		3-0-3
MEE	301	Thermodynamics I		3-0-3
MEE	321	Kinematics of Machines		2-3-3
MEE	340L	Engineering Experimentation Laboratory		0-4-2
			17	17
		Junior Year		
MEE	302	Thermodynamics II	3-0-3	
MEE	308	Fluid Mechanics	3-0-3	
MEE	310L	Manufacturing Processes Laboratory	0-3-1	
MEE	312	Engineering Materials	3-3-4	
MEE	316	Mechanical Engineering Analysis	3-0-3	
MEE	414B	Seminar	1-0-0	1-0-0
—	—	General education requirements[2]	3-0-3	3-0-3
ELE	321	Basic Electric Theory		3-0-3
MEE	313	Manufacturing Processes		2-0-2
MEE	319	Mechanical Vibrations		3-0-3
MEE	410	Heat Transfer		3-0-3
—	—	Technical elective[3]		3-0-3
			17	17

		Senior Year		
ELE	312	Engineering Electronics I	3-0-3	
MEE	423L	Mechanical Engineering Laboratory	0-9-3	
MEE	427	Mechanical Design I	3-3-4	
MEE	435	Feedback Control Systems	3-0-3	
—	—	General education requirements[2]	3-0-3	6-0-6
MEE	414B-A	Seminar	1-0-0	1-0-1
MEE	—	Mechanical engineering elective		3-0-3
PHY	316	Engineering Ethics		3-0-3
—	—	Technical elective[3]		3-0-3
			16	16

[1]For example: 3-0-3 means 3 class hrs., 0 lab. hrs., 3 sem. hrs. credit.

[2]See General Education Requirements, Chapter V. Some general education requirements are specified in the program (e.g., PHY 208); others are to be chosen from the listing of approved courses. Consult advisor.

[3]Technical elective to be selected from engineering, mathematics, or science.

FACULTY

John J. Schauer, *Chairperson*
Professors: Boehman, Chuang, Minardi, Ray, Sargent, Schauer, Smith, VonOhain, Wurst
Associate Professors: Brockman, Doyle, Harmer, Havener, Jain, Scott
Assistant Professor: Montgomery
Adjunct Professors: Shine, Weeks
Adjunct Assistant Professors: Endres, Kreitzer, Wurstner

COURSES OF INSTRUCTION

MEE 106L. ENGINEERING DESIGN GRAPHICS I: Fundamentals of engineering graphics and the part that graphical communication plays in engineering. Application of these principles to the development of team proposals and solutions of engineering design problems. Two hours lecture, four hours laboratory. *2 sem. hrs.*

MEE 210L. MATERIALS AND PROCESSES LABORATORY: Mechanics of metal cutting, study of machine tools and machining processes. Basic experiments in metal cutting and workshop metrology. Tensile testing of metals and polymers, creep and hardness testing, modulus of rupture. Industrial field trips. One hour lecture, four hours laboratory. Prerequisites: CHM 123, MEE 106L, PHY 206. *2 sem. hrs.*

MEE 227L. ENGINEERING GRAPHICS II: Training in the analysis and graphical solution of fundamental problems involving three dimensions and the applications of these solutions to engineering problems. Prerequisite: MEE 106L. *1 sem. hr.*

MEE 301. THERMODYNAMICS I: Concepts, definitions, and laws of thermodynamics. Properties of pure substances, introduction to use of thermodynamic property tables and equations of state. Applications of the laws of thermodynamics to processes, heat engines, and control volumes. Prerequisite: MTH 218. *3 sem. hrs.*

MEE 302. THERMODYNAMICS II: Gas and two-phase heating, cooling, and power cycles. Gas mixtures and air conditioning. Chemical reactions in combustion. Chemical equilibrium. Prerequisite: MEE 301. *3 sem. hrs.*

MEE 308. FLUID MECHANICS: Laws and theory relative to incompressible fluids, continuity, momentum, and energy relations in flow situations; internal and external flow in laminar and turbulent regimes. Prerequisites: MEE 301, MTH 219. *3 sem. hrs.*

MEE 310L. MANUFACTURING PROCESSES LABORATORY: Study of metal removal processes and machine tools such as lathes, grinders, milling machines, shapers, and planers; theory and practice of precision dimensional metrology. Three hours of laboratory. Prerequisites: CHM 123, MEE 106L, PHY 206. *1 sem. hr.*

MEE 312. ENGINEERING MATERIALS: Principles of the mechanical, electronic, magnetic, optical, and thermal behavior of metallic, ceramic, and polymeric materials. Introduction to fracture mechanics. Principles of corrosion. Prerequisites: MEE 210L or 310L, EGM 303 or permission of instructor. Corequisite: MEE 312L. *3 sem. hrs.*

MEE 312L. MATERIALS LABORATORY: Experiments illustrating the behavior of metallic, ceramic, and polymeric materials. Strengthening mechanisms, crystallization, metallography, corrosion, thermal processing. Corequisite: MEE 312. *1 sem. hr.*

MEE 313. MANUFACTURING PROCESSES: Casting processes, design of castings, and casting defects; metal working processes; metal shearing and forming; welding processes; powder metallurgy; fabrication processes for plastics. Prerequisites: EGM 303, MEE 210L, 312. *2 sem. hrs.*

MEE 315. MECHANICAL ENGINEERING ANALYSIS: Problem formulation and mathematical modeling of engineering systems and control volumes. Development of computer skills; analysis and generalization of system responses. Introduction to vibration and heat transfer theory and to the application of Fourier series and partial differential equations to engineering problems. Prerequisites: CPS 132, MTH 219, MEE 301, PHY 207. *4 sem. hrs.*

MEE 316. MECHANICAL ENGINEERING ANALYSIS: Problem formulation and mathematical modeling of engineering systems and control volumes. Development of computer skills; analysis and generalization of system responses. Introduction to vibration and heat transfer theory and to the application of Fourier series and partial differential equations to engineering problems. Prerequisites: CPS 132, MTH 219, MEE 301, PHY 207. *3 sem. hrs.*

MEE 319. MECHANICAL VIBRATIONS: Undamped and damped, free and forced vibrations of single degree of freedom translational and rotational systems; vibration isolation and absorption; multi-degree of freedom systems, continuous system, transient vibration, approximate and numerical solution. Prerequisites: CPS 132, EGM 301, MEE 315 or 316. Corequisite: EGM 303. *3 sem. hrs.*

MEE 321. KINEMATICS OF MACHINES: Kinematic analysis of mechanisms and machines; study of machine elements such as linkages, cams, gears, gear trains, and differentials. Prerequisite: EGM 301. Corequisite: MEE 321L. *2 sem. hrs.*

MEE 321L. KINEMATICS OF MACHINES LABORATORY: Laboratory exercises based on principles covered in MEE 321. Prerequisite: EGM 301. Corequisite: MEE 321. 1 sem. hr.

MEE 330. ENGINEERING ECONOMICS: Basic principles and techniques of economic analysis of engineering projects. Prerequisite: MTH 119. *1 sem. hr.*

MEE 340L. ENGINEERING EXPERIMENTATION LABORATORY: Design of experiments; use of instrumentation; data acquisition and processing; error and statistical analysis; comparison to theory; oral presentation; technical report writing. Measurement of basic engineering properties including temperature, pressure, flow rate, power, frequency, displacements, friction, stress, voltage. Prerequisites: ENG 102, PHY 207. Corequisite: MTH 219. *2 sem. hrs.*

MEE 402. ENERGY CONVERSION SYSTEMS: Introduction to global energy concerns; fossil and nuclear fuels; energy consumption analysis; solar energy and alternative energy concepts; nuclear power plants, steam power plants, industrial gas turbines, and total energy power plants; energy management and conservation techniques. Prerequisite: MEE 302 or CME 305 or MCT 232. *3 sem. hrs.*

MEE 403. ENERGY AND WESTERN CIVILIZATION: Introduction to global history of energy: fossil and nuclear fuels; energy consumption analysis; solar energy and alternative energy concepts; nuclear power plants, steam power plants, industrial gas turbines, and total energy power plants; energy management and conservation techniques. Prerequisite: CME 305 or MEE 301 or MCT 232. *3 sem. hrs.*

MEE 410. HEAT TRANSFER: Fundamentals of conduction, convection, and thermal radiation energy transfer. Conduction of heat in steady and unsteady state. Principles of boundary layer theory applicable to free and forced convection heat transfer for internal and external flows. Radiation analysis with and without convection and conduction. Prerequisites: MEE 308, MEE 315 or 316. *3 sem. hrs.*

MEE 414A. SEMINAR: Presentations on contemporary mechanical engineering subjects by students, faculty, and engineers in active practice. Registration required of all students in their last term prior to graduation. *1 sem. hr.*

MEE 414B. SEMINAR: Presentations on contemporary mechanical engineering subjects by students, faculty, and engineers in active practice. Registration required of all junior and senior students not registered in MEE 414A. *No credit*

MEE 417. INTERNAL COMBUSTION ENGINES: Combustion and energy release processes. Applications to spark and compression ignition, thermal jet, rocket, and gas turbine engines. Emphasis on air pollution problems caused by internal combustion engines. Idealized and actual cycles studied in preparation for laboratory testing of I. C. engines. Prerequisite: MEE 301 or permission of instructor. *3 sem. hrs.*

MEE 418. ADVANCED FLUID MECHANICS: Application of the basic thermodynamic and fluid motion laws to the solution of engineering problems in fluid mechanics. Use of differential and integral equations for internal and external flow of compressible fluids with friction and heat transfer. Isentropic flow; adiabatic flow; normal and oblique shocks; Prandtl-Meyer flow; Fanno and Rayleigh line flow. Prerequisites: MEE 308, MEE 315 or 316. *3 sem. hrs.*

MEE 420. HEATING AND AIR CONDITIONING: Theory and methods of maintaining comfortable industrial and residential environments. Psychrometrics; effects of solar radiation; heat transmission through solid boundaries and transparent materials; heating and cooling load calculations; sizing of equipment; energy conservation and management concepts. Corequisite: MEE 410 or permission of instructor. *3 sem. hrs.*

MEE 423L. MECHANICAL ENGINEERING LABORATORY: Three-hour laboratory session and three-hour out-of-class group session each week. Analysis, modeling, testing, and oral and written presentation of studies in power generation, heat transfer, and fluid dynamic systems. Prerequisites: MEE 302, 308, 340L, 410. *3 sem. hrs.*

MEE 426L. MECHANICAL ENGINEERING LABORATORY: Analysis, modeling, testing, and technical presentation of studies in power generation, heat transfer, thermodynamics fluid flow, and combinations thereof. Turbo-machinery, internal combustion engines, heat transfer and refrigeration systems, and fluid dynamic systems; aerodynamics, aero-optical measurements, and turbulence. Prerequisites: MEE 308, 340L, 410. *2 sem. hrs.*

MEE 427. MECHANICAL DESIGN I: Stress and deflection analysis of machine components; theories of failure; fatigue failure of metals; design and analysis of mechanical components such as spur gears, shafts, springs, fasteners. Prerequisites: EGM 303, MEE 321. Corequisite: MEE 427L. *3 sem. hrs.*

MEE 427L. MECHANICAL DESIGN LABORATORY I: Design projects applying principles covered in MEE 427. Solution of complex problems with emphasis on synthesis and design of mechanical systems. Corequisite: MEE 427. *1 sem. hr.*

MEE 428. MECHANICAL DESIGN II: Advanced topics in stress and deflection analysis; analysis and design of mechanical elements such as gears, journal and ball bearings, belts, brakes, and clutches; principles of fracture mechanics; failure analysis; machiery construction principles. Prerequisite: MEE 427. Corequisite: MEE 428L. *2 sem. hrs.*

MEE 428L. MECHANICAL DESIGN LABORATORY II: Projects related to principles covered in MEE 427 and 428, encompassing all aspects of a typical design project from development of a proposal to evaluation of the design. Corequisite: MEE 428. *1 sem. hr.*

MEE 435. FEEDBACK CONTROL SYSTEMS: Analyses of automatic feedback control systems using time domain solutions, Laplace transforms, block diagrams, transfer functions, characteristic functions, stability criteria, and control actions. System performance based on Nyquist, Bode, and root-locus with system compensation. Prerequisite: MEE 319. *3 sem. hrs.*

MEE 436. VEHICLE PERFORMANCE ANALYSIS: Ground, air, water, space vehicles. Development of force, moment, and kinematic equations. Advanced applications including stability, control, performance evaluations. Vehicle simulation. Analog computation. Prerequisite: MEE 308 or permission of instructor. *3 sem. hrs.*

MEE 499. SPECIAL PROBLEMS IN MECHANICAL ENGINEERING: Particular assignments to be arranged and approved by departmental chairperson. *1-6 sem. hrs.*

In addition to the courses listed above, students may select as undergraduate electives mechanical engineering (MEE) courses from the 500 series listed in the Graduate Issue of the Bulletin.

SERVICE (EGR, EGM, ISE) AND INTERDISCIPLINARY (ENI) COURSES FOR ENGINEERING

COURSES OF INSTRUCTION—EGR

EGR 103. INTRODUCTION TO ENGINEERING: Introductory-level course with emphasis on engineering problem definition, methods, and solution; engineering units and terminology; engineering career areas; and utilization of computers in engineering. *2 sem. hrs.*

EGR 320. SYSTEMS-DESIGN—HONORS: Systems-design experience to emphasize the basic problem-solving approach and philosophy of engineering for students of varied background. By permission only. *3 sem. hrs.*

EGR 399. PROFESSIONAL DEVELOPMENT: Development of students' self-concepts as professional engineers with strong personal career directions based on individual strengths, interests, and technical abilities. *0-3 sem. hrs.*

EGR 498. HONORS THESIS: Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in Honors Program. *3-6 sem. hrs.*

EGR 499. SPECIAL PROBLEMS IN ENGINEERING: Particular assignments to be arranged and approved by the dean of engineering. *1-6 sem. hrs.*

COURSES OF INSTRUCTION—EGM

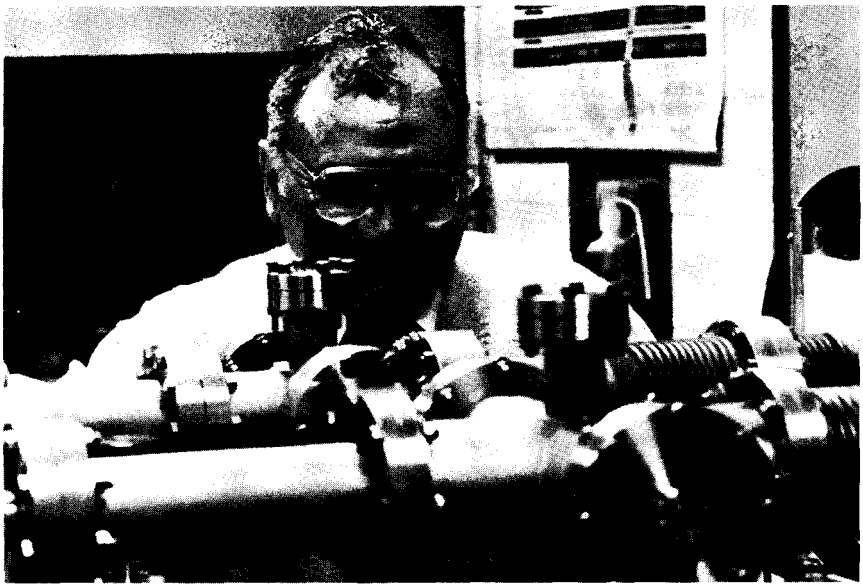
Engineering mechanics (EGM) courses are taught and administered by the Department of Civil Engineering and Engineering Mechanics.

EGM 101. STATICS: The principles of mechanics; force systems, free body diagrams, resultants and equilibrium, centroids and centers of gravity; application to trusses, frames, machines, and beams; friction; moments of inertia. Corequisite: MTH 119. *3 sem. hrs.*

EGM 301. DYNAMICS: Kinematics, including translation, rotation, plane motion, and relative motion; kinetics of particles and bodies by the methods of force-mass-acceleration, work-energy, and impulse-momentum. Prerequisite: EGM 101. *3 sem. hrs.*

EGM 303. STRENGTH OF MATERIALS: The study of stresses, strains, and deflections in tension, compression, shear, flexure, and torsion; shear and moment diagrams; analysis of stresses and strains at a point; Mohr's circle; analysis of columns. Prerequisite: EGM 101. Each term. *3 sem. hrs.*

EGM 304. ADVANCED STRENGTH OF MATERIALS: Stresses and strains at a point; shear center; unsymmetrical bending; curved beams; flat plates; torsion of noncircular bars; beams on elastic support; buckling. Prerequisite: EGM 303. First and second terms each year. *3 sem. hrs.*



COURSES OF INSTRUCTION—ISE

Industrial and systems engineering (ISE) courses are taught and administered by the Department of Engineering Management and Systems.

ISE 313. ENGINEERING LAW: Legal principles applied to engineering. *2 sem. hrs.*

ISE 369. PROBABILITY AND STATISTICS FOR ENGINEERS: Conceptual development of probability and statistics with engineering applications. Random variables, probability distributions, Bayes theorem, central limit theorem, population and sample moments, point and interval estimates, hypothesis testing, regression analysis. Prerequisite: MTH 218. *3 sem. hrs.*

ISE 401. ENGINEERING ECONOMY: Basic principles and techniques of economic analysis of engineering projects. Time value of money, short- and long-term investments, replacement analysis, depreciation methods, cost allocation, and measures of cost effectiveness. Self-paced instruction. Prerequisite: MTH 218. *1-2 sem. hrs.*

ISE 402. ECONOMIC DECISION ANALYSIS FOR ENGINEERS: Introduction to the models and methods of economic decision analysis as they relate to engineering decisions. Fundamental economic concepts, cost estimates, interest and time value of money, comparison of alternatives, before- and after-tax analysis, analysis of public activities, decision making under risk and uncertainty, break-even analysis, linear programming models. Prerequisite: MTH 218. *3 sem. hrs.*

ISE 421. RELIABILITY AND MAINTAINABILITY: Application of probability and statistical theory to engineering reliability design and analysis; reliability of components and assemblies; design of systems for reliability and maintainability. Prerequisites: MTH 368 or ISE 369; CPS 132. *3 sem. hrs.*

ISE 423. QUALITY ASSURANCE: Principles of statistical quality control. Application of attributes and variable acceptance sampling plans; control charts; design of quality control systems and procedures. Prerequisites: MTH 368 or ISE 369; CPS 132. *3 sem. hrs.*

ISE 428. DESIGN AND ANALYSIS OF ENGINEERING EXPERIMENTS: Application of statistical methods to engineering experimentation; analysis of experimental response through statistical methods. Prerequisites: MTH 368 or ISE 369; CPS 132. *3 sem. hrs.*

ISE 451. PRODUCTION AND INVENTORY PLANNING AND CONTROL: Analysis and design of systems of personnel and machines for production processes. Forecasting, scheduling, production and inventory control. Prerequisites: MTH 368 or ISE 369; CPS 132. *3 sem. hrs.*

ISE 452-453. OPERATIONS RESEARCH I AND II: Applications and elementary theory of selected topics such as linear programming, transportation and assignment problems, network analysis, game theory, nonlinear programming, queueing theory, and Markov processes. Prerequisites: MTH 368 or ISE 369; CPS 132. *3 sem. hrs. each*

ISE 455. PRINCIPLES OF SYSTEMS: Basic concepts of structure in dynamic systems; starting point for systems approach to dynamic systems in multidisciplinary courses in urban, ecological, corporate, or other social systems. Prerequisites: MTH 368 or ISE 369; CPS 132. *3 sem. hrs.*

ISE 499. SPECIAL PROBLEMS IN SYSTEMS: Particular assignments to be arranged and approved. *1-6 sem. hrs.*

COURSES OF INSTRUCTION—ENI

Information on engineering interdisciplinary (ENI) courses is available in the Office of the Dean of the School of Engineering.

ENI 310. SOCIETY AND TECHNOLOGY: For nonengineering students. The interaction of science, humanities, technology, and society. Study of current problems to which the interface between the liberal arts disciplines and the engineering disciplines may provide solutions. Interdisciplinary techniques for analyzing and decision making. No prerequisites. *3 sem. hrs.*

ENI 451. INTRODUCTION TO PUBLIC POLICY PLANNING: Introduction to public policy and program planning, the role of engineering in public policy formulation, systems approaches to complex decision making, introduction to interpretive structural modeling and its policy-oriented uses. *3 sem. hrs.*

ENI 455. SYSTEMS MODELING I: Introduction to the modeling of social systems, emphasizing feedback loops and their behavior; development of methods for understanding mechanisms underlying growth, stagnation, and cyclical fluctuations; formulation of models for industrial, economic, social, and ecological systems; laboratory digital simulation. *3 sem. hrs.*

ENI 456. SYSTEMS MODELING II: An individual or group project in guided research with emphasis on modeling of economic, industrial, urban, ecological, and world systems. *3 sem. hrs.*

ENGINEERING TECHNOLOGY

The Engineering Technology programs lead to the Bachelor of Science in Engineering Technology in any of several technical areas. The four-year programs emphasize the application of engineering principles and are designed to provide excellent preparation in the major field as well as sufficient breadth in both technical and nontechnical areas so that the graduate may work effectively with persons of varied educational backgrounds. The significant number of technical electives permits the student to explore technical areas other than the major and thus to become more versatile.

BIO-ENGINEERING TECHNOLOGY (BET)

Typically, graduates from the Bio-Engineering Technology Program engage in the definition, selection, and operational management of medical instrumentation and hardware. They often work with such equipment as X-ray machines, patient-monitoring devices, or electrocardiographs. To prepare effectively for this interdisciplinary field, the student pursues studies in human anatomy and physiology, mathematics, physics, and chemistry, as well as in the electronics and mechanical engineering technology.

PROGRAM—T1: BACHELOR OF SCIENCE WITH A MAJOR IN BIO-ENGINEERING TECHNOLOGY (BET)

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Freshman Year		
CPT	125	Inorganic Chemistry	3-3-4	
EET	104	Introduction to Electronic Engineering Technology	3-0-3	
SET	152	Introduction to Engineering Technology	1-0-1	
ENG	101-102	College Composition I, II	3-0-3	3-0-3
SET	109, 111	Engineering Technology Mathematics I, II	4-0-4	3-0-3
SET	153	Technical Computation		1-0-1
EET	110	Electrical Circuits I		3-3-4
HST	101 or 102	History of Western Civilization		3-0-3
—	—	General education requirement[2]		3-0-3
			15	17
		Sophomore Year		
EET	111	Electrical Circuits II	3-3-4	
MCT	220	Statics and Dynamics	3-0-3	
BIO	151	Concepts of Biology I	3-0-3	
EDD	305-306	Human Anatomy and Physiology	3-0-3	3-0-3
SET	210-211	Engineering Technology Mathematics III, IV	3-0-3	3-0-3
BIO	—	Biology elective		3-0-3
EET	206	Electron Devices I		3-3-4
PHY	203	Modern Technical Physics		3-2-4
			16	17
		Junior Year		
SET	306	Engineering Technology Mathematics V	3-0-3	
SET	334	Technical Writing	2-0-2	
CPT	210	Organic Chemistry	3-0-3	
MCT	221	Strength of Materials	3-0-3	
SET	301-302	The Technological Society I, II	3-0-3	3-0-3
—	—	General education requirements[2]	3-0-3	3-0-3
CPS	144	FORTRAN		3-0-3
—	—	Technical electives		3-0-3
MCT	103L	Technical Drawing I		0-6-2
MCT	231	Fluid Mechanics		3-0-3
			17	17

		Senior Year		
EET	455	Biotechnology I	3-0-3	
MCT	400	Biomechanics	3-0-3	
SET	499	Seminar	1-0-1	
SPE	101	Fundamentals of Effective Speaking	3-0-3	
—	—	General education requirements[2]	3-0-3	6-0-6
—	—	Technical electives	3-0-3	6-0-6
IET	215	Organization and Management		3-0-3
			16	15

[1]For example, 3-0-3 means 3 class hrs., 0 lab. hrs., and 3 sem. hrs. of credit.

[2]See General Education Requirements, Chapter V. Some general education courses are specified in the program (e.g., PHY 203); others are to be chosen from the listing of approved courses. Consult advisor.

CHEMICAL PROCESS TECHNOLOGY (CPT)

Graduates of the Chemical Process Technology Program are suited for professional positions in process operations. The chemical process industries produce and distribute many key materials such as pharmaceuticals, petroleum products, paper, plastics, rubber, insecticides, fertilizers, and metals. Typical positions involve the supervision of production, the management of quality assurance, maintenance planning and control, or marketing and technical service. The program includes mathematics, basic and engineering sciences, process technology, computer programming, and general education courses. Topics in industrial management are taken as electives.

PROGRAM—T2: BACHELOR OF SCIENCE WITH A MAJOR IN CHEMICAL PROCESS TECHNOLOGY (CPT)

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Freshman Year		
CPT	125	Inorganic Chemistry	3-3-4	
SET	152	Introduction to Engineering Technology	1-0-1	
MCT	103L	Technical Drawing I	0-6-2	
—	—	General education requirement[2]	3-0-3	
ENG	101-102	College Composition I, II	3-0-3	3-0-3
SET	109, 111	Engineering Technology Mathematics I, II	4-0-4	3-0-3
SET	153	Technical Computation		1-0-1
CPT	212	Quantitative Analysis		2-5-4
EET	201	Fundamentals of Electronic Technology		3-0-3
HST	101 or 102	History of Western Civilization		3-0-3
			17	17
		Sophomore Year		
MCT	220	Statics and Dynamics	3-0-3	
—	—	General education requirement[2]	3-0-3	
IET	215	Organization and Management	3-0-3	
CPT	210	Organic Chemistry	3-3-4	
SET	210-211	Engineering Technology Mathematics III, IV	3-0-3	3-0-3
MCT	231	Fluid Mechanics		3-0-3
MCT	232	Thermodynamics		3-0-3
PHY	203	Modern Technical Physics		3-2-4
SPE	101	Fundamentals of Effective Speaking		3-0-3
			16	16
		Junior Year		
SET	306	Engineering Technology Mathematics V	3-0-3	
CPT	313	Topics in Physical Chemistry	3-0-3	
CPT	316	Analytical Instrumentation	3-3-4	
CPS	144	FORTRAN	3-0-3	
SET	301-302	The Technological Society I, II	3-0-3	3-0-3
SET	334	Technical Writing		2-0-2
CPT	305	Materials Science		3-0-3
MTI	221	Strength of Materials		3-0-3
—	—	General education requirement[2]		3-0-3
—	—	Technical elective		3-0-3
			16	17

		Senior Year		
CPT	215	The Chemical Industry	3-0-3	
SET	499	Seminar	1-0-1	
—	—	Technical electives	6-0-6	6-0-6
—	—	General education requirements[2]	3-0-3	3-0-3
CPT	401-402	Process Operations I, II	3-3-4	3-3-4
CPT	420	Instrumentation and Control		3-0-3
			17	16

[1]For example, 3-0-3 means 3 class hrs., 0 lab. hrs., and 3 sem. hrs. of credit.

[2]See General Education Requirements, Chapter V. Some general education courses are specified in the program (e.g., PHY 203); others are to be chosen from the listing of approved courses.

FACULTY

David I. Gross, *Chairperson*
Professor: C. Shaw
Assistant Professor: Gross
Lecturer: Anduze
Part-time Instructors: Hughes, Nelson, Richardson, Snyder, Woods

COURSES OF INSTRUCTION

*CPT 122. GENERAL CHEMISTRY: Survey of the general principles of chemistry including elements and their simpler compounds. Emphasis on topics of importance in industrial activities. *3 sem. hrs.*

CPT 122L. GENERAL CHEMISTRY LABORATORY: To accompany CPT 122. Three hours of laboratory a week. *1 sem. hr.*

CPT 125. INORGANIC CHEMISTRY: Comprehensive treatment of the fundamentals of general chemistry, with application to the essential groups of elements in the periodic table. *3 sem. hrs.*

CPT 125L. INORGANIC CHEMISTRY LABORATORY: Semi-micro qualitative analysis to accompany CPT 125. Three hours of laboratory a week. *1 sem. hr.*

CPT 210. ORGANIC CHEMISTRY: Study of aliphatic, aromatic, and heterocyclic compounds, including reactions, properties, and applications. Prerequisite: CPT 122 or 125. *3 sem. hrs.*

CPT 210L. ORGANIC CHEMISTRY LABORATORY: To accompany CPT 210. Three hours of laboratory a week. *1 sem. hr.*

CPT 212. QUANTITATIVE ANALYSIS: Fundamental principles and techniques involved in exact analysis. Gravimetric, volumetric, and colorimetric analyses; techniques such as weighings and separations. Prerequisite: CPT 122 or 125. *2 sem. hrs.*

CPT 212L. QUANTITATIVE ANALYSIS LABORATORY: To accompany CPT 212. Five hours of laboratory a week. *2 sem. hrs.*

*CPT 214. GENERAL CHEMISTRY WITH CASE STUDIES: Survey of the principles of chemistry including elements, their simpler compounds, and molecular phenomena. Includes a sequence of case studies of industrial applications, their economic and environmental effects, and their impact on personal, social and environmental values. *4 sem. hrs.*

*CPT 215. THE CHEMICAL INDUSTRY—TECHNOLOGY AND ISSUES: Broad survey of the chemical process industries stressing their underlying chemistry, unit operations, and generation of by-products. Environmental concerns and key economic factors are examined as issues bearing on individual values and the ethics of industrial decisions. Prerequisite: General chemistry. *3 sem. hrs.*

CPT 305. MATERIALS SCIENCE: Introduction to engineering materials and their properties and behavior. Emphasis on physical metallurgy, metals, alloys. Some coverage of ceramics, cements and aggregates, wood, glasses, and plastics. *3 sem. hrs.*

CPT 313. TOPICS IN PHYSICAL CHEMISTRY: Consideration of several topics pertinent to physical chemistry: thermodynamics, states of matter, solutions, electrochemistry, nuclear chemistry, absorption. Prerequisite: CPT 122 or 125. *3 sem. hrs.*

CPT 316. ANALYTICAL INSTRUMENTATION: Study of analytical instrumentation commonly available to research laboratories and process industries. Includes underlying physical principles, equipment operations, and the interpretation of spectra and other data. Prerequisites: CPT 210, 212. *3 sem. hrs.*

CPT 316L. ANALYTICAL INSTRUMENTATION LABORATORY: To accompany CPT 316. Three hours of laboratory a week. *1 sem. hr.*

CPT 400. SELECTED CHEMICAL TOPICS: Investigation and discussion of current technical topics in chemical technology. May be taken more than once. Prerequisite: Permission of department chairperson. *3 sem. hrs.*

CPT 401. PROCESS OPERATIONS I: Study and application of the engineering principles and methods which underlie chemical process operations. Material and energy balances, fluid flow, heat transfer, evaporation, drying, and filtration. Prerequisites: MCT 231, 342, CPT 313.

CPT 402. PROCESS OPERATIONS II: Continuation of CPT 401, emphasizing mass transfer operations. Humidification, distillation, liquid-liquid extraction, gas scrubbing, and adsorption. Prerequisite: CPT 401. *3 sem. hrs.*

CPT 401L, 402L. PROCESS OPERATIONS LABORATORY I, II: To accompany CPT 401, 402. Three hours of laboratory a week. *1 sem. hr. each*

CPT 420. INSTRUMENTATION AND CONTROL: Survey of devices for detecting and signaling the state of process control variables. Principles and methods of automatic process control. Control modes, controllers, feedback and feed forward operations, tuning methods, and data acquisition systems. Includes tuning exercises using computer-simulated processes. *3 sem. hrs.*

CPT 437. INTRODUCTION TO NUCLEAR TECHNOLOGY: Selected principles of physics and engineering to include nuclear phenomena, radioactivity, reactor thermodynamics, and heat power generation. Includes studies of reactor configurations, materials, fuels, shielding, safety, and security. Prerequisite: MCT 342. *3 sem. hrs.*

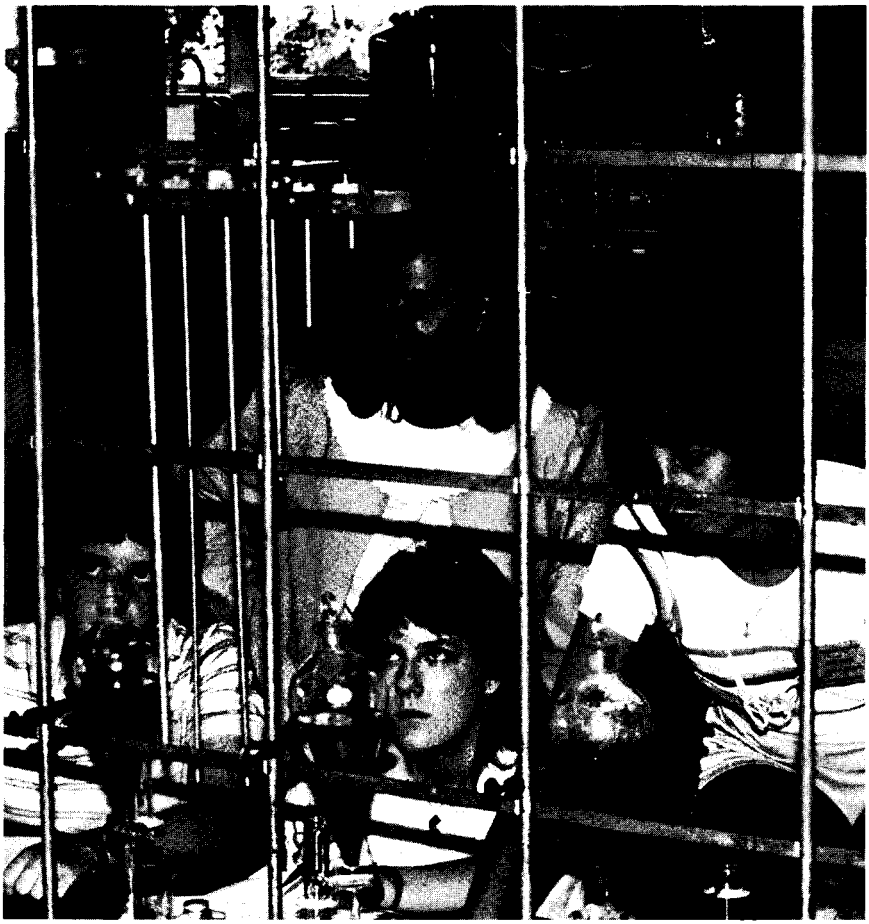
CPT 452. POLLUTION CONTROL I: Study of air pollution, its origins and effects, and methods of pollution abatement. Emphasis on control mechanisms, industrial control equipment, and operations. Prerequisite: CPT 122. *3 sem. hrs.*

CPT 453. POLLUTION CONTROL II: Study of water pollution, its occurrence, effects, and control provisions. Examination of municipal water and wastewater practices; case study of an industrial waste point source. Prerequisites: CPT 122, MCT 231. *3 sem. hrs.*

CPT 452L, 453L. POLLUTION CONTROL LABORATORIES I, II: A series of plant trips and laboratory sessions to demonstrate industrial practices in the control of air and water pollution. Trip reports and analytical assessments. Three hours of laboratory a week. Corequisite: Enrollment in corresponding lecture. *1 sem. hr. each*

CPT 462. POLYMERS: Introduction to addition, condensation, cellulosic and natural polymers, their production, processing, properties, and use. Extensive examination of plastics manufacturing operations including casting, extrusion, and composite methods. Prerequisite: CPT 122. *3 sem. hrs.*

*General education course. See Chapter V.



ELECTRONIC ENGINEERING TECHNOLOGY (EET)

The Department of Electronic Engineering Technology prepares students for service as engineering technologists in industry. Emphasis is on the fundamentals of circuit theory, electronics, digital electronics, measurements, and communications and on mathematics, physics, and chemistry. The graduate is prepared to perform basic designs in electronics, digital electronics, and communications or to serve in engineering sales of electronic systems and supervision for electrical or electronic manufacturers.

This program is accredited by The Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.

PROGRAM—T3: BACHELOR OF SCIENCE WITH A MAJOR IN ELECTRONIC ENGINEERING TECHNOLOGY (EET)

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Freshman Year		
EET	104	Introduction to Electronic Engineering Technology	3-0-3	
SET	152	Introduction to Engineering Technology	1-0-1	
SET	153	Technical Computation	1-0-1	
ENG	101-102	College Composition I, II	3-0-3	3-0-3
—	—	General education requirements[2]	3-0-3	3-0-3
SET	109, 111	Engineering Technology Mathematics I, II	4-0-4	3-0-3
CPT	122	General Chemistry		3-3-4
EET	110	Electrical Circuits I		3-3-4
			15	17
		Sophomore Year		
CPS	144	FORTRAN	3-0-3	
EET	111	Electrical Circuits II	3-3-4	
EET	207	Electrical Measurements	3-3-4	
MCT	220	Statics and Dynamics	3-0-3	
EET	300	Electronic Engineering Technology Seminar	1-0-0	1-0-0
SET	210-211	Engineering Technology Mathematics III, IV	3-0-3	3-0-3
EET	206	Electron Devices I		3-3-4
EET	208	Cathode Ray Oscilloscope		1-0-1
EET	223	Schematics and Diagrams		1-0-1
EET	224	Digital Computer Fundamentals		3-3-4
PHY	203	Modern Technical Physics		3-2-4
			17	17
		Junior Year		
EET	306	Electron Devices II	3-3-4	
EET	357	Microprocessors	3-0-3	
SET	306	Engineering Technology Mathematics V	3-0-3	
HST	101 or 102	History of Western Civilization	3-0-3	
SPE	101	Fundamentals of Effective Speaking	3-0-3	
EET	300	Electronic Engineering Technology Seminar	1-0-0	1-0-0
EET	328	Electronic Communications		3-3-4
EET	340L	Electronic Instrumentation		0-3-1
EET	—	Electronic engineering technology elective		3-0-3
IET	215	Organization and Management		3-0-3
SET	301	The Technological Society I		3-0-3
—	—	Technical elective		3-0-3
			16	17

		Senior Year		
EET	427	Pulse Circuit Fundamentals	3-3-4	
EET	___	Electronic engineering technology elective	3-0-3	
SET	334	Technical Writing	2-0-2	
SET	499	Seminar	1-0-1	
EET	300	Electronic Engineering Technology Seminar	1-0-0	1-0-0
___	___	General education requirements[2]	3-0-3	6-0-6
___	___	Technical electives	3-0-3	6-0-6
EET	430	Special Electronic Projects		1-0-1
SET	302	The Technological Society II		3-0-3
			16	16

[1]For example, 3-0-3 means 3 class hrs., 0 lab. hrs., and 3 sem. hrs. of credit.

[2]See General Education Requirements, Chapter V. Some general education courses are specified in the program (e. g., PHY 203); others are to be chosen from the listing of approved courses.

FACULTY

Richard R. Hazen, *Chairperson*
Professors: Farren, Hanneman, Hazen, Iselin, Rooney
Instructor: Ismail

COURSES OF INSTRUCTION

EET 104. INTRODUCTION TO ELECTRONIC ENGINEERING TECHNOLOGY: Topics in electronic engineering technology including circuits, electron devices, measurements, computers, power, and machinery. Corequisite: SET 109. *3 sem. hrs.*

EET 110. ELECTRICAL CIRCUITS I: Practical concepts of DC circuits: resistance, resistivity, power, and magnetism. Circuit calculations using basic formulas. Prerequisite: EET 104. Corequisite: SET 111. *3 sem. hrs.*

EET 110L. ELECTRICAL CIRCUITS I LABORATORY: To accompany EET 110. Three hours of laboratory a week. *1 sem. hr.*

EET 111. ELECTRICAL CIRCUITS II: Practical concepts of AC circuits: inductance, capacitance, reactance, impedance, phase, power, and power factor. Circuit calculations utilizing vectors and complex quantities. Prerequisite: EET 110. Corequisite: SET 210. *3 sem. hrs.*

EET 111L. ELECTRICAL CIRCUITS II LABORATORY: To accompany EET 111. Three hours of laboratory a week. *1 sem. hr.*

EET 201. FUNDAMENTALS OF ELECTRONIC TECHNOLOGY: Selected topics from DC and AC circuits, measurements, and electron devices for non-electronic technology students. Corequisite: SET 110. *3 sem. hrs.*

EET 206. ELECTRON DEVICES I: Fundamentals of transistors (bipolar and field effect), vacuum tubes, gas tubes, semi-conductor diodes, and their associated circuits. Prerequisite: EET 111. Corequisite: SET 211. *3 sem. hrs.*

EET 206L. ELECTRON DEVICES I LABORATORY: To accompany EET 206. Three hours of laboratory a week. *1 sem. hr.*

EET 207. ELECTRICAL MEASUREMENTS: Application of direct and alternating current circuit analysis to electrical measuring methods and techniques with emphasis on industrial problems and considerations. Corequisite: EET 111. *3 sem. hrs.*

EET 207L. ELECTRICAL MEASUREMENTS LABORATORY: To accompany EET 207. Three hours of laboratory a week involving circuit design for electrical measurements. *1 sem. hr.*

EET 208. CATHODE RAY OSCILLOSCOPE: To study the design, operation and application of the cathode ray oscilloscope. Prerequisite: EET 111. *1 sem. hr.*

EET 210. ELECTRICAL MACHINERY: Fundamentals of the construction and application of direct current and alternating current machines and apparatus to industrial uses. Prerequisite: EET 111. *3 sem. hrs.*

EET 210L. ELECTRICAL MACHINERY LABORATORY: To accompany EET 210. Three hours of laboratory a week. *1 sem. hr.*

EET 211. MOTOR CONTROL: Industrial uses of standard controllers for electric motors. Prerequisite: EET 210. *3 sem. hrs.*

EET 211L. MOTOR CONTROL LABORATORY: To accompany EET 211. Three hours of laboratory a week. *1 sem. hr.*

EET 223. SCHEMATICS AND DIAGRAMS: Procedures, standards, and symbols used on electronic circuit diagrams. *1 sem. hr.*

EET 224. DIGITAL COMPUTER FUNDAMENTALS: Fundamental theory and techniques of electronic data processing to include binary arithmetic, switching theory (Boolean algebra), and basic circuitry (gates, adders, registers, and memory). Corequisite: EET 206. *3 sem. hrs.*

EET 224L. DIGITAL COMPUTER FUNDAMENTALS LABORATORY: To accompany EET 224. Three hours of laboratory a week. *1 sem. hr.*

EET 226. INTRODUCTION TO ANALOG COMPUTERS AND SERVOMECHANISMS: Fundamentals and design of synchros and related error detectors, rate generators, magnetic amplifiers, and friction dampers. Prerequisite: EET 206. *3 sem. hrs.*

EET 226L. ANALOG COMPUTER AND SERVOMECHANISM LABORATORY: To accompany EET 226. Three hours of laboratory a week. *1 sem. hr.*

EET 300. ELECTRONIC ENGINEERING TECHNOLOGY SEMINAR: Exchange of ideas in electronics, to include student lectures, guest lectures, and industrial visitations. Required of all EET students who are enrolled in or have taken EET 111. *No credit*

EET 306. ELECTRON DEVICES II: Fundamentals of integrated circuits, operational amplifiers, transistors, photoelectric devices, silicon-controlled rectifiers, and their associated circuits. Prerequisite: EET 206. Corequisite: SET 306. *3 sem. hrs.*

EET 306L. ELECTRON DEVICES II LABORATORY: To accompany EET 306. Three hours of laboratory a week. *1 sem. hr.*

EET 328. ELECTRONIC COMMUNICATIONS: Principles of operation of filters, modulators, demodulators, and converters. Corequisite: EET 306. *3 sem. hrs.*

EET 328L. ELECTRONIC COMMUNICATIONS LABORATORY: To accompany EET 328. Three hours of laboratory a week. *1 sem. hr.*

EET 340L. ELECTRONIC INSTRUMENTATION: Three hours of laboratory a week to provide a knowledge of the operation of and the interpretation of data taken from complex electronic measurement and test equipment. Prerequisite: EET 111. *1 sem. hr.*

EET 357. MICROPROCESSORS I: Study of microprocessor architecture, hardware, software, and application. Prerequisite: EET 224. *3 sem. hrs.*

EET 400. SELECTED ELECTRONIC TOPICS: Investigation and discussion of current technical topics in electronic engineering technology. May be taken more than once. Prerequisite: Permission of department chairperson. *1-4 sem. hrs.*

EET 427. PULSE CIRCUITS: Selected topics relating to radar, television, and computer circuits including integrators, differentiators, blocking oscillators, multivibrators, and time-base generators utilizing Laplace transform analysis. Prerequisites: EET 224, SET 306. *3 sem. hrs.*

EET 427L. PULSE CIRCUITS LABORATORY: To accompany EET 427. Three hours of laboratory a week. *1 sem. hr.*

EET 430. SPECIAL ELECTRICAL PROJECTS: Laboratory work and reading associated with a phase of electricity selected by the student and approved by department chairperson. Prerequisite: EET 206. *1 sem. hr.*

EET 450. MICROELECTRONICS: Study of the principles, design techniques, and fabrication processes utilized in the construction of thick film, thin film, and integrated circuits. Prerequisite: EET 206. *3 sem. hrs.*

EET 451. ADVANCED INSTRUMENTATION: Unstructured laboratory study of modern instrumentation. Independent projects including CRT system, integrating DVM, acoustical equipment, and advanced standards. Prerequisites: EET 207, 208. *2-3 sem. hrs.*

EET 452. FEEDBACK CONTROLS: Study of signal flow, circuit stability. Nyquist criteria, Bode plots, oscillators, amplifiers, and electromechanical devices. Prerequisite: EET 306. *3 sem. hrs.*

EET 453. ANTENNAS: Study of basic antenna types and their application to arrays and other systems. Prerequisite: EET 328. *3 sem. hrs.*

EET 454. ENVIRONMENTAL NOISE CONTROL: Study of noise, noise measurement, physiological effects of noise, federal regulations, and design criteria for noise reduction. Prerequisite: Junior status. *3 sem. hrs.*

EET 455. BIOTECHNOLOGY I: An engineering technology approach to the medical field including resistance analogy, storage analogy, and biological systems analysis. Student participation at local hospitals. Prerequisite: EET 206. *3 sem. hrs.*

EET 456. BIOTECHNOLOGY II: A continution of Biotechnology I with emphasis on biomedical instrumentation. Prerequisite: EET 455. *3 sem. hrs.*

EET 458. MICROPROCESSORS II: Advanced studies in microprocessor software design, mass storage systems, and applications. Prerequisites: CPS 144, EET 357. *3 sem. hrs.*

EET 459. MICROPROCESSOR SYSTEMS DESIGN: Introduction to industrial design procedures for microprocessor-based control systems. Emphasis on the integration of microcomputer hardware and software. Prerequisite: EET 458. *3 sem. hrs.*

EET 460. SIXTEEN-BIT MICROPROCESSORS: Study of a sixteen-bit microprocessor family and its application to systems. Applications include single and multiprocessor design. Prerequisite: EET 357. *3 sem. hrs.*

EET 461. POWER DISTRIBUTION AND CONTROL: Study of power distribution systems including components, basic operation, and characteristics. Emphasis on the generation of electric power, its transmission and control. Prerequisite: EET 111 or 201. *3 sem. hrs.*

EET 462. TELECOMMUNICATIONS TECHNOLOGY: Study of the theoretical and practical electronic structures involved in the telecommunications industry. Applications to data transmission, satellite communications, telephony, and television. Prerequisites: EET 328, 328L. *3 sem. hrs.*

ENVIRONMENTAL ENGINEERING TECHNOLOGY (EVT)

Graduates of the Environmental Engineering Technology Program are prepared for responsibilities in both the private and public sectors wherein the effects and control of pollution are of major concern. Typical professional positions include the oversight of waste treatment operations, the supervision of pollution abatement programs, and the control of regulatory implementation. The study program includes mathematics, basic and engineering sciences, and pollution control technology.

PROGRAM—T4: BACHELOR OF SCIENCE WITH A MAJOR IN ENVIRONMENTAL ENGINEERING TECHNOLOGY (EVT)

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Freshman Year		
CPT	125	Inorganic Chemistry	3-3-4	
SET	152	Introduction to Engineering Technology	1-0-1	
MCT	103L	Technical Drawing	0-6-2	
—	—	General education requirement[2]	3-0-3	
ENG	101-102	College Composition I, II	3-0-3	3-0-3
SET	109, 111	Engineering Technology Mathematics I, II	4-0-4	3-0-3
SET	153	Technical Computation		1-0-1
CPT	212	Quantitative Analysis		2-5-4
EET	201	Fundamentals of Electronic Technology		3-0-3
HST	101 or 102	History of Western Civilization		3-0-3
			17	17
		Sophomore Year		
MCT	220	Statics and Dynamics	3-0-3	
—	—	General education requirement[2]	3-0-3	
BIO	151	Concepts of Biology I	3-0-3	
CPT	210	Organic Chemistry	3-3-4	
SET	210-211	Engineering Technology Mathematics III, IV	3-0-3	3-0-3
BIO	350	Applied Microbiology		3-0-3
MCT	231	Fluid Mechanics		3-0-3
PHY	203	Modern Technical Physics		3-2-4
SPE	101	Fundamentals of Effective Speaking		3-0-3
			16	16
		Junior Year		
SET	306	Engineering Technology Mathematics V	3-0-3	
CPT	316	Analytical Instrumentation	3-3-4	
IET	215	Organization and Management	3-0-3	
MCT	342	Thermodynamics	3-0-3	
SET	301-302	The Technological Society I, II	3-0-3	3-0-3
SET	334	Technical Writing		2-0-2
GEO	218	Engineering Geology		3-0-3
CPS	144	FORTRAN		3-0-3
—	—	Technical elective		3-0-3
—	—	General education requirement[2]		3-0-3
			16	17

		Senior Year		
EET	454	Environmental Noise Control	3-0-3	
SET	499	Seminar	1-0-1	
CPT	215	The Chemical Industry	3-0-3	
CPT	452-453	Pollution Control I, II	3-3-4	3-3-4
—	—	Technical electives	3-0-3	6-0-6
—	—	General education requirements[2]	3-0-3	3-0-3
CPT	420	Instrumentation and Control		3-0-3
			17	16

[1]For example, 3-0-3 means 3 class hrs., 0 lab. hrs., and 3 sem. hrs. of credit.

[2]See General Education Requirements, Chapter V. Some general education courses are specified in the program (e.g., PHY 203); others are to be chosen from the listing of approved courses.

INDUSTRIAL ENGINEERING TECHNOLOGY (IET)

The Industrial Engineering Technology Program has as its objective providing specialized education to prepare students for management and technical staff positions in such areas as manufacturing, health care, banking, transportation, food service, and government. They may be involved in the economic selection and location of equipment, the planning of work methods and expected output, and the scheduling and controlling of the flow of materials. The curriculum emphasizes courses in time and motion study, production planning and control, facilities layout, economic analysis, statistical quality control, labor and wage administration, and mathematical decision making.

This program is accredited by The Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.

PROGRAM—T5: BACHELOR OF SCIENCE WITH A MAJOR IN INDUSTRIAL ENGINEERING TECHNOLOGY (IET)

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Freshman Year		
SET	152	Introduction to Engineering Technology	1-0-1	
IET	104	Industrial Materials and Processes	3-0-3	
MCT	103L	Technical Drawing I	0-6-2	
SET	109, 111	Engineering Technology Mathematics I, II	4-0-4	3-0-3
ENG	101-102	College Composition I, II	3-0-3	3-0-3
—	—	General education requirements[2]	3-0-3	3-0-3
IET	108	Production Methods and Control		3-0-3
IET	215	Organization and Management		3-0-3
SET	153	Technical Computation		1-0-1
			16	16
		Sophomore Year		
IET	225	Elements of Cost Control	3-0-3	
MCT	108L	Manufacturing Processes Laboratory	0-3-1	
MCT	220	Statics and Dynamics	3-0-3	
CPS	144	FORTRAN	3-0-3	
SPE	101	Fundamentals of Effective Speaking	3-0-3	
SET	210-211	Engineering Technology Mathematics III, IV	3-0-3	3-0-3
EET	201	Fundamentals of Electronic Technology		3-0-3
IET	230	Motion and Time Study I		2-3-3
MCT	206L	Dimensional Measurements		0-3-1
CPT	122	General Chemistry		3-3-4
HST	101 or 102	History of Western Civilization		3-0-3
			16	17
		Junior Year		
IET	316	Quantitative Methods in Industrial Engineering Technology	3-0-3	
IET	317	Industrial Economic Analysis	3-0-3	
IET	331	Motion and Time Study II	2-3-3	
MCT	313	Industrial Mechanisms	3-0-3	
SET	334	Technical Writing	2-0-2	
—	—	Technical elective	3-0-3	

IET	318	Statistical Quality Control		3-0-3
IET	418	Cost Estimating		3-0-3
SET	301	The Technological Society I		3-0-3
PHY	203	Modern Technical Physics		3-2-4
—	—	General education requirement[2]		3-0-3
			17	16
		Senior Year		
IET	420	Industrial and Environmental Safety	3-0-3	
IET	432	Plant Layout	2-3-3	
SET	499	Seminar	1-0-1	
—	—	General education requirements[2]	3-0-3	3-0-3
—	—	Technical electives	6-0-6	3-0-3
IET	405	Labor and Wage Administration		3-0-3
IET	415	Industrial Engineering Technology Seminar		3-0-3
SET	302	The Technological Society II		3-0-3
			16	15

[1]For example, 3-0-3 means 3 class hrs., 0 lab. hrs., and 3 sem. hrs. of credit.

[2]See General Education Requirements, Chapter V. Some general education courses are specified in the program (e.g., PHY 203); others are to be chosen from the listing of approved courses.

FACULTY

James F. Courtright, *Director*
Professor: McGraw
Associate Professor: Courtright
Assistant Professor: Summers

COURSES OF INSTRUCTION

IET 104. INDUSTRIAL MATERIALS AND PROCESSES: Study of modern industrial materials with emphasis on their chemical and physical properties and methods by which they may be processed. *3 sem. hrs.*

IET 108. PRODUCTION METHODS AND CONTROL: Principles and techniques of production; current practices in production planning, routing, and scheduling; forecasting techniques, materials requirements planning, and just-in-time systems. *3 sem. hrs.*

IET 215. ORGANIZATION AND MANAGEMENT: Study of the structure of industrial and service organizations; the responsibilities and duties of a manager or supervisor in developing an effective production team. *3 sem. hrs.*

IET 225. ELEMENTS OF COST CONTROL: Survey of the methods of breakdown and cost analysis of labor, material, and overhead used in manufacturing organizations. *3 sem. hrs.*

IET 230. MOTION AND TIME STUDY I: Fundamentals of work simplification and motion economy using the techniques of motion and time study for the development of effective methods of production. Prerequisite: SET 210. *2 sem. hrs.*

IET 230L. MOTION AND TIME STUDY LABORATORY I: To accompany IET 230. Three hours of laboratory a week. *1 sem. hr.*

IET 316. QUANTITATIVE METHODS IN INDUSTRIAL ENGINEERING TECHNOLOGY: Introduction to the application of mathematics to decision making in industry. Probability, linear programming, decision analysis, queueing theory, and simulation. Prerequisite: SET 210. *3 sem. hrs.*

IET 317. INDUSTRIAL ECONOMIC ANALYSIS: Introduction to economic investment in equipment, buildings, and projects including a study of compound interest and depreciation. Prerequisite: SET 210. *3 sem. hrs.*

IET 318. STATISTICAL QUALITY CONTROL: Introduction to the techniques of industrial process control using statistical methods. Prerequisite: SET 210. *3 sem. hrs.*

IET 331. MOTION AND TIME STUDY II: Study of techniques in work measurement and in setting time standards, including stop-watch time study and work sampling. Introduction to predetermined time systems and standard data. Prerequisite: IET 230. *2 sem. hrs.*

IET 331L. MOTION AND TIME STUDY LABORATORY II: To accompany IET 331. Three hours of laboratory a week. *1 sem. hr.*

IET 400. SELECTED INDUSTRIAL TOPICS: Investigation and discussion of current technical topics in industrial engineering technology. May be taken more than once. Prerequisite: Permission of program director. *1-4 sem. hrs.*

IET 405. LABOR AND WAGE ADMINISTRATION: Brief history of labor unionism and labor legislation. Survey of collective bargaining contracts, grievances, and arbitration. Wage administration including job evaluation, wage structures, wage incentives, and employee evaluation. *3 sem. hrs.*

IET 415. INDUSTRIAL ENGINEERING TECHNOLOGY SEMINAR: Summary of the most commonly used tools to solve manufacturing production problems. Prerequisite: IET senior status. *3 sem. hrs.*

IET 418. COST ESTIMATING: Study of the fundamentals involved in cost estimating for manufacturing plants, the construction industry, and special projects. Prerequisite: SET 210. *3 sem. hrs.*

IET 420. INDUSTRIAL AND ENVIRONMENTAL SAFETY: Study of the OSHA regulations as they apply to industry and the environment. Study and review of life safety codes. *3 sem. hrs.*

IET 432. PLANT LAYOUT: Study of the economical arrangement of stock, machines, and aisles for efficient material handling and production. Prerequisites: IET 108, MCT 103L. *2 sem. hrs.*

IET 432L. PLANT LAYOUT LABORATORY: To accompany IET 432. Three hours of laboratory a week. *1 sem. hr.*

MECHANICAL ENGINEERING TECHNOLOGY (MCT)

The Mechanical Engineering Technology Program is designed to give the student a practical knowledge of the fundamental principles of mechanical engineering technology as they are applied in industrial and scientific endeavor. Emphasis is on applied mechanics, strength of materials, mechanisms, thermodynamics, fluid mechanics, fluid power, machine design, and design for manufacturing, and on basic courses such as technical drawing, physics, mathematics, and chemistry. Career opportunities are in mechanical design, product development, design of processes and systems, manufacturing engineering, technical sales, field service, fluid power and controls, supervision, and management.

This program is accredited by The Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.

PROGRAM—T6: BACHELOR OF SCIENCE WITH A MAJOR IN MECHANICAL ENGINEERING TECHNOLOGY (MCT)

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Freshman Year		
SET	152	Introduction to Engineering Technology	1-0-1	
IET	104	Industrial Materials and Processes	3-0-3	
—	—	General education requirements[2]	3-0-3	3-0-3
ENG	101-102	College Composition I, II	3-0-3	3-0-3
SET	109, 111	Engineering Technology Mathematics I, II	4-0-4	3-0-3
MCT	103L-104L	Technical Drawing I, II	0-6-2	0-6-2
MCT	108L	Manufacturing Processes Laboratory		0-3-1
SET	153	Technical Computation		1-0-1
IET	215	Organization and Management		3-0-3
			16	16
		Sophomore Year		
MCT	206L	Dimensional Measurements	0-3-1	
MCT	215	Statics	3-0-3	
EET	201	Fundamentals of Electronic Technology	3-0-3	
CPS	144	FORTRAN	3-0-3	
HST	101 or 102	History of Western Civilization	3-0-3	
SET	210-211	Engineering Technology Mathematics III, IV	3-0-3	3-0-3
SET	334	Technical Writing		2-0-2
MCT	217	Dynamics		3-0-3
MCT	221	Strength of Materials		3-0-3
MCT	231	Fluid Mechanics		3-0-3
MCT	332	Design for Manufacturing		2-0-2
			16	16
		Junior Year		
CPT	122	General Chemistry	3-3-4	
SET	306	Engineering Technology Mathematics V	3-0-3	
MCT	313	Industrial Mechanisms	3-0-3	
MCT	336	Fluid Power	3-3-4	
MCT	342	Thermodynamics	3-0-3	
MCT	330	Design of Machine Elements		3-0-3
MCT	333L	Measurements II		0-3-1
PHY	203	Modern Technical Physics		3-2-4
SPE	101	Fundamentals of Effective Speaking		3-0-3
—	—	Technical elective		3-0-3
—	—	General education requirement[2]		3-0-3
			17	17

		Senior Year		
MCT	435	Mechanical Design	1-0-1	
SET	499	Seminar	1-0-1	
SET	301-302	The Technological Society I, II	3-0-3	3-0-3
MCT	—	Mechanical engineering technology electives	3-0-3	3-0-3
—	—	Technical electives	3-0-3	6-0-6
—	—	General education requirements[2]	3-0-3	3-0-3
			14	15

[1]For example, 3-0-3 means 3 class hours, 0 lab. hours, and 3 sem. hrs. of credit.

[2]See General Education Requirements, Chapter V. Some general education courses are specified in the program (e.g., PHY 203); others are to be chosen from the listing of approved courses.

FACULTY

Robert L. Mott, *Chairperson*
Professors: Mott, Wilder, Wolff
Associate Professor: Doepker
Assistant Professors: Kretzler, Seefluth
Adjunct Associate Professor: Wendeln

COURSES OF INSTRUCTION

MCT 103L. TECHNICAL DRAWING I: Introduction to technical drawing with emphasis on orthographic projection and conventional industrial practices in producing technical sketches and completed drawings. Six hours of laboratory a week. *2 sem. hrs.*

MCT 104L. TECHNICAL DRAWING II: Descriptive geometry drawing problems involving points, lines, planes, and geometric shapes presented and solved in orthographic projection form. Six hours of laboratory a week. Prerequisite: MCT 103L. *2 sem. hrs.*

MCT 108L. MANUFACTURING PROCESSES LABORATORY: Basic metal removal processes, metal cutting theory, and production machines, such as lathes, grinders, milling machines, and drill presses. Three hours of laboratory a week. *1 sem. hr.*

MCT 206L. DIMENSIONAL MEASUREMENTS: Theory and practice of precision dimensional metrology. Three hours of laboratory a week. Prerequisite: SET 111. *1 sem. hr.*

MCT 215. STATICS: Force systems, resultants and equilibrium, centroids of areas and centers of gravity of bodies, trusses, frames, beams, friction, and moments of inertia of areas and bodies. Prerequisite: SET 111. *3 sem. hrs.*

MCT 217. DYNAMICS: Principles of applied engineering dynamics, including kinetics, kinematics, conservation of energy, conservation of momentum, and introduction to mechanical vibrations. Prerequisite: MCT 215 or 220. *3 sem. hrs.*

MCT 220. STATICS AND DYNAMICS: Force systems, components, resultants, equilibrium, center of gravity, friction, moment of inertia, kinematics and kinetics. Prerequisite: SET 111. *3 sem. hrs.*

MCT 221. STRENGTH OF MATERIALS: Principles of applied strength of materials primarily with reference to mechanical design. Prerequisites: MCT 220 or 215; SET 210. *3 sem. hrs.*

MCT 231. FLUID MECHANICS: Properties of fluids, hydrostatic and buoyant forces, Bernoulli's equation, energy equation, flow of real fluids in pipes, friction losses, measurement of flow. Prerequisite: SET 111. *3 sem. hrs.*

MCT 313. INDUSTRIAL MECHANISMS: Motions, displacements, velocities, accelerations, cams, linkages, and gears with applications to selected machines or devices. Prerequisite: MCT 220 or 217. *3 sem. hrs.*

MCT 330. DESIGN OF MACHINE ELEMENTS: Analytical design of springs, shafts, couplings, bearings, gears; stress analysis, working stresses, fatigue. Prerequisites: MCT 313, 221. *3 sem. hrs.*

MCT 332. DESIGN FOR MANUFACTURING: Basic principles of the design of tools for material removal, pressworking, casting, and joining processes; material selection and torque, thrust, horsepower, pressures required. Corequisite: MCT 221. *2 sem. hrs.*

MCT 333L. MEASUREMENTS II: Laboratory experiences in selected physical measurements and evaluations: typical selections from pressure, temperature, flow, power, hardness, stress, and strain. Three hours of laboratory a week. Prerequisites: IET 104; MCT 220 or 217; MCT 231. *1 sem. hr.*

MCT 336. FLUID POWER: Study of hydraulic and pneumatic fluid power systems and components as used in industrial, mobile, and aerospace applications. Analytical design of circuits, components, and basic control devices. Prerequisite: MCT 231. Corequisite: MCT 336L. *3 sem. hrs.*

MCT 336L. FLUID POWER LABORATORY: Laboratory to accompany MCT 336. Evaluation of fluid power components, circuits, and control devices accomplished from physical measurements and visual inspections. Graphical design and further analytical design of circuits and systems. Three hours of laboratory a week *1 sem. hr.*

MCT 342. THERMODYNAMICS: General laws of thermodynamics, properties of pure substances, processes, cycles, and applications to machines. Prerequisite: SET 210. *3 sem. hrs.*

MCT 400. SELECTED MECHANICAL TOPICS: Investigations and discussion of current technical topics in mechanical engineering technology. May be taken more than once. Prerequisite: Permission of the department chairperson. *1-4 sem. hrs.*

MCT 423. DESIGN OF MECHANICAL SYSTEMS: Synthesis of mechanical devices and systems. Emphasis on the integration of various machine elements into a single unit. Original team design projects required. Prerequisite: MCT 330. *3 sem. hrs.*

MCT 430. DESIGN OF FLUID POWER SYSTEMS: Design of fluid power systems using graphical and analytical optimizing techniques. Open and closed loop circuit studies. Original design projects. Prerequisite: MCT 336. *3 sem. hrs.*

MCT 431. FLUID POWER CONTROLS: Study of pneumatic fluid power and control systems including moving and non-moving fluid logic; logic theory; electric, programmable controllers and servo controls. Prerequisite: MCT 336. *3 sem. hrs.*

MCT 432. HEAT POWER: Applications of the fundamentals of thermodynamics, emphasizing energy transfer systems such as internal combustion engines, gas turbines, steam power plants, and reversed cycle devices. Prerequisite: MCT 232. *3 sem. hrs.*

MCT 434. INTRODUCTION TO NUMERICAL CONTROL: Manual and computer-assisted programming and operation of NC machine tools, study of robotic and computer-integrated manufacturing concepts. Prerequisite: SET 111. *3 sem. hrs.*

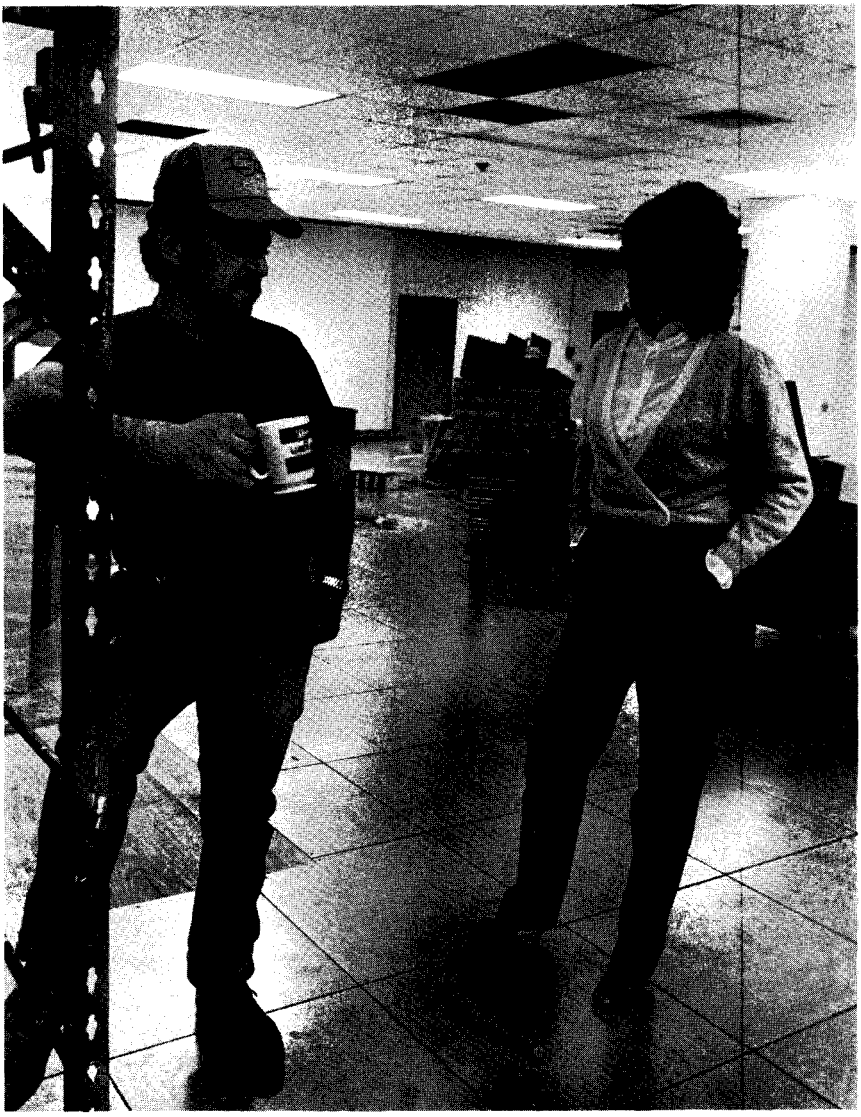
MCT 435. MECHANICAL DESIGN: Bringing analytical and graphical techniques from previous courses together to accomplish the design of complete mechanisms or other types of mechanical devices. Prerequisite: MCT 330. *1 sem. hr.*

MCT 438. THERMAL CONTROL: Elements of heat transfer: conduction, convection, and radiation; heat transmission through walls, applications to industry and building construction. Prerequisite: MCT 231. *3 sem. hrs.*

MCT 440. APPLIED VIBRATIONS: Vibration of single degree of freedom systems, reciprocating machinery, and rotating machinery; balancing; vibration damping; isolation; applications to noise reduction. Prerequisites: MCT 217, SET 306. *3 sem. hrs.*

MCT 445. EXPERIMENTAL MECHANICS: Principles of experimental stress analysis and motion measurement using strain gages, photoelasticity, brittle coatings, accelerometers, and computerized data acquisition and analysis. Corequisite: MCT 445L, 330. Prerequisite: EET 201. *2 sem. hrs.*

MCT 445L. EXPERIMENTAL MECHANICS LABORATORY: Laboratory to accompany MCT 445. Laboratory experiments to install and calibrate strain gages, measure strain on structures in tension and bending using strain gages, photoelasticity and brittle coatings, vibration measurement using accelerometers and motion transducers. Corequisite: MCT 445. *1 sem. hr.*



ENGINEERING TECHNOLOGY SERVICE COURSES (SET)

FACULTY

Professor: Strange
Associate Professor: Staub
Assistant Professor: C. Schleppi

COURSES OF INSTRUCTION

SET 101. INDUSTRIAL MATHEMATICS: Review of introductory algebra and other selected mathematical topics. *3 sem. hrs.*

SET 109. ENGINEERING TECHNOLOGY MATHEMATICS I: Fundamental processes of algebra including factoring, fractions, exponents and radicals, linear and quadratic equations, determinants, logarithms, inequalities, arithmetic and geometric progressions. *4 sem. hrs.*

SET 111. ENGINEERING TECHNOLOGY MATHEMATICS II: Introduction to trigonometry including angular measure, interpolation, identities, graphs, right and oblique triangle, functions of composite angles. Topics of analytic geometry including straight lines and conic sections. Prerequisite: SET 109. *3 sem. hrs.*

SET 134. EFFECTIVE SPEAKING: Organization and presentation of spoken materials with emphasis on voice and physical delivery and audience reaction. *2 sem. hrs.*

SET 152. INTRODUCTION TO ENGINEERING TECHNOLOGY: The environment of engineering technology, an introduction to problem-solving techniques and basic engineering technology concepts. *1 sem. hr.*

SET 153. TECHNICAL COMPUTATION: Introduction to computer programming in BASIC, including BASIC statements, input, output, looping, branching, and arrays. *1 sem. hr.*

SET 210. ENGINEERING TECHNOLOGY MATHEMATICS III: Introduction to the basic concepts of differential and integral calculus. The derivative, maxima and minima, differentials, the antiderivative, applications. The definite integral, integration, areas, volumes, centroids, work. Prerequisite: SET 111. *3 sem. hrs.*

SET 211. ENGINEERING TECHNOLOGY MATHEMATICS IV: The derivative and antiderivative formulas for composite functions: chain rule, exponential and logarithmic functions, trigonometric functions, integration techniques. Introduction of partial derivatives and multiple integrals. Prerequisite: SET 210. *3 sem. hrs.*

*SET 301. THE TECHNOLOGICAL SOCIETY I: History of technology as a revolutionary social force and of the interrelationships between technology, politics, and economics. Prerequisite: HST 101 or 102. *3 sem. hrs.*

*SET 302. THE TECHNOLOGICAL SOCIETY II: Continuation of SET 301 with emphasis on the sociology of technology; criticism and defense of technology as a social force. *3 sem. hrs.*

SET 306. ENGINEERING TECHNOLOGY MATHEMATICS V: Selected topics from ordinary differential equations with emphasis on operational methods for solving problems encountered in engineering technology. Prerequisite: SET 211. *3 sem. hrs.*

SET 334. TECHNICAL WRITING: Comprehensive treatment of the fundamentals of writing effective technical documentation for industry, including use of technical illustrations and tables. *2 sem. hrs.*

SET 400. SPECIAL TOPICS IN ENGINEERING TECHNOLOGY: Investigation and discussion of current topics in engineering technology. May be taken more than once. Prerequisite: Permission of instructor. *1-4 sem. hrs.*

SET 401. DESIGN OF SYSTEMS: An interdisciplinary course in which a team of students solves a complex problem using a three-phased systems approach. Projects vary from term to term, but all are concerned with societal problems, such as transportation, energy, or environment. *3 sem. hrs.*

SET 499. SEMINAR: Selected technical and occupational topics. Required of all technology students in the senior year. *1 sem. hr.*

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*General education course. See Chapter V.