IX School of Engineering

David C. Kraft, Dean
James L. McGraw, Associate Dean for Engineering Technology
Jay D. Pinson, Associate Dean for Graduate Studies and Research

The School of Engineering has as its purpose the preparation of men and women for professional careers in engineering 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 disciplines as well as a broad outlook on the technical and social problems that confront society. Additionally, the engineering programs provide excellent background and training 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 such areas as 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 within a private university, the School of Engineering places strong emphasis on the individualized engineering faculty/engineering student counseling program that begins prior to the student's formal course work at the University. Emphasis in the counseling program is placed on assisting all students to be challenged individually and to meet their educational objectives within the engineering program.

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 humanistic-social 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 School of Engineering welcomes transfer students from both community and senior colleges and works 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.

OPTIONAL COOPERATIVE EDUCATION PROGRAM

Students majoring in chemical engineering, electrical engineering, and mechanical engineering 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, 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
Chemical Processing
Circuit Analysis
Digital Systems
Dynamic Analysis of Mechanical Systems
Electromagnetics
Energy Conversion
Environmental Engineering
Industrial and Systems Engineering
Magnetics
Materials Engineering
Public Policy and Planning
Structures
Thermal Engineering

Students, in conjunction 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.

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 services; (3) departmental examination 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.

REQUIRED FIRST-YEAR PROGRAM

Dept.	*No.*	*Courses*	*Semester Hours*
CPS	144	EGR 144-Fortran for Engineers[1]	2
CHM	123	General Chemistry	4
EGM	101	Mechanics I	3

EGR	103	Introduction to Engineering[2]	2
ENG	111	College Composition I[3]	4
MTH	118-119	Analytic Geometry and Calculus	8
MEE	106L	Engineering Design Graphics	2
PHY	196	General Physics	3
—	—	Humanistic-social studies electives[4]	6
		Total first-year credit requirements	34

[1]An engineering/computer science course for engineering students.

[2]An introduction to the School of Engineering, the profession and career areas of engineering, and engineering problem solution.

[3]Required of every student. ENG 111 credit may be granted for successful performance on CLEP or CEEB Advanced Placement. The ENG 111 requirement may be waived, but no credit granted, for successful performance on the TSWE part of SAT, ACT, or the University-administered placement test. Students who satisfy the ENG 111 requirement in either of these ways take ENG 112 in the freshman year.

[4]Each program requires humanistic-social studies electives, of which 12 sem. hrs. must be selected from philosophy (including logic and ethics) and/or religious studies. Students majoring in mechanical engineering may select a 3-sem.-hr. free elective (generally any course except military science and physical education) in place of 3 sem. hrs. of the humanistic-social studies electives.

COURSES OF INSTRUCTION—ENGINEERING (EGR)

The courses below provide a broad, uniform basis for subsequent, more specialized courses. For other course descriptions, see departmental designations—for example, MEE (Mechanical Engineering).

EGR 103. INTRODUCTION TO ENGINEERING: An 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 144. FORTRAN FOR ENGINEERS (CPS 144): An engineering/computer science course for engineering students emphasizing basic programming theory and its application to engineering problems. *2 sem. hrs.*

DEGREE REQUIREMENTS

A student enrolls in the curriculum prescribed for the academic year in which he/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 degrees—Bachelor of Chemical, Civil, Electrical, or Mechanical Engineering, and Bachelor of Engineering—are conferred at commencement if the following requirements have been fulfilled:

1. All prescribed courses outlined in the respective curricula must have been passed (with a grade of D or better). Although courses may be scheduled in terms other than as listed, all prerequisites and corequisites must be met.
2. The cumulative quality point average in the student's engineering curriculum must be at least 2.0 (C average).
3. 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 Engineering	120
Chemical Engineering	132
Civil Engineering	133
Electrical Engineering	127
Mechanical Engineering	133

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 would select the program would have received some advanced placement upon entry to engineering at the freshman level or would have taken an occasional summer course either at the University of Dayton or at universities near their homes.

The formal request for entrance into this program is made prior to 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

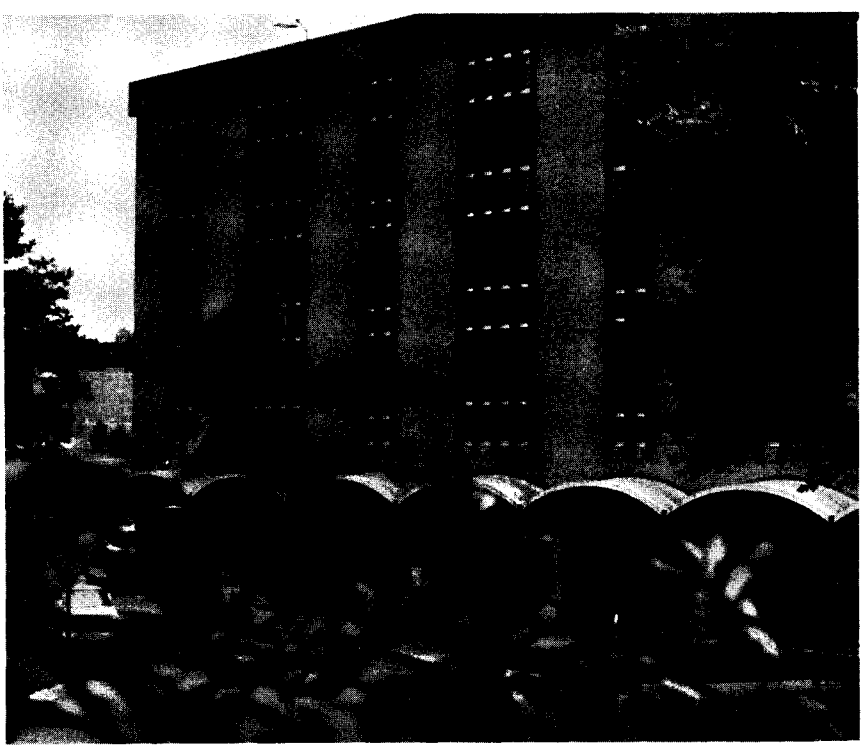
The department chairperson and the graduate program director serve as an advisory committee to the student in establishing the 5-year combined program requirements. The freshman, sophomore, and junior years follow the curriculum of the student's selected bachelor's program. The guideline curriculum requirements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

Course Area	*1st Term*	*2nd Term*
	Semester Hours	
Senior Year		
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 (includes 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 mathmatics, physics, and chemistry. The chemistry background is stressed. Courses include inorganic, 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 to the instructional laboratories, 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 bio-chemical engineering should contact the Department Chairperson.

PROGRAM—EN1: BACHELOR OF CHEMICAL ENGINEERING

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Sophomore Year		
CHM	124	General Chemistry[2]	3-3-4[1]	
CME	203	Material and Energy Balances	3-0-3	
CHM	313	Organic Chemistry		3-3-4
ENG	112	College Composition II	3-0-3	
MTH	218	Analytic Geometry and Calculus III	4-0-4	
MTH	219	Applied Differential Equations		3-0-3
—	—	Humanistic-social studies elective[3]		3-0-3
PHY	207-208	General Physics	3-0-3	3-0-3
SPE	101	Fundamentals of Effective Speaking		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 Math 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
CHM	304	Organic Chemistry	3-3-4	
ELE	321	Basic Electric Theory		3-0-3
—	—	Humanistic-social studies elective[3]	3-0-3	
—	—	Engineering elective		3-0-3
			17	16

		Senior Year		
CME	306	Kinetics	3-0-3	
CME	408B-A	Seminar	1-0-0	1-0-1
CME	411-412	Unit Operations	3-0-3	3-0-3
CME	413L-414L	Unit Operations Laboratory	0-5-2	0-5-2
CME	430	Chemical Engineering Design		3-0-3
CME	452	Process Control	3-0-3	
CME	453L	Process Control Laboratory		0-3-1
CME	—	Technical electives	3-0-3	3-0-3
—	—	Humanistic-social studies electives[3]	3-0-3	3-0-3
			17	16

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

[2]Chemical engineering students are encouraged to complete CHM 124 during their freshman year.

[3]A total of 18 sem. hrs. of humanistic-social studies electives, of which 12 must be selected from philosophy (including logic and ethics) and religious studies.

FACULTY

Ronald A. Servais, *Chairperson*
Professor: Bobal
Associate Professor: Servais
Assistant Professors: Lu, Myerson, Sandy
Adjunct Associate Professors: Moon, Rolinski

COURSES OF INSTRUCTION

CME 203. MATERIAL AND ENERGY BALANCES: An 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 305. THERMODYNAMICS: Development of the fundamental principles of thermodynamics, particularly with respect to chemical engineering processes. Prerequisite: MTH 218. Second term, each year. *3 sem. hrs.*

CME 306. KINETICS: Reaction kinetics, catalysis, and adsorption. Prerequisite: CME 305. First term, each year. h*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. First term, each year. *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. APPLIED MATHEMATICS FOR CHEMICAL ENGINEERS: A course supplying the mathematics to support transport phenomena and process control. Topics include 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: Study of the principles of process development, plant design, and economics. Prerequisite: CME 411. Second term, each year. *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. Prerequisites: CME 452. Second term, each year. *1 sem. hr.*

CHEMICAL ENGINEERING ELECTIVES

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

CIVIL ENGINEERING (CIE)

The Department of Civil Engineering and Engineering Mechanics has designed a curriculum to provide a thorough education in the principles fundamental to the civil engineering profession, so that the graduate is prepared for professional practice or advanced study.

During the first two years, emphasis is on those subjects underlying all engineering—English, mathematics, chemistry, physics, graphics, surveying, and mechanics. The third and fourth years are devoted principally to technical subjects relative to environmental, highway, hydraulic, sanitary, soils, structural, and traffic engineering.

Engineering projects, completed or under construction, are visited under the guidance of the instructors. The Student Chapter of the American Society of Civil Engineers is very active, and close association is maintained with the Dayton Section of the American Society of Civil Engineers.

At the end of the junior year, students who appear to be qualified for graduate study may elect to plan their programs so as to complete certain courses during their senior year for graduate credit. Thus it is possible to complete the requirements for the bachelor's degree and the master's degree in a total of five years. (See introduction to this chapter.)

PROGRAM—EN2: BACHELOR OF CIVIL ENGINEERING

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*	
		Sophomore Year			Summer
CIE	207	Surveying I	4-0-4[1]		
CIE	408B	Seminar	1-0-0		
EGM	303	Strength of Materials	3-0-3		
ENG	112	College Composition II	3-0-3		
MTH	218	Analytic Geometry and Calculus III	4-0-4		
PHY	207	General Physics	3-0-3		
CHM	124	General Chemistry		3-3-4	
CIE	208	Surveying II		3-0-3	
CIE	408B	Seminar		1-0-0	
EGM	301	Dynamics		3-0-3	
GEO	218	Engineering Geology		3-0-3	
MEE	227L	Engineering Graphics II		0-3-1	
PHY	208	General Physics		3-0-3	
CIE	209L	Surveying Field Practice			x-x-3
			17	17	3
		Junior Year			
CIE	313	Hydraulics	3-3-4		
CIE	408B	Seminar	1-0-0		
—	—	Humanistic-social studies elective[2]	5-0-5		
EGM	304	Advanced Strength of Materials	3-0-3		
MTH	219	Applied Differential Equations	3-0-3		
CIE	310L	Civil Engineering Laboratory		0-3-1	
CIE	312	Soil Mechanics		3-3-4	
CIE	315	Theory of structures		3-0-3	
CIE	333	Sanitary Engineering I		3-0-3	
CIE	408B	Seminar		1-0-0	
—	—	Humanistic-social studies electives[2]		6-0-6	
			15	17	

		Senior Year		
CIE	405	Highway Engineering	3-0-3	
CIE	408B	Seminar	1-0-0	
CIE	415	Steel Structure Design	3-0-3	
CIE	417	Reinforced Concrete	3-0-3	
CIE	434	Sanitary Engineering II	3-0-3	
CIE	—	CIE elective	3-0-3	
CIE	406	Indeterminate Structures		3-0-3
CIE	408A	Seminar		1-0-1
CIE	418	Structural Design Projects		1-6-3
CIE	—	CIE elective		3-0-3
—	—	Free elective[3]		3-0-3
—	—	Engineering elective		3-0-3
			15	16

[1]For example, 4-0-4 means 4 class hrs., 0 lab. hrs., 4 sem. hrs. credit.
[2]A total of 20 sem. hrs. of humanisitic-social studies electives, of which 12 must be selected from philosophy (including logic and ethics) and religious studies.
[3]Course selected by student with approval of advisor, generally any course other than military science and physical education.

FACULTY

Seymour J. Ryckman, *Chairperson of the Department of Civil Engineering and Engineering Mechanics*
Professors: Kraft, Ryckman, Thomson
Associate Professors: Payne, Shaw, Weiss
Assistant Professor: Phillips

COURSES OF INSTRUCTION

CIE 207. SURVEYING I: 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. *4 sem. hrs.*

CIE 208. SURVEYING II: 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 207. Second term, each year. *3 sem. hrs.*

CIE 209L. 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 208. Summer. *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. Corequisites: CIE 312L, EGM 304. 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 are 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 333. SANITARY ENGINEERING I: An integrated study of the principles of water sanitation, water supply, stream pollution abatement, and waste water disposal systems. Prerequisites: CIE 313, CIE 313L. Second term, each year. *3 sem. hrs.*

CIE 390. ENVIRONMENTAL POLLUTION CONTROL: A study of environmental pollution problems relating to air, water, and land resources. Includes pollution causes and effects as well as technology for solving the problems. Legal and political considerations. For junior and senior students other than Civil Engineering. Credit may not be applied for Civil Engineering degree. Prerequisite: some knowledge of chemistry. *3 sem. hrs.*

CIE 405. HIGHWAY ENGINEERING: Fundamentals of highway design, construction maintenance, and economics with illustrative practical problems. Prerequisites: CIE 208, CIE 310L. First term, each year. *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 408A. SEMINAR: 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 408B. SEMINAR: Practice in the presentation and discussion of papers; lectures by staff and practicing engineers. Attendance required of Civil Engineering sophomores, juniors, and first-term seniors. First and second terms, each year. *no credit*

CIE 415. STEEL STRUCTURE DESIGN: Design and behavior of structural steel connections, columns, beams, 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. Prerequisite: CIE 315. First term, each year. *3 sem. hrs.*

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

CIE 434. SANITARY ENGINEERING II: A continuation of CIE 333 with brief considerations of municipal and rural sanitation. Prerequisite: CIE 333. First term, each year. *3 sem. hrs.*

CIVIL ENGINEERING ELECTIVES

In addition to courses listed below, students may select with departmental approval Civil Engineering and Engineering Mechanics courses in the 500 series

listed in the Graduate Catalog, including such courses as advanced structural analysis, structural analysis by computers, prestressed concrete, plastic design in steel, advanced soil mechanics, foundation design, traffic engineering, advanced sanitary engineering, industrial waste treatment, hydrology and seepage, advanced hydraulics, sanitary chemistry, experimental stress analysis, analytical dynamics, applied elasticity, theory of elasticity; and special problems in civil engineering.

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. Corequisite: CIE 405. *3 sem. hrs.*

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

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 give 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

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Sophomore Year		
ENG	112	College Composition II		3-0-3
ELE	231-232	Circuit Theory I & II	3-0-3[1]	3-0-3
ELE	233	Field Theory I		3-0-3
MTH	218	Analytic Geometry and Calculus III	4-0-4	
MTH	219	Applied Differential Equations		3-0-3
—	—	Humanistic-social studies elective[2]	3-0-3	
PHY	207-208	General Physics	3-0-3	3-0-3
SPE	101	Fundamentals of Effective Speaking	3-0-3	
			16	15
		Junior Year		
EGM	301	Dynamics	3-0-3	
ELE	312-313	Electronics I & II	3-0-3	3-0-3
ELE	331-332	Circuit Theory III & IV	3-0-3	3-0-3
ELE	333-334	Field Theory II & III	3-0-3	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	410B	Seminar	1-0-0	1-0-0
—	—	Humanistic-social studies elective[2]	3-0-3	
MTH	—	Mathematics elective[3]		3-0-3
—	—	Engineering elective		3-0-3
			16	17
		Senior Year		
CME	305	Thermodynamics	3-0-3	
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
ELE	—	Technical electives	3-0-3	3-0-3
—	—	Humanistic-social studies electives[2]	3-0-3	3-0-3
ISE	313	Engineering Law		2-0-2
			16	14

[1]For example: 3-0-3 means 3 class hrs., 0 lab. hrs., 3 sem. hrs. credit.
[2]A total of 18 sem. hrs. of humanistic-social studies electives, of which 12 must be selected from philosophy (including logic and ethics) and/or religious studies.
[3]Selected from list approved by the Department of Electrical Engineering.

FACULTY

Bernhard M. Schmidt, *Chairperson*
Professors: Morgan, Schmidt, Strnat
Associate Professors: Evers, Kubach, Lewis
Assistant Professor: Albers
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 312. ENGINEERING ELECTRONICS I: A first course on the terminal behavior of electron devices. Topics include qualitative physical description, volt ampere curves, graphical solutions. Formulation of incremental and piecewise linear models. Analysis of simple amplifier circuits. Prerequisite: ELE 232. *3 sem. hrs.*

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

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

ELE 322. FUNDAMENTAL ENGINEERING ELECTRONICS: An introduction to electron devices and electronic circuits leading to applications that emphasize instrumentation and control. For students not majoring in electrical engineering. Prerequisite: ELE 321 or equivalent background in DC and AC circuit theory. *2 sem. hrs.*

ELE 322L. FUNDAMENTAL ENGINEERING ELECTRONICS LABORATORY: Experiments dealing with electronics, instrumentation, transducers, and automatic control. Corequisite: ELE 322. *1 sem. hr.*

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 332. CIRCUIT THEORY IV: A study of techniques for analyzing electrical circuits and systems excited by nonsinusoidal sources. Numerical solution of state equations using the computer. ECAP. Orthogonal functions and singularity functions. Impulse response and convolution integral. Fourier integral and transforms. Prerequisite: ELE 331. *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 334. FIELD THEORY III: Maxwell's equation as an axiomatic foundation of electromagnetics. Plane wave theory, field and energy propagation in unbounded media of various types. Reflection and transmission, stratified media. Guided wave propagation. Resonators. Two-conductor transmission lines. Radiation theory with introduction to antennas. Prerequisite: ELE 333. *3 sem. hrs.*

ELE 335L. ELECTRICAL ENGINEERING LABORATORY I: Experimental situations stressing familarization 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 343. ENGINEERING ELECTROMAGNETICS: Device and design related electromagnetics for non-Electrical Engineering majors 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 the students and 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 the students and 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 332. *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 332; 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.*

ELECTRICAL ENGINEERING ELECTIVES

ELE 415. MICROWAVE ENGINEERING: A design-oriented course in microwave engineering. Communication, radar, industrial, scientific, and measurement applications are described. Operating principles and specifications of current building-block subsystems are investigated in sufficient depth to enable engineering design of microwave systems. Prerequisites: ELE 334, 413. *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. 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. Prerequisite: ELE 313. *3 sem. hrs.*

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

ENGINEERING LATE ENTRY (BEN)

Program EN5, the "Late Entry into Engineering Program," which leads to the Bachelor of Engineering, was designed especially for those people working in engineering-related fields who wish to complete the baccalaureate degree. The program is interdisciplinary, including appropriate course work in mechanical, electrical, and industrial and systems engineering. It is adequately supported by courses in mathematics, English, business, and philosophy.

Students entering the Bachelor of Engineering Program will be considered for advanced placement through the following:

1. Transfer of credits received from other institutions,
2. Life experience,
3. Acceptable scores from the College Level Examination Program (CLEP).

It is expected that the average student will have considerable advanced standing and finish the program in perhaps four years, taking approximately six semester hours each term. It would be possible for a student to enter the program with no advanced standing, take ten semester hours a term, three terms a year, and finish the program in four years.

The Bachelor of Engineering (late entry) Program is specifically designed for the mature person who is working full time in an engineering-related job. No one less than age 22 may be admitted to this program without special permission. Most students are between 25 and 35 years old, although persons over 50 are not rare.

Classes are held in the evenings and on Saturdays. Laboratory sessions, in the form of institutes, are held one day a week, usually Saturday, for five successive weeks. All courses are taught by regular departmental faculty and are identical in content with the same numbered courses in the regular day sessions.

Many courses, however, are in a self-paced, self-directed mode, reinforced by counseling and testing services.

PROGRAM—EN5: BACHELOR OF ENGINEERING

			Semester Hours
1. Basic Science			
CHM	123	General Chemistry	3
PHY	208	General Physics III: Mechanics of Waves	3
			6
2. Communication Skills			
CPS/EGR	144	Fortran for Engineers	2
ENG	112	College Composition II	3
ENG	118	Topics in Composition: Reporting in Industry	3
MEE	106L	Engineering Design Graphics	2
			10
3. Mathematics			
MTH	118-119	Analytical Geometry and Calculus I, II	8
MTH	218	Analytical Geometry and Calculus III	4
MTH	219	Applied Differential Equations	3
			15
4. Applied Mathematics			
ISE	302	Engineering Economy	1
ISE	369	Probability and Statistics for Engineers	3
ISE	423	Quality Assurance	3
MEE	316	Mechanical Engineering Analysis	3
			10

5. Engineering Mechanics			
EGM	101	Mechanics I	3
EGM	301	Dynamics	3
EGM	303	Strength of Materials	3
			9
6. Electrical Engineering			
ELE	231-232	Circuit Theory I, II	6
ELE	312	Electronics I	3
ELE	343	Engineering Electromagnetics	3
ELE	431	Electro-Mechanical Energy Conversion	3
			15
7. Mechanical Engineering			
MEE	301	Thermodynamics I	3
MEE	306	Materials and Processes	3
MEE	308	Fluid Mechanics	3
MEE	319	Mechanical Vibrations	3
MEE	410	Heat Transfer	3
MEE	427	Mechanical Design	3
			18
8. Five Institutes (Each 5 days, 7 hours per day)			
ELE	2321	Circuit and Systems Institute	1
ELE	3121	Electronic Systems Institute	1
MEE	3061	Materials Institute	1
MEE	3081	Instrumentation Institute	1
MEE	4101	Power Institute	1
			5
9. Engineering Technical Electives			
Minimum of 9 semester hours, of which 6 are to be selected from one of the following groups (A, B, or C):			
A. MEE	431	Energy Conversion Systems	3
MEE	435	Feedback Control Systems	3
B. ELE	313	Electronics II	3
ELE	331	Circuit Theory III	3
C. ISE	452	Operations Research I	3
ISE	453	Operations Research II	3
			9
10. Business Electives			
Any four approved 1-semester-hour courses			4
			4
11. Humanistic-Social Studies Electives[1]			
Philosophy and/or Religious Studies			12
Other humanistic-social studies electives			7
			19

[1]Each program requires humanistic-social studies electives, of which 12 sem. hrs. must be selected from philosophy (including logic and ethics) and/or religious studies.

ENGINEERING SERVICE COURSES (ISE, EGM)

FACULTY

Professor: Schmid
Associate Professors: Engler, Kovacs
Part-Time Instructor: Cline

COURSES OF INSTRUCTION

ISE 302. ENGINEERING ECONOMY: Emphasis on rational scientific methods of economic analysis for engineering and management decision making. Prerequisite: MTH 118. *1-3 sem. hrs.*

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

ISE 369. PROBABILITY AND STATISTICS FOR ENGINEERS: A conceptual development of probability and statistics with engineering applications: Bayes formula, random variables, binomial and normal distributions, population and sample mean and variance, central limit theorem, point and interval estimates of mean, distribution, hypothesis testing, confidence intervals, and regression analysis. *3 sem. hrs.*

ISE 381. MANAGEMENT SYSTEMS: Basic concepts and their applications in defining objectives, planning, organizing, and controlling man-machine systems in business, industrial, and service organizations; brief survey of the problems in managing an organized effort and the engineering techniques used to solve these problems. *1 sem. hr.*

ISE 382. PROJECT PLANNING AND BUDGETING FOR ENGINEERING MANAGEMENT: Engineering projects and programs in terms of objectives rather than organizations or functions. CPM, PERT and Gantt chart scheduling techniques. Cost/benefit procedures and cost/effectiveness measures useful in managing projects to objectives. *1 sem. hr.*

ISE 383. FINANCIAL ANALYSIS AND PLANNING: Introduction to financial analysis including how to read financial reports. Interactive computer programs used to simulate "real world" group interplay in decision making. *1 sem. hr.*

ISE 384. HUMAN RELATIONS FOR ENGINEERS: Survey of a broad spectrum of human relations, stressing motivation, communication, and self awareness. *1 sem. hr.*

ISE 421. RELIABILITY AND MAINTAINABILITY: Applications of statistical theory to engineering reliability design; testing methods for determining reliability; design of components and assemblies for reliability. Prerequisites: CPS 144, ISE 369, or MTH 368. *3 sem. hrs.*

ISE 423. QUALITY ASSURANCE: Principles of statistical quality control. Application of p-charts, x and R charts, and attribute and variable acceptance sampling plans. Design of quality control systems and procedures. Prerequisites: CPS 144, ISE 369, or MTH 368. *3 sem. hrs.*

ISE 428. DESIGN AND ANALYSIS OF ENGINEERING EXPERIMENTS: Emphasis on establishment of test conditions for a complex engineering experiment designed for specific predetermined objectives and analysis of random response through statistical methods. Prerequisites: CPS 144, ISE 369, or MTH 368. *3 sem. hrs.*

ISE 451. PRODUCTION AND INVENTORY PLANNING AND CONTROL: Analysis and design of systems of personnel and machines for production process; forecaster and feedback adjustments of product demand and labor staffing, scheduling, and control of production and inventory levels. Prerequisites: CPS 144, ISE 369 or MTH 368. *3 sem. hrs.*

452-453. OPERATIONS RESEARCH I AND II: The fundamental ideas of operations research, to provide an understanding of the strength as well as the inherent limitations of operations research. No advanced training in business administration or industrial engineering is necessary; however, a mathematical sophistication that is acquired in college-level introductory calculus and infinite mathematics is assumed. Prerequisites: CPS 144, ISE 369, or MTH 368. *6 sem. hrs.*

ISE 454. CYBERNETICS AND CONTROL THEORY: Emphasis on total systems concept of solving design problems. Introduction to the theory of control: general principles rather than specific control systems; common concepts of control such as feed-back, stability, regulation, ultra-stability, information coding, noise. Prerequisites: CPS 144, ISE 369, or MTH 368. *3 sem. hrs.*

ISE 455. PRINCIPLES OF SYSTEMS: Basic concepts of structure in dynamic systems course as a starting point for invoking a systems approach to dynamic systems in multidisciplinary courses on urban, ecological, corporate, or other social systems. Prerequisites: CPS 144, ISE 369, or MTH 368. *3 sem. hrs.*

ISE 456. DISCRETE TIME SERIES: Emphasis on industrial application of open loop statistical forecasts. Techniques of describing a time series by very general classes of functions, including trigonometric functions. Prerequisites: CPS 144, ISE 369, or MTH 368. *3 sem. hrs.*

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

ENGINEERING MECHANICS (EGM)

Engineering Mechanics courses are service courses taught and administered by the Department of Civil Engineering and Engineering Mechanics.

EGM 101. MECHANICS I: 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 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.*

MECHANICAL ENGINEERING (MEE)

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

The Mechanical Engineering curriculum 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 contemporary problems in the social and economic world. The curriculum also provides the opportunity to continue study at the graduate level to complete the requirement for a master's degree at the University of Dayton 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, bioengineering, and business management. No other field of engineering provides a better professional base for interdisciplinary activities.

PROGRAM—EN4: BACHELOR OF MECHANICAL ENGINEERING

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Sophomore Year		
EGM	301	Dynamics	3-0-3[1]	
ELE	321	Basic Electric Theory		3-0-3
ENG	112	College Composition II	3-0-3	
MTH	218	Analytic Geometry and Calculus III	4-0-4	
MTH	219	Applied Differential Equations		3-0-3
MEE	210L	Materials and Processes Laboratory[2]	1-4-2	
MEE	227L	Engineering Graphics II	0-3-1	
MEE	301	Thermodynamics I		3-0-3
MEE	304	Theory of Engineering Experimentation[2]		1-0-1
MEE	321	Theory of Machines		2-3-3
PHY	207-208	General Physics	3-0-3	3-0-3
			16	16
		Junior Year		
EGM	303	Strength of Materials	3-0-3	
ELE	322	Fundamentals of Engineering Electronics	2-2-3	
—	—	Humanistic social studies elective[3]		3-0-3
MEE	302	Thermodynamics II	3-0-3	
MEE	308	Fluid Mechanics	3-0-3	
MEE	310-311	Engineering Materials I and II	2-0-2	2-3-3
MEE	316	Mechanical Engineering Analysis	3-0-3	
MEE	319	Mechanical Vibrations		3-0-3
MEE	341L	Instrumentation Laboratory		0-3-1
MEE	410	Heat Transfer		3-0-3
MEE	414B	Seminar	1-0-0	1-0-0
MEE	427	Mechanical Design I		3-3-4
			17	17

		Senior Year		
MEE	330	Engineering Economics	1-0-1	
MEE	402	Energy Conversion Systems	3-0-3	
MEE	414B-A	Seminar	1-0-0	1-0-1
MEE	418	Advanced Fluid Mechanics	3-0-3	
MEE	424L	Mechanical Engineering Laboratory	0-3-1	
MEE	435	Feedback Control Systems	3-0-3	
MEE	450L	Mechanical Engineering Laboratory Project		0-3-1
MEE	—	Technical electives	3-0-3	3-0-3
—	—	Humanistic-social studies electives[3]		6-0-6
—	—	Free elective[4]	3-0-3	
—	—	Science elective		3-0-3
—	—	Engineering elective		3-0-3
			17	17

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

[2]One half of sophomore class takes MEE 210L first term; MEE 304 second term. One half of sophomore class takes MEE 304 first term; MEE 210L second term.

[3]A total of 12 sem. hrs. of humanistic-social studies electives must be selected from philosophy (including logic and ethics) and religious studies.

[4]Course selected by student with approval of advisor, generally any course except military science and physical education.

FACULTY

Howard E. Smith, *Chairperson*
Professors: Minardi, Pinson, Ray, Schauer, Smith
Associate Professors: Boehman, Bogner, Chuang, Crisp, Harmer, Wurst
Assistant Professors: Eimermacher, Scott
Adjunct Assistant Professor: Endres

COURSES OF INSTRUCTION

MEE 106L. ENGINEERING DESIGN GRAPHICS: Fundamentals of engineering graphics and the part that graphical communication plays in engineering. Application of these principles to the development of appropriate student 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 machining processes and machine tools. Basic experiments in metal cutting and in workshop metrology. Tensile testing of metals and polymers, creep testing, modulus of rupture, stress-strain. Industrial field trips. One hour lecture, four hours laboratory. Prerequisites: CHM 123, MEE 106L, PHY 196. *2 sem. hrs.*

MEE 211. MATERIALS AND PROCESSES: Introduction to the structure and properties of materials and the metallurgy of steel and cast iron, casting processes, powder metallurgy, and welding. Prerequisites: CHM 123, MEE 106L, PHY 196. Corequisite: MEE 211L. *2 sem. hrs.*

MEE 211L. MATERIALS AND PROCESSES LABORATORY: Mechanics of metal cutting, study of machining processes and machine tools. Basic experiments in metal cutting, experiments in workshop metrology, industrial trips. One hour lecture, two hours laboratory. Corequisite: MEE 211. *1 sem. hr.*

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: Review of second law and entropy. Treatment of irreversibility; mixtures and solutions; chemical reactions; vapor and gas power cycles. Prerequisite: MEE 301. *3 sem. hrs.*

MEE 303. METALLURGY: Electronic structure, bonding, crystal structure, imperfections in crystals, strengthening mechanisms, phase transformations, equilibrium diagrams, heat treatment, mechanical behavior and corrosion. Prerequisite: MEE 211, or permission of instructor. *2 sem. hrs.*

MEE 303L. METALLURGY LABORATORY: Heat treatment of ferrous and aluminum alloys, hardness testing, preparation and examination of metallographic specimens, interpretation of metallurgical microstructures, thermal analysis. Corequisite: MEE 303. *1 sem. hr.*

MEE 304. THEORY OF ENGINEERING EXPERIMENTATION: Conceptual approach to engineering experimentation; design of experimentation; instrumentation terminology and theory; error analysis; data acquisition and processing; technical report writing. Corequisite: MTH 218. *1 sem. hr.*

MEE 306. MATERIALS AND PROCESSES: Crystalline nature of solids, mechanical properties of metals, phase transformations, equilibrium diagrams, heat treatment, corrosion. Study of industrial processes, metal cutting and machining. Prerequisites: CHM 123, MEE 106L. Registration restricted to Bachelor of Engineering students only. *3 sem. hrs.*

MEE 306I. MATERIALS AND PROCESSES INSTITUTE: Mechanics of metal cutting, study of machining processes and machine tools; workshop metrology; heat treatment; hardness testing; metallographic examination of materials. Prerequisite: ENG 112 or 118, MEE 306. This institute will meet 7 clock hours per day for 5 days. Registration restricted to Bachelor of Engineering students only. *1 sem. hr.*

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 308I. INSTRUMENTATION INSTITUTE: Theory of basic instrumentation; sensing devices, measurement of various quantities including strain, displacement, pressure, force, speed, flow, rate, temperature, torque, power, sound level. Analysis of experimental data. Prerequisite: ENG 112 or 118, MEE 308. This Institute will meet 7 clock hours per day for 5 days. Registration restricted to Bachelor of Engineering students only. *1 sem. hr.*

MEE 310. ENGINEERING MATERIALS I: Electronic structure, bonding, metallic crystal structure, vacancies, dislocations, strengthening mechanisms, phase transformation, equilibrium diagrams, heat treatment, mechanical behavior of metals, metal selection. Prerequisite: MEE 210L or permission of instructor. *2 sem. hrs.*

MEE 311. ENGINEERING MATERIALS II: Crystal structures of ceramic materials, their manufacturing, mechanical properties, and applications. Polymer terminology, structures, manufacture, and properties. Mechanical properties of composite materials. Fundamentals of electrical, magnetic, optical, and thermal properties of engineering materials. Prerequisite: MEE 310. *2 sem. hrs.*

MEE 311L. METALLURGY LABORATORY: Determination of crystal structures, quantitative microscopy, equilibrium diagrams, crystallization, recovery, recrystallization and grain growth, heat treatment of ferrous and nonferrous alloys, corrosion. Corequisite: MEE 311. *1 sem. hr.*

MEE 316. MECHANICAL ENGINEERING ANALYSIS: Mathematical modeling and simulation of engineering systems. Solutions and evaluation by digital and analog methods. Prerequisites: MTH 219, MEE 301. *3 sem. hrs.*

MEE 319. MECHANICAL VIBRATIONS: Undamped free vibration; damped free vibration; forced vibration; vibration isolation and absorption; vibrations of systems with several degrees of freedom; transient vibration, Rayleigh method. Prerequisites: EGM 301, 303; MEE 316. *3 sem. hrs.*

MEE 321. THEORY OF MACHINES: Kinematic and dynamic 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. THEORY OF MACHINES LABORATORY: Laboratory exercises based on the principles covered in MEE 321. Prerequisite: EGM 301. Corequisite: MEE 321. *1 sem. hr.*

MEE 330. ENGINEERING ECONOMICS: Basic techniques of cost analysis applied to the economic selection of engineering systems. Prerequisite: MTH 218. *1 sem. hr.*

MEE 341L. INSTRUMENTATION LABORATORY: Measurements of basic engineering properties: temperature, pressure, speed, frequency, flow rate, torque, power, area, sound. Prerequisites: EGM 303, MEE 302, MEE 304. *1 sem. hr.*

MEE 402. ENERGY CONVERSION SYSTEMS: Introduction to various energy conversion systems; advanced steam power plants; fossil and nuclear fuels; power reactors; aviation and industrial gas turbines; total energy concept; energy consumption analysis; thermal insulation studies; solar heating. Prerequisite: MEE 302. *3 sem. hrs.*

MEE 410. HEAT TRANSFER: A study of the fundamentals of conduction, convection and thermal radiation energy transfer. Conduction of heat in the steady and unsteady state. Boundary layer analysis for laminar and turbulent flow. Free and forced convection for tubes, ducts, and exterior surfaces. Radiation analysis with and without convection and conduction. Prerequisite: MEE 308. Corequisite: MEE 316. *3 sem. hrs.*

MEE 410I. POWER INSTITUTE: Analysis and testing of selected power generation and heat transfer devices, such as turbo-generators, internal combustion engines, pumps, fans, direct energy conversion devices. Prerequisites: ENG 112 or 118, MEE 410. This institute will meet 7 clock hours per day for 5 days. Registration restricted to Bachelor of Engineering students only. *1 sem. hr.*

MEE 414A. SEMINAR: Presentation of papers by students and lectures by engineers in active practice. Registration required of all students in their last term prior to graduation. *1 sem. hr.*

MEE 414B. SEMINAR: Presentation of papers by the students and lectures by engineers in active practice. Registration required of all junior and senior students not registered in MEE 414A. *No credit.*

MEE 417. INTERNAL COMBUSTION ENGINES: A study of combustion and energy release processes. Applications to spark and compression ignition, thermal jet, rocket, and gas turbine engines. Special emphasis given to understanding of air pollution problems caused by internal combustion engines. Idealized and actual cycles are 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: A study of the application of the basic thermodynamic and fluid motion laws of a system to the solution of engineering problems in fluid mechanics. The use of differential and integral equations for internal and external flow

of viscous and compressible fluids with friction and heat transfer. Isentropic flow; adiabatic flow; normal and oblique shocks; Fanno and Rayleigh line flow. Prerequisites: MEE 308, 316. Corequisite: MEE 410. *3 sem. hrs.*

MEE 420. HEATING AND AIR CONDITIONING: Thermal environments and methods of control. Included are psychrometrics, solar radiation, heat transmission through solid boundaries, industrial residential environments, heating and air conditioning load calculations and systems design, refrigeration principles. Prerequisite: MEE 302 or permission of instructor. *3 sem. hrs.*

MEE 424L. MECHANICAL ENGINEERING LABORATORY: Analysis and testing of selected power generation devices and turbo-machinery, such as turbines, internal combustion engines, pumps, fans, fuel cells, solar cells, thermoelectric power generators. Prerequisite: MEE 341L. Corequisite: MEE 410. *1 sem. hr.*

MEE 425L. MECHANICAL ENGINEERING LABORATORY IV: Analysis and testing of heat transfer devices involving principles of conduction, convection, radiation and condensation. Special heat transfer projects arranged by instructor. Prerequisites: MEE 341L, 410, 424L. *1 sem. hr.*

MEE 427. MECHANICAL DESIGN I: Stress and deflection analysis of machine components, strength of mechanical elements, design and analysis of mechanical components such as fasteners, springs, bearings, and shafts. Prerequisites: EGM 303, MEE 321. Corequisites: MEE 311, 427L. *3 sem. hrs.*

MEE 427L. MECHANICAL DESIGN LABORATORY I: Design projects involving the application of 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: Design, analysis, and selection of mechanical elements such as bearings, gears, clutches, brakes, flexible elements. Advanced topics in stress and deflection analysis. Prerequisite: MEE 427. Corequisite: MEE 428L. *2 sem. hrs.*

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

MEE 431. ENERGY CONVERSION SYSTEMS: Irreversibility; chemical reactions. Energy demands and resources; power cycles; power generation; direct energy conversion. Prerequisite: MEE 301. Registration restricted to Bachelor of Engineering students only. *3 sem. hrs.*

MEE 435. FEEDBACK CONTROL SYSTEMS: Introduction to analysis and design of automatic control systems. Component analysis. Time domain analysis and frequency domain analysis. Stability of complex feedback control systems. Prerequisites: MEE 308, 316, 319, ELE 321. *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 for selected vehicles. Vehicle simulation. Analog computation. Prerequisite: MEE 308. *3 sem. hrs.*

MEE 450L. MECHANICAL ENGINEERING LABORATORY PROJECT: Laboratory project in mechanical engineering, materials engineering or aerospace engineering subject matter. Individual or group projects to be arranged by students and the instructor before the term starts (usually while registered in MEE 424L). Prerequisite: MEE 424L. *1 sem. hr.*

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

ENGINEERING TECHNOLOGY DIVISION

James L. McGraw, Associate Dean of Engineering

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.

TRANSFER STUDENTS

The Engineering Technology Division welcomes tranfer students from associate degree programs in engineering technologywho wish to pursue the Bachelor of Technology degree. 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 of Technology.

OPTIONAL COOPERATIVE EDUCATION PROGRAM

Students majoring in Chemical Technology, Electronic Engineering Technology, Industrial Engineering Technology, and Mechanical Engineering Technology have the option of participating in the Cooperative Education Program. To be eligible, they must have a cumulative grade point average of not less than 2.3. Those applying for the program will be accepted on a 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 put classroom work to practical use while still in school, resulting in early career identification and greater motivation as well as providing a source of funds. See Chapter X.

ACADEMIC PROGRAMS

The Engineering Technology Division offers a unique two-step educational program. All freshmen entering the Engineering Technology Division enroll in one of the 2½-year associate degree programs. Upon satisfactory completion of one of these programs they are graduated with an associate degree in a specific field of technology.

Any student wishing to continue for the Bachelor of Technology degree must take an additional 1½ years as outlined under the heading Bachelor of Technology.

BACHELOR OF TECHNOLOGY

The curriculum is designed to provide the opportunity for those who hold the Associate in Technology degree to continue their education. Associate in Technology programs are described on the following pages, and a student satisfactorily completing any of these programs is eligible to enroll in the Bachelor of Technology program. Emphasis in the Bachelor of Technology curriculum is placed upon broadening the student's technical knowledge to include areas other than the Associate Degree specialization. Flexibility in the curriculum permits the student, with the advisor's consent, to plan an individual program based on needs, interests, educational background, and occupational objectives. This is an E.C.P.D. accredited Engineering Technology curriculum.

PROGRAM—T1: BACHELOR OF TECHNOLOGY

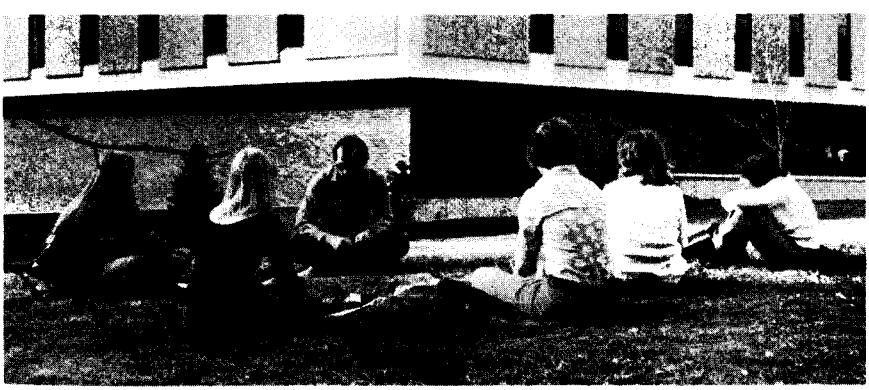
Degree requirements for the Bachelor of Technology:
A. Completion of the requirements for the Associate in Technology Degree.
B. Completion of a minimum 46 additional semester hours distributed as follows:

Dept.	*No.*	*Course*	*Semester Hours*
ENG	—	English elective	3
STI	306	Engineering Technology Mathematics IV	3
—	—	General elective	3
—	—	Humanistic-social studies electives[1]	12
—	—	Approved technical electives (minimum of 6 sem. hrs. in major)	24
STI	499	Seminar	1
			46

[1]Must include 6 sem. hrs. of Philosophy and/or Religious Studies.

ASSOCIATE DEGREE PROGRAMS

Programs leading to the degree of Associate in Technology are described in the following pages under departmental and interdepartmental designations.



BIO-ENGINEERING TECHNOLOGY (BEI)

Graduates from the Bio-Engineering Technology program could assist in the design and selection of medical instrumentation, medical hardware, and devices for human safety or welfare, or they might be involved in the maintenance supervision, operation, and calibration of existing medical equipment and in patient electrical safety. For further information, consult with the chairperson, Department of Chemical Technology.

PROGRAM—T2: ASSOCIATE IN TECHNOLOGY WITH A MAJOR IN BIO-ENGINEERING TECHNOLOGY

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Freshman Year		
STI	134	Effective Speaking	2-0-2	
BIO	101-102	General Biology I, II	3-0-3	3-3-4
CTI	122	General Chemistry	3-3-4	
ENG	111	College Composition I[2]	4-0-4	
STI	107-108	Engineering Technology Mathematics I, II	5-0-4	5-0-4
—	—	Philosophy or Religious Studies		3-0-3
MTI	220	Statics and Dynamics		3-0-3
ETI	110	Electrical Circuits I		3-0-3
			17	17
		Sophomore Year		
—	—	Philosophy or Religious Studies	3-0-3	
CTI	208-209	Organic Chemistry I, II	3-0-3	3-0-3
STI	207	Engineering Technology Mathematics III	4-0-4	
ETI	111	Electrical Circuits II	3-3-4	
STI	251	Economics of Industry	3-0-3	
BIO	307L	Human Anatomy Laboratory		0-3-1
ETI	206	Electron Devices I		3-3-4
STI	252	American Political Ideas		3-0-3
—	—	Mechanical Engineering Technology electives[3]		6-0-6
			17	17
		Junior Year		
PHY	203	Modern Technical Physics	3-0-3	
BIO	403	Physiology	3-0-3	
ITI	315	Organization and Management	3-0-3	
MTI	400	Biomechanics	3-0-3	
ETI	455	Biotechnology I	3-0-3	
STI	334	Technical Writing	2-0-2	
CTI	300	Seminar	1-0-1	
			18	

[1]For example, 3-0-3 means 3 class hrs., 0 lab. hrs., 3 sem. hrs. of credit.
[2]Students testing out of ENG 111 will take ENG 112 (3 sem. hrs.).
[3]Select from MTI 221, 231, or 232.

CHEMICAL TECHNOLOGY (CTI)

The Chemical Technology curriculum is designed to develop the student into a responsible, humane citizen with a strong fundamental background in technical subjects. From the technical standpoint, emphasis is on understanding, analysis, and laboratory skills. Nonmajor technical subjects and humanistic-social studies courses complete the student's academic education. A close faculty-student relationship is maintained, and students are encouraged, through elective courses and special projects, to pursue their own technical interests. Graduates find careers in a variety of chemical and engineering industries ranging from research and development to manufacturing and including production, management, and sales.

PROGRAM—T3: ASSOCIATE IN TECHNOLOGY WITH A MAJOR IN CHEMICAL TECHNOLOGY

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Freshman Year		
STI	134	Effective Speaking	2-0-2	
CTI	122	General Chemistry	3-3-4	
STI	107-108	Engineering Technology Mathematics I, II	5-0-4	5-0-4
ENG	111	College Composition I[2]	4-0-4	
STI	151	Introduction to Engineering Technology	3-0-3	
MTI	220	Statics and Dynamics		3-0-3
CTI	212	Quantitative Analysis		2-6-4
MTI	103L	Technical Drawing		2-4-2
—	—	Philosophy or Religious Studies		3-0-3
			17	16
		Sophomore Year		
CTI	208-209	Organic Chemistry I, II	3-3-4	3-3-4
STI	207	Engineering Technology Mathematics III	5-0-4	
STI	251	Economics of Industry	3-0-3	
ITI	315	Organization and Management	3-0-3	
—	—	Philosophy or Religious Studies	3-0-3	
CTI	316	Analytical Instrumentation		3-3-4
CTI	305	Materials Science		3-0-3
ETI	110	Electrical Circuits I		3-0-3
STI	252	American Political Ideas		3-0-3
			17	17
		Junior Year		
CTI	313	Topics in Physical Chemistry	3-0-3	
CTI	300	Seminar	1-0-1	
STI	334	Technical Writing	2-0-2	
ETI	111	Electrical Circuits II	3-3-4	
CTI	310	Chemical Engineering Fundamentals	3-3-4	
PHY	203	Modern Technical Physics	3-0-3	
			17	

[1]For example, 2-0-2 means 2 class hours, 0 lab. hrs., 2 sem. hrs. of credit.
[2]Students testing out of ENG 111 will take ENG 112 (3 sem. hrs.).

FACULTY

G. William Lawless, *Chairperson, Department of Chemical Technology*
Associate Professors: Lawless, Shaw

COURSES OF INSTRUCTION

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

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

CTI 125. INORGANIC CHEMISTRY: A comprehensive treatment of the fundamentals of general chemistry, with emphasis on their application to the essential groups of elements in the periodic table. Laboratory work is devoted to semi-micro qualitative analysis. Prerequisite: CTI 122. *3 sem. hrs.*

CTI 125L. INORGANIC CHEMISTRY LABORATORY: To accompany CTI 125. Three hours of laboratory a week. *1 sem. hr.*

CTI 208-209. ORGANIC CHEMISTRY: A study of aliphatic, aromatic, and heterocyclic compounds, including reactions, properties, and applications of organic substances. Prerequisite: CTI 122. *6 sem. hrs.*

CTI 208L-209L. ORGANIC CHEMISTRY LABORATORY: To accompany CTI 208-209. Three hours of laboratory per week. *2 sem. hrs.*

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

CTI 212L. QUANTITATIVE ANALYSIS LABORATORY: To accompany CTI 202. Six hours of laboratory a week. *2 sem. hrs.*

CTI 300. SEMINAR: Use of technical handbooks, review of computer fundamentals and calculations, use of the library, discussions of employment and continued education, student papers, presentations, projects. *1 sem. hr.*

CTI 305. MATERIALS SCIENCE: Introduction to engineering materials and their properties and behavior: such areas as metallurgy; corrosion; ferrous, nonferrous, and organic materials and composites. *3 sem. hrs.*

CTI 310. FUNDAMENTALS OF CHEMICAL ENGINEERING TECHNOLOGY: Introduction to process variables, materials and energy balance, equilibrium conditions and unit operations. *3 sem. hrs.*

CTI 310L. FUNDAMENTALS OF CHEMICAL ENGINEERING TECHNOLOGY LABORATORY: Introduction to unit operations, equipment and its utilizations. To accompany CTI 310. *1 sem. hr.*

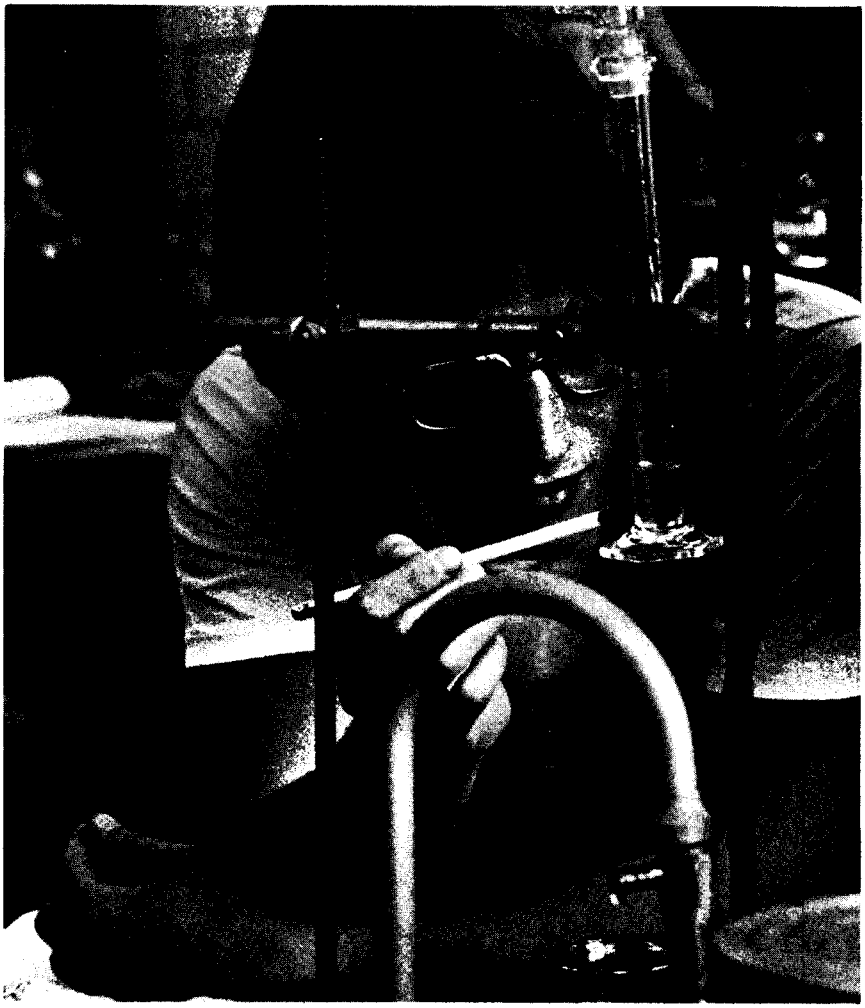
CTI 313. TOPICS IN PHYSICAL CHEMISTRY: Consideration of several topics pertinent to physical chemistry: thermodynamics, states of matter, solutions, electrochemistry, nuclear chemistry, absorption. Prerequisite: CTI 122 or equivalent. *3 sem. hrs.*

CTI 316. ANALYTICAL INSTRUMENTATION: A study of the analytical instruments available to the research laboratory and to the manufacturing process. Insofar as possible, students will operate the instruments, or see them in operation, and interpret the resulting spectra and data. A tour of a neighboring laboratory is usually arranged with possible demonstrations of analytical equipment not currently available on campus. *3 sem. hrs.*

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

CTI 400. SELECTED CHEMICAL TOPICS: Investigation and discussion of current technical topics in chemical technology. May be taken more than once. Prerequisite: Permission of the department chairperson. *1-4 sem. hrs.*

CTI 451. POLLUTION: The range of environmental pollution problems: air, water, waste disposal, the automobile and alternatives to it, energy crisis, noise, pesticides; other topics as appropriate. Methods of control and the economics will also be considered. *3 sem. hrs.*



ELECTRONIC ENGINEERING TECHNOLOGY (ETI)

Electronic Engineering Technology prepares students for service as engineering technicians in the industrial world. Emphasis is on the fundamentals of circuit-theory, electronics, and measurements in addition to related courses in mathematics, physics, and chemistry. The graduate is prepared to perform research and development and to serve with manufacturers of electronic equipment and with users of modern electrical and electronic devices. This is an E.C.P.D. accredited Engineering Technology curriculum.

PROGRAM—T5: ASSOCIATE IN TECHNOLOGY WITH A MAJOR IN ELECTRONIC ENGINEERING TECHNOLOGY

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Freshman Year		
CTI	122	General Chemistry		3-3-4
ENG	111	College Composition I[2]	4-0-4	
ETI	104	Introduction to Electronic Engineering Technology	3-0-3	
ETI	110	Electrical Circuits I		3-0-3
MTI	220	Statics and Dynamics		3-0-3
—	—	Philosophy or Religious Studies	3-0-3	3-0-3
STI	107-108	Engineering Technology Mathematics I, II	5-0-4	5-0-4
STI	151	Introduction to Engineering Technology	3-0-3	
			17	17
		Sophomore Year		
ETI	111	Electrical Circuits II	3-3-4	
ETI	204-205	Electrical Measurements	2-3-3	3-3-4
ETI	206	Electron Devices I		3-3-4
ETI	223	Schematics and Diagrams	1-0-1	
ETI	300	Seminar	1-0-0	1-0-0
ETI	324	Digital Computer Fundamentals		3-0-3
ITI	315	Organization and Management		3-0-3
PHY	203	Modern Technical Physics	3-0-3	
STI	207	Engineering Technology Mathematics III	5-0-4	
STI	134	Effective Speaking	2-0-2	
STI	251	Economics of Industry		3-0-3
			17	17
		Junior Year		
ETI	300	Seminar	1-0-0	
ETI	306	Electron Devices II	3-3-4	
ETI	327	Pulse Circuit Fundamentals	3-3-4	
ETI	328	Electronic Communications	3-3-4	
ETI	330	Special Electronic Projects	1-0-1	
STI	252	American Political Ideas	3-0-3	
STI	334	Technical Writing	2-0-2	
			18	

[1]For example, 3-0-3 means 3 class hrs., 0 lab hrs., and 3 sem. hrs. of credit.
[2]Students testing out of ENG 111 will take ENG 112 (3 sem. hrs.).

FACULTY

Richard R. Hazen, *Chairperson, Department of Electronic Engineering Technology*
Professors: Hazen, Hanneman
Associate Professors: Farren, Iselin, Rooney

COURSES OF INSTRUCTION

ETI 104. INTRODUCTION TO ELECTRONIC ENGINEERING TECHNOLOGY: Topics in electronic engineering technology including circuits, electron devices, measurements, computer, power, and machinery. Corequisite: STI 107. *3 sem. hrs.*

ETI 110. ELECTRICAL CIRCUITS I: Practical concepts of D.C. circuits: resistance, resistivity, power, and magnetism. Circuit calculations using basic formulas. Prerequisite: STI 107, ETI 104. *3 sem. hrs.*

ETI 111. ELECTRICAL CIRCUITS II: Practical concepts of A.C. circuits: inductance, capacitance, reactance, impedance, phase, power, and power factor. Circuit calculations utilizing vectors and complex quantities. Prerequisite: ETI 110, STI 108. *3 sem. hrs.*

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

ETI 201. FUNDAMENTALS OF ELECTRONIC TECHNOLOGY: Selected topics: D.C.-A.C. circuits, measurements and electron devices for non-Electronic Technology students. Prerequisite: STI 108, 215. *3 sem. hrs.*

EIT 204. ELECTRICAL MEASUREMENTS: Fundamentals of direct and alternating current measuring instruments and methods of measurement, with particular emphasis on industrial applications. Prerequisite: ETI 110. *2 sem. hrs.*

ETI 204L. ELECTRICAL MEASUREMENTS LABORATORY: To accompany ETI 204. Three hours of laboratory a week. *1 sem. hr.*

ETI 205. ELECTRONIC MEASUREMENTS: Study of modern electronic measuring instruments and systems including oscilloscopes, counters, and telemetry. Prerequisite: ETI 111. *3 sem. hrs.*

ETI 205L. ELECTRONIC MEASUREMENTS LABORATORY: To accompany ETI 205. Three hours of laboratory a week. *1 sem. hr.*

ETI 206. ELECTRON DEVICES I: Fundamentals of transistors (bipolar and field effect), vacuum tubes, gas tubes, semi-conductor diodes, and their associated circuits. Prerequisites: ETI 111, STI 207. *3 sem. hrs.*

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

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

ETI 210L. ELECTRICAL MACHINERY LABORATORY: To accompany ETI 210. Three hours of laboratory a week. Evening classes only. *1 sem. hr.*

ETI 211. MOTOR CONTROL: Industrial uses of standard controllers for electric motors. Prerequisite: ETI 210. Evening classes only. *3 sem. hrs.*

ETI 211L. MOTOR CONTROL LABORATORY: To accompany ETI 211. Three hours of laboratory a week. Evening classes only. *1 sem. hr.*

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

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

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

EIT 300. SEMINAR: An exchange of ideas in electronics, to include student lectures, guest lectures, and industrial visitations. Required of all ETI students who are enrolled in, or have taken, ETI 111. *No credit.*

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

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

ETI 324. DIGITAL COMPUTER FUNDAMENTALS: Fundamental theory and techniques of electronics data processing to include binary arithmetic, switching theory (Boolean algebra), and basic circuitry (gates, adders, registers and memory). Prerequisite: ETI 201 or 111. *3 sem. hrs.*

ETI 327. 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. Prerequisite: ETI 206 and 324. *3 sem. hrs.*

ETI 327L. PULSE CIRCUITS LABORATORY: To accompany ETI 327. Three hours of laboratory a week. *1 sem. hr.*

ETI 328. ELECTRONIC COMMUNICATIONS: Principles of operation of filters, modulators, demodulators and converters. Prerequisite: ETI 206. *3 sem. hrs.*

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

ETI 330. SPECIAL ELECTRICAL PROJECTS: Laboratory work and reading associated with a phase of electricity selected by the student and approved by chairperson of the department. Prerequisite: ETI 206. *1 sem. hr.*

ETI 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.*

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

ETI 451. ADVANCED INSTRUMENTATION: A study of modern laboratory instrumentation utilizing the flexibility of an unstructured laboratory where independent projects including modern CRT system, integrating DVM, acoustical equipment, advanced standards, and other projects can be carried out. Prerequisites: ETI 204, 205. *2-3 sem. hrs.*

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

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

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

ETI 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 is an essential part of the course. Prerequisite: ETI 206. *3 sem. hrs.*

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

ETI 457. MICROPROCESSORS: A study of microprocessor architecture, hardware, software, and applications. Prerequisite: ETI 206, 324. *3 sem. hrs.*

ENVIRONMENTAL ENGINEERING TECHNOLOGY (EEI)

The graduate from the Environmental Engineering Technology program would be working to solve some of the practical problems of energy, transportation, housing, and pollution that await the attention of the technologically oriented. This program provides the graduate with a fundamental knowledge of the major areas of environmental pollution and their interrelationships. Demands for this technology are in both industry and government. For further information, consult with the chairperson, Department of Chemical Technology.

PROGRAM—T6: ASSOCIATE IN TECHNOLOGY WITH A MAJOR IN ENVIRONMENTAL ENGINEERING TECHNOLOGY

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Freshman Year		
CTI	122	General Chemistry I	3-3-4	
STI	107-108	Engineering Technology Mathematics I, II	5-0-4	5-0-4
STI	134	Effective Speaking	2-0-2	
ENG	111	College Composition I[2]	4-0-4	
—	—	Philosophy or Religious Studies	3-0-3	3-0-3
CTI	212	Quantitative Analysis		2-6-4
MTI	220	Statics and Dynamics		3-0-3
ITI	315	Organization and Management		3-0-3
			17	17
		Sophomore Year		
CTI	208-209	Organic Chemistry I, II	3-3-4	3-3-4
STI	207	Engineering Technology Mathematics III	5-0-4	
STI	251	Economics of Industry	3-0-3	
BIO	101-102	General Biology I, II	3-0-3	3-0-3
STI	334	Technical Writing	2-0-2	
CTI	316	Analytical Instrumentation		3-3-4
CTI	451	Environmental Pollution		3-0-3
ETI	201	Fundamentals of Electronic Technology		3-0-3
			16	17
		Junior Year		
CTI	300	Seminar	1-0-1	
GEO	208	Environmental Geology	3-3-4	
ETI	454	Environmental Noise Control	3-0-3	
CIE	390	Environmental Pollution Control	3-0-3	
STI	252	American Political Ideas	3-0-3	
PHY	203	Modern Technical Physics	3-0-3	
			17	

[1]For example, 3-0-3 means 3 class hrs., 0 lab. hours, and 3 sem. hrs. of credit.
[2]Students testing out of ENG 111 will take ENG 112 (3 sem. hrs.).

GEOCHEMICAL TECHNOLOGY (GCI)

The Geochemical Technology curriculum is designed to prepare students to be both field and laboratory oriented in such areas as outdoor exploration sampling and survey, and in-lab study and analysis. Graduates could gain employment with many state and federal agencies and with those industries requiring an outdoor supply of raw materials (oil, coal, minerals, ore, etc.). Such a background could also lead to employment in the field of oceanography. For further information, consult with the chairperson, Department of Chemical Technology.

PROGRAM—T7: ASSOCIATE IN TECHNOLOGY WITH A MAJOR IN GEOCHEMICAL TECHNOLOGY

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Freshman Year		
STI	134	Effective Speaking		2-0-2
CTI	122	General Chemistry I	3-3-4	
STI	107-108	Engineering Technology Mathematics I, II	5-0-4	5-0-4
GEO	115	Physical Geology	3-3-4	
ENG	111	College Composition I[2]	4-0-4	
CTI	212	Quantitative Analysis		2-6-4
GEO	116	Historical Geology		3-3-4
—	—	Philosophy or Religious Studies		3-0-3
			16	17
		Sophomore Year		
STI	334	Technical Writing	2-0-2	
GEO	201	Mineralogy	3-3-4	
STI	207	Engineering Technology Mathematics III	5-0-4	
CTI	313	Topics in Physical Chemistry	3-0-3	
STI	251	Economics of Industry	3-0-3	
CTI	316	Analytical Instrumentation		3-3-4
MTI	220	Statics and Dynamics		3-0-3
MTI	221	Strength of Materials		3-0-3
CTI	305	Materials Science		3-0-3
ETI	201	Fundamentals of Electronic Technology		3-0-3
			16	16
		Junior Year		
GEO	—	Geology Elective	3-3-4	
STI	252	American Political Ideas	3-0-3	
MTI	231	Fluid Mechanics	3-0-3	
CTI	300	Seminar	1-0-1	
PHY	203	Modern Technical Physics	3-0-3	
—	—	Philosophy or Religious Studies	3-0-3	
			17	

[1]For example, 3-0-3 means 3 class hrs., 0 lab. hrs., and 3 sem. hrs. of credit.
[2]Students testing out of ENG 111 will take ENG 112 (3 sem. hrs.).

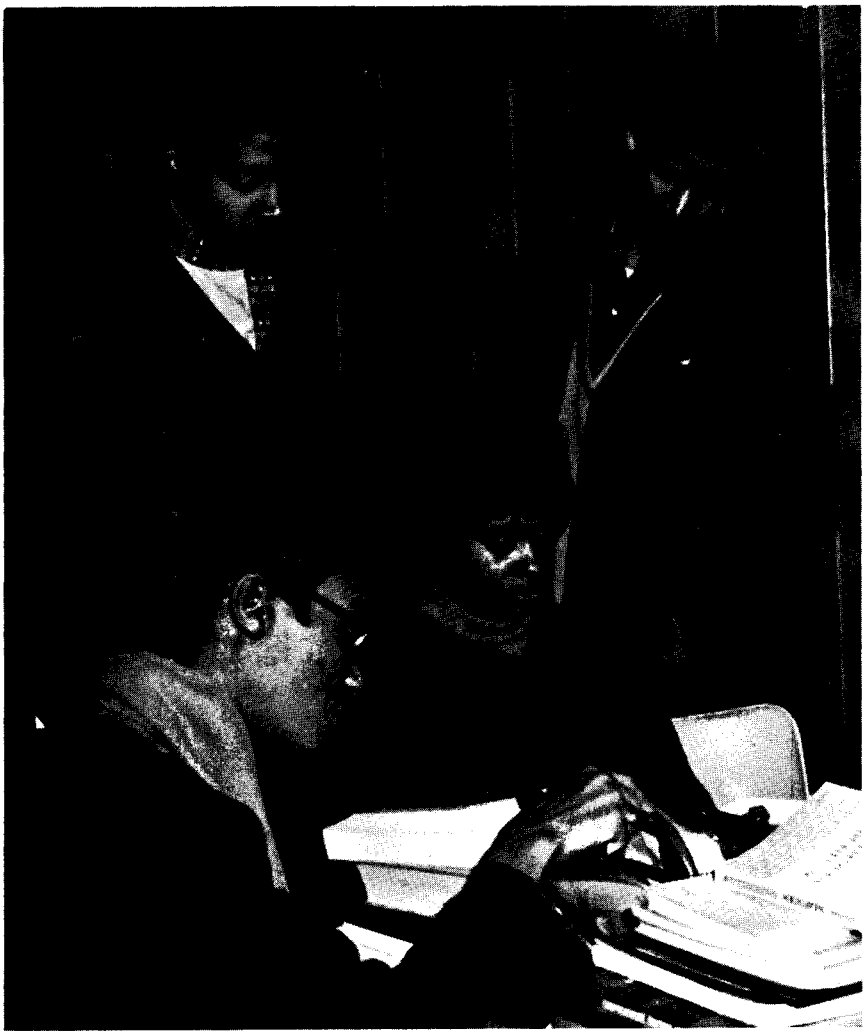
INDUSTRIAL ENGINEERING TECHNOLOGY (ITI)

The Industrial Engineering Technology program has as its objective providing specialized education to prepare students primarily for technological services to management in such industrial engineering areas as production, operations, and control. The curriculum also covers the essentials of management with which foremen, supervisors, and administrative personnel in general are concerned. Emphasis is on courses in motion and time study, production control, plant layout, quality control, and cost control. This is an E.C.P.D. accredited Engineering Technology curriculum.

PROGRAM—T9: ASSOCIATE IN TECHNOLOGY WITH A MAJOR IN INDUSTRIAL ENGINEERING TECHNOLOGY

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Freshman Year		
ITI	104	Industrial Material and Processes		3-0-3
MTI	103L	Technical Drawing		2-4-2
MTI	106L	Testing and Measurements		0-3-1
MTI	108L	Manufacturing Processes I Laboratory		0-3-1
STI	107-108	Engineering Technology Mathematics I, II	5-0-4	5-0-4
MTI	220	Statics and Dynamics		3-0-3
STI	134	Effective Speaking	2-0-2	
STI	151	Introduction to Engineering Technology	3-0-3	
ENG	111	College Composition I[2]	4-0-4	
—	—	Philosophy or Religious Studies	3-0-3	3-0-3
			16	17
		Sophomore Year		
ITI	108	Production Methods and Control	3-0-3	
ITI	225	Elements of Cost Control		3-0-3
ITI	216	Quantitative Methods in Industrial Engineering Technology		3-0-3
ITI	217	Industrial Economics Analysis		3-0-3
ITI	230	Motion and Time Study I		2-3-3
CTI	122	General Chemistry	3-3-4	
MTI	213	Industrial Mechanisms	3-0-3	
ETI	201	Fundamentals of Electronic Technology		3-0-3
PHY	203	Modern Technical Physics	3-0-3	
STI	251	Economics of Industry		3-0-3
STI	252	American Political Ideas	3-0-3	
			16	18
		Junior Year		
ITI	305	Labor and Wage Administration	3-0-3	
ITI	315	Organization and Management	3-0-3	
ITI	318	Statistical Quality Control	3-0-3	
ITI	331	Motion and Time Study II	2-3-3	
ITI	332	Plant Layout	2-3-3	
STI	334	Technical Writing	2-0-2	
			17	

[1]For example, 3-0-3 means 3 class hrs., 0 lab. hrs., 3 sem. hrs. of credit.
[2]Students testing out of ENG 111 will take ENG 112 (3 sem. hrs.).



FACULTY

Professors: McGraw, Puckett
Assistant Professor: Staudter

COURSES OF INSTRUCTION

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

ITI 108. PRODUCTION METHODS AND CONTROL: Principles and the techniques used in production; current practices in production planning, routing, scheduling, and dispatching; study of production standards, labor efficiency, and costs; quantity and quality control. Prerequisite: ITI 104. *3 sem. hrs.*

ITI 216: QUANTITATIVE METHODS IN INDUSTRIAL ENGINEERING TECHNOLOGY: Introduction to the application of mathematics to decision making in industry. Prerequisite: STI 108. *3 sem. hrs.*

ITI 217. INDUSTRIAL ECONOMIC ANALYSIS: Introduction to the economics of tools, equipment, and machinery, including an elementary study of compound interest and depreciation. Prerequisite: STI 108. *3 sem. hrs.*

ITI 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.*

ITI 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: STI 107. *2 sem. hrs.*

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

ITI 305. 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.*

ITI 315. ORGANIZATION AND MANAGEMENT: Study of the structure of industrial organizations and the responsibilities and duties of a supervisor in developing an effective production team. *3 sem. hrs.*

ITI 318. STATISTICAL QUALITY CONTROL: Introduction to the techniques of industrial process control using statistical methods. Prerequisite: STI 107. *3 sem. hrs.*

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

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

ITI 332. PLANT LAYOUT: Study of the economical arrangement of stocks, machines, and aisles for efficient material handling and production. Prerequisites: ITI 108 and MTI 103L. *2 sem. hrs.*

ITI 332L. PLANT LAYOUT LABORATORY: To accompany ITI 332. Three hours of laboratory a week. *1 sem. hr.*

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

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

ITI 416. COMPUTER APPLICATIONS IN INDUSTRIAL ENGINEERING TECHNOLOGY: Extended application of existing computer programs to the solution of industrial engineering technology problems. *3 sem. hrs.*

INTERDISCIPLINARY (TII)

Students should consult with the Associate Dean for Engineering Technology.

COURSE OF INSTRUCTION

TII 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.*

MECHANICAL ENGINEERING TECHNOLOGY (MTI)

The Mechanical Engineering Technology curriculum 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 courses in applied mechanics, strength of materials, mechanisms, thermodynamics, fluid mechanics, fluid power, machines design, and design for manufacturing, and on basic technical courses such as technical drawing, physics, mathematics, and chemistry. The nontechnical courses (English, speech, and technical writing) are intended to teach a student how to formulate and deliver technical communications, both oral and written.

Career opportunities exist for young men and women as engineering technicians in research and development, design of machines, design of processes and systems, manufacturing engineering, technical sales, customer relations and field service, fluid power and controls, supervision, and management. This is an E.C.P.D. accredited Engineering Technology curriculum.

PROGRAM—T10: ASSOCIATE IN TECHNOLOGY WITH A MAJOR IN MECHANICAL ENGINEERING TECHNOLOGY

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Freshman Year		
STI	151	Introduction to Engineering Technology	3-0-3	
STI	107-108	Engineering Technology Mathematics I, II	5-0-4	5-0-4
ENG	111	College Composition I[2]	4-0-4	
—	—	Philosophy or Religious Studies	3-0-3	3-0-3
MTI	103L	Technical Drawing	2-4-2	
MTI	108L	Manufacturing Processes I Laboratory	0-3-1	
ITI	104	Industrial Materials and Processes		3-0-3
MTI	215	Statics		3-0-3
MTI	106L	Testing and Measurements		0-3-1
MTI	213	Industrial Mechanisms		3-0-3
			17	17
		Sophomore Year		
STI	207	Engineering Technology Mathematics III	5-0-4	
MTI	104L	Graphical Computations	2-4-2	
MTI	217	Dynamics	3-0-3	
STI	334	Technical Writing	2-0-2	
MTI	221	Strength of Materials	3-0-3	
PHY	203	Modern Technical Physics	3-0-3	
MTI	332	Design for Manufacturing		2-0-2
MTI	232	Thermodynamics		3-0-3
MTI	231	Fluid Mechanics		3-0-3
MTI	330	Design of Machine Elements		3-0-3
STI	252	American Political Ideas		3-0-3
ETI	201	Fundamentals of Electronic Technology		3-0-3
			17	17
		Junior Year		
MTI	331	Fluid Power	2-3-3	
STI	134	Effective Speaking	2-0-2	
CTI	122	General Chemistry	3-3-4	
ITI	315	Organization and Management	3-0-3	
MTI	333L	Measurements II	0-3-1	
MTI	335	Mechanical Design	1-0-1	
STI	251	Economics of Industry	3-0-3	
			17	

[1]For example, 3-0-3 means 3 class hrs., 0 lab. hrs., and 3 sem. hrs. of credit.
[2]Students testing out of ENG 111 will take ENG 112 (3 sem. hrs.).

FACULTY

Robert L. Mott, *Chairperson, Department of Mechanical Engineering Technology*
Professor: Wilder
Associate Professors: Mott, Wolff
Assistant Professors: Kretzler, Rolle
Adjunct Associate Professor: Wendeln

COURSES OF INSTRUCTION

MTI 103L. TECHNICAL DRAWING: An introduction to technical drawing with emphasis on orthographic projection and conventional industrial practices in producing technical sketches and completed detail drawings. Two hours of class and four hours of laboratory a week. *2 sem. hrs.*

MTI 104L. GRAPHICAL COMPUTATIONS: Descriptive geometry drawing problems involving points, lines, planes, and geometric shapes presented and solved in orthographic projection form. Two hours of class and four hours of laboratory a week. Prerequisite: MTI 103L. *2 sem. hrs.*

MTI 106L. TESTING AND MEASUREMENTS: Theory and practice of precision dimensional metrology; and standard mechanical testing equipment. Three hours of laboratory a week. Corequisite: ITI 104. *1 sem. hr.*

MTI 108L. MANUFACTURING PROCESSES I LABORATORY: Basic concepts of cutting and noncutting metal removal processes, metal cutting theory, forming, joining, and production and general-purpose machines. *1 sem. hr.*

MTI 213. INDUSTRIAL MECHANISMS: Motions, displacements, velocities, cams, linkages, and gears with applications to selected machines or devices. Corequisite: MTI 220 or 215. *3 sem. hrs.*

MTI 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. Corequisite: STI 108. *3 sem. hrs.*

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

MTI 220. STATICS AND DYNAMICS: Principles of applied engineering mechanics. Corequisite: STI 108. *3 sem. hrs.*

MTI 321. STRENGTH OF MATERIALS: Principles of applied strength of materials primarily with reference to mechanical design. Prerequisites: MTI 220 or 215. Corequisite: STI 207. *3 sem. hrs.*

MTI 226L. MECHANISMS: Motions, displacements, velocities, friction wheels, flexible connectors, cams, linkages, and gears. One hour of class and three hours of laboratory a week. Prerequisite: MTI 103L. Corequisite: MTI 220 or 217. *2 sem. hrs.*

MTI 231. FLUID MECHANICS: Property of fluids, hydrostatic and buoyant forces, Bernoulli's equation, energy equation, flow of real fluids in pipes, friction losses, measurement flow. Prerequisite: STI 207. *3 sem. hrs.*

MIT 232. THERMODYNAMICS: General laws of thermodynamics, properties and processes of gases, vapor and gas-vapor mixtures; cycles, and the flow of fluids, application of thermodynamics to machines such as engines. Prerequisite: STI 207. *3 sem. hrs.*

MTI 330 DESIGN OF MACHINE ELEMENTS: Analytical design of springs, shafts, couplings, bearings, gears; applying laws governing simple, variable and combined stresses. Prerequisites: MTI 213, 221. *3 sem. hrs.*

MTI 331. FLUID POWER: Study of hydraulic and pneumatic fluid power systems and components as used in industrial, mobile, and aero-space applications. Includes analytical design of circuits, components, and basic control devices. Prerequisite: MTI 231. *2 sem. hrs.*

MTI 331L. FLUID POWER LABORATORY: Laboratory to accompany MTI 331. 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. *1 sem. hr.*

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

MTI 333L. MEASUREMENTS II: Laboratory experiences in selected physical measurements and evaluations: typical selections from pressure, temperature, flow, power, stress and strain. *1 sem. hr.*

MTI 335. 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: MTI 330. *1 sem. hr.*

MTI 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.*

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

MTI 430. DESIGN OF FLUID POWER SYSTEMS: Design of fluid power systems using graphical and analytical optimizing techniques. Includes open and closed loop circuit studies. Original individual design projects will be required. Prerequisite: MTI 331. *3 sem. hrs.*

MTI 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. Introduction to nuclear energy and direct conversion techniques. Prerequisite: MTI 232. *3 sem. hrs.*

MTI 434. INTRODUCTION TO NUMERICAL CONTROL: Manual programming for basic N/C machines; introduction to computer programming using APT and small computer languages; geometric terms, N/C machines and applications, economic justification. *3 sem. hrs.*

METALLURGICAL TECHNOLOGY (MLI)

A graduate of the Metallurgical Technology program might develop and test new alloys, improve metals, analyze metallic failures, develop anti-corrosion techniques, and study material with specialized applications. This curriculum is designed to provide a thorough knowledge of modern metallurgical practices. For further information, consult with the chairperson, Department of Chemical Technology.

PROGRAM—T11: ASSOCIATE IN TECHNOLOGY WITH A MAJOR IN METALLURGICAL TECHNOLOGY

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Freshman Year		
CTI	122	General Chemistry	3-3-4	
STI	107-108	Engineering Technology Mathematics I, II	5-0-4	5-0-4
ITI	104	Industrial Materials and Processes		3-0-3
—	—	Philosophy or Religious Studies	3-0-3	3-0-3
ENG	111	College Composition I[2]	4-0-4	
MTI	220	Statics and Dynamics		3-0-3
CTI	212	Quantitative Analysis		2-6-4
			15	17
		Sophomore Year		
MTI	106L	Testing and Measurements	0-3-1	
MTI	108L	Manufacturing Processes I Laboratory	0-3-1	
STI	207	Engineering Technology Mathematics III	5-0-4	
—	—	Technical Electives	6-0-6	
STI	251	Economics of Industry	3-0-3	
STI	134	Effective Speaking	2-0-2	
MEE	303	Metallurgy		2-3-3
MTI	221	Strength of Materials		3-0-3
CTI	305	Materials Science		3-0-3
STI	252	American Political Ideas		3-0-3
ETI	201	Fundamentals of Electronic Technology		3-0-3
MTI	103L	Technical Drawing		2-4-2
			17	17
		Junior Year		
CTI	300	Seminar	1-0-1	
CTI	313	Topics in Physical Chemistry	3-0-3	
ITI	315	Organization and Management	3-0-3	
STI	334	Technical Writing	2-0-2	
MTI	332	Design for Manufacturing	2-0-2	
—	—	Technical Elective	3-0-3	
PHY	203	Modern Technical Physics	3-0-3	
			17	

[1]For example, 3-0-3 means 3 class hrs., 0 lab. hrs., and 3 sem. hrs. of credit.
[2]Students testing out of ENG 111 will take ENG 112 (3 sem. hrs.).

PLASTICS TECHNOLOGY (PTI)

The Plastics Technology curriculum is designed to provide the graduate with a broad and fundamental knowledge of the ever-expanding plastics industry. The modern principles of chemistry are combined with polymer formulation, testing, and use. A multitude of new products and applications are waiting to be developed, tested, and marketed. For further information, consult with the chairperson, Department of Chemical Technology.

PROGRAM—T12: ASSOCIATE IN TECHNOLOGY WITH A MAJOR IN PLASTICS TECHNOLOGY

Dept.	*No.*	*Course*	*1st Term*[1]	*2nd Term*
		Freshman Year		
STI	134	Effective Speaking	2-0-2	
CTI	122	General Chemistry I	3-3-4	
ENG	111	College Composition I[2]	4-0-4	
—	—	Philosophy or Religious Studies	3-0-3	3-0-3
STI	107-108	Engineering Technology Mathematics I, II	5-0-4	5-0-4
CTI	212	Quantitative Analysis		2-6-4
STI	334	Technical Writing		2-0-2
MTI	106L	Testing and Measurements		0-3-1
MTI	220	Statics and Dynamics		3-0-3
			17	17
		Sophomore Year		
STI	207	Engineering Technology Mathematics III	5-0-4	
CTI	208-209	Organic Chemistry I, II	3-3-4	3-3-4
STI	251	Economics of Industry	3-0-3	
ETI	201	Fundamentals of Electronic Technology	3-0-3	
CTI	400	Polymers I and II	3-0-3	3-0-3
ITI	318	Statistical Quality Control		3-0-3
CTI	316	Analytical Instrumentation		3-3-4
CTI	305	Materials Science		3-0-3
			17	17
		Junior Year		
MTI	221	Strength of Materials	3-0-3	
ITI	315	Organization and Management	3-0-3	
CTI	300	Seminar	1-0-1	
PHY	203	Modern Technical Physics	3-0-3	
STI	252	American Political Ideas	3-0-3	
CTI	313	Topics in Physical Chemistry	3-0-3	
MTI	108L	Manufacturing Processes I Laboratory	0-3-1	
			17	

[1]For example, 3-0-3 means 3 class hrs., 0 lab. hrs., and 3 sem. hrs. of credit.
[2]Students testing out of ENG 111 will take ENG 112 (3 sem. hrs.).

SERVICE COURSES (STI) FOR ENGINEERING TECHNOLOGY

FACULTY

Associate Professor: Strange
Assistant Professors: Fehlmann, Staub

COURSES OF INSTRUCTION

STI 101. INDUSTRIAL MATHEMATICS: A review of introductory algebra and other selected mathematical topics. Prerequisite for the Engineering Technology program. *3 sem. hrs.*

STI 105. TECHNICAL MATHEMATICS I: Fundamental processes of algebra including factoring, fractions, exponents and radicals, linear and quadratic equations, determinants, logarithms. Introduction to trigonometry including angular measure, interpolation, identities, graphs. *3 sem. hrs.*

STI 106. TECHNICAL MATHEMATICS II: Additional topics in trigonometry including solution of right triangles, solution of oblique triangles, functions of composite angles. Topics in analytic geometry and differential calculus. Prerequisite: STI 105. *3 sem. hrs.*

STI 107. ENGINEERING TECHNOLOGY MATHEMATICS I: Fundamental processes of algebra including factoring, fractions, exponents and radicals, linear and quadratic equations, determinants, logarithms. Introduction to trigonometry including angular measure, interpolation, identities, graphs. *4 sem. hrs.*

STI 108. ENGINEERING TECHNOLOGY MATHEMATICS II: Additional topics in trigonometry including solution of right triangles, solution of oblique triangles, functions of composite angles. Topics in analytic geometry and differential calculus. Prerequisite: STI 107. *4 sem. hrs.*

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

STI 151. INTRODUCTION TO ENGINEERING TECHNOLOGY: The environment of engineering technology, an introduction to problem solving techniques and to the design process. *3 sem. hrs.*

STI 206. TECHNICAL MATHEMATICS III: Practical applications of selected topics in differential and integral calculus to engineering technology. Prerequisite: STI 106. *3 sem. hrs.*

STI 207. ENGINEERING TECHNOLOGY MATHEMATICS III: Applications of selected topics in differential and integral calculus to engineering technology. Prerequisite: STI 108. *4 sem. hrs.*

STI 251. ECONOMICS OF INDUSTRY: Basic economic principles as applied to major industrial problems. *3 sem. hrs.*

STI 252. AMERICAN POLITICAL IDEAS AND PRACTICES: Fundamentals of democratic processes and practices in government. *3 sem. hrs.*

STI 306. ENGINEERING TECHNOLOGY MATHEMATICS IV: Selected topics from ordinary differential equations with emphasis on operational methods for solving problems encountered in engineering technology. Prerequisite: STI 207. *3 sem. hrs.*

STI 334. TECHNICAL WRITING: A comprehensive treatment of the fundamentals of writing effective technical documentations for industry, including use of technical illustrations and tables. *2 sem. hrs.*

STI 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.*

STI 451. TECHNOLOGY: IMPACT AND IMPLICATIONS: Study of the revolutionary impact of technology on society; its implications for the future; criticism and defense of technology as a social force; responsibility of technologists for social change. *3 sem. hrs.*

STI 499. SEMINAR: Selected technical and occupational topics. Required of all Bachelor of Technology students in the second term of the senior year. *1 sem. hr.*