School of Engineering and Technology

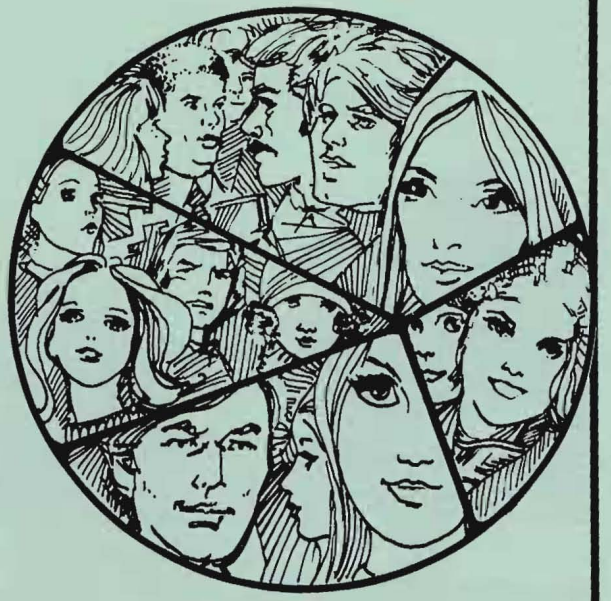
bulletin 1973-74

Indiana University–Purdue University at Indianapolis

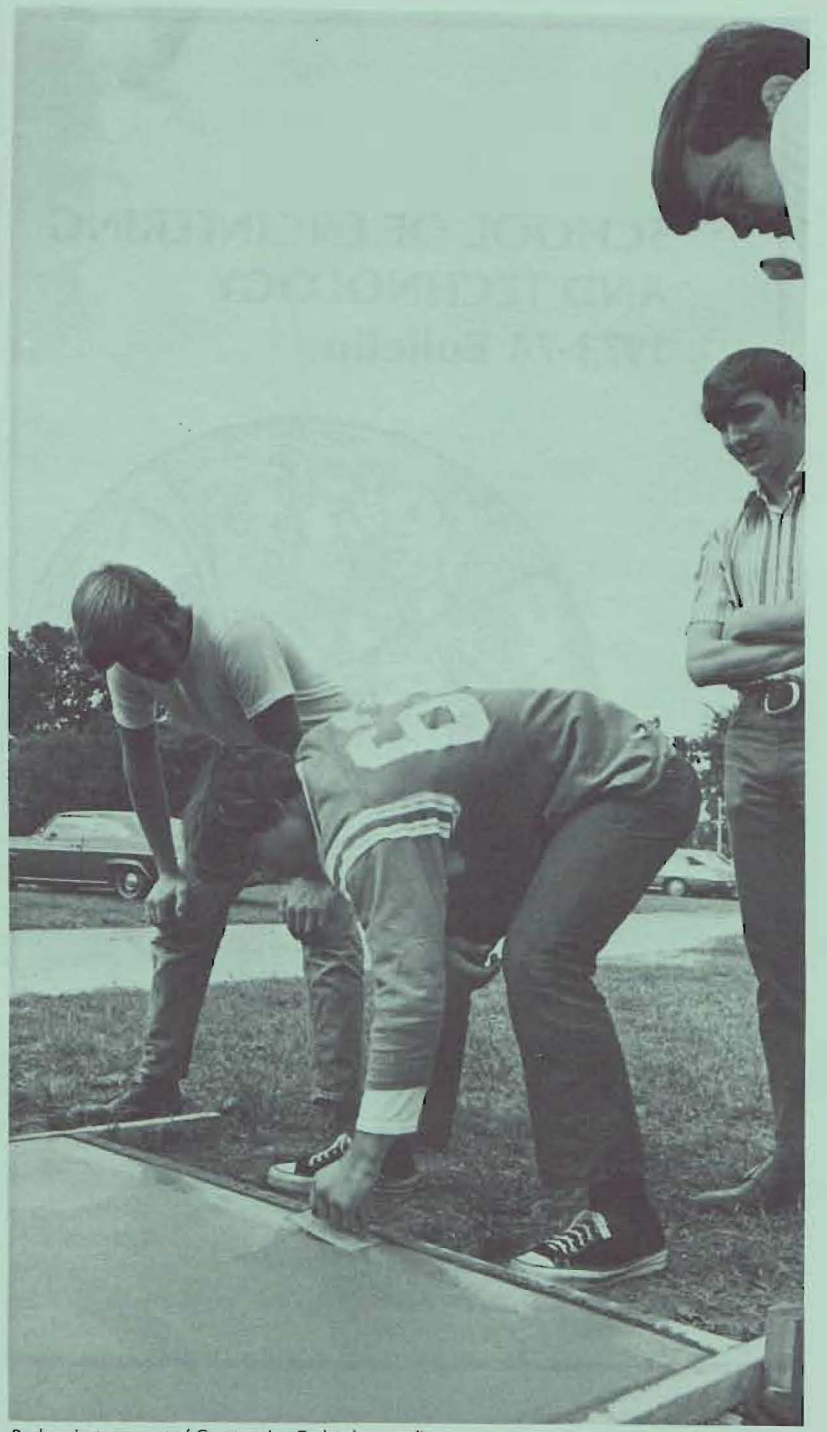
School of Engineering and Technology
Offering Program in . . .

For all admissions information contact:
IUPUI Admissions Office
1201 East 38th Street
Indianapolis, In. 46205
Telephone (317) 264-4644

SCHOOL OF ENGINEERING AND TECHNOLOGY
1973-74 Bulletin



Indiana University-Purdue University at Indianapolis



Real projects are part of Construction Technology studies

CALENDAR

1973-74 FIRST SEMESTER

Classes begin	W	Aug	22
Labor Day Holiday	M	Sept	3
Last day to withdraw from a class with W	T	Sept	4
Mid-term Reports	F	Oct	12
Last day to withdraw from class with W or WF	W	Nov	14
Thanksgiving recess—1st day	W	Nov	21
Classes resume	M	Nov	26
Classes end—last day	M	Dec	10
Exams begin	T	Dec	11
Exams end—last day	M	Dec	17
Semester ends	W	Dec	19

SECOND SEMESTER

Classes begin	Th	Jan	10
Last day to withdraw from class with W	W	Jan	23
Mid-term reports	F	Mar	1
Last day to withdraw from class with W or WF	W	Apr	3
Spring recess	M	Mar	4
Classes resume	M	Mar	11
Classes end—last day	W	May	1
Exams begin	Th	May	2
Exams end—last day	W	May	8
Semester ends	F	May	10
Commencement	Sun	May	19

SUMMER SESSION I

Classes begin	M	May	13
Memorial Day Holiday	M	May	27
Last day to withdraw from class with W or WF	W	June	12
Classes end Summer Session I	M	Jun	24
Session ends	W	Jun	26

SUMMER SESSION II

Classes begin	F	July	5
Last day to withdraw from class with W or WF	T	Aug	6
Classes end Summer Session II Classes end Intra-Sessions	Th	Aug	15
Summer Session II ends Intra-Sessions end Summer Term ends	S	Aug	17

ADMINISTRATIVE OFFICERS

INDIANA UNIVERSITY

John W. Ryan, Ph.D., President
Herman B Wells, A.M., LL.D., Chancellor
W. George Pinnell, D.B.A., Vice-President and Treasurer

PURDUE UNIVERSITY

Arthur G. Hansen, Ph.D., D. Eng., D. Sc., President
John C. Hancock, Ph.D., Dean of the Schools of Engineering and Director of Engineering Experiment Stations
G.W. McNelly, Ph.D., Dean of the School of Technology

INDIANA UNIVERSITY-PURDUE UNIVERSITY AT INDIANAPOLIS

Maynard K. Hine, D.D.S., Chancellor*
Jack M. Ryder, Ph.D., Vice Chancellor and Dean for Administrative Affairs
John C. Buhner, Ph.D., Vice Chancellor and Dean of the Faculties
Hugh A. Wolf, Ed.D., Dean for Student Services
John C. Krivacs, M.S., Director of Admissions
Neil E. Lantz, M.S., Registrar

SCHOOL OF ENGINEERING AND TECHNOLOGY

William A. Nevill, Ph.D., Acting Dean
Howard Wisner, M.S., Acting Assistant Dean

*Retiring, Summer 1973

The Student's Responsibility

All colleges establish certain academic requirements which must be met before a degree is granted. These regulations concern such things as curricula and courses, majors and minors, and campus residence. Advisors, directors, and deans will always help a student meet these requirements, but the student himself is responsible for fulfilling them. At the end of his course of study, the faculty and the Board of Trustees vote upon the conferring of the degree. If requirements have not been satisfied, the degree will be withheld pending adequate fulfillment. For this reason, it is important for each student to acquaint himself with all regulations and remain currently informed throughout his college career.

Gears, and a "hands-on" approach is part of the technology experience

HISTORY

The School of Engineering and Technology was formed in 1972 and draws its traditions from the former Purdue Indianapolis Campus. This campus grew out of World War II training programs and developed into a technical institute in 1946. The School of Technology was formed in 1965.

In January 1969, the Boards of Trustees of Indiana University and Purdue University approved a plan to unify their operations in Indianapolis. The combined system is known as "Indiana University-Purdue University at Indianapolis" (IUPUI). Since it joins the arts, sciences, the health professions, engineering and technology, and other professional divisions, IUPUI is potentially the most comprehensive public institution of higher education in the state.

With a growing enrollment that exceeds 17,000, a 1,300-faculty, a 3,600 member supporting staff, and an annual operating budget exceeding $82 million, IUPUI is a substantial operation. Currently, IUPUI offers more than 1,700 courses with more than 100 complete programs ranging from two-year associate to baccalaureate, master's and doctoral degrees.

For a complete listing of the academic divisions of IUPUI, see the back cover of this catalog.

Undergraduate, professional, and graduate divisions give IUPUI academic ties to virtually every profession and every business area in modern society. The university is accredited by the North Central Association of College and Secondary Schools(NCA) through the Master's level. In addition, the Associate in Applied Science programs in EET, IET, and MET and the Bachelor programs in ET and MT are accredited by the Engineers Council for Professional Development (ECPD).

ORGANIZATION AND PURPOSE

The School of Engineering and Technology combines the strengths of several departments and divisions to advance the application of engineering and technology to human concerns. The School conducts the curricula on a plan keyed to the economic and industrial needs of not only the individual but also the community and state.

The School is organized with a Division of Engineering and a Division of Technology. Degrees awarded range from the two-year Associate in Applied Science to the Master of Science. All degrees are granted by Purdue University.

In addition, several departments in the School offer cooperative programs with industry in which students alternate periods of attendance at the University with work experience in selected local industries. Further information on this program is contained in this bulletin.

ADMISSION

All inquiries about admission to the School of Engineering and Technology as well as requests for admission applications should be addressed to the IUPUI Admissions Office, 1201 East 38th Street, Indianapolis, Indiana

46205. The application should be filled according to the instructions and submitted to the high school from which the individual was graduated. Prospective students are encouraged to apply at the end of six semesters. This enables the University to notify the applicants of action before they are graduated.

The following factors will guide the Admissions Committee in selecting new students: Graduation from high school, subject matter requirements, high school rank and College Entrance Examination (SAT) results.

1. Subject Matter Requirements:

   A. ENGINEERING

      Three years of English, three years of mathematics (including trigonometry), one year of laboratory science, one year of social studies and three additional units of one or more of these subjects mentioned, a total of not less than 15 units.

   B. TECHNOLOGY

      Three years of English, two years of mathematics (algebra and geometry), one year of laboratory science and one year of social studies, a total of not less than fifteen units.

2. Class Standing:

   High school rank in class is a measure of the quality of academic preparation. (Students are expected to rank in the *upper half* of their class for Admission to Engineering and the *upper two-thirds* for admission to Technology.)

3. College Entrance Examination Board Tests:

   All applicants who have not completed a full year of college work are required to take the Scholastic Aptitude Test (SAT).

   On the basis of high school records College Board scores and other pertinent information, one of the following decisions may be made:

   a. Granted unqualified admission,

   b. Admitted on probation,

   c. Admission denied or postponed.

Nonresident Admission

Out-of-state applicants must rank in the upper one-third of their graduating class or in the top one-third of the College Board Examinations to qualify for admission. Applicants who are qualified will be considered according to the facilities of the campus. The University reserves the right to alter admission requirements for this group as the situation requires.

Transfer Students

An applicant transferring from another college or university must fulfill the following requirements:

1. Submit an application for admission on the prescribed form through the high school from which he was graduated.

2. Forward an official transcript of work done in institutions previously attended.

3. An average of at least "C" for Indiana applicants and "B" for out-of-state applicants is required for all courses previously taken at a recognized college or university.
4. Submit the completed application, including all items specified above, prior to a deadline established by the Admissions Office.

Foreign Students

Applicants from foreign countries will be considered for admission without taking the American Entrance Examination on the basis of credentials certifying the completion of secondary school. Official translations must accompany transcripts and other credentials not written in English. The applicant must submit evidence of adequate English proficiency by means of the TOEFL (Test of English as a foreign language) Examination. Financial aids for new foreign students are not available although upon attendance, application may be made for assistance.

Nondegree Students

Mature persons who are local residents and who desire to study in any of the departments of the University without undertaking a regular plan of study, and without becoming candidates for degrees, may be admitted as nondegree students. Applicants must give evidence of prerequisite background for the course or courses for which they apply. Application for admission as a nondegree student should be made to the Director of Admissions.

Advanced Placement in Courses

Entering freshmen who have taken advanced mathematics, chemistry and English courses in high school may be given credit and placed in advanced courses on the basis of their high school records and advanced placement examinations. Qualified applicants should request details from the admissions office or the freshman engineering counselor.

Auditing Classes

Courses may be audited. No grades or credits are received. Attendance in class is permissible when the regular class fees are paid and the individual has declared himself as a visitor or auditor.

GRADES, GRADE REQUIREMENTS, AND HONORS

Instructors will assign each student a grade for each course in which he is enrolled at the close of a session. The student shall be responsible for the completion of all required work by the time of the last scheduled meeting in the course unless his assignment to the course has been properly cancelled. The grade shall indicate the student's achievement with respect to the objectives of the course.

Pass/Fail Option

To provide students with the opportunity to broaden their educational foundations with minimal concern for grades earned, an alternate

grading system, the pass/fail option, is permitted for a limited portion of the required graduation hours. The detailed limitations upon this option can be different for each degree granting unit, but the following general rules are some that are currently applicable:

1. Subject to the regulations of his division or department, a student may elect this option in any course which does not already appear on his academic record and in which he is otherwise eligible to enroll for credit with letter grade. A student may elect this option for not more than 20 percent of the total credit hours required for his graduation.
2. The registrar's class rosters will indicate which students have elected this option.
3. A student who is enrolled in a course under this option has the same obligations as those who are enrolled in the course for credit with letter grade. When the instructor reports final grades in the course, he will report that any such who would have earned a grade of A, B, or C has "passed" the course and that any other such student has "not passed and will receive F." The registrar will make an appropriate notation on the student's academic record in place of a letter grade but will not use the course in computing grade indexes.
4. This option shall not be available to students on probation.
5. This option shall be available for a maximum of two courses in any one semester, one course during a summer session.
6. Consistent with the policy of the School of Engineering and Technology, a student receiving the grade of "pass" in a course taken under the pass/fail option may not take the same course for a letter grade.

These are general or minimum guidelines for those electing this option, but the individual schools administering the curriculum of the student may impose further restrictions.

Students electing the pass/fail option are advised that there are certain specific limitations placed upon the registration for this option. Of special note is the regulation that this option may be elected during advanced registration, delayed registration, and during the drop/add period included in the first week of classes during any semester. Changes from credit with letter grade to pass/fail and vice versa may be made during the first week of classes, but not afterwards.

Grades

For credit classes grading conforms to the following:

A (4.0) highest passing grade.

B (3.0)

C (2.0)

D (1.0) lowest passing grade; passing minimal objectives of the course.

F (No credit) failed the work in a course or failed to complete an official withdrawal.

P **Pass/Fail Option:** issued when the student's grade would be A, B, or C level under the letter option.

F **Not passing:** issued when the grade would be a D or F.

For incomplete work, either credit or noncredit:

I **Incomplete, no grade:** a temporary record of work which was interrupted by unavoidable absence or other causes beyond a student's control, and which work was passing at the time it was interrupted. An instructor may require the student to secure the recommendation of the dean of men or the dean of women that the circumstances warrant a grade of incomplete. On the record a grade of I will be equivalent to a W unless and until the record is duly changed withing one semester.

Directed grades: The Registrar is directed to record the following grades and symbols under special circumstances:

W **Withdrew:** a record of the fact that a student was enrolled in a course and withdrew or cancelled the course after the last date for late registration and adding courses.

WF **Withdrew failing:** a record of course cancellation after the last date (see Univ. Calendar) for cancelling a course without grade, at which time, according to a statement from the instructor, the student was not passing in his work. This grade counts in all respects as a failing grade. A grade of WF may be directed by the dean or the Committee on Scholastic Delinquency and Readmission when a student is dropped from a course for serious scholastic delinquency.

Good Standing

For purposes of reports and communications to other institutions and agencies and in the absence of any further qualification of the term, a student shall be considered in good standing unless he has been dismissed, suspended, or dropped from the University and has not been readmitted.

Scholarship Indexes

This scholarship standing of all regular students enrolled in programs leading to an undergraduate degree shall be determined by two scholastic indexes, the Semester Index and the Graduation Index.

1. The Semester Index is an average determined by weighting each grade received during a given semester by the number of semester hours of credit in the course.
2. The Graduation Index is a weighted average of all grades received by a student while in the curriculum in which he is enrolled plus all other grades received in courses taken in other curricula offered by the University and properly accepted for satisfying the requirements of the curriculum of the school in which the student is enrolled. With the consent of his adviser, a student may repeat a course. In the case of courses which have been repeated or in which conditional grades have been removed by examination or for which a substantially equivalent course has been substituted, the most recent grade received shall be used.
3. For the purpose of averaging, each grade shall be weighted in the following manner.

   A 4 x semester hours = index points

B 3 x semester hours = index points

C 2 x semester hours = index points

D 1 x semester hours = index points

F, WF 0 x semester hours = index points

P, N, and W are not included in the index.

Graduation Index Requirements

For bachelor's degree: A minimum Graduation Index of 2.00 is required for graduation.

For associate degree: A minimum Graduation Index of 1.90 is required for graduation.

Scholastic Probation

A candidate for the bachelor's or associate degree shall be placed on probation if his semester or graduation index at the end of any semester is less than that required for a student with his classification as shown in Table A. A student on probation shall be removed from that status at the end of the first subsequent semester in which he achieves semester and graduation indexes equal to or greater than those required for a student with his classification as shown in Table A. Any grade change due to a reporting error will require reconsideration of probation status.

Nondegree students who do not achieve academic standing required of regular students may be discontinued. Probation applies only to normal semesters and not with the summer sessions.

A "probation" time unit for part-time students will be the last 12 semester hours taken. If a part-time student is on probation, he will stay on probation for at least 12 more semester hours before his status will be reviewed.

TABLE A. INDEX LEVELS FOR PROBATION

S=Semester Index; G=Graduation

Index

Class Standing	Cumulated Credit Hours	S	G
1—Freshman	0-16	1.5	1.5
	17-32	1.5	1.5
2—Sophomore	33-48	1.6	1.75
	49-64	1.6	1.90
3— Junior	65-80	1.7	1.95
	81-96	1.7	2.0
4—Senior	97-112	1.7	1.0
	113 and up	1.7	2.0

Dropping of Students for Scholastic Deficiency

A student on scholastic probation shall be dropped from the University if at the close of any semester the semester or graduation index is less than that required of a student with his classification as shown in Table B. This rule shall not apply for the semester in which the student completes all requirements for his degree. A student dropped by this rule and later duly readmitted as a regular student shall be readmitted on probation.

TABLE B. INDEX LEVELS FOR DROPPING

S=Semester Index; G=Graduation

Index

Class Standing	Cumulated Credit Hours	S	G
1—Freshman	0-16*	1.2	1.2
	17-32	1.3	1.3
2—Sophomore	33-48	1.4	1.5
	49-64	1.4	1.6
3—Junior	65-80	1.5	1.7
	81-96	1.5	1.8
4—Senior	97-112	1.5	1.85
	113 and up	1.5	1.9

A student who has been dropped may petition the Faculty Committee on Scholastic Delinquencies and Readmissions for readmission. If he is readmitted, he will be on probation.

*Affects only students entering on probation.

WOMEN STUDENTS IN ENGINEERING AND TECHNOLOGY

The number of women enrolled in each new freshman engineering and technology class has increased considerably in recent years. Private industry, research institutions, governmental agencies, and education offer an excellent career opportunity for women in engineering and technology. There are many opportunities for women with a background in engineering and technology to make contributions in solving urgent social problems. Careers can be combined with family life: for example, it is estimated that eight out of every ten women engineers have families.

Women who enjoy using mathematics and science in practical applications are encouraged to apply to one of the many fields of engineering and technology. Counselors in all departments and divisions of the School of Engineering and Technology are available to explain the many technical careers.

EXPENSES AND FINANCIAL AID

University Fees

Fees are subject to change by the Board of Trustees without notice. Costs for classes at IUPUI are figured on a credit hour basis. The student pays only for the classes he takes as compared with the usual semester flat fee basis.

The following table shows how much he will pay for courses in this program:

Rates per Credit Hour	Indiana Residents	Out-of-State Residents
Undergraduate	$20	$40
Graduate	$25	$50

Lab fees are $5 extra for each laboratory contact hour.

The typical cost including books and supplies for an average 17-hour full-time semester would be approximately $400 for a resident undergraduate student.

SPECIAL EXAMINATION FEES: Any student may obtain credit for any course provided he or she is not currently enrolled in the course. The examination fee is $5.

INSURANCE: Hospitalization insurance is available to students at a reduced rate. The IUPUI student insurance can only be obtained at the beginning of each semester by making application at the Student Services Office. This insurance program provides hospitalization, surgical, and medical coverage for the student during the calendar year.

Financial Aids

It is the philosophy of IUPUI to encourage students in their educational goals and to reduce financial barriers. The University recognizes that many students and their parents can not afford to finance a college education entirely from their own income and assets. For this reason, a program of financial assistance is available to admitted and enrolled students who have a demonstrated financial need. Aid is available in the form of counseling, scholarships, grants, and loans.

Individuals desiring further information about any of the financial aid programs should write to:

Office of Scholarships & Financial Aids
IUPUI
Room 303, Cavanaugh Hall
925 West Michigan Street
Indianapolis, Indiana 46202

OR

IUPUI—Columbus Center
Bakalar Municipal Airport
Columbus, Indiana 47201

PART-TIME AND SUMMER EMPLOYMENT: Many students who attend IUPUI are able to earn part of their expenses through part-time and summer employment. The placement service offers assistance in locating jobs and maintains current information regarding employment opportunities.

For further information concerning financial assistance students should contact the Placement Office.

WORK-STUDY PROGRAM: The Work-Study Program is one part of the Higher Education Act of 1965. The purpose of this program is to stimulate and promote the part-time employment of students in institutions of higher education who are in need of the earnings from such employment to pursue courses of study.

The Work-Study Program is available at IUPUI and a student who has been admitted to the University may apply through the Student Services Office.

Co-Op Education Program

This program is explained on page 19.

STUDENT WELFARE

Employment, Housing, Library

JOB PLACEMENT: The IUPUI Placement Office assists students and alumni in obtaining employment. The office maintains a library of company information, employment trends, and occupational information. It also provides career counseling to aid students with career planning and development.

Companies seeking college graduates interview students on campus September through November and January through March. A list of firms and institutions which will visit the campus is published and circulated early in the Fall Semester. Students interested in interviewing with a company should register with the Placement Office. The Placement Office also serves as a referral agent to many companies and organizations. In specific cases the local placement office works in coordination with the placement services located on the Bloomington and Lafayette campuses.

SUMMER AND PART-TIME EMPLOYMENT: Another function of the Placement Office is to provide information regarding part-time and summer employment opportunities for students. Part-time employment listings are posted on job bulletin boards located throughout the University. Students interested in summer employment should register early with the Placement Office.

HOUSING: Residential housing for IUPUI students is located at the University Quarter Campus with approximately 575 beds for single students and 155 apartments for married students. Facilities are available to students from all divisions of IUPUI on a first come basis. Residential housing is managed by the Department of Housing in the University Quarter. In addition, off-campus housing is available to students throughout Indianapolis. Although the University does not control off-campus housing facilities, the Department of Housing maintains a file of rooms and small private home apartments.

LIBRARY: The IUPUI Library system is composed of six separate libraries which are open to all students enrolled at the University. These are located at the Dental School, Herron School of Art, Blake Street, Law School, Medical School, and 38th Street. The Normal College also maintains a reference room of professional physical education materials. The Dental, Herron, Law, and Medical libraries contain specialized collections reflecting their respective curricula. The collections at 38th Street covers a wide range of academic disciplines from humanities to science, engineering, and technology. Since procedures vary slightly among the different libraries, students should consult each before checking out books and other materials.

Parking

Parking at IUPUI is based on a paid parking system, with free parking provided in certain areas. The University recognizes that students need autos in the city.

Five classes of parking are available to faculty, staff and students, each designated by different colored signs and permits. Red areas are specified for students, yellow areas are restricted for visitors and out-patients of the University hospitals only. All come under the fee system. Orange areas designate free parking.

The fee system for students is as follows: Red permits—Students taking 9 or more credit hours of courses:

$10 per semester

Students taking 8 or fewer credit hours of courses:

$5 per semester

Students with more than one vehicle may purchase a pool permit.

Enforcement

Parking regulations are enforced daily at all campuses from 8 a.m. to 9 p.m. Parking restrictions are not enforced on weekends or holidays.

All fees and fines collected from the parking violations are restricted for maintaining and improving IUPUI parking system-wide.

Special Parking for the Handicapped

Persons who have a physical disability may be eligible for special parking permits issued for blue parking areas during the period of their disability. Student requests for these permits must be approved by the Dean for Student Services. Regular blue permit fees will be in effect for this special parking.

Students should refer to Motor Vehicle Regulation folder for complete and detailed information concerning the IUPUI parking policy.

IUPUI COMPUTING CENTERS

IUPUI operates four computer centers, the Research Computer Center, the Educational Computer Center, the Administrative Data Processing Center, and the Hospital Data Processing Center. Of these, students have access to the Educational Computer Center and the Research Computer Center.

The Educational Computer Center maintains an IBM 360/44 devoted exclusively to processing student jobs. This system provides all of the major languages as well as an on-line graphic system. In addition, the center also provides an IBM 1620 computer which students are able to use in a "hands-on" environment. Unit record equipment, such as sorters and collators, also are available for student use.

The Research Computer Center has a Digital Equipment Corporation model KI10 computer which supports terminal operation from remote terminals throughout the IUPUI campuses. Interactive programming and Computer Assisted Instruction are provided for students through this facility. The KI10 also provides a link to the CDC 6600 computer at Indiana University-Bloomington.

There also are several analog computers and mini-computers located within the individual departments of the School of Engineering and Technology.

AUDIO-VISUAL FACILITIES

Audio-visual learning centers are located in the Krannert and Administration buildings at the 38th Street, and in Cavanaugh Hall on the University Quarter Campus. The centers provide a variety of audio-visual materials, equipment, and services for student and faculty use. Study carrels are equipped with cassette tape recorders and projectors (movie or slide) provide convenient facilities for individual study of recorded course and reference material. Equipment is available for classroom and laboratory use includes audio and video tape recorders, closed-circuit TV, and various projectors (overhead, movie and slide).

STUDENT COUNSELING SERVICE

It is the philosophy throughout this school to help every student obtain maximum benefit from University experiences and assist him in developing to his fullest potential.

Upon initial admission, a student is assigned to an academic counselor. The counselor is responsible, upon request, to advise on all matters pertaining to academic program planning and implementation. Each student has the responsibility to keep in close contact with his academic counselor. Transfer students from another university or an IUPUI school should contact the department chairman or the counselor of the discipline he is planning to enter.

Students desiring specific career information, or vocational testing, can contact one of the student services offices.

EVENING ADMINISTRATION

The IUPUI Evening Administration Office, in the Krannert Building, is the communication link after 5 p.m. for the public, students, faculty, and all the departmental secretaries. The Evening Administration Office offers all the services of the Registrar's and Admissions Offices after 5 p.m.

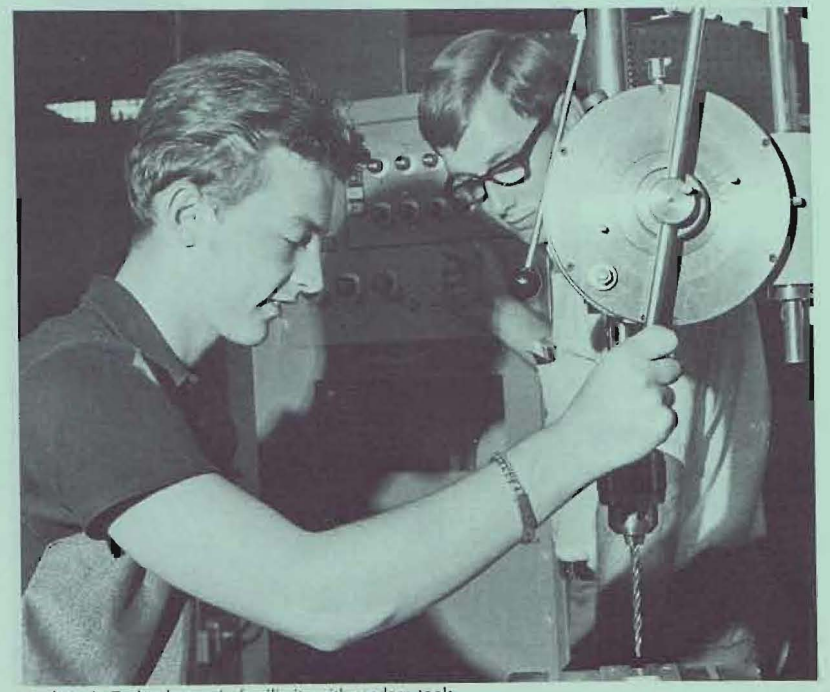
Bulletins and other University information are available at the Evening Administration Office.

VETERANS BENEFITS

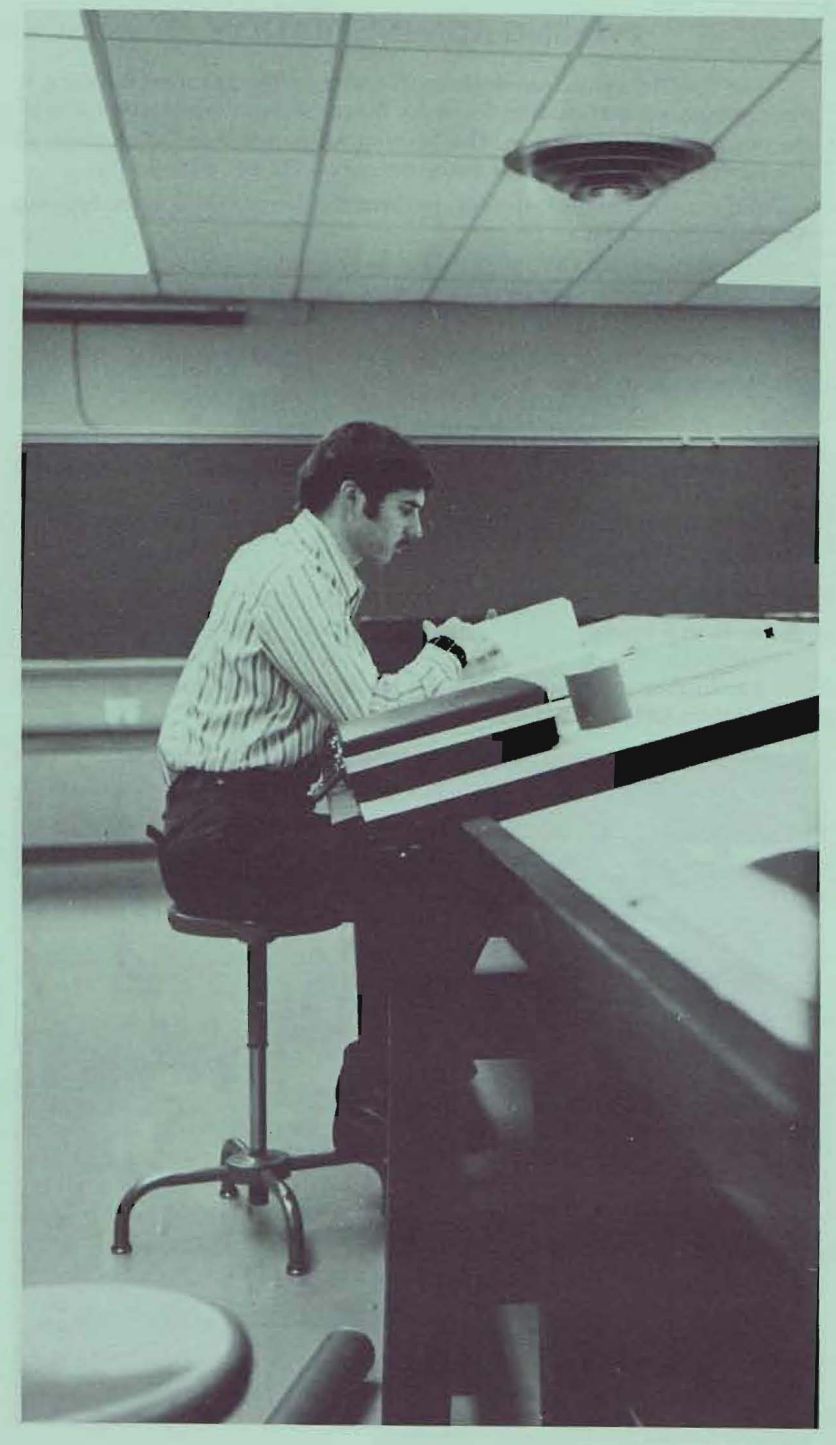
Students who are eligible for Veterans benefits may enroll under the following scale of benefits:

FALL/SPRING	BENEFITS	SUMMER (6 week session)
12 hours or more	Full benefits	4 hours
9 through 12 hours	¾ benefits	3 hours
6 through 8 hours	½ benefits	2 hours
fewer than 6 hours	tuition only	1 hour

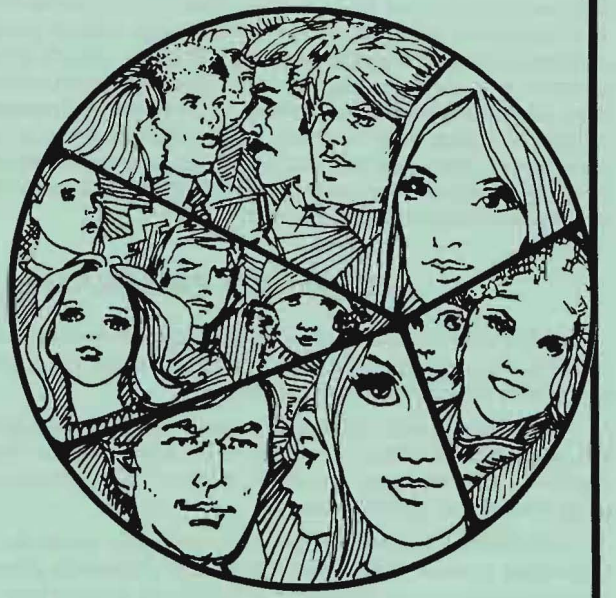
For further information, consult the V. A. Certification Clerk at the Registration Office, 925 West Michigan Street.



Students in Technology gain familiarity with modern tools



PLANS OF STUDY



PLANS OF STUDY

Typical programs for full time students pursuing degrees in the areas within the School of Engineering and Technology are listed on the following pages. Listed are plans of study for students leading to the degree of Associate in Applied Science, to the degree of Bachelor of Science, and certificate programs.

The curricula, course descriptions, and graduation requirements of each listed plan are those which were in effect at the time of printing. Course content and curricula, however, do gradually evolve, reflecting the changing needs of business, industry, and government. The student is therefore encouraged to obtain the latest course and curriculum information from his academic advisor.

Although specific lengths of time are established for each University degree program, the required time may vary for some individual students. Well-qualified students with excellent high school preparation may, for example, complete a program in less than the length of time noted. Other students who elect to couple cooperative education with their course work may take more time to complete all degree requirements. Students may choose to adjust their semester credit loads in order to maintain employment or for other personal reasons. Programs are tailored for part-time and evening students. Extended time has not proved to be detrimental to the successful completion of a program.

CERTIFICATE PROGRAMS

Certificate programs are designed primarily for the mature, part-time student through consultation with representatives from labor, industry, and the service areas of our society.

Progress in each of these programs can be varied to suit the needs of the individual student who may take one, two, or three courses each semester. The average part-time student can complete any one of the programs within three years.

Enrollment is on the basis of a program carefully tailored to meet individual student needs and vocational objectives through consultation with an experienced counselor. Changes in the student's program arising from new work assignments or changes in vocational objective may be worked out with his counselor.

Students successfully completing personal service courses earn certificate units and not University credit.

HIGHWAY TECHNICIAN PROGRAM

This program is offered during the summer term by the Department of Construction Technology in conjunction with the Indiana State Highway Commission, and students are paid a nominal salary while attending school provided satisfactory grades are maintained. At the completion of the program, students who pass are given jobs with the Indiana State Highway Commission and are obligated to work there for one year. Nine of the 11 credit hours can be applied toward the degree of Associate in Civil Engineering Technology.

Course Number and Title	Certificate Units
CET 100—(Technical Computations)	3
CET 104—(Elementary Surveying)	3
CET 208—(Route Surveying)	2
ART 116—(Const. Drafting)	3

COOPERATIVE EDUCATION

A career in Engineering or Technology requires one to have a knowledge of the mathematical and natural sciences, gained by study, experience and practice. The knowledge must be applied with judgment in order to utilize economically the materials and forces of nature for the benefit of mankind.

Cooperative Education at IUPUI is an elective plan of education in which a student may alternate periods of academic study with periods of employment in business, government or industry. It contributes essential elements to the educational process and is directly related to one's career field of study. Work assignments provide varied experience with increasing difficulty and responsibility. These experiences cannot be acquired through college laboratory participation or limited work experience during summer vacations. Cooperative education is a formalized educational plan built into any one of many curricula.

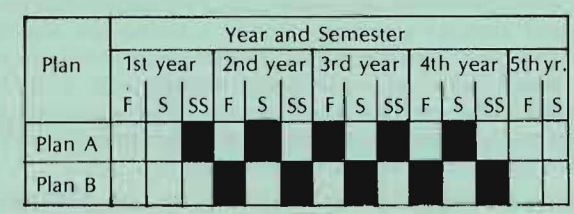
In the co-op calendars shown below, the shaded area designate the work periods and the blank areas represent semesters or summer sessions on campus.

If an engineering student selects Plan A, he attends classes the fall and spring semesters of his freshman year. He works in industry during the summer and returns to the campus for the fall semester, thus alternates work and campus studies as shown on the line "Plan A."

If a student selects Plan B he attends the summer session immediately following his freshman year. He then works in industry during the fall semester, thus alternates work and campus studies as shown on the line "Plan B."

In both plans, the co-op spends two summer sessions working in industry and two summer sessions studying on campus.

Cooperative Engineering Education



Cooperative Technology Education

The technology student co-op calendar is as follows:

Plan	Year and Semester								
	1st year			2nd year			3rd year		
	F	S	SS	F	S	SS	F	S	SS
Plan A		■		■		■		■	
Plan B			■		■		■		■

Associate Degree

Plan	4th year			5th year			6th year		
	F	S	SS	F	S	SS	F	S	SS
Plan A	■		■		■		■		
Plan B		■		■		■			

Bachelor of Science

A student on Plan "A" attends classes the fall semester of the freshman year. The Spring Semester is scheduled as the first cooperative work period. The student then returns to the campus for summer courses and alternates work periods with campus studies as shown on Plan "A". A student on Plan "B" attends academic classes both the fall and spring semesters of the freshman year and the first cooperative work period is the summer. The student then returns to the campus for the fall semester and alternates work periods and campus studies as shown in Plan "B".

Once a student has accepted cooperative employment with a company, he will be encouraged to continue with the company throughout the program. Students will not be permitted to change employers indiscriminately.

A student should apply directly to the cooperative education coordinator for information and specifics of program implementation.

DIVISION OF TECHNOLOGY

ASSOCIATE IN APPLIED SCIENCE DEGREE PROGRAMS

Science and technology range from applied and practicable to highly theoretical and abstract activities. At one extreme are the theoretical scientists; at the other, the mechanics, draftsmen, and service personnel. Within this broad spectrum, educational backgrounds include doctor's degrees, master's degrees, bachelor's degrees, and associate's degrees at the university level, as well as certificates and diplomas from other post-high-school educational and training institutions.

Frequently, the degree level is indicative of the job level. For example, in the medical profession, job titles include physicians (doctor's degree),

medical technologists (bachelor's degree), nurses (associate and bachelor's degrees) at the university level as well as the practical nurse, hospital technician, and operating room technician (diploma) offered at other post-high-school educational institutions.

The Associate in Applied Science degree offered at IUPUI in the School of Engineering and Technology is awarded after two years of university-level study in an applied scientific field. Graduates of such programs are called technicians.

A technician is an employee whose job requires applied technical knowledge and applied technical skills. His job requirements normally include manipulative skills necessary to perform the technical tasks. In his field he has considerable technical knowledge of the materials and processes involved as well as knowing how to apply the principles of physical and biological sciences. In general, he uses instruments in contrast with tools. His contribution is mainly through mental effort in conjunction with application of skills. In many organizations he is permitted to move vertically in the organization to higher levels of responsibilities, depending upon the individual's capability and his willingness to continue his education.

There are 10 two-year curricula available at IUPUI:

ART—Architectural Technology

CET—Civil Engineering Technology

CHT—Chemical Technology

CPT—Computer Technology

EET—Electrical Engineering Technology

IET—Industrial Engineering Technology

INSM—Institutional Management Technology—(Food Service & Lodging Supervision)

MDT—Mechanical Drafting Design Technology

MET—Mechanical Engineering Technology

PCT—Pollution Control Technology

BACHELOR OF SCIENCE DEGREE PROGRAMS

The Bachelor of Science degree awarded under the "2+2" education plan is unique. A student following this plan earns first an associate degree in two years and then a Bachelor of Science degree in two more years. In case of transfer students, all departmental regulations must be met.

A student is awarded an Associate in Applied Science degree upon successful completion of the two-year program. The associate degree signifies that the recipient is educated at the technician's level and is "job-ready." Thus, individuals may go directly into well-paying jobs, or they may elect to continue study.

A student who desires to continue his formal education may be admitted to a two-year "add-on" technologist's program. A student who successfully completes this program is awarded a Bachelor of Science degree. This provides the background for increased job responsibility. The following options are available to qualified students.

Degree Options

Computer Technology—for graduates of the computer technology associate degree program.

Construction Technology—for graduates of architectural technology or civil engineering technology associate degree programs.

Electrical Technology—for graduates of the electrical engineering technology associate degree program.

Industrial Engineering Technology—for graduates of the industrial engineering technology associate degree program.

Industrial Education—for graduates of any technical associate degree program.

Mechanical Technology—for graduates of the mechanical engineering technology associate degree program.

Supervision Technology—for graduates of any technical associate degree program.

Admission Requirements

Applicants for admission to any of these options must have earned an associate degree or equivalent in one of the technologies. Transfer students will be admitted according to individual departmental requirements.

Graduation Requirements

The technician who pursues a Bachelor of Science degree will follow a departmental plan of study which requires approximately 67 semester credit hours beyond the associate degree. Students transferring from other institutions must complete at least 32 semester credit hours of course work in residence in the third and fourth year of the Bachelor of Science degree program.

ARCHITECTURAL TECHNOLOGY

This curriculum is designed to prepare students for technological employment with architectural firms, construction firms, building materials suppliers, and various governmental agencies.

Emphasis is placed on architectural graphics, construction details, construction materials, specifications, regulations, and estimating, as well as on related courses in mathematics and physical science. Also included are courses dealing with some of the historic, economic, and human relation aspects related to the individual in our American industrial life.

Graduates are prepared to accept positions as architectural technicians, architectural draftsmen, estimators, expeditors, planning technicians, field inspectors, and sales representatives. Graduates may also continue their education by pursuing a Bachelor of Science degree with a major in Construction Technology.

FRESHMAN YEAR

First Semester

ART 116—Construction Drafting	2
ART 162—Building Materials and Methods	2
CET 104—Elementary Surveying	3
MA 147—Algebra and Trigonometry for Technology I	3
English	3
Social science elective	3
	16

Second Semester

ART 120—Freehand Drawing I	2
ART 150—Architectural Construction I	3
ART 172—Systems of Construction	2
CET 160—Statics	3
MA 148—Algebra and Trigonometry for Technology II	3
COM 114—Fundamentals of Speech Communication	3
	16

SOPHOMORE YEAR

Third Semester

ART 220—Freehand Drawing II	2
ART 222—Architectural Construction II	3
ART 276—Specifications and Contract Documents	2
ART 284—Mechanical Equipment for Buildings	3
CET 260 Strength of Materials	3
PHYS 218—General Physics	4
	17

Fourth Semester

ART 224—Architectural Construction III	3
ART 285—Electricity for Buildings	2
CET 266—Materials Testing	3
CNT 280—Quantity Survey and Estimating	3
ART 210—History of Architecture I	3
Business elective	3
	17

CIVIL ENGINEERING TECHNOLOGY

This program is designed to prepare students for employment in the Civil Engineering field. Emphasis is placed on the development of applied skills, including drafting, surveying, structural calculations, subdivision layout, and cost estimating. The Associate in Applied Science degree is awarded at the completion of the program.

Graduates of this program accept positions with construction contractors, engineering firms, testing laboratories, material suppliers, and high-

way departments. They may work in the field as surveyors, field engineers, or inspectors; or they may work in an office as draftsmen, detailers, topographers, estimators, or laboratory technicians. Experienced graduation may achieve responsible supervisory and managerial positions.

Graduates also may continue their education by pursuing a Bachelor of Science degree in Construction Technology or in land surveying.

FRESHMAN YEAR

First Semester

CET 104—Elementary Surveying	3
ART 116—Construction Drafting	2
ART 162—Building Materials, and Methods	2
MA 150—Mathematics for Technology	5
English	3
	15

Second Semester

CET 108—Route Surveying and Design	3
CET 160—Statics	3
ART 150—Architectural Construction I	3
MA 221—Calculus for Technology I	3
COM 114 Fundamentals of Speech Communication	3
	15

SOPHOMORE YEAR

Third Semester

CET 209—Land Surveying and Subdivision	3
CET 253—Hydraulics and Drainage	3
CET 260—Strength of Materials	3
ART 276—Specifications and Contract Documents	2
PHYS 218—General Physics	4
Social Science elective	3
	18

Fourth Semester

CET 266—Materials Testing	3
CNT 280—Quantity Survey and Estimating	3
Structural elective	3
Mathematics/Science elective	3
Business elective	3
Nontechnical elective	3
	18

CHEMICAL TECHNOLOGY

The purpose of the program in Chemical Technology is to provide two years of collegiate-level training in chemical technology. The program is designed to prepare men and women for employment in the chemical and allied product industries, sanitation departments, clinical, forensic and allied health laboratories. The knowledge gained in the program will enable the technician to work with a chemist, chemical engineer or plant supervisor in developing procedures, making tests, developing research models, and making technical measurements necessary for chemical project or plant operation, for control of environment and for support of health care.

FRESHMAN YEAR

Fall Semester

C 105—Principles of Chemistry I	5
W 131—English Composition	2
ENGL 185—Developmental Reading	1
IET 104—Industrial Organization	4
MA 150—Mathematics for Technology	5
	17

Spring Semester

C 106—Principles of Chemistry	5
PHYS 218—General Physics	4
POLS 103—Introduction to Government	3
SPE 110—Fundamentals of Speech Communication	3
MA 221—Calculus for Technology	3
	18

SOPHOMORE YEAR

Fall Semester

CHM 255, 255L—Organic Chemistry I	4
CHT 224 or CHM 321—Analytical Chemistry	4
PHYS 219—General Physics	4
BIOL 103—Principles of Biology	3
MA 222—Calculus for Technology	3
	18

Spring Semester

CHT 225—Quantitative Analysis, Instrument	4
CHM 256, 256L—Organic Chemistry II	4
PSY 120—Elementary Psychology	3
or	
PSY 370—Psychology in Business and Industry	3
GNT 220—General Report Writing	3
BCHM 207—Biochemistry	4
	18

ASSOCIATE DEGREE COMPUTER TECHNOLOGY

This two-year associate degree program is designed to produce a graduate competent in computer programming in either the commercial or technical area, depending on which of the two options is selected. It prepares a person to perform the following functions: analyze problems, design flowcharts, write computer programs verify programs, and evaluate and modify existing programs. It also familiarizes him with procedures common in his area of specialization.

Graduates may continue their education by pursuing a Bachelor of Science degree with a major in computor technology.

FRESHMAN YEAR

First Semester

CPT 115—Introduction to Data Processing	5
SPCH C110—Fundamentals of Speech Communication	3
ENGL 185 Developmental Reading	1
IET 104 —Industrial Organization	3
MA 150—Mathematics for Technology	5
	17

Second Semester

CPT 122—Computer Mathematics	3
CPT 131—Assembly Language Programming I	3
ENG W117—English Composition I	3
Option courses	6
Elective	3
	18

SOPHOMORE YEAR

Third Semester

CPT 132—Assembly Language Programming II	3
CPT 225—Statistical Methods	3
CPT 264—FORTRAN Programming	3
Option courses	6
	15

Fourth Semester

CPT 261—RPG Programming	3
or	
CPT 286—Computer Operating Systems I	3
CPT 294—Computer Seminar	1
ECON E201—Principles of Economics	3
GNT 220—Technical Report Writing	3
Option courses	6
	16

Commercial Option

BUS A201—Introductory Accounting	3
BUS A202—Cost Accounting	3
CPT 254—Commercial Systems Applications	3
CPT 265—COBOL Programming	3
Electives	6

Technical Option

MA 221—Calculus for Technology I	3
MA 222—Calculus for Technology II	3
Laboratory science electives†	8
CPT 220—Numerical Methods I	3
Elective	3

†Laboratory science electives must be a two-semester sequence.

BACHELOR OF SCIENCE
COMPUTER TECHNOLOGY

This is a two-year "add-on" curriculum open to associate degree graduates of computer technology, either commercial or technical option.

The program builds on the student's knowledge of computer programming acquired in the first two years and emphasizes the practical aspects of computer systems design and commercial systems analysis. The inclusion of many elective courses enables the students to pursue areas of special interest.

Graduates are prepared to fill a variety of positions related to data processing, computer systems, and computer programming.

JUNIOR YEAR

Fifth Semester

CPT 340—Data Communications	3
Computer concentration	6
MA 221—Calculus for Technology I†	3
Communication elective	3
Elective	2
	17

Sixth Semester

CPT 360—PL/1 Programming	3
Computer concentration	3
MA 222—Calculus for Technology II†	3
Physical science elective†	4
Elective	3
	16

SENIOR YEAR

Seventh Semester

Computer concentration	6
Physical science elective†	4
Social science elective	3
Humanities elective	3
	16

Eighth Semester

Computer concentration	6
Social science elective	3
Humanities elective	3
Electives	4
	16

COMPUTER CONCENTRATION

Any two of the following sequences plus any two additional computer-oriented courses make up the computer concentration.

Commercial systems: CPT 354, 454; INDM 300*
Computer systems analysis: CPT 380, 480; CS 542
Systems programming: CPT 386, 486, CS 402
Technical systems: CPT 320, 364, 444

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†Technical option graduates substitute following sequence:
CPT 265 (COBOL Programming)
Business electives (2)
Elective

*Any Upper division Business, Industrial Supervision, or Industrial Engineering Technology Course.

CONSTRUCTION TECHNOLOGY

This baccalaureate program is open to students with an associate degree in architectural technology, civil engineering technology, or the equivalent. It emphasizes the principles and practices of construction and the techniques of construction management. Technical electives permit students to orient their program toward a specific segment of the construction industry.

Graduates of the program find employment with construction firms, construction management firms, construction cost consultants, building material and equipment suppliers, architectural and engineering firms, and governmental agencies. Their work may be in the field or in an office. Many graduates will ultimately become owners or managers of construction firms or management/consulting firms.

Students wishing to enlarge upon architectural or civil studies for employment in these areas may elect upper level courses in these fields.

This curriculum prepares students for registration as professional constructors, but not as professional architects or engineers.

JUNIOR YEAR

Fifth Semester

CNT 344—Construction Inspection	3
Technical electives (2)*	6
CPT 200—Computer Programming Fundamentals	3
Communications elective	3
Elective	3
	18

Sixth Semester

CNT 340—Construction Scheduling	2
Technical electives (2)*	6
Business elective	3
Communication elective	3
Elective	3
	17

Summer Session

CNT 390—Construction Work Experience	1

SENIOR YEAR

Seventh Semester

CNT 441—Construction Operations	4
Technical elective*	3
Business elective	3
Business elective	3
Non technical elective	3
Elective	3
	16

Eighth Semester

CNT 442—Construction Costs and Bidding	3
Technical elective*	3
Business elective	3
Non technical elective	3
Elective	3
	15

*Technical electives should be upper level courses in Architectural Technology or Civil Engineering Technology or in related fields, reflecting the students interest.

ELECTRICAL ENGINEERING TECHNOLOGY ASSOCIATE DEGREE

The electrical engineering technology program provides a combination of courses in electricity, electronics, mathematics, science, and general academic areas that leads to the degree of Associate in Applied Science after two years of full-time course work. This program is designed to prepare students for employment as technicians in research laboratories, electronic industries, and other industries that use electrical power or electronic controls.

The basic curriculum provides the student with sufficient education to find employment in the fields of communication electronics, industrial electronics, computer electronics, automation, electronic servicing, television, electrical power, and others. Specialization in these areas is

provided by technical elective courses in the second year of the program. Courses in this program are offered both in the daytime and evening.

Graduates of this program are eligible for admission to the degree of Bachelor of Science degree program. Approximately two additional years of study are necessary to complete the requirements for this degree.

FRESHMAN YEAR

First Semester

EET 102—Electrical Circuits I	4
EET 104—Electronics I	3
MA 150—Mathematics for Technology*	5
ENGL W117—Basic English Composition	3
	15

Second Semester

EET 152—Electrical Circuits II	4
EET 154—Electronics II	4
PHYS 218—General Physics	4
MA 221—Calculus for Technology I	3
	15

SOPHOMORE YEAR

Third Semester

MA 222—Calculus for Technology II	3
EET 204—Electronics III	4
EET 212—Electrical Power and Machinery	4
EG 110—Drafting Fundamentals (MET 157)	3
PHYS 219—General Physics	4
	18

Fourth Semester

EET 254—Electronics IV	4
EET 302—Electro-Mechanical Control Components	4
EET 303—Communications I or EE 316—Television I	4
Non-Technical Elective	3
SPCH C110	3
	18

*Mathematics—A student whose program requires MA 150 and who does not qualify for MA 150 as indicated by the placement tests in algebra and trigonometry and high school grades will be assigned to MA 147. Thus it is strongly urged that he complete MA 147, or equivalent, in the summer session preceding entrance into full-time study. Otherwise, the student may require five semesters to complete his program.

ELECTRICAL TECHNOLOGY BACHELOR OF SCIENCE

The student who completes the plan of study and receives the degree of Associate in Applied Science is eligible to enter the following Bachelor of Science program. This B.S. degree program prepares the student for positions as a technologist in industry. The plan provides additional study in electrical engineering technology and courses that provide the background of related technical and non-technical topics which are essential in modern industry.[1]

JUNIOR YEAR

Fifth Semester

Science or Mathematics Elective	3
Technical Writing Elective	3
EET 383—Advanced Electrical Networks	3
Computer Elective	3
Non-EET Technical Elective	3
	15

Sixth Semester

EET Elective	4
Communication (Speech) Elective	3
Non-EET Technical Elective	3
Free Elective	3
Communications, Humanities and Social Science Elective	3
	16

SENIOR YEAR

Seventh Semester

EET Elective	4
EET Senior Design Project	3
Non-EET Technical Elective	3
Science or Mathematics Elective	3
Communications, Humanities and Social Science Elective	3
	16

Eighth Semester

EET Elective	4
Non-EET Technical Electives	6
Communications, Humanities and Social Science Elective	3
Free Elective	3
	16

[1]The sequence of courses and the electives are selected by the faculty. The electives in this program must be chosen from the departmental approved course list. A student may petition the department for any alternate courses.

INDUSTRIAL EDUCATION

The two sections of the Department of Industrial Education—industrial arts and vocational-technical—are concerned with equipping men and women for entrance into career fields where practical application of knowledge in the humanities, science, and technologies will be helpful. Students may elect to pursue a major which will lead to the degree of Bachelor of Science in Industrial Education with a specialty in one of the following areas:

1. Industrial Arts Teaching
2. Technology Teaching (Junior College and Technical Institute Teaching)
3. Vocational-Industrial Teaching

Students can complete all of the general education requirements and some of the professional and technical course requirements toward the technology teaching or the vocational-industrial teaching programs at IUPUI. One full year of work may be completed toward industrial arts teaching. The remaining requirements for the Bachelor of Science Degree in Industrial Education must be completed at Purdue University, West Lafayette, Indiana.

Professional Courses

In addition to the three programs, a number of dual-level courses (500 level) are offered for the primary purpose of upgrading certification, credentials, salaries, and skills of industrial education teachers. These courses are listed in the "Description of Courses" section.

Each student's BSIED requirements will be based on the major which he has selected. Modifications may be made from time to time to fit individual needs, but the plans of study outlined below generally will apply in each case.

The curriculum in industrial education fulfills the provisional teaching license requirements specified by the Indiana State Teacher Training and Licensing Commission for teaching certificates in industrial arts and vocational-industrial education. Additional in-service teacher education activities are offered to meet the needs of instructor in central Indiana.

Industrial Arts Teaching

Excellent employment opportunities have been consistently available to graduates in industrial arts teaching. The demand for industrial arts teachers continues to exceed the number of qualified graduates.

Prospective teachers of industrial arts study a broad core program of general education subjects essential for all teachers. In addition, they develop technical competencies which will enable them to present effective instruction covering a broad range of industrial tools, materials, and processes.

FRESHMAN YEAR

First Semester

English Composition I	2
MA 153—Algebra and Trigonometry I	3
Elementary Psychology	3
IED 110—Introduction to Industrial Education	1
IED 211—Industrial Arts Materials and Processes	3
Drafting I	2
	14

Second Semester

English Composition II	2
MA 154—Algebra and Trigonometry II	3
IED 210—Foundation of Industrial Arts	3
IED 217—Wood Technics	4
Elective	3
	15

SOPHOMORE YEAR

Third Semester

Fundamentals of Speech Communication	3
Introductory Chemistry	3
Sociology	3
Drafting II	2
IED 245—General Metals	4
General education electives	1
	16

Fourth Semester

IED 242—Electrical Fundamentals for Teachers	4
Economics	3
IED 220—Contemporary American Industry	3
Philosophy selective	3
Elective	3
	16

JUNIOR YEAR[1]

Fifth Semester

IED 344—Graphic Arts Fundamentals	4
IED 326—Introduction to Power	4
Nature of Physical Science I	3
Humanities elective	3
Social and behavioral science elective	3
	17

Sixth Semester

IED 310—Management of Industrial Arts Laboratories	3
Educational Psychology	3
Nature of Physical Science II	3
Technical elective	3
Humanities elective	3
	15

[1]Students must be admitted to the program for the preparation of teachers before being permitted to register for education courses.

SENIOR YEAR

Seventh Semester

IED 411—Industrial Design	3
Principles of Teaching	2
Technical elective	6
Social and behavioral science elective	3
General education elective	3
	17

Eighth Semester

American School System	3
ED 460—Special Methods of Teaching	3
ED 464—Supervised Teaching	6
ED 469—Organization of Instruction Materials	3
IED 481—Comprehensive General Shop	3
	18

Technology Teaching

The Department of Industrial Education offers a major in technology teaching designed to prepare students to become instructors of technical subjects in post-high school, industrial-technical curricula. Entry is based upon completion of a two-year college level, technical program leading to a degree comparable to an Associate in Applied Science offered through the School of Engineering and Technology. Transfer students are given credit for appropriate courses, satisfactorily completed in the two-year institution.

Graduates of this major are equipped to teach future technicians who will serve principally as assistants to scientists and engineers. Degree requirements have been established in line with the basic qualifications necessary for effective teaching performance. The program provides a sound base for professional growth of career teachers in one of the following technologies: chemical, civil, computer, electrical and electronic, industrial or mechanical.

FRESHMAN YEAR

First Semester

English Composition I	2
Sociology	3
MA 153—Algebra and Trigonometry I	3
IED 110—Introduction to Industrial Education	1
Technical specialty credit	6
	15

Second Semester

English Composition II	2
Elementary Psychology	3
MA 154—Algebra and Trigonometry II	3
Technical specialty credit	9
	17

SOPHOMORE YEAR

Third Semester

Nature of Physical Science I	3
or	
Introductory Chemistry I	3
MA 223—Introductory Analysis I	3
Technical specialty credit	9
	15

Fourth Semester

Nature of Physical Science II	3
or	
Introductory Chemistry II[1]	3
Fundamentals of Speech Communication	3
Technical specialty credit	9
	15

JUNIOR YEAR[2]

Fifth Semester

IED 260—Principles and Objectives of Industrial Education	3
Educational Psychology	3
Philosophy	3
Humanities elective	4
Advanced technical elective[3]	3
	16

Sixth Semester

Principles of Teaching	2
Economics	3
Social and behavioral science elective	3
General education elective	2
Elective	2
Advanced technical elective	3
	15

[1]Students must complete the sequence of either physics or chemistry.

[2]Students must be admitted to the program for the preparation of teachers before being permitted to register for education courses.

[3]A minimum of nine semester hours technical coursework beyond the associate degree will be selected from the upper-division Technology courses.

COOPERATIVE YEAR

Seventh Semester

IED 362—Cooperative Occupational Internship[4] 5

Eighth Semester

IED 362—Cooperative Occupational Internship[4] 5

SENIOR YEAR

Ninth Semester

IED 375—Teaching Methods in Occupational Education 3
The American School System 3
General Education Elective 3
Social and behavioral science elective 2
Advanced Technical elective 3
Humanities elective 2

16

Tenth Semester

IED 510—Course Development in Industrial and Occupational Education ..
IED 467—School Shop Management 3
IED 444—Occupational Analysis for Curriculum Planning 3
Education 464—Supervised Teaching in Industrial Education Subjects . 6

15

Vocational-Industrial Teaching

Vocational-industrial teaching, also known as trade and industrial teaching, is a part of the total Indiana program of vocational education. Vocational-industrial teachers must be occupationally competent in one of the many skilled and technical crafts found in industry in the United States. In order to qualify for the vocational teaching license, the student must complete at least three years of work above the learner level, in a craft, skilled trade, or some other type of industrial occupation, plus the general and professional education courses specified by the Teacher Training and Licensing Commission of the State Board of Education. The plan of study, when completed, entitles the student to a full-time trade and industrial education teacher license.

Graduates may find employment in day-trade-vocational programs in public high schools, in area vocational-technical centers, or one of a variety of institutions (including private) which are coming into prominence. He may serve as either a craft or occupational instructor or as a teacher of related subjects. He may, in addition, be called upon to teach apprentices or workers who attend part-time or evening-school classes. By completing one additional specified course, he may be certified as an Industrial Cooperative Training Coordinator. Increasingly, demands are made upon the qualified vocational-industrial teacher to help adults to prepare for work in occupations with which they are not familiar and in which there are shortages of trained workers.

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[4]IED 462—Appraisal of Occupational Experience and Competency may be substituted.

FRESHMAN YEAR

First Semester

English Composition I	2
MATH 153—Algebra & Trigonometry I	3
IED 110—Introduction to Industrial Education	1
Sociology	3
Elementary Psychology	3
Technical elective	4
	16

Second Semester

English Composition II	2
MATH 154—Algebra & Trigonometry II	3
Social and behavioral sciences elective	3
Economics	3
Technical elective	4
	15

First Summer

IED 362—Cooperative Occupational Internship[1]	3

SOPHOMORE YEAR

Third Semester

IED 362—Cooperative Occupational Internship[1]	5
	5

Fourth Semester

Nature of Physical Sciences I	3
or	
Introductory Chemistry I	3
IED 260—Principles and Objectives of Industrial Education	3
Fundamentals of Speech Communication	3
General education elective	3
Technical elective	4
	16

Second Summer

IED 362—Cooperative Occupational Internship[1]	3

JUNIOR YEAR[2]

Fifth Semester

IED 362—Cooperative Occupational Internship[1]	5

[1]IED 462—Appraisal of Occupational Experience and Competency may be substituted for IED 362.

[2]Students must be admitted to the program for the preparation of teachers before being permitted to register for education courses.

Sixth Semester

Nature of Physical Science II	3
or	
Introductory Chemistry II[3]	3
Social and behavioral science elective	2
Philosophy	3
Educational Psychology	3
Humanities elective	3
Elective	3
	17

Third Summer

IED 362—Cooperative Occupational Internship[1]	3

COOPERATIVE YEAR

Seventh Semester

IED 362—Cooperative Occupational Internship[1]	5

Eighth Semester

IED 362—Cooperative Occupational Internship[1]	5

Fourth Summer

IED 362—Cooperative Occupational Internship[1]	3

SENIOR YEAR

Ninth Semester

IED 375—Teaching Methods in Occupational Education	3
The American School System	3
Principles of Teaching	2
General education	3
Life and physical Science elective	2
Humanities elective	3
Elective	1
	17

Tenth Semester

Educ 464—Supervised Teaching in Industrial Education Subjects	6
IED 444—Occupational Analysis for Curriculum Planning	3
IED 510—Course Development in Industrial and Occupational Education	3
IED 467—School Shop Management	3
	15

[1]IED 462—Appraisal of Occupational Experience and Competency may be substituted for IED 362.

[2]Students must be admitted to the program for the preparation of teachers before being permitted to register for education courses.

[3]Students must complete the sequence of either physics or chemistry.

INDUSTRIAL ENGINEERING TECHNOLOGY

This field is designed to develop technicians to support the problem-solving and decision-making functions of management in such areas as planning and control, work method analysis, work measurements, quality assurance and controls, and systems and procedures analysis. Practical applications of production-oriented operations, data processing, and computer programming fundamentals are stressed. Because an industrial engineering technician is concerned with an organization which has human dimensions at least as important as the technical ones, this aspect is also stressed throughout the curriculum.

Curriculum In Industrial Engineering Technology

FRESHMAN YEAR

First Semester

EG 110—Drafting Fundamentals	3
IET 104—Industrial Organization	3
MA 150—Elementary Mathematics for Engineering and the Physical Sciences	5
MET 100—Applied Engineering Computations	1
PHYS 218—Physics: Mechanics and Heat	4
	16

Second Semester

ENG 117—English Composition	3
IET 204—Techniques of Maintaining Quality	3
CPT 200—Computer Prog. Fund.	3
STAT 401—Elementary Statistical Methods	3
MET 335—Basic Machining	2
PHYS 219—Physics: Electricity, Sound and Light	4
	18

SOPHOMORE YEAR

Third Semester

ECON E202—Principles of Economics	3
IET 224—Production Planning and Control	3
IET 262—Motion Study and Work Methods	3
IS 252—Human Relations in Industry	3
IET 220—Critical Path Analysis	2
Technical Electives	3
	17

Fourth Semester

GNT 220—Technical Report Writing	3
IET 250—Fundamentals of Production Cost Analysis	3
IET 266—Work Measurement and Incentives	3
SPCH C110—Fundamentals of Speech Communication	3
Technical Electives	4-6
	16-18

TECHNICAL ELECTIVES: Methods Improvement Option IET 120, 272, 296; Material Handling Option IET 268, 312, 296; Quality Control Option STAT 402, IET 354, 364, Production Option IET 323, 324, 296.

Bachelor of Science
Industrial Engineering Technology

The plan of study provides for the broadening of the IET Associate Graduate in communication, interpersonal relations, supervision techniques and in his technical competance.

This baccalaureate program prepares graduates to fill technical positions in Industrial Engineering Departments in the traditional industries as well as hospitals, banks and other institutions where efficiency and scientific management is a goal.

Bachelor Degree Program

JUNIOR YEAR

Fifth Semester

MA 221—Introductory Analysis I	3
IET 312—Materials Handling	3
EET 216—Electrical Machines and Control	3
English Elective	3
ENG 185—Developmental Reading	1
MET 212—Mechanics of Materials	4
	17

Sixth Semester

MA 222—Introductory Analysis II	3
IET 301—Cost Evaluation and Control	3
MET 180—Materials and Processes	2
IS 368—Legislation Affecting Industrial Relations	3
MET 330—Introduction to Fluid Power	3
IS 374—Industrial Supervision	3

SENIOR YEAR

Seventh Semester

MET 384—Instrumentation	3
IS 331—Industrial Safety	2
IET 354—Attribute and Variable Sampling	2
MET 200—Power Systems	3
IS 356—Personnel Problems	2
SPCH C410—Speech Communication of Technological Information	3
General Education Elective	3
	18

Eighth Semester

IET 364—Total Quality Control	3
IET 497—Senior Project	3
ENG 421—Business Writing	3
SPCH C402—Discussion of Technical Problems	3
General Education Elective	3
	15

INSTITUTIONAL MANAGEMENT (INSM)

Option: Food Service and Lodging Supervision

This program is designed to prepare men and women for employment in the food service and lodging field. The knowledge gained will prepare individuals for a supervisory or middle-management positions.

Along with classroom theory and laboratory work, the curriculum includes specialized courses in food service sanitation, executive housekeeping, quantity food production, personnel management, food purchasing, food and labor cost control, equipment and specialty food service.

Graduates of this program may elect to continue their education for a Purdue Bachelor of Science degree in Restaurant—Lodging Management.

FRESHMAN YEAR

First Semester

ENGl W117—Basic English Composition	3
INSM 135—Introduction to Food Service and Lodging Industry	3
F&N 303—Essentials of Nutrition	3
Mathematics	3
SOC S161—Principles of Sociology	3
IS 252—Human Relations in Industry	3
	18

Second Semester

ENGl	1
INSM 210—Food Service Sanitation	3
F&N 203—Foods: Their Selection and Preparation	3
PSY B104—Introduction to Psychology	3
BUS A201—Introduction to Management Accounting I	3
INSM 320—Executive Housekeeping	3
	16

INSM 200—Food Service and Lodging Practices—Optional during the summer. (1-2)

SOPHOMORE YEAR

Third Semester

INSM 337—Quantity Food Production	4
INSM 342—Personnel Management for Institutions	3
INSM 440—Institutional Food Purchasing	2
INSM 441—Institutional Organization and Management	3
SPCH C110—Fundamentals of Speech Communication	3
Humanities Elective	3
	18

Fourth Semester

INSM 445—Food and Labor Cost Control	3
INSM 438—Equipment for Institutions	3
INSM 380—Specialty Food Service	3
or	
INSM 460—Advance Food Production Management	3
INSM 300—Practicum in Institutional Management	1
IS 240—Labor Relations Problems	3
Elective	3
	16

MECHANICAL DRAFTING-DESIGN TECHNOLOGY

This program prepares senior draftsmen and junior design draftsmen for employment in manufacturing and construction industries, government, utilities, and other service firms. In addition, graduates are prepared to make industrial illustrations for parts manuals, brochures, proposals, and assembly instructions.

Mechancial drafting design technology concerns matters such as the preparation of sketches and drawings for design proposals, experimental models, prototype configurations, and production parts and assemblies.

Graduates of this program may perform drafting design functions such as the development of the design of a sub-assembly or major component under the direction of an engineer or an engineering technologist.

With additional experience, promotion to checker, designer, or drafting supervisor is possible. Also, this program is sufficiently broad to allow for progression into a variety of other technical or supervisory positions.

FRESHMAN YEAR

First Semester

MET 100—Applied Engineering Computations	1
MET 180—Materials and Processes	2
EG 110—Drafting Fundamentals	3
ENG W117—English Composition I	3
MA 111—Algebra	*3
CPT 100—Computer Utilization	3
	15

Second Semester

MET 335—Material Fabrication	2
MET 204—Production Drawing	3
MET 112—Applied Mechanisms	3
MET 156—Graphical Computations	3
MA 112—Trigonometry	*3
SPCH C110—Fundamentals of Speech Communication	3
	17

SOPHOMORE YEAR

Third Semester

MET 212—Mechanics of Materials	4
MET 236—Jig & Fixture Design	3
MET C299—Computer Graphics	3
EG 317—Production Illustration	2
PHYS 218—Physics: Mechanics and Heat	4
	16

Fourth Semester

MET 288—Die Design	3
MET 330—Introduction to Fluid Power	3
IET 204—Techniques of Maintaining Quality	3
Technical Elective	2
Elective	2
PHYS 219—Physics: Electricity, Sound and Light	4
	17

*MA 147 and MA 148 sequence recommended for students with sufficient math background and ability.

MECHANICAL ENGINEERING TECHNOLOGY

This program is intended to prepare specialists in the development of machines and products, in production processes, in the installation and maintenance of machines, and in solving repetitive engineering problems.

Mechanical engineering technology concerns the generation, transmission, and utilization of mechanical and fluid energy and the design and production of tools and machines and their products.

Graduates of the program accept jobs as laboratory technicians, engineering aides, plant maintenance men, layout men, production assistants, and technical salesmen. With additional experience, promotion to positions such as industrial supervisors, machine and tool designers, technical buyers, production expeditors, and cost estimators is possible.

Co-op work programs with industry may be made available to students on an individual basis.

Graduates of the associate degree program in mechanical engineering technology are eligible for certification as associate engineering technicians.

FRESHMAN YEAR

First Semester

MET 100—Applied Engineering Computations	3
MET 180—Materials and Processes	2
EG 110—Drafting Fundamentals	3
ENG W117—English Composition	3
MA 150—Elementary Mathematics	5
IET 104—Industrial Organization	3
	17

Second Semester

MET 204—Production Drawing	3
MET 335—Basic Machining	2
GNT 220—Technical Report Writing	3
MA 221—Calculus for Technology I	3
MET 210—Applied Statics	2
MET 200—Power Systems	3
	16

SOPHOMORE YEAR

Third Semester

MA 222—Calculus for Technology II	3
PHYS 218—General Physics	4
Technical Elective	3
MET 211—Applied Strength of Materials	4
SPCH C110—Fundamentals of Speech	3
	17

Fourth Semester

MET 330—Fluid Power	3
IS 252—Human Relations in Industry	3
PHYS 219—General Physics Technical Elecitve	3
MET 216—Machine Elements	4
	17

Bachelor of Science Mechanical Technology

Graduates of the two-year Mechanical Engineering Technology program are eligible for admission to this two-year "add-on" curriculum leading to a Bachelor of Science Degree.

This two-year add-on program is designed to specifically satisfy the needs of industry. Practical, applied courses are selected to give the student additional depth in communicative skills, supervision, interdisciplinary technical understanding as well as develop his expertise in his major area.

Graduates have excepted positions with such titles as Manufacturing Engineer, Power Engineer, Sales Engineer, Design Engineer, Cost Estimator, etc.

Curriculum In Mechanical Technology

JUNIOR YEAR

Fifth Semester

CPT 200—Computer Programming Fundamentals	3
EET* 101—Electrical Circuits I	3
MET 300—Applied Thermodynamics	3
IS 374—Industrial Supervision	3
ENGL 185—Developmental Reading	1
SPCH C401—Speech Communication Technical Information	3
	16

Sixth Semester

EET* 151—Electrical Circuits II	3
Interdisciplinary Elective	2
MET 350—Applied Fluid Mechanics	3
MET—Elective	3
ECON E210—Principles of Economics I	3
SPCH C402—Discussion of Technical Problems	3
	17

SENIOR YEAR

Seventh Semester

STAT 401—Elementary Statistical Methods I	3
EET* 211—Electric Machinery	3
MET—Elective	3
IS—Supervision Elective	2
ENGL 421—Business Writing: Engineering Applications	3
Living Skills Elective	3
	17

Eighth Semester

Interdisciplinary Elective	3
MET 497—Senior Project	3
IET 250—Fundamentals of Production Cost Analysis	3
Communication Elective	2
Living Skills Elective	3
Interdisciplinary Elective	3
	17

POLLUTION CONTROL TECHNOLOGY

The control of pollution in our air and water is becoming an increasingly serious problem. As increased attention is given to this problem, increased technical manpower is required. This curriculum prepares pollution control technicians for employment in the fields of water and wastewater treatment, air pollution control, and solid waste disposal.

Graduates are needed in public health and other departments of local, state, and federal governments; in manufacturing industries; and in consulting sanitary engineering firms. Some of the job opportunities include: research and development technician, sales and service technician, treatment plant operator, regulatory inspector, and design and construction technician.

Graduates also may continue their education by pursuing a Bachelor of Science degree in Environmental Health in the IUPUI Division of Allied Health Sciences. Positions for bachelor degree graduates will be in the same areas as listed above but at the staff and supervisory level. For additional information, contact the Director of Environmental Health Program at the IUPUI Medical Center.

*Or alternate EET series approved by counselor.

FRESHMAN YEAR

First Semester

AHL H321—Environmental Issues Eq. to PCT 110	3
CHM C101—Elementary Chemistry I	5
MA 150—Mathematics for Technology	5
MET 100—Applied Engineering Calculations	1
ENG W117—English Composition	3
	17

Second Semester

EG 110—Drafting Fundamentals	3
CHM C102—Elementary Chemistry II	5
BIOL 220—Introduction to Microbiology	3
CET 104—Elementary Surveying	3
GNT 220—Technical Report Writing	3
	17

SOPHOMORE YEAR

Third Semester

AHL H431—Water Supply and Waste Water Treatment—Eq. to PCT 220	4
AHL H460—Environmental Health Instrumentation—Eq. to PCT 210	3
CET 253—Hydraulics and Drainage	3
PHYS 218—General Physics	4
SPCH C110—Fundamentals of Speech	3
	17

Fourth Semester

AHL 451—Air Pollution and Control Eq. to PCT 221	3
AHL 452—Solid Waste Technology Eg. to PCT 222	2
PCT 223—Water Supply and Waste Water Treatment II	4
PHYS 219—General Physics	4
Nontechnical Elective	3
	16

SUPERVISION TECHNOLOGY
BACHELOR OF SCIENCE

The supervision technology option is administered by the Department of Industrial Supervision. This option utilizes the technical proficiency of the associate degree to prepare the student for a career in the supervision of technical groups. Candidates for this degree must have earned the degree of Associate in Applied Science in one of the technologies or a comparable degree. A minimum of 67 hours beyond the A.A.S. degree is required for the B.S. degree in Supervision Technology, and includes required, selective, and elective hours distributed in three areas as indicated below.

I. **TECHNOLOGY AREA:**
23 hrs. minimum (6 Science, 17 Interdisciplinary Technology)

(6) **Science**

Required

MATH 221—Calculus for Technology I 3
MATH 222—Calculus for Technology II 3

Selective

CHEM C101—Introductory Chemistry 5
CPT 200—Computer Programming Fundamentals 3
STAT 401—Elementary Statistical Methods 3
PHYS 218—General Physics 4

Elective

Courses in Science/Math

(17) **Interdisciplinary Technology**

Required

EET—Option with counselor's approval 3
MET 180—Materials and Processes 2
MET 200—Power Systems 3
MET 212—Mechanics of Materials 4
MET 335—Basic Machining 2

Selective

CET 104—Elementary Surveying 3
EET 104—Electronics I 3
IET 224—Production Planning & Control 3
MET 216—Machine Elements 4

Elective

Courses in Technology/Science

II. **SUPERVISION TECHNOLOGY AREA:**
26 hours minimum

Required

CPT 100—Computer Utilization 3
SPV 368—Legislation Affecting Industrial Relations 3

SPV 374—Elements of Supervision 3
BUS A201—Intro. to Mgt. Accounting I 3
BUS A202—Intro. to Mgt. Accounting II 3
ECON 202—Principles of Economics 3

Selective

IET 204—Techniques of Maintaining Quality 3
IET 262—Motion Study and Work Methods 3
SPV 376—Supervision and Personnel Problems 3
SPV 252—Human Relations in Supervision 3
SPV 331—Occupational Safety and Health 3
SPV 240—Labor Relations Problems 3
SPV 268—Elements of Law 3

III. **GENERAL EDUCATION AREA:**
18 hours minimum (12 Communications, 6 Living Skills)

(12) **Communications**

Required

ENG—English Composition 2
ENG 185—Developmental Reading 1
ENG 421—Business Writing: Engineering Applications 3
SPCH C401—Communication of Technical Info. 3
SPCH C402—Discussion of Technical Problems 3

(6) **Living Skills**

Elective

Courses in humanities, i.e.: History, languages, "ologies"

Students in Electrical labs practice, practice, practice

DIVISION OF ENGINEERING
BACHELOR OF SCIENCE IN ENGINEERING

The BSE program is designed to provide students with a strong foundation in fundamental engineering disciplines upon which they can either build a sound engineering career or pursue subsequent studies in a professional field.

The IUPUI curriculum conforms to the trends recognized and recommended by the recent Goals Report of the American Society for Engineering Education which stresses that engineers need a broadly-based interdisciplinary education.

An engineer must be versatile and flexible to adapt his skills to new problem areas. This has been demonstrated recently by the drastic shifts in engineering needs as national priorities have changed from the space effort to environmental concerns. As engineering has become more science-oriented, engineering course content has become more unified. Many career opportunities exist in interdisciplinary areas. To fulfill this concept, the IUPUI program furnishes students with the basic tools for analysis and design in the broadest sense so they can apply their skills to wide discipline areas. The BSE program thus meets the needs of the present and future.

The first two years conform to the usual engineering program, covering the basic sciences and mathematics, including a computer applications course. The third year consists of a broad spectrum of basic courses from various engineering disciplines.

The senior year offers the student a wide freedom of choice—of 30 of the required hours, 21 are electives. With 9 to 12 hours of these being technical electives, there is the opportunity for either in-depth specialization or further broad technical preparation. The basic and engineering sciences are drawn together in the senior year design course to provide experience in the synthesis of components and systems.

For those who wish to obtain a degree in a specific engineering discipline, the courses provided in this program will transfer to other degree programs. Usually two to three years of undergraduate courses can be transferred without loss. Students are urged to confer with their counselor to insure that all their work is applicable in their specific program.

General Education Program

A total of 21 hours of general education courses is required in the engineering curricula, and these hours are distributed as indicated below:

A. Six credit hours in communications are required in the Freshman Engineering Program. These are ENGL W117 and SPCH C110.

B. The remaining credit hours are to be selected by the student and his school counselor in line with the following two recommendations:

   1. In choosing the elective part of the General Education Program, the student and his counselor should reach a compromise between the following guiding principles:

      a. The student should have the opportunity to explore different areas.

b. His General Education Program should have a unifying framework and constitute a coherent experience.

2. Courses such as accounting, industrial management, personal finance, ROTC, and personnel administration are not considered as fulfilling the purposes of the General Education Program, regardless of their general value in the total engineering curriculum.

As a means of exemplification and for the purpose of facilitating the task of selection of an appropriate General Education Program for each student, a pamphlet has been prepared and it can be obtained by each student from his academic counselor.

The pamphlet arranges the suggested general education courses into four groups:

Group I.—Foreign languages, communication, creative arts

Group II.—History, philosophy, literature

Group III.—Economics, political science, psychology, sociology, anthropology

Group IV.—Interdisciplinary sequences

Included in the pamphlet are an analysis and description of the objectives of each of the sequences.

The sequences listed are suggested ones, and it is further suggested that the General Education Program of a student, if based on the lists, be drawn from not more than two different sequences (preferably belonging to two different groups) and that at least six credit hours be drawn from the same sequence.

For all the interdisciplinary sequences and all the sequences of Group IV it is suggested that at least nine credit hours from any one sequence be considered in the formulation of a meaningful program.

Some students have special needs in the area of general education. The head of the Division of Engineering, or his designated representative, is authorized to make substitutions if as the substitution will provide greater depth to the course sequence. Students should consult counselors to obtain prior approval for any variations.

Requirements For Graduation

The requirements for graduation include receiving credit in all required courses listed in the curriculum shown. This involves a total of at least 126 credit hours which includes a minimum of 21 credit hours of non-technical courses including English Composition and Speech.

Qualified students are urged to continue in graduate work if at all possible. Currently, students must complete the requirements for a degree with at least a 2.8 index in order to qualify for admission to the Graduate School. A student who expects to do graduate work should see his counselor about the selection of his technical electives.

FRESHMAN YEAR

First Semester

MA 163—Mathematics for Engineering and the Physical Sciences I	5
CHM C111—General Chemistry I@	4
SPCH C110—Fundamentals of Speech Communications	3
or	
ENGL W117—English Composition I	3
ENGR 190—Introductory Engineering Design	3
or	
ENGR B195—Engineering Problem Solving	3
	15

Second Semester

MA 164—Mathematics for Engineering and the Physical Sciences II	5
CHM C112—General Chemistry II@	3
PHYS 152—Physics; Mechanics and Sound	4
ENGL W117—English Composition I	3
or	
SPCH C110—Fundamentals of Speech Communications	3
ENGR 109—Introduction to Computer Programming	2
	17

@Students intending to enroll in Schools of Chemical or Metallurgical Engineering take 10 hours of Chemistry C105 and C106 but may take only three hours of introductory ENGR courses.

Only students with adequate background training will be expected to accomplish their Freshman year in two semesters. Students with inadequate preparation, particularly in mathematics and chemistry, may require an additional semester or summer session to obtain sophomore standing.

SOPHOMORE YEAR

Third Semester

MA 261—Mathematics for Engineers and the Physical Sciences III	4
PHYS 251—Physics; Heat, Electricity and Optics	5
ESC 205—Basic Mechanics I	3
EE 201—Introduction to Electrical Engineering	3
EE 207—Electrical Engineering Laboratory I	1
	16

Fourth Semester

MA 262—Mathematics for Engineers and the Physical Sciences IV	4
ESC 206—Basic Mechanics II	3
EE 202—Linear Electronics Circuits	3

EE Y495—Electrical Engineering Laboratory IIa* 1
ESC 223—Mechanics of Materials# 3
or
EE 251—Introduction to Non-Linear Circuits# 3
and
EE T495—Electrical Engineering Laboratory IIb#* 1
General Education Elective 3

17 or 18

*Students taking both EE Y495 and EE T495 will receive EE 208 credit.
#See note after Senior Year.

JUNIOR YEAR

Fifth Semester

ME 303—Thermodynamics 4
EE 301—Signals and Systems 4
ME 310—Fluid Mechanics 4
EE 302, IE 230 or other Introductory
Statistics Course 3

15

Sixth Semester

ME 315—Heat and Mass Transfer 4
ME 340—Measurement and Computers 3
IE 356—Human Factors 3
MSE 411—Engineering Materials 3
General Education Elective 3

16

SENIOR YEAR

Seventh Semester

EE 483—Automatic Control Systems 3
EE D495—Engineering Design I# 3
or
ME D497—Engineering Design I# 3
Technical Elective* 3
General Education Elective 6

15

Eighth Semester

EE E495—Engineering Design II 3
or
ME E497—Engineering Design II 3
Technical Electives* 6
Free Elective 3
General Education Elective 3

15

(TOTAL CREDITS—126 SEMESTER HOURS MINIMUM)

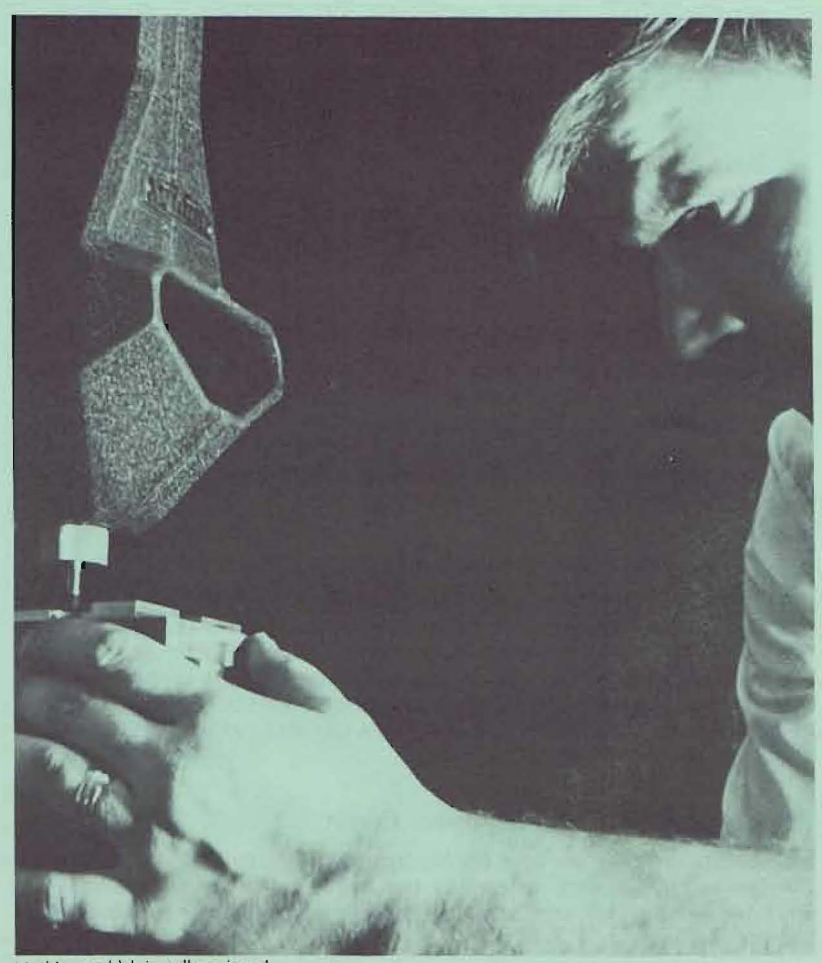
#Students are expected to follow the EE 251, EE T495, EE D495, and EE E495 or the ESC 223, ME D497, and ME E497 sequence.

*Students are expected to complete a technical elective sequence allowing for depth and specialization in an area of the student's technical interest.

Electives

The twenty-seven (27) credit hours of General Education and Technical electives are to be chosen in accordance with the following conditions:

1. A minimum of 15 credit hours of General Education Electives must be chosen to conform with the requirements as explained under the General Education Program.
2. Nine credit hours of technical electives are to be selected with the advice of a counselor from 300, 400 and 500 level courses to meet the student's educational objectives.
3. The three credit hour free elective may be either a general education elective or a technical elective.



Machine tool lab is well-equipped

GRADUATE ENGINEERING PROGRAMS

In addition to the bachelor's degree in engineering, graduate programs are also offered at IUPUI in the following areas of engineering.

1. Master of Science in Engineering (MSE). This is an interdisciplinary program involving courses from such disciplines as mechanical engineering, electrical engineering, aeronautical and engineering science, mathematical science and physics. A nuclear engineering option is available under the MSE program.
2. Master of Science in Electrical Engineering (MSEE). This program requires completion of a group of core courses in electrical engineering with additional courses from that field, other engineering areas or mathematics and physics.
3. Master of Science in Industrial Operations (MS). This is an undesignated degree designed for engineers engaged in manufacturing or production operations. Most courses are from the industrial engineering discipline.

Admission

Application for admission should be made at the Graduate Office at 38th Street. Applications should be made at least eight weeks before the beginning of the session in which the student wishes to enroll. The applicant will be advised of action on his application by the Dean of the Graduate School.

Regular Graduate Student Application

Application for admission as a regular graduate student must be made before a student starts graduate work toward a degree. However, a student currently enrolled as a temporary graduate student may make application for regular degree status. Applicants must request an official transcript of all previous college and university credits be sent to their major department for evaluation.

Temporary Graduate Student Application

The temporary graduate student classification is primarily for those casual students who wish to take courses for personal improvement. Admission is made by the Admissions Office at 38th Street upon recommendation of the chairman in the department of the student's interest. NOT MORE THAN NINE HOURS OF CREDIT EARNED UNDER THIS CLASSIFICATION MAY BE USED IN A DEGREE PROGRAM WITHOUT GRADUATE COUNCIL APPROVAL.

Transfer Credit

Acceptability of transfer credits from another college or university is determined by the student's major department. However, transfer credit will be allowed for the masters degree only after one semester of satisfactory work.

General Degree Requirements

A. Regular graduate student standing.

B. English requirement satisfied.

Candidates for advanced degrees whose native language is English satisfy the English requirement (1) if they made no grade below B in undergraduate courses in composition or (2) if they make a scaled score of 600 higher on the Verbal Aptitude Section of the Graduate Record Examination or 36 higher on the verbal portion of the Admission Test for Graduate Students in Business. If the English requirement is satisfied in one of the above ways and the information is included as a part of the information submitted with the graduate application, English clearance will be given automatically. If the student takes the G.R.E. after applying for admission to the Graduate School, the student must be certain the Educational Testing Service sends test scores to the Graduate School.

Those not cleared as specified above write a test paper for the Committee on Standards in English and are held for further writing if the test paper is not acceptable. Students so held are expected to work toward satisfying the requirement without delay. Students should be certain that the Committee on Standards in English sends the Graduate School notice of satisfaction when completed. Arrangements can be made through the graduate office or the graduate engineering counselor.

C. Plan of Study—The plan of study shall include a primary area and a related area or areas which are chosen on the basis of the student's interests and needs. A tentative plan of study should be drawn up in advance of registration for the first semester of graduate work. This should be done by the student and his graduate advisor. The formal plan of study should be submitted as soon as possible and before the final semester. The English requirement must be met before the plan of study may be filed.

D. Grades and index requirement—There is no general Graduate School cumulative index requirement. Specific requirements, if any, are up to the individual departments. Only grades of A and B are acceptable on a plan of study. The student's advisory committee may permit C's in certain courses.

E. Hours of work required—This varies by department from thirty-three to thirty-six semester hours of credit.

F. Oral and written examinations—The Graduate School has no general requirement for oral and written examinations for the masters degree. A department may waive the final examinations if the student meets minimum requirements. In any event, a final examining committee, usually the advisory committee, is appointed for each candidate for the masters degree. The committee must certify to the Graduate School either that the student has passed the required examination of the department in which his major graduate study has been taken or that the committee is satisfied with the accomplishment of the student as based on a committee conference.

Registration

See the engineering graduate advisor. Exact dates for registration can be obtained from the Registrar's Office. New graduate students should apply for admission at least 8 weeks in advance of registration.

Eligibility

To be considered for candidacy for the MSE, MSEE, or MSME degrees, an applicant must normally have been graduated from a curriculum accredited by the Engineer's Council for Professional Development (ECPD) with scholastic performance which places him in the highest quarter of his class.

Graduates from non-accredited curricula and others who do not meet the above requirements will be considered for admission to the M.S. degree program provided they can demonstrate superior knowledge and ability. Persons will be admitted if they perform sufficiently well on the Advanced Test in Engineering and the Aptitude Test portions of the Graduate Record Examination. Information on testing dates and locations can be obtained from Educational Testing Service, 20 Nassau Street, Princeton, New Jersey.

Temporary graduate, non-degree students are admitted to pursue course work for which they have the prerequisites but are not eligible to become candidates for an advanced degree until enrolled as regular graduate students.

Thirty-three credit hours of course work are required except for the MSME program at Columbus. Substitutions in the program may be made to meet individual student needs and interests if prior approval is obtained. No thesis is required.

Electrical Engineering Program

Core courses are:

EE 500: Random Variables and Signals (3 cr.)
EE 502: Lumped System Theory (3 cr.)
EE 504: Electromagnetic Field Theory (3 cr.)
EE 506: Electrical Properties of Materials (3 cr.)

Plus two of the following:

MA 510: Advanced Calculus (3 cr.)
MA 511: Linear Analysis (3 cr.)
MA 525: Introduction to Complex Analysis (3 cr.)

Common electives:

EE 546: Linear Graphs and Electrical Networks (3 cr.)
EE 547: An Introduction to Statistical Communication Theory (3 cr.)
EE 548: Linear Active Network Theory (3 cr.)
EE 554: Electronic Instrumentation and Control Circuits (3 cr.)
EE 555: Semiconductor-Circuit Analysis (3 cr.)
EE 556: Semiconductor Devices (3 cr.)
EE 586: Introduction to Modern Control Theory (3 cr.)
PHYS 550: Introduction to Quantum Mechanics (3 cr.)
PHYS 556: Introductory Nuclear Physics (3 cr.)

Other electives may be chosen from the engineering program.

Engineering Program (Interdisciplinary)

Core courses are (A minimum of two related pairs of the following courses are required):

A&ES 507: Basic Mechanics III (3 cr.)
A&ES 546: Strength of Materials (3 cr.)
EE 583: Introduction to Automatic Control Systems (3 cr.)
EE 586: Introduction to Modern Control Theory (3 cr.)
ME 500: Thermodynamics (3 cr.)
ME 509: Intermediate Fluid Mechanics (3 cr.)
NUCL 501: Nuclear Engineering Principles (3 cr.)
NUCL 502: Nuclear Engineering Systems (3 cr.)

Plus two of the following:

MA 510: Advanced Calculus (3 cr.)
MA 511: Linear Analysis (3 cr.)
MA 525: Introduction to Complex Analysis (3 cr.)

Common electives:

CS 512: Numerical Methods in Engineering (3 cr.)
CS 514: Numerical Analysis (3 cr.)
IE 543: Manufacturing Analysis (3 cr.)
IE 544: Manufacturing Management (3 cr.)
ME 501: Statistical Thermodynamics (3 cr.)
ME 505: Heat and Mass Transfer (3 cr.)
ME 510: Gas Dynamics (3 cr.)
ME 525: Combustion (3 cr.)
ME 563: Mechanical Vibrations (3 cr.)
MA 520: Boundary Value Problems of Differential Equations (3 cr.)
MA 529: Operational Calculus (3 cr.)
NUCL 510: Nuclear Reactor Theory (3 cr.)
NUCL 550: Nuclear Power Systems (3 cr.)
STAT 511: Statistical Methods I (3 cr.)
STAT 512: Statistical Methods II (3 cr.)

Other electives may be chosen from the E.E. courses in the MSEE program. Other graduate courses in engineering may be offered upon sufficient demand.

Mechanical Engineering Program at Columbus

Core courses are:

ME 500: Thermodynamics (3 cr.)
ME 505: Heat and Mass Transfer (3 cr.)
ME 509: Intermediate Fluid Mechanics (3 cr.)
ME 563: Mechanical Vibrations (3 cr.)
ME 566: Mechanics of Machinery (3 cr.)
ME 575: Theory and Design of Control Systems (3 cr.)
A&ES 507: Basic Mechanics III (3 cr.)
A&ES 546: Strength of Materials (3 cr.)
MA 510: Advanced Calculus (3 cr.)
MA 520: Boundary Value Problems of Differential Equations (3 cr.)

Industrial Operations (M.S.) Program

This program is designed to provide an opportunity for those engineers engaged in manufacturing or production operations to obtain an advanced degree.

Entrance requirements are similar to those for the engineering programs. Thirty-six credit hours of course work are required.

STAT 511, or its equivalent, is a prerequisite. Those needing the statistics prerequisite will be able to carry STAT 511 during the first year along with graduate courses required for the Master of Science degree.

Non Industrial Engineering graduates should take IE 543 and IE 544 during the first year. Industrial Engineering graduates are exempt from above two courses and should substitute other courses from another minor area.

MAJOR (Industrial Operations)—24 Semester Hours

IE 533: Methods of Experimental Research
IE 536: Operations Research
IE 543: Manufacturing Analysis
IE 544: Manufacturing Management
IE 546: Economic Decisions in Engineering
IE 579: Advanced Production Control
IE 666: Production Management Analysis
IE 6901: Case Studies in Systems Design for Industrial Operations

MINORS—In addition, 2 Minors of 6 hours each must be selected for the plan of study.*

MINOR A (Man in the Organization)—6 Semester Hours (2 of the following courses)

PSY 570: Industrial Psychology
PSY 577: Human Factors in Engineering
INDM 631: Industrial Relations

MINOR B (Computer Utilization)—6 Semester Hours (2 of the following courses)

CS 542: Design of Data Processing Systems
CS 590: Topics in Computer Science
IE 679: Manufacturing Applications of Data Processing

MINOR C (Statistics)—6 Semester Hours (2 of the following courses)

STAT 512: Statistical Methods II
STAT 513: Applications of Statistics in Industry
or
IE 530: Quality Control
STAT 519: Introduction to Applied Probability
STAT 522: Sampling and Survey Techniques
STAT 551: Introduction to Theoretical Statistics I
STAT 552: Introduction to Theoretical Statistics II

MINOR D (Mathematics)—6 Semester Hours (2 of the following courses)

MATH 510: Advanced Calculus
MATH 511: Linear Analysis
MATH 525: Introduction to Complex Analysis
MATH 556: Introduction to the Theory of Numbers

MINOR E (Engineering)—6 Semester Hours (2 of the following courses)

EE 500: Random Variable and Signals
EE 502: Lumped System Theory
EE 504: Electromagnetic Field Theory
EE 506: Electrical Properties of Materials
ME 500: Thermodynamics
ME 505: Heat and Mass Transfer
ME 509: Intermediate Fluid Mechanics
ME 510: Gas Dynamics

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*Courses other than those listed in the minors may be approved by the student's advisory committee if deemed desirable to satisfy the student's degree objective.

One of the following may be used:

MINOR F (Management of Business Finance)

F 502: Management of Business Finance I
F 503: Management of Business Finance II

MINOR G (Business Conditions)

G 501: Analysis of Business Conditions

Plus one of the following:

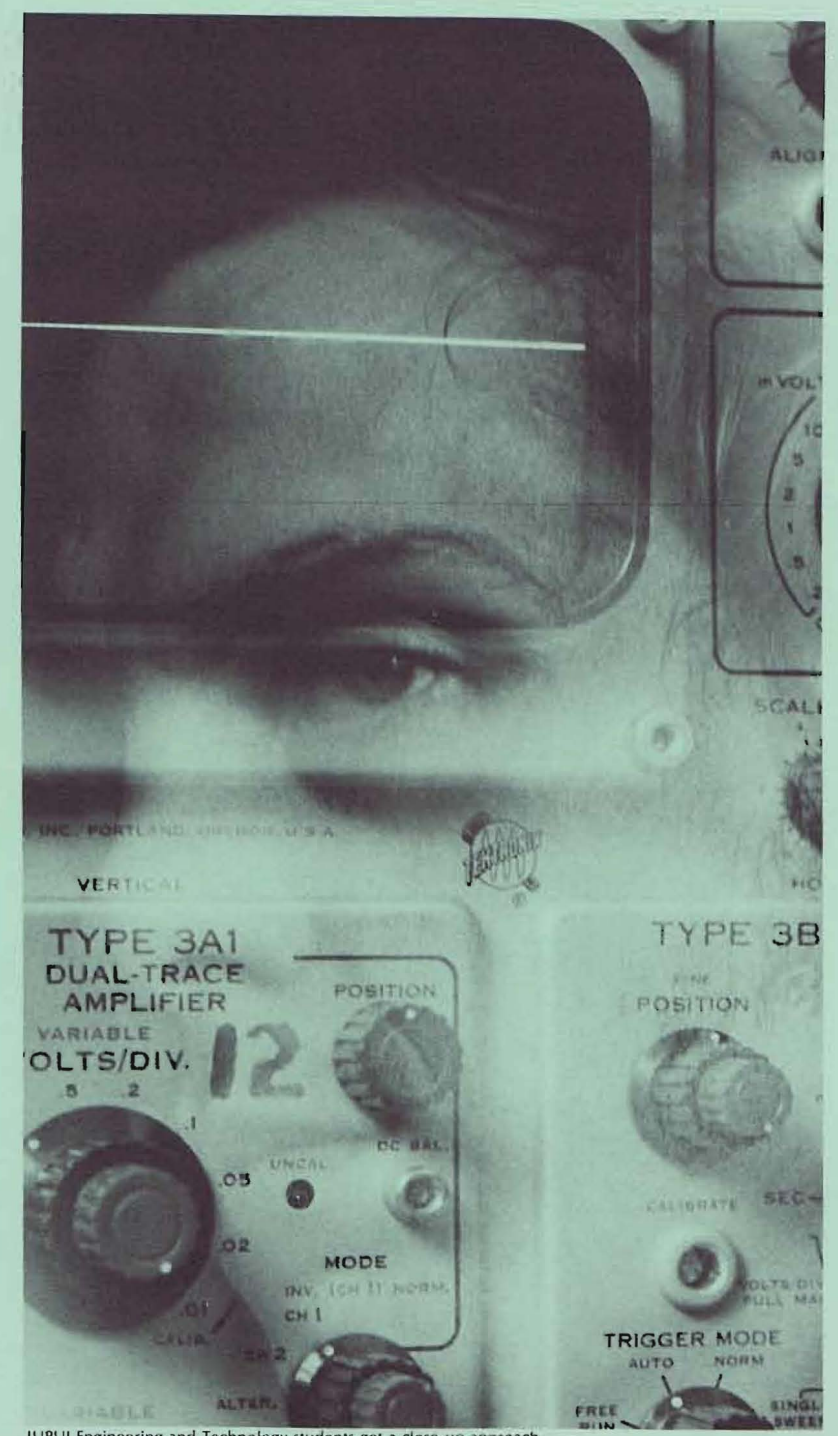
G 502: Managerial Economics
G 503: Business and Public Policy
G 550: Seminar in Business Conditions Analysis

MINOR H (General Business)

With prior approval by the student's advisory committee:

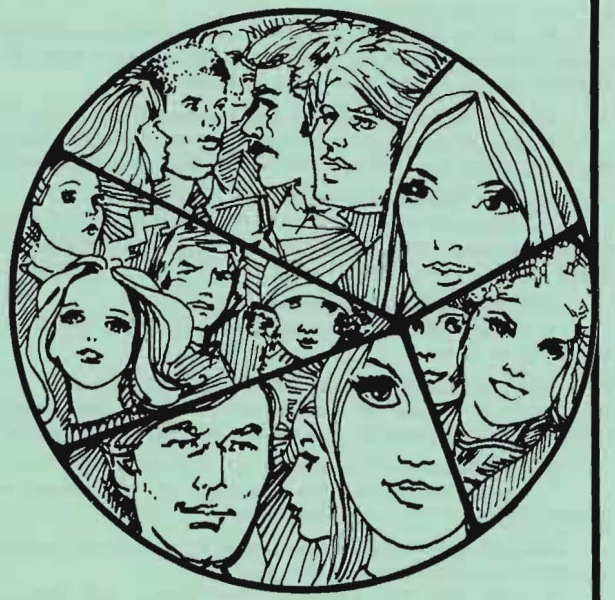
L 501: Legal Environment of Business
or
M 502: Marketing Management

Plus one other 3 credit course approved by the student's advisory committee.



IUPUI Engineering and Technology students get a close-up approach

TECHNOLOGY COURSE OFFERINGS



The abbreviation "P" refers to the course prerequisites which are the requirements which must be met before enrollment. The abbreviation "R" refers to requirements which are suggested as desirable prior to enrollment, but not necessary for enrollment. Consent of the instructor is an implicit prerequisite for all courses in the School of Technology and Engineering.

ARCHITECTURAL TECHNOLOGY

Professor Davis, Chairman; Associate Professor Richardson; Assistant Professors Clark, Leech.

Undergraduate Level
Lower-Division Courses

ART 116 Construction Drafting Lab. 6 (2 cr.)
Introduction to drafting fundamentals with emphasis on architectural and civil engineering topics. Use of instruments, lettering, orthographic projection, auxiliary views, intersections, perspective, and working drawings.

ART 120 Freehand Drawing I Lab. 6 (2 cr.)
Development of freehand sketching, using pencil, charcoal and ink, as a means of communication with an emphasis on architectural subjects.

ART 150 Architectural Construction I Lab. 9, (3 cr.) (Evening Divisions: Lab. 6, 3 cr., with outside assignments required.)
P: ART 116 or EG 110. A study of wood frame construction through a semester project requiring planning, preliminary and working drawings, and a model of the framing system. Field trips may be included.

ART 162 Building Materials and Methods Class 1, Lab. 3 (2 cr.)
Properties and use of various building materials in modern construction and an introduction to the skills and methods related to their erection.

ART 172 Systems of Construction Class 2 (2 cr.)
A survey of the organization of the construction industry, and introduction to various building components and systems with emphasis on a non-mathematical study of structural systems.

ART 204 Building Regulations Class 2 (2 cr.)
Building codes, ordinances, and regulations, with emphasis on those for structures in Indiana.

ART 210 History of Architecture I Class 3 (3 cr.)
Western survey of architectural periods and technological and social influences which make up architecture from ancient times to the present day.

ART 220 Freehand Drawing II Lab. 6 (2 cr.)
Continuation of ART 120. The study of color theory and the use of color techniques in architectural presentations.

ART 222 Architectural Construction II Lab. 9 (3 cr.) (Evening Divisions: Lab. 6, 3 cr., with outside assignments required.)
P: ART 150. Preparation of preliminary and working drawings for an intermediate-sized commercial or institutional building.

ART 224 Architectural Construction III Lab. 9 (3 cr.) (Evening Divisions: Lab. 6, 3 cr., with outside assignments required.)
P: ART 222. Continuation of ART 222 with emphasis on larger and more complex structures.

ART 276 Specifications and Contract Documents Class 2 (2 cr.)
Preparation of general conditions and major phases of building construction specifications, study agreements, contracts, liens, and bonds.

ART 284 Mechanical Equipment of Buildings Class 3 (3 cr.)
A study of plumbing, heating and air-conditioning for residential and commercial buildings. Water supply and drainage systems, heat loss and heat gain, heating systems, and air-conditioning systems.

ART 285 Electricity for Buildings Class 2 (2 cr.)
A survey of electrical and lighting requirements for residential and commercial buildings. Lighting fundamentals and design, electric circuits, power requirements, and wiring layout.

ART 299 Architectural Technology (1-4 Cr.)
Hours and subject matter to be arranged with staff. Course may be repeated up to nine hours.

Undergraduate Level
Upper-Division Courses

ART 310 History of Architecture II Class 3 (3 cr.)
P: ART 210 or consent of instructor. The study of Western architecture, structure, and building technology of the nineteenth and twentieth centuries.

ART 341 Architectural Design I Class 1, Lab. 5 (3 cr.)
P: ART 224. Planning, development, and architectural delineation of structures with pencil, charcoal, and water color models.

ART 342 Architectural Design II Class 1, Lab. 5 (3 cr.)
P: ART 341. Continuation of ART 341 with emphasis on larger and more complex structures.

ART 360 Community Planning I Class 2, Lab. 3 (3 cr.)
A study of planning methods, legislation, and agencies. Emphasis on collection of data about an existing community and the preparation of land-use maps from that data.

ART 362 Community Planning II Class 1, Lab. 6 (3 cr.)
P: ART 360. Application of planning methods to the development of a new community or the redevelopment of an existing community.

ART 460 Real Estate Class 3 (3 cr.)
A study of the legal aspects and practices of the real estate business, including appraising, finance, property management, and land development.

ART 476 Specifications Class 3 (3 cr.)
Expansion of the general principles of construction documents covered in ART 276. Detailed study of purpose and intent of specifications. Preparation of various sections of specifications for specific jobs, including development of the general conditions, adaptation of selected provisions from standard specifications, and delineation of special supplemental conditions.

ART 490 Senior Project (1-6 cr.)
Final project aimed at combining the skills and knowledge gained from the various areas of studies. The student will be expected to report graphically, orally, and in written form on a final project approved by the advisor. Presentation will be made to a representative board of the faculty determined by the advisor.

ART 499 Architectural Technology (1-4 cr.)
Hours, subject matter, and credit to be arranged with staff. Course may be repeated for credit up to nine hours.

CIVIL ENGINEERING TECHNOLOGY

Professor Davis, Chairman; Associate Professor Beck; Assistant Professor Douglas.

Undergraduate Level
Lower-Division Courses

CET 100 Technical Computations Class 3 (3 cr.)
A study of elements from algebra and trigonometry appropriate to surveying and construction, and of related computational methods including slide rule, logarithms, calculator, and computer.

CET 104 Elementary Surveying Class 2, Lab. 3 (3 cr.)
P or corequisite; MA 112, 150, or equivalent. Measurement of distances, directions and angles, using the tape, level, compass, and transit. Computation of areas and traverses, lines and grades.

CET 108 Route Surveying and Design Class 1, Lab. 6 (3 cr.)
P: CET 104. Preliminary and construction surveys for route location. Calculation and field work for simple and easement curves, grade lines, and slope stakes. Preparation of plans, profiles, and cross-sections from field survey data earthwork estimates.

CET 160 Statics Class 3 (3 cr.)
P: MA 154 or equivalent. A study of forces acting on bodies at rest, including coplaner and noncoplanar forces, concurrent and nonconcurrent forces, friction forces, and hydrostatic forces. Centroids and moments of inertia are included. Practice in use of the slide rule will be included.

CET 208 Route Surveying Class 1, Lab. 3 (2 cr.)
P: CET 104. Preliminary and construction surveys for highways and railroads, including simple, compound, reverse, and easement curves, super-elevation of curves, profiles, grade lines, slope stakes, yardage estimates, and mass and haul diagrams.

CET 209 Land Surveying and Subdivision Class 1, Lab. 6 (3 cr.)
P: CET 104. Theory and practice of land surveying, subdivision, filing and recording deeds, United States governmental survey of public lands, laws of land surveying, descriptions and area computations for land surveys. Subdivision planning, calculations and plotting, water main layouts, storm and sanitary sewer calculations and layouts. Street plans and profiles.

CET 253 Hydraulics and Drainage Class 3 (3 cr.)
P: MA 150. Basic hydrostatics, Bernouilli's equation, flow in water and sewer lines, overland and ditch drainage, and culvert size determination.

CET 260 Strength of Materials Class 3 (3 cr.)
P: CET 160. Study of stress-strain relationships, shear and bending moment diagrams, stresses and deflections of beams, axial loads, and combined stresses. Applied problems in the field of structural design.

CET 262 Strength of Materials I Class 2, Lab. 3 (3 cr.)
P: CET 160. Study of stress-strain relationships of construction materials, connections, and shear and moment diagrams. Testing of materials to determine physical and mechanical properties. The sequence CET 262-264 fulfills the requirement of CET 260-266.

CET 264 Strength of Materials II Class 2, Lab. 3 (3 cr.)
P: CET 262. A study of bending stresses, beam deflections, column behavior, and combined stresses as applied to symmetric structural members. Tests of beams and columns to measure load-deflection relationships.

CET 266 Materials Testing Class 1, Lab. 6 (3 cr.)
P: CET 260. Testing of construction materials to determine physical and mechanical properties. Preparation of reports from data secured from such tests.

CET 280 Structural Calculations Class 3 (3 cr.)
P: CET 260. Practice in the calculation of loads, reactions- shear, and moment for determinate structures. Introduction to indeterminate structures with emphasis on moment distribution.

CET 281 Applied Structural Design Class 1, Lab. 6 (3 cr.)
P: CET 260. Standard design procedures for steel and wood frame structures. Computation of loads, shears, moments and deflections. Sizing of beams, columns, and connections. Preparation of structural drawings.

CET 282 Structural Detailing Class 1, Lab. 6 (3 cr.)
P: CET 260 and ART 150. Detailing simple structural steel, reinforced concrete and wood structures, elementary design principles.

CET 299 Civil Engineering Technology (1-4 cr.)
Hours to be arranged with the staff. Primarily for third and fourth semester students. Subject matter to be assigned by the staff.

Undergraduate Level
Upper-Division Courses

CET 366 Materials Testing II Class 1, Lab. 6 (3 cr.)
P: CET 266. An introduction to testing structural elements and complete structures. Strain gauge measurements, instrumentation, and the design of tests to eliminate variables. Statistical analysis of test data.

CET 368 Experimental Stress Analysis Lab Class 1, Lab. 3 (2 cr.)
P: CET 266. Introduction to and application of the use of electrical strain gauges, brittle lacquers and photoelastic means of determining location, direction and magnitude of strains in scale and full-size structural systems and components.

CET 380 Structural Design Standards Class 3, Lab. 3 (4 cr.)
P: CET 280. Standard design procedures for the selection of steel, concrete and wood members, including shear, moment, and compression criteria, with emphasis on the limitations of these procedures.

CET 382 Steel Construction Class 2, Lab. 3 (3 cr.)
P: CET 280. Design of steel framed structures, including beams, columns, and connections. The preparation of structural drawings, and a study of erection practices.

CET 384 Wood Construction Class 2, Lab. 3 (3 cr.)
P: CET 280. Design of wood frame construction and the formwork for concrete construction, including the preparation of structural and construction drawings.

CET 386 Reinforced Concrete Construction Class 4 (4 cr.)
P: CET 280. A study of concrete both as a construction material and as a structural material. Field methods and practices used in concrete construction. Fundamentals of reinforced concrete design as applied to beams, slabs, columns, walls, and footings.

CET 408 Construction of Highways Class 1, Lab. 3 (2 cr.)
P: CET 108 and 431. Materials, design, and construction methods used in asphalt and concrete pavements. Preliminary layout and design of intersections. Design and construction of highway subgrades.

CET 409 Property Surveying Class 2, Lab. 3 (3 cr.)
P: CET 209. Office and field work associated with land surveying. Laws of land surveying, and public records of real property. Metes and bounds, federal subdivision, and state plane coordinate descriptions.

CET 431 Property and Behavior of Soils Class 2, Lab. 3 (3 cr.)
P: CET 260. Identification and properties of soils with emphasis on laboratory and field testing. Behavior of soils relating to design and construction of structures and highways.

CET 432 Foundation Construction Class 2 (2 cr.)
P: CET 431. Design and construction of shallow and deep foundations, excavating and bracing, and construction site dewatering.

CET 499 Civil Engineering Technology (1-4 cr.)
Hours, subject matter, and credit to be arranged by staff. Course may be repeated for credit up to nine hours.

COMPUTER TECHNOLOGY

Associate Professors Crozier (Chairman), Kira, Mclear; Assistant Professors Forget, Randall, Williams. Instructors Fox, Fraser.

Undergraduate Level
Lower-Division Courses

CPT 100 Computer Utilization Class 3 (3 cr.)
An introduction to data processing techniques through the use of unit record and highspeed computer equipment. Emphasis will be on how computers can assist the potential user.

CPT 115 Introduction to Data Processing Class 4, Lab. 2 (5 cr.)
Not open to students with credit in CPT 116 or 117. An introduction to computers and data processing. The historical development of unit record equipment and electronic digital computers; an introduction to unit record equipment, machine language, assembly language, compiler languages; and a survey of computer applications.

CPT 116 Introduction to Data Processing I Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)
CPT 116-117 is a two-semester version of CPT 115. Not open to students with credit in CPT 115.

CPT 117 Introduction to Data Processing II Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)
Continuation of CPT 116. Not open to students with credit in CPT 115.

CPT 122 Computer Math Class 3 (3 cr.)
P: MA 147 or 150. Selected topics in mathematics that are related to business and computer computations. Topics include: symbolic logic, binary, octal, and hexadecimal number systems; determinants; matrices; and linear systems.

CPT 131 Assembly Language Programming I Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)
P: CPT 115 or 116. Programming of a digital computer at the machine language and assembly language levels with emphasis on the meticulous step by step development of a program. Topics include: computer hardware, stored program concepts, operation codes, addresses, flow diagrams and assembly language translators. In the laboratory students write, process, and debug programs using the computer on an open shop basis.

CPT 132 Assembly Language Programming II Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)
P: CPT 131. Advanced symbolic programming techniques, programming exercises, and case studies are designed to familiarize the student with actual programming practices and to bridge the gap from the theoretical to the real world of data processing.

CPT 133 Assembly Language Programming I Class 3, Lab. 2 (4 cr.)
P: CPT 115 or 116. Programming of a digital computer at the machine language and assembly language levels with emphasis on the meticulous step by step development of a program. Topics include: computer hardware, stored program concepts, operation codes, addresses, flow diagrams and assembly language translators. In the laboratory, students write, process and debug programs using the computer on an open shop basis.

CPT 134 Assembly Language Programming II Class 3, Lab. 2 (4 cr.)
P: CPT 131 or 133. Advanced symbolic programming techniques, programming exercises, and case studies are included to familiarize the student with actual programming practices and to bridge the gap from the theoretical to the real world of data processing.

CPT 198 Data Processing Practice I (1 cr.)
Practice in industry with written reports of this practice for co-op students. May be repeated once.

CPT 200 Computer Programming Fundamentals Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)

The presentation of the basic elements of programming digital computers. There is a treatment of absolute and symbolic coding, magnetic tape functions, and random access processing. Major emphasis will be on compiler language (FORTRAN) programming.

CPT 220 Numerical Analysis I Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)

P: CPT 264 and MA 221. Numerical methods necessary for finding solutions to mathematical equations and for analysis of tabulated data. A laboratory course consisting chiefly of the solution of specific problems by computer programming and other methods. Topics include: iterative and direct solutions of linear equations, matrix operations, integration techniques, and error analysis.

CPT 225 Statistical Methods Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)

P or corequisite: CPT 264. An introduction to elementary statistics with emphasis on the analysis of actual data. Topics include: description and representation of sample data, probability, theoretical distributions, sampling, estimating, correlation, regression, and computer statistical routines.

CPT 254 Commercial Systems Applications Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)

P: CPT 131 or CPT 133. An introduction to commercial data processing principles and practices as related to computer-oriented systems. A study of the basic concepts, flowcharting, forms design, and writing of procedures for the major application areas including payroll, accounts receivable, accounts payable, and inventory control.

CPT 261 RPG Programming Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)

Computer programming using RPG, Report Program Generator. Study of the language structure, applications, and related utility programs.

CPT 264 FORTRAN Programming Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)

P: CPT 131 or CPT 133. The structure and details of FORTRAN, a mathematically oriented compiler language. Numerous problems are solved on the computer to demonstrate the many facets of the language.

CPT 265 COBOL Programming Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)

P: a prior programming course. A study of the programming language, COBOL, which is oriented toward data handling and processing tasks. The student will study the structure and details of COBOL and perform programming exercises as well as consider practical applications.

CPT 284 Utility Programs Class 2, Lab. 2 (3 cr.)

P: CPT 131 and 264. This course is designed to familiarize the student with existing programs normally found in operating data processing centers. These include sort/merge routines, supervisory routines, report generators, random access utility programs, magnetic tape routines, etc.

CPT 286 Computer Operating Systems I Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)

P: CPT 131 or CPT 133. An introduction to the computer operating systems and other systems software. Topics include: utility programs, job control monitors, program supervisors, loaders and link-editors.

CPT 290 Computer Project (1-4 cr.)

Independent study for sophomore students who desire to execute a complete computer-oriented project. Course may be repeated for credit up to six hours.

CPT 294 Computer Seminar Class 2 (1 cr.)

P: an introductory computer course. Current problems and issues in the computer field. Field trips are required.

CPT 298 Data Processing Practice II (1 cr.)

Practice in industry with written reports of this practice for co-op students. May be repeated once.

CPT 299 Computer Technology (1-4 cr.)
Hours, credit, and subject matter to be arranged by staff. May be repeated for credit up to nine hours.

Undergraduate Level
Upper-Division Courses

CPT 300 Introduction to Computers Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)
A broad survey of computers, data processing, and applications. Punched cards preparation, unit record equipment, computer hardware, and programming principles and languages. Applications emphasize how the computer is used as a tool to assist the user.

CPT 320 Numerical Methods II Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)
P: CPT 220 and MA 222. A continuation of CPT 220. Topics include: finite difference calculus, finite difference equations, differentiation techniques, and error analysis applied to these techniques.

CPT 340 Data Communications Class 2, Lab. 2 (3 cr.)
P: CPT 132. The role of data communications in modern computation. Real time systems and data transmission. Topics include: terminal equipment, communication media, data codes, error detection and correction, and terminal software.

CPT 345 Computer Graphics Class 2 (2 cr.)
P: an introductory computer course. A survey of computer hardware used to make graphic displays including printer, plotter, and cathode rays tube. Programming techniques for plotting lines and special symbols, the organization and representation of data, and a survey of applications.

CPT 354 Management Information Systems I Class 2, Lab. 2 (3 cr.)
P: CPT 254 and 265. The processing of data in an integrated management information system environment with emphasis on the source, flow, dissemination, and interrelationship of data required for various operational areas of an industrial organization. The laboratory period is used for programming (in COBOL) and documentation of practical problems in management information systems.

CPT 360 PL/1 Programming Class 3 (3 cr.)
P: CPT 264 and 265. Detailed study of the PL/1 programming language and comparison of the language with COBOL and FORTRAN. Students will program representative applications in the PL/1 programming language.

CPT 364 Topics in FORTRAN Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)
P: CPT 264 and MA 222. A continuation of CPT 264. Dialects of FORTRAN with emphasis on FORTRAN IV, FORTRAN compilers, computational methods, and applications in various technical and commercial areas.

CPT 367 APL Programming Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)
P: CPT 264 and MA 222. Computer programming using APL, A Programming Language (Iverson). Study of the language structure and applications.

CPT 380 Systems Analysis of Computer Applications Class 3 (3 cr.)
P: CPT 254. Total computerization of various applications. Case studies will be used to enforce those systems analysis techniques presented.

CPT 386 Computer Operating Systems II Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)
A continuation of CPT 286 with emphasis on systems generation, control languages, and time-sharing.

CPT 396 Computer Laboratory Lab. 1-6 (1-2 cr.)
Applied computer laboratory experiences carried out on an independent study basis in conjunction with other courses, assignments, or problems.

CPT 398 Data Processing Practice III (1 cr.)
Practice in industry with written reports of this practice for co-op students. May be repeated once.

CPT 444 Hybrid Computing Systems Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)
P: CPT 340. Study of analog and hybrid computing systems. Topics will include: analog to digital and digital to analog conversion, process control systems, real-time monitoring.

CPT 454 Management Information Systems II Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)
P: CPT 354. A continuation of the material presented in CPT 354, including topics in operations research.

CPT 480 Computer System Planning Class 3 (3 cr.)
P: CPT 354 and INDM 360. The planning and design of computer systems, including the formulation of corporate requirements, configuration of hardware to satisfy stated requirements, comparison and evaluation of equipment, installation considerations, and implementation procedures.

CPT 486 Systems Programming Class 3 (3 cr.) or Class 2, Lab. 2 (3 cr.)
P: CPT 386. Programming and maintenance of software packages. Software areas to be covered include operating systems, subroutine sets, assemblers and compilers, micro-programming.

CPT 490 Senior Project (1-4 cr.)
Independent study for seniors who desire to execute a complete computer oriented project. Course may be repeated for credit up to six hours.

CPT 498 Data Processing Practice IV (1 cr.)
Practice in industry with written reports of this practice for co-op students. May be repeated once.

CPT 499 Computer Technology (1-4 cr.)
Hours, credit, and subject matter to be arranged by staff. May be repeated for credit up to six hours.

CONSTRUCTION TECHNOLOGY

Professor Davis, Chairman; Assistant Professor Merz.

Undergraduate Level
Lower-Division Courses

CNT 190 Construction Observation (1 cr.)
Directed observation and inspection of construction work in progress on or near the campus. May be repeated twice.

CNT 198 Construction Practice I (1 cr.)
Practical experience in the construction industry with written reports of this experience for co-op students.

CNT 280 Quantity Survey and Estimating Class 2, Lab. 3 (3 cr.)
P: ART 150. A study of methods to estimate quantities of materials required in construction. Practice in making quantity surveys. Introduction to estimating labor and costs.

CNT 298 Construction Practice II (1 cr.)
Practical experience in the construction industry with written reports of this experience for co-op students.

Undergraduate Level
Upper-Division Courses

CNT 340 Construction Scheduling Class 2 (2 cr.)
A study of the planning and control of construction projects. Time schedules for materials, labor, and equipment; expediting material delivery; bar charts; and CPM scheduling.

CNT 344 Construction Inspection Class 2, Lab. 3 (3 cr.)
P: ART 276. Inspection procedures as applied to contracted construction, and the role inspection plays in the execution of the completed contract. The laboratory period is for field trips to construction sites.

CNT 390 Construction Experience (1 cr.)
Minimum of ten weeks work experience in the construction industry, with at least five weeks experience in the field. Written report of this experience.

CNT 398 Construction Practice III (1 cr.)
Practical experience in the construction industry with written reports of this experience for co-op students.

CNT 441 Construction Operations Class 4 (4 cr.)
P: junior or senior standing. Management, methods and equipment used in the construction of buildings, earthworks, bridges and roads. Contractor organization, job management, and safety. Excavation, formwork, concrete, masonry, and steel erection methods.

CNT 442 Construction Costs and Bidding Class 2, Lab. 3 (3 cr.)
P: CNT 280 and 441. Estimating total job costs, and the study of bidding practices of the construction industry. Topics include: unit costs of materials and labor, quantity survey, overhead, subcontracts, total estimated costs, and bid price. The laboratory period is for the development of costs for an actual job.

CNT 445 Construction Management Class 3 (3 cr.)
P: INDM 200. Business policy and problems as they relate to construction companies. Contractors' organization, financial management, project management, supervision, cost analysis, and equipment economics.

CNT 498 Construction Practice IV (1 cr.)
Practical experience in the construction industry with written reports of this experience for co-op students.

CNT 499 Construction Technology (1-4 cr.)
Hours, subject matter and credit to be arranged by staff. Course may be repeated for credit up to nine hours.

ELECTRICAL ENGINEERING TECHNOLOGY

Associate Professors Sharp (Chairman); Burley, Keller, Needler, Ryan, Warren; Assistant Professors Messinger, Singh, Smith, Willison.

EET 101 Electrical Circuits I* Class 3 (3 cr.)
P or corequisite: MA 150. A study of DC electrical circuits, Ohm's Law, Kirchhoff's Laws, series and parallel circuits, power, introductory magnetism, ammeters, voltmeters, ohm-meters, inductance, capacitance, and an introduction to alternating voltages, currents, and reactances.

EET 102 Electrical Circuits I Class 3, Lab. 3 (4 cr.)
P or corequisite: MA 150. A study of DC electrical circuits, Ohm's Law, Kirchhoff's Laws, series and parallel circuits, power, introductory magnetism, ammeters, voltmeters, ohm-meters, inductance, capacitance, and an introduction to alternating voltages, currents, and reactances.

EET 103 Electronics I* Class 2 (2 cr.)
P or corequisite: EET 101 or consent of instructor. Orientation topics on departmental and university services and industrial careers. Field trips related to career fields may be required.

EET 104 Electronics I Class 2, Lab. 3 (3 cr.)
P or corequisite: EET 102 or consent of instructor. Orientation topics on departmental and university services and industrial careers. Field trips related to career fields may be required. An introduction to conductors, semi-conductors,

insulators, and the physical construction and elementary operation of electron tubes, solid-state diodes, and transistors. Includes characteristic curves and properties related to DC load lines. An introduction to the use of electronic calculators and digital computers.

EET 113 Electrical Engineering Technology Laboratory I* Lab. 6 (2 cr.)
P or corequisites: EET 101 and EET 103. The first of a sequence of practical laboratory courses designed to develop technical skills and techniques in circuit construction, instrument operation, testing, measuring, troubleshooting, and circuit analysis. Instruments such as ammeters, voltmeters, ohmmeters, DC bridges, and oscilloscopes are used in DC and AC circuits.

EET 151 Electrical Circuits II* Class 3 (3 cr.)
P: EET 101 and 113. Corequisite: EET 163. A study of DC and AC electrical circuits, network theorems, j operator, phasors, reactances, impedances, phase relationships, power, resonance, ideal and aircore transformers and an introduction to graphical techniques and transients.

EET 152 Electrical Circuits II Class 3, Lab. 3 (4 cr.)
P: EET 102. A study of DC and AC electrical circuits, network theorems, j operator, phasors, reactances, impedances, phase relationships, power, resonance, ideal and aircore transformers and an introduction to graphical techniques and transients.

EET 153 Electronics II* Class 3 (3 cr.)
P: EET 101, 103, 113, and MA 150. P or corequisites: EET 151 and 163. A study of the characteristics and applications of transistors, integrated circuits, and other solid-state devices. Includes rectifier circuits, waveform interpretation, AC and DC load lines, biasing techniques, equivalent circuits, single and multi-stage class A small-signal amplifiers, and h parameters.

EET 154 Electronics II Class 3, Lab. 3 (4 cr.)
P: EET 102, 104, and MA 150. P or corequisite: EET 152. A study of the characteristics and applications of transistors, integrated circuits, and other solid-state devices. Includes rectifier circuits, waveform interpretation, AC and DC load lines, biasing techniques, equivalent circuits, single and multi-stage class A small-signal amplifiers, and h parameters.

EET 163 Electrical Engineering Technology Laboratory II* Lab. 6 (2 cr.)
P or corequisite: EET 153. The second of a sequence of practical laboratory courses designed to develop technical skills and techniques in circuit construction, testing, instrument operation, measuring, troubleshooting and circuit analysis. Experimental work on transistor and electron tube circuits, DC and AC networks, and electromechanical devices; using ammeters, voltmeters, wattmeters, oscilloscopes, signal generators, wavemeters, frequency meters, and bridges.

EET 198 Industrial Practice I (1 cr.)
Practice in industry with written reports of this practice by the co-op students.

EET 203 Electronics III* Class 3 (3 cr.)
P: EET 151, 153, 163, and MA 221. Corequisite: EET 213. A study of the applications of transistors, integrated circuits, and other solid state devices. Feedback principles as applied to amplifiers, oscillators, and regulated power supplies. Includes large-signal power amplifiers, special-purpose amplifiers, and AM and FM modulation and detection techniques. Introduction to filters as applied to tuned amplifiers.

EET 204 Electronics III Class 3, Lab. 3 (4 cr.)
P: EET 152, 154 and MA 221. A study of the applications of transistors, integrated circuits and other solid-state devices. Feedback principles as applied to amplifiers, oscillators, and regulated power supplies. Includes large-signal power amplifiers, special-purpose amplifiers, and AM and FM modulation and detection techniques. Introduction to filters as applied to tuned amplifiers.

EET 211 Electrical Power and Machinery* Class 3 (3 cr.)
P: EET 151 and 163. A study of power transformers, single and polyphase circuits, and an introduction to the National Electric Code. The study of DC machines and AC single and polyphase synchronous and induction machines.

EET 212 Electrical Power and Machinery Class 3, Lab. 3 (4 cr.)
P: EET 152. A study of power transormers, single and polyphase circuits, and an introduction to the National Electric Code. The study of DC machines and AC single and polyphase synchronous and induction machines.

EET 213 Electrical Engineering Technology Laboratory III* Lab. 6 (2 cr.)
P: EET 203 and 211. The third of a sequence of practical laboratory courses designed to develop technical skills and techniques in circuit construction, testing, instrument operation, measuring, troubleshooting, and circuit analysis. Experimental work and measurements on power supply circuits, filters, receivers, transmitters, electrical machines, waveshaping circuits, sweep circuits, logic circuits and commercial equipment and selected experiments from the student's specialty.

EET 216 Electrical Machines and Controls Class 3 (3 cr.)
P: MA 150 and GNT 176 or equivalent. (Not open to EET students.) Lecture, recitation, and demonstration are combined to acquaint the student with the elements of electrical circuits and machines as they are applied as component parts of machine drives and controls within the requirements of the National Electrical Code and in conformity to the ratings and dimensional specifications of NEMA. Manufactures catalogs and pamphlets are used freely as classroom aide.

EET 253 Electronics IV* Class 3 (3 cr.)
P: EET 153, 163, and MA 222. Corequisite: EET 263. A study of transients, waveshaping techniques, switching circuits, multivibrators, logic gates, triggering and synchronizing techniques, binary arithmetic and introductory Boolean algebra. Includes diodes, transistors, and integrated circuits in pulse and digital applications such as shift registers and ring counters.

EET 254 Electronics IV Class 3, Lab. 3 (4 cr.)
P: EET 154 and MA 221. A study of transients, waveshaping techniques, switching circuits, multivibrators, logic gates, triggering and synchronizing techniques, binary arithmetic and introductory Boolean algebra. Includes diodes, transistors, and integrated circuits in pulse and digital applications such as shift registers and ring counters.

EET 263 Electrical Engineering Technology Laboratory IV* Lab. 3 (1 cr.)
P or corequisite: EET 253. Selected experiments to provide a broad technical background. Experiments are selected from specialty areas such as communications, electrical power, television, computers, medical electronics, automatic controls, and aviation electronics.

EET 298 Industrial Practice II (1 cr.)
Practice in industry with written reports of this practice by the co-op students.

EET 302 Electro-Mechanical Control Components** Class 3, Lab. 2 (4 cr.)
P: MA 221. P or corequisite: EET 204 and EET 212. A study of the components in open-loop and closed-loop systems. Included are sensing devices, error detectors, potentiometers, synchros, resolves, modulators, demodulators, amplifiers, motors, generators, and networks. An analysis course that stresses operation, time- and frequency-response characteristics, and proper adjustment of the components.

EET 303 Communications I** Class 3, Lab. 2 (4 cr.)
P: EET 204 and MA 222 or consent of instructor. A study of AM and FM modulation and detection, receivers, transmitters, networks, filters, antennas, and transmission lines through the VHF frequency spectrum.

EET 306 Television I* Class 3 (3 cr.)
P: EET 203 and 213. A study of television transmission and receiving systems. Includes analysis of transmitted signal, FM, video amplifiers, power supplies, synchronization, deflection, alignment, and antennas.

EET 316 Television I Class 3, Lab. 2 (4 cr.)
P: EET 204. A study of television transmission and receiving systems. Includes analysis of transmitted signal, FM, video amplifiers, power supplies synchronization, deflection, alignment, and antennas.

EET 321 Generation and Transmission of Electrical Power* Class 3 (3 cr.)
P: EET 211. A study of the generation and transmission of electrical energy. Includes techniques used by electric utilities for the protection of generating equipment and transmission lines, an introduction to the economic considerations of power plant operation, and three-winding transformers and methods of solving unbalanced three-phase systems.

EET 331 Generation and Transmission of Electrical Power Class 3, Lab. 2 (4 cr.)
P: EET 212. A study of the generation and transmission of electrical energy. Includes techniques used by electric utilities for the protection of generating equipment and transmission lines, an introduction to the economic considerations of power plant operation, and three-winding transformers and methods of solving unbalanced three-phase systems.

EET 366 Transistors and Semiconductor Devices* Class 3 (3 cr.)
P: EET 203, 213, and MA 222. A study of solid-state diodes, controlled rectifiers, transistors, characteristic curves, bias techniques, parameters, equivalent circuits, small-signal amplifiers, power amplifiers, oscillators, and linear integrated circuits.

EET 368 Linear Integrated Circuits Class 3, Lab 2 (4 cr.)
P: EET 204 and 383 or consent of instructor. A study of the application if I.C. operational amplifiers, I.C. differential amplifiers to a multitude of applications. Specifications and limitations will also be stressed. Various special purpose I.C.'s that perform one given function will also be investigated.

EET 376 Electronic Troubleshooting Laboratory Class 1, Lab. 3 (2 cr.)
P or corequisite: EET 204 or EET 213. Experimental work in analyzing and repairing equipment. The use of test instruments to locate faulty components in AM and FM receivers, television, and industrial circuits.

EET 383 Advanced Electrical Networks Class 3 (3 cr.)
P or corequisites: EET 152 and MA 222. An advanced course in network analysis that stresses network theorems, solutions of time- and frequency-domain problems.

EET 396 Electrical Technology Class 2-4 and/or Lab. 3-9 (1-7 cr.)
Hours as arranged with staff. Special studies in electrical technology. Primarily for students who have completed the requirements for the degree of Associate in Applied Science. The primary objective of this course is to provide the advanced student with the opportunity to select and develop individual projects under the supervision of the staff. The student makes use of the knowledge and the many techniques acquired in the basic two-year technology curriculum.

EET 398 Industrial Practice III (1 cr.)
Practice in industry with written reports of this practice by the co-op students.

EET 417 Analog and Digital Circuits Class 3, Lab. 2 (4 cr.)
P: EET 317 and 383. A study of analog and digital devices; flip-flops, counters, shift registers, linear devices, multipliers, dividers, analog circuits, memory systems, multiplexing, and sequential circuit analysis and synthesis.

EET 462 Automatic Control Systems* Class 3, (3 cr.)
P: EET 383. The transfer function approach to the study of feedback control systems. Stability criteria are examined. Uses of Nichols charts, Bode diagrams and root-locus plots to predict performance are studied. Analog and digital simulation is introduced and various techniques are applied to selected industrial control systems.

EET 463 Communications II Class 3, lab. 2, (4 cr.)
P: EET 303 and 383. A study of high frequency systems (1-meter or less) and microwave technology to familiarize the student with the fields of radar, facsimile,

television, transmission lines, antennas, propagation, wave guides and cavities, and measuring equipment.

EET 472 Automatic Control Systems Class 3, lab. 2 (4 cr.)
P: EET 302 and 383 or consent of instructor. The transfer function approach to the study of feedback control systems. Stability criteria are examined. Uses of Nichols charts, Bode Diagrams and root-locus plots to predict performance are studied. Analog and digital simulation is introduced and various techniques are applied to selected industrial control systems.

EET 490 Senior Design Project, Phase I (1 cr.) hours arranged.
P: Consent of instructor. An extensive individual design and/or analytical project performed in consultation with one or more faculty advisors. Collaboration with representatives of industry, government agencies, or community institutions is encouraged. Evidence of extensive and thorough laboratory performance is required.

Phase I includes, but not limited to:
1. Faculty acceptance of project proposal.
2. Defining and limiting project objectives.
3. Initial research and source contacts.
4. Procurement of materials.
5. Periodic progress reports.

EET 491 Senior Design Project, Phase II (2-5 cr.) hours arranged.
P: EET 490

Phase II includes, but not limited to:
1. Continued research and finalized design.
2. Oral presentation to faculty and other interested parties.
3. Standard format written technical report.

EET 498 Industrial Practice IV (1 cr.)
Practice in industry with written reports of this practice by the co-op students.

EET 499 Electrical Engineering Technology Class 0-4, lab. 3-9, (1-9 cr.)
Hours and subject matter to be arranged by staff. Course may be repeated for credit up to nine hours.

*To be deleted effective Spring 1976.

**These courses will be offered as a three credit-hour lecture without laboratory in 1973-74.

ENGINEERING GRAPHICS

ADMINISTERED BY MANUFACTURING TECHNOLOGY

Professor R. E. Peale, Chairman.

Undergraduate Level
Lower-Division Courses

110. Drafting Fundamentals, Sem. 1 and 2, Class 1, Lab 6, (3 cr.)(1 IED, el.)
A basic course in drawing; orthographic projection, pictorial drawing, print reading, and reproduction of drawings. Problems designed to require practical reasoning and develop good techniques.

210 Industrial Sketching. Sem. 2, Lab 6, (2 cr.) (3 IED, el.)
P: EG 110. The application of freehand sketching on paper and the blackboard of industrial problems in representation and design using axonometric, oblique, perspective, and multiview drawings. Laboratory problems include drawing from the object, layout from notes, and simple design problems. Introduction to shade and shadow and artist's perspective.

317 Production Illustration. Sem. 1, Lab 6, or Class 1, Lab 6, (2 or 3 cr.) (el.).
P: EG 110. To give the student a good knowledge of and some experience in graphical construction and some rendering techniques necessary to produce accurate pictorial drawings suitable for catalogs, production planning, and design analysis.

GENERAL STUDIES

Administered By O. A. Paul, Chairman and Associate Professor of Supervison; Assistant Professor Cox.

220 Technical Report Writing. Class 3, (3 cr.)
Extensive application of the principles of good writing in industrial reporting, with emphasis on the techniques of presenting information graphically as well as in a clear, concise written form.

INDUSTRIAL EDUCATION

Associate Professor Fleenor, Chairman.

Undergraduate Level
Lower-Division Courses

IED 110 Introduction To Industrial Education Class 1, (1 cr.)
Overview of industrial education with emphasis upon its function and structure in industry and the public school.

IED 199 Selected Topics For Vocational Teachers In Service (1-8 cr.)
May be repeated to a total of eight credits. designed primarily for conditionally certified vocational teachers for development and improvement of basic teaching skills and license upgrading.

IED 260 Principles and Objectives of Industrial Education. Class 3, (3 cr.
P. or corequisite: IED 110. Historical, legislative, and theoretical foundations of industrial education; objectives of the various types of schools and programs.

Undergraduate Level
Upper-Division Courses

IED 375 Teaching Methods in Occupational Education Class 3, (3 cr.)
Development of competencies in the use and appraisal of the basic methods of teaching occupational subjects. Appropriateness, advantages, and limitations of specific methods.

Dual Level
Undergraduate-Graduate

IED 566 Educational and Industrial Coordination Class 3, (3 cr.)
P: senior standing or consent of instructor. Common problems of education and industry, with emphasis on the development and maintenance of close correlation between school programs of industrial vocational education and the manpower needs of industrial organizations.

IED 568 Development of Instructional Materials for Industrial and Occupational Education (3 cr.)

Principles of, and practices in, developing supplemental instructional materials and aids for courses in industrial and occupational Education.

IED 572 Contemporary Problems in Industrial and Occupational Education (3 cr.)

Analysis and implications of current problems in industrial and occupational education at the secondary, post-secondary, and adult levels. Immediate and long range effects along with solutions and alternatives will be considered.

IED 576 Cooperative Education Programs Class 3, (3 cr.)

P: senior standing or consent of instructor. History and development of cooperative education, underlying principles and theories, operating practices and programs, administrative and legal aspects.

IED 588 Technical Problems in Industrial Education (1-6 cr.)

P: consent of instructor. Supervised individual problem work in a technical subject matter area.

IED 590 Individual Research Problems (1-6 cr.)

P: consent of department. Opportunity for students to study particular problems in any phase of industrial education or to initiate themselves into research techniques under the guidance of a member of the staff. Does not include thesis work.

INDUSTRIAL ENGINEERING TECHNOLOGY

Administered by Professor Peale, Chairman of Manufacturing Technology; Associate Professor Bowman

Undergraduate Level
Lower-Division Courses

IET 104 Industrial Organization Class 3 (3 cr.)

A detailed survey of organizational structures, operational, financial, marketing, and accounting activities; duties of management, planning, control, personnel, safety, wages, policy, and human factors necessary for effective management.

IET 120 Systems and Procedures Class 3, (3 cr.)

An introduction to the systems concept. Surveys recognizing and defining the system's problem; the management audit and tools for systems analysis; design and control of forms, work simplification, work measurement and procedures; operations research; punched card systems; management and administration; and organization of the systems function.

IET 198 Industrial Practice I (1 cr.)

Practice in industry and written reports of this practice for co-op students.

IET 204 Techniques of Maintaining Quality Class 2, lab 3, (3 cr.)

P: MA 111 and 112, or 150. An analysis of the basic principles of quality control. Includes statistical aspects of tolerances, basic concept of probabilities, frequency distribution, X and R charts and uses of mechanical, electronic, air and light devices for checking and measuring to determine quality levels of acceptance.

IET 220 Critical Path Analysis Class 1, lab 3, (2 cr.)

Detailed study of planning and control of a schedule by network techniques, including the time/cost analysis of CPM scheduling for application on construction projects, job shop scheduling and related problems. Includes an introduction to PERT and the use of the computer for network analysis.

224 Production Planning and Control Class 2, lab 3 (3 cr.)

Preproduction planning of the most economical methods, machines, operations, and materials for the manufacture of a product. The planning, scheduling, routing, and detailed procedure of production control.

IET 250 Fundamentals of Production Cost Analysis Class 2, lab 2, (3 cr.)

P. or corequisite: IET 104. Surveys of fundamental mechanics of accounting, principles of account classification, financial and operating statements, and the generation of cost data according to cost accounting principles. Surveys the generation of cost data according to the principles of engineering economy. Examines applications of cost accounting data to specific management decision areas through selected case problems.

IET 262 Motion Study and Work Methods Class 2, lab 3, (3 cr.)

The study of the various techniques of motion study including process charts, operation charts, multiple activity charts, micro and memo motion study, therbligs, the movie camera, along with actual practice in their use. Includes study and application of the basic principles used to develop better methods of performing work.

IET 266 Work Measurement and Incentives Class 2, lab 3, (3 cr.)

P: IET 262. A study of the fundamentals of time study and work measurement with actual practice in their use. Includes stop watch time study, measuring work with movie camera, the establishment of allowances by both stop watch and work sampling studies, the establishment and use of predetermined time values, and the construction and use of work measurement formulae.

IET 268 Plant Layout Class 2, lab 3 (3 cr.)

P: EG 110, or equivalent. Arrangement of stock, machine, layout of aisles, and use of space, and material handling for the highest efficiency of production.

IET 272 Job Evaluation Class 2 (2 cr.)

A survey of the basic principles and significance of job evaluation. An analysis of current practices and techniques used in job analysis, job descriptions, and job evaluation.

IET 280 Wage Incentive Class 2 (2 cr.)

An analysis and study of various types of wage incentive plans, their significance, adaptibility, effectiveness, and equitability. A systematic appraisal of the basic objectives and currently used techniques in the administration of wage incentive programs.

IET 296 Industrial Technology Case Problems Class 2, (2 cr.)

Application of theories developed in the several industrial technology courses to selected general case problems—to provide practice in the integration of principles.

IET 298 Industrial Practice II (1 cr.)

Practice in industry and written reports of this practice for co-op students.

IET 299 Industrial Engineering Technology Class 0-4, lab 3-9, (1-9 cr.)

Hours and subject matter to be arranged by staff. Course may be repeated for credit up to nine hours.

Undergraduate Level
Upper-Division Courses

IET 301 Cost Evaluation and Control Class 3, (3 cr.)

P: IET 250 Designing, installing, and improving standard cost systems in industry, including the establishment of basic standards. Develops the mechanics of operating control reports utilizing principles of management by exception. The use of cost systems for estimating, scheduling, facilities planning, and making economic evaluations. The use of electronic data processing for establishing and analyzing production cost standards will be emphasized.

IET 312 Materials Handling Class 3, (3 cr.)
A survey of materials handling elements, the unit load, packaging, bulk handling, the economics of materials handling, improving existing handling methods, justification for handling equipment, special handling techniques, and the management of the materials handling divisions in the industrial organization.

IET 323 Production Planning and Expediting Class 2, lab 3 (e cr.)
Methods of planning for routing, tooling, equipment, costing and production of manufactured and processed products. Includes a detailed study of expediting procedures. P: IET 224

IET 324 Production Techniques Class 3, (3 cr.)
P: IET 224. MET 256 or MET 335. Continuation of operation planning with emphasis upon the equipment, tools, and techniques used in mass production. Adaptation of proposed plans to conform to existing facilities.

IET 351 Production Control Techniques Class 3, (3 cr.)
P: IET 224 and 301. The study of the various established techniques for analyzing and improving production operations. Emphasis is placed on the application of established analysis techniques such as critical-path scheduling, PERT inventory control, inventory management, forecasting, and linear programming. The use of computer programs for solving problems will be emphasized.

354 Attribute and Variable Sampling Class 2, (2 cr.)
P: IET 204. Survey single, double, sequential, variable, and continuous production sampling plans. It includes the calculation and plotting of OG, AOQ, and AOQL curves and determining the economic sampling number. Also includes the use of Dodge Romig, MIL STD 105 and MIL STD 414 tables.

IET 364 Total Quality Control Class 3, (3 cr.)
The course is aimed at determining customer needs and wants, interpreting these into a design during production, follow-up on field performance, and feeding back quality information to further improve the quality system.

IET 398 Industrial Practice III (1 cr.)
Practice in industry and written reports of this practice for co-op students.

IET 404 Industrial Organization Class 3, (3 cr.)
(Not open to students who have had IET 104.) A study of industrial organization structures and an introduction to managerial responsibilities including the activities of industrial administration, financing, managerial controls, product development, manufacturing engineering, material control, quality control, and manpower management areas of operations.

IET 450 Production Cost Analysis Class 2, lab 2, (3 cr.)
(Not open to students who have had IET 250.) An introduction to financial statements and to the study of the costs of production to financial statements and to the study of the costs of production in terms of break-even and least cost alternatives including present and future costs when related to the time value of money, budgeting, labor and overhead, production cost control and the role of the supervisor and the industrial engineering technologist to cost control.

IET 460 Motion and Time Study Class 2, lab 3, (3 cr.)
P: junior standing. Techniques of motion and time study, process charts, operation charts, multiple activity charts, micromotion study, therbligs, and stop-watch time study. (Not open to students who have IET 262.)

497 Senior Project Class 2, lab 2 (3 cr.)
Hours to be arranged. Directed work on individual projects for senior industrial engineering technology students.

498 Industrial Practice IV (1 cr.)
Practice in industry and written reports of this practice for co-op students.

INSTITUTIONAL MANAGEMENT

Associate Professor Dault, Chairman.

INSM 135 Introduction to Food Service and Lodging Industry Class 1, Lab. 4, (3 cr.)

An overview of supervisory careers, opportunities, and responsibilities in the food service and lodging industry.

INSM 200 Food Service and Lodging Practices SS. (1-2 cr.)

Varied practical work experience in a food service and lodging establishment under the supervision of the manager and the course instructor: six, 40-hour weeks or 240 clock hours for 1 credit; 480 clock hours for 2 credits.

INSM 210 Food Service Sanitation Class 3, (3 cr.)

The application of sanitary and public health engineering pinciples to food service and lodging operations.

INSM 300 Practicum in Institutional Management (1 cr.)

P: 15 credits in institutional management or consent of the head of the department. In-service training and practical experience, totaling at least 300 hours, in an approved food service and/or lodging operation.

INSM 320 Executive Housekeeping Class 3, (3 cr.)

The systematic internal control of hospitality spaces and equipment to safeguard public health and to utilize available aesthetic values in food and lodging environment.

INSM 337 Quantity Food Production Class 2, Lab. 6, (4 cr.)

Principles of quantity food production, menu planning, and merchandising with experience in each of these areas.

INSM 342 Personnel Management For Institutions.

The concepts of management of people for effective operation of institutions involving supervisory development and communications; the pretesting, training, and evaluating of employees and the development of attitudes and morale of people working together.

INSM 380 Specialty Food Service Class 1, Lab. 4, (3 cr.)

Exploration and creative use of specialty foods and unusual cuisine for the hospitality field. Concepts of management for the effective operation of quantity specialty food service organizations within a financial framework involving menu-planning, customer relations and production-service logistics.

INSM 438 Equipment For Institutions Class 3, (3 cr.)

Principles of selection, operation, and maintenance of food service equipment including materials, structural details, design, cost, performance and specification standards.

INSM 440 Institutional Food Purchasing Class 1, Lab. 2, (2 cr.)

Methods of buying, bases of selection, and storage of food.

INSM 441 Institutional Organization and Management Class 2, Lab. 3 (3 cr.)

Factors involved in establishing an institution, business policies and decision making, departmental organization, administrative development including management experience; job analysis and evaluation; salary and wage structures; employee benefits; personnel selection and employment practices including allocation of labor.

INSM 445 Food and Labor Cost Control Class 3, (3 cr.)

Work management methods and accounting control records are correlated and implemented to aid the student in management decision making.

INSM 460 Advanced Food Service Management Class 1, Lab. 6.

The assumption of maximum responsibility of the management of an actual

food service operation based on sound managerial principles and successful food production techniques.

FOODS AND NUTRITION

FN 203 Foods: Their Selection and Preparation Class 2, Lab. 3, (3 cr.)
Principles of food selection, preparation, and meal planning. Includes purchasing guides, nutrition principles, and meal service.

FN 303 Essentials of Nutrition 3, (3 cr.)
No prerequisites. Credit not given for both F&N 303 and 315. Basic nutrition and its application in meeting nutritional needs of all ages. Consideration is given to food selection and legislation and community nutrition education programs.

MECHANICAL ENGINEERING TECHNOLOGY

Manufacturing Technology

Professor Peale (Chairman); Associate Professors Close, Frank, Milgate, Stoelk, Ulrich; Assistant Professors Buehler, Moll, Tharp.

Undergraduate Level
Lower-Division Courses

MET 100 Applied Engineering Computations Lab 3, (1 cr.)
Practical application of the proper use of the slide rule, desk calculator, and an introduction to the electronic calculator, computer terminals and dimensional analysis. How to draw graphs and introduction to means of their reproduction.

MET 112 Applied Mechanisms Class 3, (3 cr.)
P: EG 110. An analysis of motions, displacements, velocities, friction wheels, instant centers, flexible connectors, cams, linkages, and gears.

MET 156 Graphic Computations Lab 6, (3 cr.)
P: EG 110; P. or corequisite: MA 112 or equivalent. Descriptive geometry principles applied to the solution of engineering problems; intersections and development of surfaces; layout of objects in space; and determination of clearances between objects in space.

MET 180 Materials and Processes Class 2, (2 cr.)
Application and characteristics, both physical and chemical, of the materials most commonly used in industry; the primary processes involved in producing these materials for industry.

MET 198 Industrial Practice I (1 cr.)
Practice in industry and written reports of this practice for co-op students.

MET 200 Power Systems Class 3, (3 cr.)
P: MA 150 or equivalent. A survey of steam and nuclear power plants, internal combustion engines, gas turbines, pumps, compressors, fans and blowers, refrigeration. Some theory in thermodynamics, combustion of fuels, heat transfer.

MET 204 Production Drawing Class 0, lab 6, (3 cr.)
P: EG 110. Application of principles of engineering drawing to detail, assembly, design layout, equipment installation, and related drawings.

MET 210 Applied Statics Class 2, (2 cr.)
P. or corequisite: MA 150, MET 100. 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.

MET 221 Applied Strength of Materials Class 4, (4 cr.) or class 3, lab 2, (4 cr.).
P: MET 210, MA 150. Principles of applied strength of materials primarily with reference to mechanical design.

MET 212 Mechanics of Materials Class 4, (4 cr.) or class 3, lab 2, (4 cr.)
P. or corequisites: MA 111 and Forces acting on rigid bodies at rest: embracing vectors, force laws and moment laws of equilibrium for various for systems, centroids, center of gravity and moments of inertia, strees and strain, riveted and welded joints, torsion, shear, bending and deflection of beams, combined stresses and columns.

MET 216 Machine Elements Class 4, (4 cr.) or class 3, lab 2, (4 cr.)
P: MET 221 or MET 212. A survey of the more important elements used in tools and machines, and their general characteristics pertaining to application and operational behavior that affect their design or selection.

MET 228 Machine Design Lab 6, (3 cr.)
P: MET 216, MET 330. Practical applications in the design of machines and products utilizing mechanical, pneumatic, hydraulic and electrical operation and control.

MET 232 Dynamics Class 3 (3 cr.) or class 2, lab 2, (3 cr.)
P: MET 211 or MET 212. Basic fundamentals of dynamics; displacement, velocities, accelerations, work energy, power, impulse, momenturm, and impact.

MET 236 Jug and Fixture Design Lab. 6, (3 cr.)
P: MET 204. Application of principles in the design and construction of drilling, milling, reaming and assembly jigs and fixtures; information related to materials, heat treatment and cost estimating.

MET 288 Die Design Lab 6, (3 cr.)
P: MET 204. Application of principles in the design and construction of piercing, blanking, forming, drawing dies; single combination, compound and progressive types dies. Cam and assembly dies. Related information as to materials, heat treatment, and cost estimating.

MRT 298 Industrial Practice II (1 cr.)
Practice in industry and written reports of this practice for co-op students.

MET 299 Mechanical Engineering Technology Class 0-4, lab 3-9, (1-9 cr.)
Hours and subject matter to be arranged by staff. Primarily for third- or fourth-semester students with special aptitudes. Course may be repeated for credit up to nine hours.

Undergraduate Level
Upper-Division Courses

MET 300 Applied Thermodynamics Class 3, (3 cr.)
P: MA 222 and MET 200. The fundamentals of thermodynamics including application of the first and second laws, enthalpy, entropy, reversible and irreversible processes.

MET 330 Introduction to Fluid Power Class 3, (3 cr.) or class 2, lab 2, (3 cr.) P: MET 211 or MET 212. A study of the development, transmission, and utilization of power through fluid power circuits and controls.

MET 332 Fluid Power Circuits Class 2, Lab 2, (3 cr.)
P: MET 330. Principles and practices for selecting and applying fluid power devices and related equipment to machine circuits for both linear and rotary motion. The nature of the work to be accomplished and the various fields of application will be analyzed.

MET 335 Basic Machining Class 1, lab 3, (2 cr.)
P: EG 110. A comprehensive survey of machine tools as they are used in converting work-pieces into finished products with consideration of cost, quality,

quantity, and interchangeability. Actual operation analysis of many machine tool setups will be provided for comparison studies.

MET 340 Piping and Plumbing Design Class 3, (3 cr.)
P: MET 350 . Design of plumbing systems, includes looses in pipes, fittings, nozzles, orifices, etc. Includes steam, water, and oil systems. Piping handbooks and catalogs are utilized in conjunction with the State of Indiana Piping Code.

MET 350 Applied Fluid Mechanics Class 3, (3 cr.)
P: MA 221 and MET 200. The fundamentals of fluid mechanics, including properties of fluid, pressure; hydrostatic force on submerged areas; kinematics and dynamics of fluid flow; friction losses and sizing of pipes.

MET 355 Production Machining Class 2, lab 3, (3 cr.)
P: MET 335. An intensive study of production processes, tools, setups, workpiece materials machinability, newer methods of machining, and the economics of efficient materials machining.

MET 360 Heating, Ventilating, and Air Conditioning Class 3, (3 cr.) or Class 2., Lab 2, (3 cr.)
P: MET 200. A study of heat losses, heat producing equipment, and cooling equipment in addition to the design of the direct systems. Includes controls and cost estimating for commercial, industrial and residential systems. Codes and standards are emphasized throughout the course.

MET 361 Refrigeration Class 3, (3 cr.) or Class 2, Lab 2, (3 cr.)
P: MET 200. Design and maintenance of refrigeration systems for large and small applications. This course is intended to complement MET 360 for large air conditioning systems.

MET 370 Introduction to Numerical Control Class 2, (2 cr.)
P: MET 335. An introduction to the numerical control process. The course includes history, economic evaluation, additional benefits, and a discussion of system components. Primarily directed toward the manufacturing process, the course covers vaious types of N/C equipment.

MET 371 Programming for Numerical Control Class 1, Lab 2, (2 cr.)
P: MET 335, MA 150 or permission of instructor. An introduction to manual and computer aided programming. The course covers manual point to point programming for both incremental and absolute systems and computer aided programming with the emphasis on the APT language.

MET 380 Materials and Processes Class 2, (2 cr.)
Open only to non-MET students. Application and characteristics, both physical and chemical, of the materials most commonly used in industry; the primary processes involved in producing these materials for industry.

MET 384 Instrumentation Class 2, Lab 3, (3 cr.)
P: MET 200 or Permission of Instructor. Introduction to the basic concepts and terminology of instruments. Procedures and techniques essential to industrial measurement and transmission of data. Emphasis on pressure flow, temperature level, and humidity measurements. Study of hysteresis repeatability, weighted signals, span, suppression and range.

MET 385 Fluid Power Systems Analysis Class 2, Lab 2, (3 cr.)
P: MET 350 and 330. Procedures and techniques essential for checking integrated systems; using electrical, mechanical, and fluid power equipment. Functional aspects, safety, efficiency, and the economics of systems combing features for power and control will be analyzed including automatic, semiautomatic and manually operated machines.

MET 398 Industrial Practice 111 (1 cr.)
Practice in industry and written reports of this practice for co-op students.

MET 426 Internal Combustion Engines Class 2, Lab. 2, (3 cr.)
P: MET 300. A study of the spark ignition, compression ignition and continuous burning internal combustion engines.

MET 497 Senior Project Class 2, Lab. 2, (3 cr.)
Directed work on individual projects for senior mechanical engineering technology students.

MET 498 Industrial Practive IV (1 cr.)
Practice in industry and written reports of this practice for co-op students.

MET 499 Mechanical Engineering Technology Class 0-4, Lab 3-9, (1-9 cr.)
Hours and subject matter to arranged by staff. Course may be repeated for credit up to nine hours.

POLLUTION CONTROL TECHNOLOGY

Administered by Professor Davis, (Chairman of Construction Technology)

Undergraduate Level
Lower-Division Courses

PCT 110 Introduction to Pollution Control Class 1, Lab. 3, (2 cr.)
An introduction to the pollution control areas of water supply, wastewater treatment, solid waste disposal, air pollution control, and other areas of environmental sanitation. Development of a broad understanding of pollution control problems related to communicable disease. Field trips are required.

PCT 210 Sanitary Chemistry and Biology Class 2, Lab. 6, (4cr.)
P: CHM 110; P. or corequisite: BIOL 220. A study of principles and procedures applicable to water and wastewater treatment, air pollution control, and solid waste disposal. An understanding of the theory as well as adequate laboratory techniques are developed.

PCT 220 Water Supply Operations Class 3, Lab. 3, (4 cr.)
P. or corequisite: PCT 210 and CET 253. Fundamental aspects of water supply operations. Topics include: water sources, treatment procedures, and distribution systems. Field trips are required.

PCT 221 Air Pollution Control Class 2, Lab. 3, (3 cr.)
P: PCT 210 Fundamental aspects of air pollution control, including sources and types of pollution, sampling procedures and analysis, and control methods. Field trips are required.

PCT 222 Solid Waste Disposal Class 1, Lab. 3, (2 cr.)
P: PCT 210. Composition and character of refuse, refuse collection, and disposal by means of sanitary landfill, incineration, and composting. Field trips are required.

PCT 223 Wastewater Treatment Class 3, Lab. 3, (4 cr.)
P. or corequisite: CET 253. Fundamental aspects of wastewater treatment, including sanitary and storm water collection systems, treatment procedures, and stream surveys. Field trips are required.

INDUSTRIAL SUPERVISION

Professor Wisner, Associate Professor Paul, Chairman; Assistant Professors Ebling, Gilbert, Weed.

Undergraduate Level
Lower-Division Courses

SPV 240 Labor Relations Problems Class 3 (3 cr.)
Problems of workers with possible solutions as suggested by organized labor

and management. Regulations concerning management, labor, the collective bargaining agreement, grievance and arbitration procedures.

SPV 252 Human Relations in Supervision Class 3, (3 cr.)
Study of the bases of human relations and organization of individual and group behavior. Special emphasis on typical supervisory relationships.

SPV 268 Elements of Law Class 3, (3 cr.)
An introductory law course with a brief comparison of the American federal system and the parliamentary system of government, and covering law with emphasis on judicial review, and court jurisdiction and procedure generally and basic law in particular.

Undergraduate Level
Upper-Division Courses

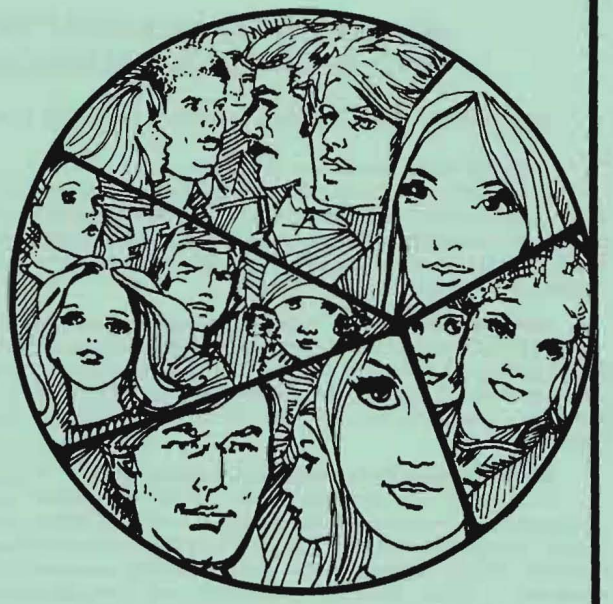
SPV 331 Occupational Safety and Health Class 3. (3 cr.)
P: consent of instructor. A presentation of those aspects of occupational safety and health which are essential to the first line supervisor. Emphasis is placed on developing an understanding of the economic, legal, and social factors related to providing a safe and healthful working environment.

SPV 368 Legislation Affecting Industrial Relations Class 3, (3 cr.)
Wage contracts and payments, workmen's compensation and insurance, injunction, strikes and boycotts, and statutes affecting labor.

SPV 374 Elements of Supervision Class 3, (3 cr.)
Introduction to and overview of the fundamental concepts of supervision. Emphasis is placed on the supervisor's major functions and essential area's of knowlege, his relations with others, and his personal development.

SPV 376 Personnel Problems in Industry Class 3, (3 cr.)
P: IS 374 or consent of instructor. Analysis of selected case problems, with emphasis on attitudes, philosophies, and responsibilities of supervisory personnel in relationship to the worker.

ENGINEERING COURSE OFFERINGS



DIVISION OF ENGINEERING

FRESHMAN ENGINEERING

Professor Max, Chairman; Associate Professor Bruyn.

ENGR 109 Introduction to Computer Programming Sem. 1 and 2. Class 2, (2 cr.)
An introduction to Fortran programming for engineering freshmen with some emphasis on solutions to engineering problems.

ENGR 190 Elementary Engineering Design Sem. 1. Class 2, Lab. 3, (3 cr.)
An introduction to engineering design.

ENGR B195. Engineering Problem Solving 1 Class 3, (3 cr.)
Corequisite: MA 163. Introduction to and practice in the use of mathematics in engineering, computer programming model building numerical and dimensional analysis application of vector and linear algebra and graphical solutions.

AERONAUTICS, ASTRONAUTICS AND ENGINEERING SCIENCES

Associate Professor Naghdi, Assistant Professor Gersting.

A&ES 507 Basic Mechanics III Class 3, (3 cr.)
P: ESC 206 or A&ES 208. Knowledge of differential equations assumed. Credit will not be granted for both A&ES 307 and 507. Kinematics, fundamental laws of mechanics, constraints and generalized coordinates, LaGrange equations, virtual work. Applications to particle dynamics, rigid body motion, theory of small oscillations, and stability of motion.

A&ES 546 Introduction To Solid Mechanics Sem. 1 and SS. Class 3, (3 cr.)
P: ESC 223 or A&ES 232 or equivalent. The purpose of this course is to provide a broad survey of the subject matter of solid mechanics. Topics covered include cartesian tensor notation, deformation, stress, balance laws, elastic and inelastic behavior of materials, two-and three-dimensional problems, and dynamics of solids. Staff.

A&ES 553 Elasticity in Aerospace Engineering Sem. 1. Class 3, (3 cr.)
Knowledge of ordinary and partial differential equations assumed. Undergraduates must have a 4.8 or higher graduation index or consent of instructor. A basic course in elasticity with applications directed toward needs of the aerospace engineer. Tensor index notation and summation convention. Three-dimensional equations of linear elasticity; orthotropic and isotropic solids. Two—and three-dimensional applications include turbines, orthotropic sandwich panels, and torsion and bending of multiple-cell aircraft structural sections. Yields and brittle fracture criteria; fatigue crack propagation.

A&ES 652 Theory of Plates and Shells Sem. 1. Class 3, (3 cr.) Admission by consent of instructor.
Formulation of boundary value problem for arbitrary configurations; bending and buckling under arbitrary loads; Green and Diracdelta functions; application of operational and variational calculus; vibrations; large deflection theory; thick shell theory; prismatic shells; dynamic instability; statistical properties of response to random vibrations; bending and buckling under random loads with random initial displacements.

ESC 205. Basic Mechanics I SS. only Class 3, (3 cr.)
P: PHYS 152; P. or corequisite: MA 261. Fundamental concepts, force systems, graphical representation of force systems, equilibrium, distributed forces, hydrostatics, virtual work, static stability, friction. First and second moments of areas, volumes, and masses, center of gravity. Application to structural and machine elements, such as bars, beams, trusses, cables, and friction devices.

ESC 206 Basic Mechanics II Sem. 1 and 2. SS. Class 3, (3 cr.)
(4 IE, 4 ME, 4 CE, 4 AGE). P: ESC 205 or ESC 221 and MA 261. Fundamental concepts, kinematics, translation, and rotation. Kinetics, impulse, momentum, work, energy. Rectilinear and curvilinear translation of point masses. Plane motion of rigid bodies and vibration. Application to projectiles, gyroscopes, machine elements, and other engineering systems.

ESC 223 Mechanics of Materials Sem. 1 and 2. SS. Class 3, (3 cr.)
(5 AGE, 4 CE, 5 IE, 6 ME, 6 MSE.) P: ESC 221 or equivalent. Analysis of stress and strain; equations of equilibrium and compatibility; stress-strain laws; extension, torsion, and bending of bars; membrane theory of pressure vessels; elastic stability; selected topics.

CHEMICAL ENGINEERING

CHE 205 Chemical Engineering Calculations Sem. 1 and 2 SS. Class 3, (3 cr.)
(3 CHE). P: CHM 116 or 117, MA 161, PHYS 152, or equivalent. Quantitative applications of material and energy balances to the chemical process industries. The use of chemical equations, yield of a chemical process; handling of multiple, by-pass, and recycle streams; and introduction to the first law of thermodynamics. Prof. Max

CHE 206 Stagewise Operations Sem. 1 and 2. SS. Class 2, (2 cr.)
(4 CHE) P: CHE 205, PHYS 251, or equivalent. The application of equilibria and heat and material balances for the design of separation processes. Use of Dalton's Raoult's, and distribution laws in development of equipment for distillation, absorption, and extraction. Stagewise successive separations and graphical methods of design used for them. Prof. Max

ELECTRICAL ENGINEERING

Assistant Professors Singh, Turpin, Yokomoto.

EE 201 Introduction to Electrical Engineering Sem. 1 and 2. SS. Class 3, (3 cr.)
(3 EE). P. or corequisites: MA 261 and PHYS 261. Physical basis of curcuit analysis. Volt-ampere descriptions of circuit elements. Circuit equations, Kirchhoff's laws, graphical analysis. Vacuum tube and transistor circuits. Exponential transients, sinusoidal steady-state, impedance. Magnetic circuits. Introduction to dc machines.

EE 202 Linear Electronic Circuits Sem. 1 and 2. SS. Class 3, (3 cr.)
(4 EE). P: EE 201 General analysis methods for linear electronic circuits. Systematic application of Kirchhoff's laws. Steady state frequency domain analysis. Terminal and port description of networks. Filters. Coupled amplifiers. General transient analysis via state variables.

EE 207 Electrical Engineering Laboratory I Sem. 1 and 2. SS. Lab. 3, (1 cr.)
(3 EE). P. or corequisite: EE 201. Laboratory exercises in instrumentation, device characteristics, vacuum tube circuits, waveforms, transistor circuits, magnetic devices, and energy converters.

EE 208 Electrical Engineering Laboratory II Sem. 1 and 2. SS. Lab. 6, (2 cr.)
(4 EE). P. or corequisites: EE 207, 202, and 251. Laboratory exercises in computer programming, modern devices, nonlinear and piece-wise linear synthesis, unipolar and bipolar transistors, resistive and first order nonlinear circuits, biasing and sensitivity, and linear amplifiers.

EE 251 Introduction to Nonlinear Circuits Sem. 1 and 2. SS. Class 3, (3 cr.)
(4 EE). P. or corequisite: EE 202. Foundations of nonlinear network theory. Operating point problem. Graphical analysis and synthesis of driving point and transfer characteristics of resistive networks. Resistive nonlinear functional networks-clippers, voltage, and current regulators. Iterative piece-wise linear

analysis and synthesis of dynamic networks. Dynamic nonlinear functional networks-multivibrators, time base generators.

EE 301 Signals and Systems Sem. 1 and 2. Class 4, (4 cr.)

(5EE). P: EE 202 and 208. Description of deterministic signals through the use of Fourier Series, Fourier and Z-Transforms. System description treated by differential and difference equations including transform methods. Computation of system response to both continuous and discrete inputs.

EE 302 Probabilistic Methods in Electrical Engineering Sem. 1 and 2. Class 3, (3 cr.)

(5 EE). P: MA 262; P. or corequisite: EE 301. An introductory treatment of probability theory including distribution and density functions, moments and random variables. Applications of normal and exponential distributions. Estimation of means, variances, correlation and spectral density functions. Random processes and response of linear systems to random inputs. Prof. Max

EE 311 Electric and Magnetic Fields Sem. 1 and 2 SS. Class 3, (3 cr.) (5 EE).

P: MA 262 and PHYS 261. Continued study of vector claculus, electrostatics, and magnetostatics. Maxwell's equations, Introduction to electro-magnetic waves, transmission lines, and radiation from antennas.

EE 402 Semiconductor Devices and Circuit Models. Sem. 1 and 2 SS. Class 4, (4 cr.)

P: EE 311 and PHYS 342. Conduction processes in solids. The operation of solid state devices is analyzed from a microscopic and equivalent circuit point of view.

EE 483 Automatic Control Systems Sem. 1 and 2 SS. Class 3 (3 cr.) (el.)

P: EE 352. Component and system transfer functions. Transient response to deterministic inputs and definition of time domain specifications. Open and closed loop frequency response. Bode diagrams. Nyquist diagrams, root locus, and frequency specifications. Stability and relative stability criteria. Introduction to synthesis.

EE D495 Senior Design I Sem. 1. Lect. 2, Lab. 3, (3 cr.)

P: Senior Standing This course and EE E495 make up a two semester series involving comprehensive design projects and a series of lectures on decision making in design. Live projects are obtained from the local industrial, municipal, state and educational communities. These projects permit the student to demonstrate his ability to use his total engineering experience in conjunction with a practicing engineer. Lectures consider such topics as: Boolean Algebra; inference; expectations; utilities, contingency tables; decision tries strategies and values and reliability. Prof. Hart.

EE E495 Senior Design II Sem. 2. Lect. 1, Lab. 6, (3 cr.)

P: EE D495 Continuation of EE D495. Prof. Hart.

EE T495 Electrical Engineering Laboratory IIB Sem. 2, Lab. 3, (1cr.)

P. or corequisites: EE 207, EE 202 and EE 251. Laboratory exercises in application of modern devices, nonlinear synthesis and first-order nonlinear networks.

EE Y495 Electrical Engineering Laboratory IIA Sem. 1 and 2, Lab. 3, (1 cr.)

P. or corequisites: EE 207 and EE 202. Laboratory exercises in measurement techniques, linear bipolar and field effect transistor amplifiers, biasing and sensitivity, and band-selective amplifiers.

EE500 Random Variables and Signals Sem. 1 and 2. SS. Class 3, (3 cr.)

P: EE 440 or 483 or graduate standing. Engineering applications of probability theory. Problems on events, independence, random variables, distribution and density functions, expectations, and characteristic functions. Dependence, correlation, and regression; multivariate Gaussian distribution. Stochastic processes, stationary, ergodicity, correlation functions, spectral densities, random inputs to linear systems; Gaussian processes.

EE 502 Lumped System Theory Sem. 1 and 2. Class 3, (3 cr.)

P: EE 440 or 483 or graduate standing. Basic methods of modern system theory. Time domain techniques for both linear and nonlinear systems. Characterization of both continuous and discrete-time linear systems in the time and frequency domains. Energy relationships and the restriction that positive energy storage places on physical systems.

EE 504. Electromagnetic Field Theory Sem. 1 and 2. SS. Class 3, (3 cr.)

P: EE 311 or graduate standing. Review of general concepts, (Maxwell's equations, materials interaction, boundary conditions, energy flow), statics (LaPlace's equation, Poisson's equation, mapping), distributed parameter systems (classification of solutions, transmission lines and waveguide), radiation and antennas (arrays, reciprocity, Huygen's principle), a selected special topic (e.g., quantum electronics, plasmas, coupled modes, relativity).

EE 506 Electrical Properties of Materials Sem. 1 and 2 SS. Class 3, (3 cr.)

P: EE 402 or graduate standing. Review of quantum mechanics. Crystal structure. Bravais lattices, energy bands. Conduction processes in metals and non-metals, effective mass, scattering mechanisms, continuity equation and junction theory. Fields-material interaction including dielectric losses and magnetic permeability. Energy converting properties of solids.

EE 546 Linear Graphs and Electrical Networks Sem. 1. Class 3, (3 cr.)

P: EE 301. Introduction to linear graph theory with emphasis on applications to electrical network theory. Classical network equilibrium equations. Formulation of the state equations. Topological formulas for network functions. Signal flow graph method of circuit and system analysis. The network flow problem.

EE 547 An Introduction to Statistical Communication Theory Sem. 1 and 2. SS. Class 3, (3 cr.)

P: EE 500. Communication as a statistical decision problem. Random signals in linear systems. Multidimensional Gaussian random processes. Vector representation of channels and signals, orthogonal expansions of signals, and geometric interpretation of signals in N-dimensional space. Information theory. Optimum receivers. Probability of error. Important channel models and analysis of various modulation methods. Optimum mean square filtering and estimation theory.

EE 548 Linear Active Network Theory Sem. 2. Class 3, (3 cr.)

P: EE 502 or 544; corequisite: MA 525. Foundations of linear networks; concepts of passivity, activity, reciprocity, causality, and stability. Scattering matrix and its application to broadband matching problems. Negative resistance amplifer. Synthesis of active RC networks. Sensitivity.

EE 554 Electronic Instrumentation and Control Circuits Class 3 (3 cr.) (el.).

P: EE 301 and 352. Analysis and design of special amplifiers, pluse circuits, operational circuits, DC amplifiers, and transducers used in instrumentation, control, and computation.

EE 555 Semiconductor-Circuit Analysis Sem. 1 and 2. Class 3, (3 cr.)

P: EE 352 and 402. Transistors as circuit elements, DC bias and stability, low-frequency small-signal amplifiers, power amplifiers, regulated power supplies, high-frequency models, broad-band low-pass implifiers, band-pass amplifier, transistors as switches, oscillators, tunnel diodes, tunnel diode circuits.

EE 556. Semiconductor Devices Class 3, (3 cr.)

P: EE 352 or equivalent. The electrical properties and applications of semiconductor devices.

EE 583 Introduction to Automatic Control Systems Class 3 (3 cr.)

P: Graduate standing (For off-campus nonelectrical engineering majors). Credit cannot be obtained for both EE 583 and ME 575. Mathematical modeling of a system. Linear systems analysis in the time and frequency domains. State variables and transfer functions. Stability, controllability, and observability. Feedback control design techniques. Equalizer synthesis on Bode-Nyquist and root-locus diagrams. Analytic design and parameter optimization techniques.

EE 586 Introduction to Modern Control Theory Sem. 1 and 2. Class 3, (3 cr.)
P: EE 502 or 583 for off-campus students. Discussion of basic theoretical methods in modern control theory. Topics include parameter optimization techniques, maximum principle and dynamic programming approaches to optimal control problems, second variation techniques and sufficient conditions, singular control and introduction to adaptive control.

EE 595 Selected Topics in Electrical Engineering (el.)
Hours and credits to be arranged.

EE 643 Pulse Techniques Sem. 2. Class 3, (3 cr.)
Must be preceded by EE 554. Fundamental principles underlying such modern applications as radar, loran, television, pulse time modulators, and radio altimeters.

EE 647 Modulation and Detection of Analog Signals Class 3, (3 cr.) Must be preceded by EE 547.
Nonlinear transformations of signals and noise are treated by the direct and transform method. Applications to square law detectors, limiters, etc. Estimation theory is reviewed and then applied to the optimum demodulation of analog signals. Linear (AM) and nonlinear (PM, FM) systems are treated. Applications include analysis of multiplex and diversity system and phase lock loops.

EE 688 Stability and Synthesis of Nonlinear Control Systems Sem. 2 Class 3, (3 cr.) Must be preceded by EE 586 and 588.
Liapunov stability. The Aizerman problem. Frequency domain stability criteria. Lurie stability functions. Synthesis of suboptimal controllers by means of Liapunov functions. Singular control. Topics in optimization of nonlinear systems. Controllability and observability. Applications to stabilization and control of space vehicles.

EE 697 Selected Topics in Electrical Engineering
Hours and credits to be arranged.

INDUSTRIAL ENGINEERING

IE 356 Human Factors in Engineering Design Class 3, (3 cr.)
P: IE 230, STAT 311, or EE 302. Engineering design and analysis of man-machine systems. Study of man's input, output, and processing subsystems. Measurement of human factors. Environmental and task considerations in the design and performance of total systems.

IE 533 Research Design and Analysis Sem. 1 Class 3, (3 cr.) (Tech. el. IE)
P: IE 330 or equivalent. Procedure for the effective planning, design and analysis of experimental research studies of industrial problems in order to optimize utilization of experimental equipment and resources. Interpretation of research results using univariate statistical analysis techniques.

IE 536 Operations Research Sem. 1 and 2. SS. Class 3, (3 cr.)
P: IE 330 and 335 or consent of instructor. (Not available to students with credit in IE 336.) An introduction to the literature and methodology of operations research (exclusive of linear programming). Applications to process design, inventory and production control, scheduling, waiting-line and replacement problems.

IE 543 Manufacturing Analysis Sem. 1 and 2. SS. Class 3, (3 cr.)
(Available at regional campus programs only.) Organization for production, manufacturing processes, process design, production control, forecasting, inventory control, estimating, data processing and system designing.

IE 554 Manufacturing Management Sem. 1 and 2. SS. Class 3, (3 cr.)
(Available at regional campus programs only. Work methods and measurement, job evaluation, and fundamentals of engineering economy and accounting as applied to manufacturing.

IE 546 Economic Decisions in Engineering Sem. 2. Class 3 (3 cr.) (Tech. el IE).
P: IE 336 or 536 and 431, or equivalent or consent of instructor. Analytical models and techniques as applied to industrial problems of replacement, production, resource allocation and related problems involving probabilistic behavior. Emphasis is given to model assumptions, implications, input data, and other information at the operating level.

IE 579 Advanced Production Control Sem. 1 and 2. Class 3, (e cr. (Tech. el. IE).
P: IE 478, 483, 480, or consent of instructor. Analysis of modern, quantitative techniques of production planning and control. Design of production control systems using methods of mathematical programming, probabilistic and deterministic models.

IE 666 Production Management Analysis Sem. 2 Class 3, (3 cr.)
Admission by consent of instructor. Production management policies with emphasis upon the improvement of performance in work situations. Measurement and improvement of productivity.

IE 679 Manufacturing Applications of Data Processing Sem. 2. Class 3, (3 cr.)
(Offered in 1973-74 and alternate years.) Must be preceded by IE 579 and a course in computer programming. Applications of electronic data processing to industrial systems. Problems and techniques for establishing compatible information and physical systems. Interdependencies among manufacturing, information, data processing and process control systems.

IE 690 Advanced Topics in Industrial Engineering SS. Sem. 1 and 2. Credit hours to be arranged.
Advanced study in various fields of industrial engineering for graduate students. May be repeated for credit with permission of adviser.

INDM 631 The Personnel Function Class 3, (3 cr.)
Basic concepts involving the personnel function in the business organization. Line and staff roles, motivation and leadership theory, and personnel techniques.

MATERIAL SCIENCE ENGINEERING

MSE 411 Engineering Materials Sem. 1 and 2. Class 3, (3 cr.) (7 ME, 8 ChE, el.).
P: a course in thermodynamics and a course in strength of materials. Structure of metals, ceramics, polymers, and other solid engineering materials. Crystallographic principles. Chemical bonding. Crystal imperfections. Phase equilibria. Irreversible processes in solids. Relations of structure to mechanical, physical, and chemical properties. Applications to materials selection and design. Prof. Max.

MSE 576 Corrosion Sem. 2 Class 3, (3 cr.) (el.).
P. or corequisite: CHM 373 or MSE 411. Rate-controlling steps in electrode processes; activation, ohmic, and concentration polarization; passivation; potentiostatic studies and alloy design; applications to engineering systems.

MECHANICAL ENGINEERING

Professors Max, O'Loughlin.

ME 303 Thermodynamics (IUPUI only). Class 4, (4 cr.)
P: MA 262 and PHYS 251. Introduction to the laws of thermodynamics. First law in closed and open systems. Second law from both microscopic and macroscopic viewpoints. Properties from statistical mechanics. Applications to engine cycles and chemical reactions. Prof. O'Loughlin

ME 310 Fluid Mechanics Sem. 1 and 2. SS. Class 3, Problem 1, Lab. 2, (4 cr.) (5 MF, 6 AGEN)

P: MA 262 ESC 206, and ME 200 or ME 307. Continuum, velocity field, fluid statics, basic conservation laws for systems and control volumes, dimensional analysis. Euler and Bernoulli equations, viscous flows, boundary layer, flow in channels and around submerged bodies, one dimensional gas dynamics. Prof. O'Loughlin

ME 315 Heat and Mass Transfer Sem. 2. Class 3, Problem 1, Lab. 2 (4 cr.) (6 ME). P. or corequisites: ME 302 and 310. Fundamental principles of heat transfer by conduction, convection, and radiation; mass transfer by diffusion and convection. Application to engineering situations. Prof. O'Loughlin

ME 340 Measurements and Computers Sem. 1 and 2. SS. Class 2, Lab. 3 (3 cr.) (5 ME).

P: MA 262 and EE 231 Characterization and behavior of typical measuring systems with emphasis on transfer function and frequency response techniques. Transducers, amplifiers, computing devices, readout devices, and their response to steady and transient phenomena. Calibrations and data analysis techniques are introduced. Introduction to analog and digital computers. Prof. Hart

ME D497 Senior Design I Sem. 1, Lect. 2, Lab. 3, (3 cr.)

P: Senior Standing This course and ME E497 make up a two semester series involving comprehensive design projects and a series of lectures on decision making in design. Live projects are obtained from the local industrial, municipal, state and educational communities. These projects permit the student to demonstrate his ability to use his total engineering experience in conjunction with a practicing engineer.

Lectures consider such topics as: Boolean Algebra; inference; expectations; utilities; contingency tables; decision tries; strategies and values and reliability. Prof. Hart

ME E 497 Senior Design II Sem. 2, Lect. 1, Lab. 6, (3 cr.)

P: ME D497. Continuation of ME D497. Prof. Hart.

ME 500 Thermodynamics Sem. 1 and 2. SS. Class 3, (3 cr.) (el.)

P: ME 302. The empirical, physical basis of the laws of thermodynamics. Formulation of the definitions and laws from the postulational approach. Properties and relations between properties in homogeneous and heterogeneous systems. The criteria of equilibrium. Application to a variety of systems and problems including phase and reaction equilibrium.

ME 501 Statistical Thermodynamics Sem. 1 Class 3, (3 cr.) (el).

P: ME 302. Experimental evidence for the quantization of energy and the existence of wave particle duality. Development of the Schroedinger theory and solution of simple cases. Details of atomic and molecular structure. The Maxwell-Boltzmann formulation of statistical mechanics and application to radiation and perfect gas behavior. The Gibbs formulation of statistical mechanics and application to metals, crystals, and real gases.

ME 505 Heat and Mass Transfer Sem. 1 and 2 SS. Class 3, (3 cr.) (el.).

P: ME 315. Heat conduction and mass diffusion in one, two and three dimensions with application of analytical, numerical, and analogical techniques; treatment of convective heat and mass transfer for internal and external flows by dimensional analysis, differential equations and integral method, and use of analogies between heat, mass, and momentum transport; radiation heat transfer for surfaces and gases; selected topics including combined heat and mass transfer, two phase heat transfer, and high speed flow phenomena.

ME 509 Intermediate Fluid Mechanics Sem. 1 and 2. SS. in odd-numbered years. Class 3, (3 cr.) (el.).

P: ME 310 or equivalent. Fluid properties, basic laws for a control volume, kinematics of fluid flow, dynamics of frictionless incompressible flow, basic hydrodynamics, equations of motion for viscous flow, viscous flow applications, boundary layer theory, unsteady flow.

ME 510 Gas Dynamics Sem. 1 and 2. SS. in even-numbered years. Class 3, (3 cr.) (el.).

P: ME 310 Flow of compressible fluids. One-dimensional gas dynamics including isentropic flow, normal and oblique shocks, Rayleigh line, Fanno line, and simple wave flows. Multi-dimensional compressible flow including general concepts, method of characteristics for nonlinear flows, and small perturbation theory for linearized flows. Shock reflection and interaction.

ME 513 Engineering Acoustics Sem. 1 Class 3, (3 cr.) (el.).

P: ME 563 or consent of instructor. The simple oscillator. Free and forced response. Applications to vibration isolation. Transient response. Applications to sonic boom excitation and spacecraft excitation by oscillating shocks. Wave motion in strings and bars. The acoustic wave equation. Sound transmission between two media and through walls. Building acoustics. Acoustic resonators and filters and applications to muffler theory.

ME 525 Combustion Sem. 2. Class 3, (3 cr.) (el.)

P: ME 501 Physical and chemical aspects of basic combustion phenomena. Rate processes and chemical kinetics. Chain reaction theory. Chain and thermal ignition. Detonation, deflagration, diffusion flames, heterogeneous combustion.

ME 528 Air Pollution Sem. 2 Class 3 (3 cr.) (el.).

P: ME 302 or 306 or 307 and 310 or permission of instructor. Definition of the air pollution problem. Kinds and sources of pollutants. Meteorology and the transport and movement of pollutants. Methods of controlling the quantities of dust, fumes, and mists generated in industrial processes. Aircraft, truck, and automobile exhausts and the pollution of the atmosphere. Biological and economic aspects of air pollution.

ME 560 Kinematics Sem. 1. Class 3 (3 cr.) (el.).

P: ME 370. Geometry of constrained plane motion with applications to linkage design. Type and number synthesis, size synthesis. Graphical, analytical, and computer techniques.

ME 563 Mechanical Vibrations Sem. 1 and 2. SS. Class 3, (3 cr.) (el.)

P: ESC 223 and ME 340. Review of systems with one degree of freedom including the LaPlace transformation. LaGrange's equations of freedom systems. Transfer functions for harmonic response, impulse response, and step response. Convolution integrals for response to arbitrary inputs. Principle frequencies and modes. Introduction to phase-plane for nonlinear problems. Applications to critical speeds, measuring instruments, isolation, torsional systems.

ME 575 Theory and Design of Control Systems Sem. 1 and 2. Class 3, (3 cr.) (el.).

P: ME 475. Techniques for modeling and control of systems using state and frequency domain descriptions, linear system theory, performance evaluation, compensation techniques, comparison of classical and modern design techniques.

ME 663 Advanced Mechanical Vibrations A Sem. 1 Class 3, (3 cr.)

Must be preceded by ME 563. Theory of small oscillations for discrete systems using matrix notation, influence coefficients, Dunkerly and Rayleigh approximations, orthogonality and normal coordinates for uncoupling dynamic equations. Formulation of equations for continuous systems, normal mode solutions, traveling wave solutions, and Rayleigh-Ritz approximations.

ME 697 Mechanical Engineering Projects SS. Sem. 1 and 2. Credit and hours to be arranged.

Individual advanced study in various fields of mechanical engineering. May be repeated for credit.

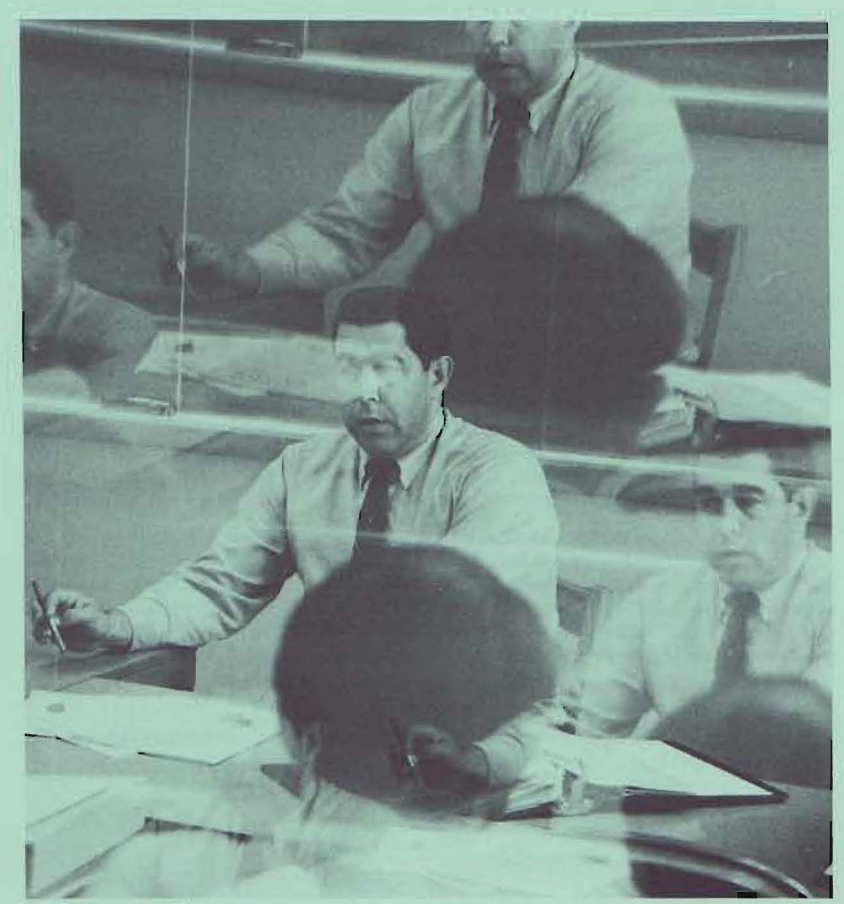
NUCLEAR ENGINEERING

NUCL 501 Nuclear Engineering Principles Sem. 1 Class 3 (3 cr.)
P: graduate standing in engineering or consent of instructor. A first course for graduate students desiring a nuclear engineering sequence. Nuclear structure; nuclear radiations; neutron behavior while slowing down and diffusing; fast and thermal reactor theory; and control.

NUCL 502. Nuclear Engineering Systems Sem. 2. Class 3 (3 cr.)
P: NUCL 501 or equivalent. Engineering aspects of nuclear power. Materials of construction: fuel and fuel cycles; heat removal; radiation shielding; economics; and nuclear power systems.

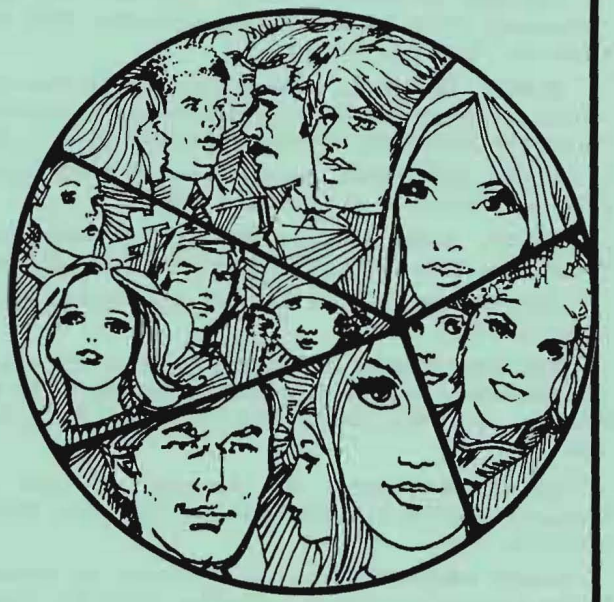
NUCL 510 Nuclear Reactor Theory I Sem. 2. Class 3 (3 cr.)
P: NUCL 501 or equivalent. Introduction to neutron transport theory; multigroup theory; heterogeneous reactors; and reactor kinetics.

NUCL 550 Nuclear Power Systems Sem. 2 Class 3, (3 cr.)
Must be preceded by NUCL 502, 510 and CHE 337 or equivalent. Utility systems, economics, thermodynamics and neutronic design parameters, fuels and materials, reactor core design. Consideration of typical reactor systems.



Lectures are part of the learning process

RESIDENT FACULTY



RESIDENT FACULTY

BECK, RICHARD J., Associate Professor of Civil Engineering Technology; (1962) B.S., University of Wisconsin, 1951; M.S., University of Illinois, 1959

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EET students test their projects

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GENERAL INFORMATION

PLANS OF STUDY

Division of Technology

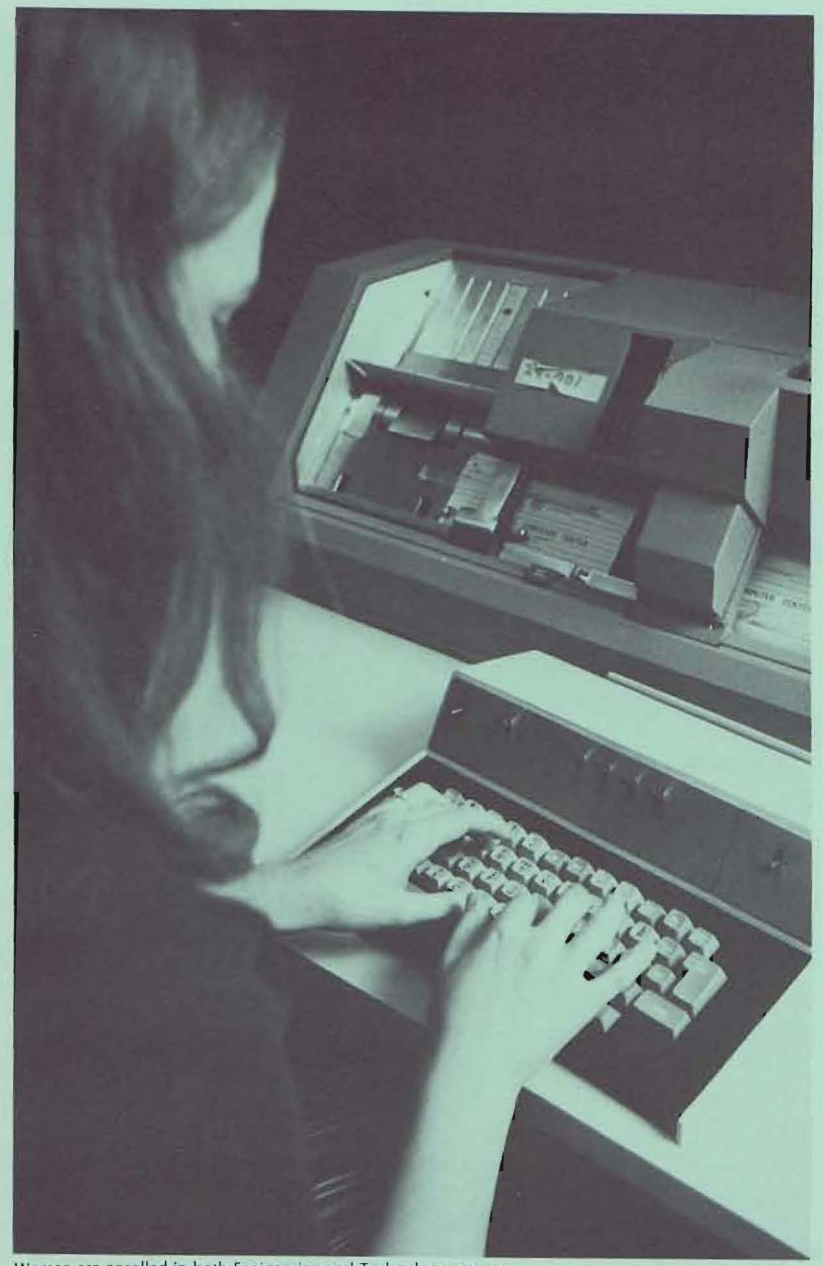
Division of Engineering

Technology Course Offerings

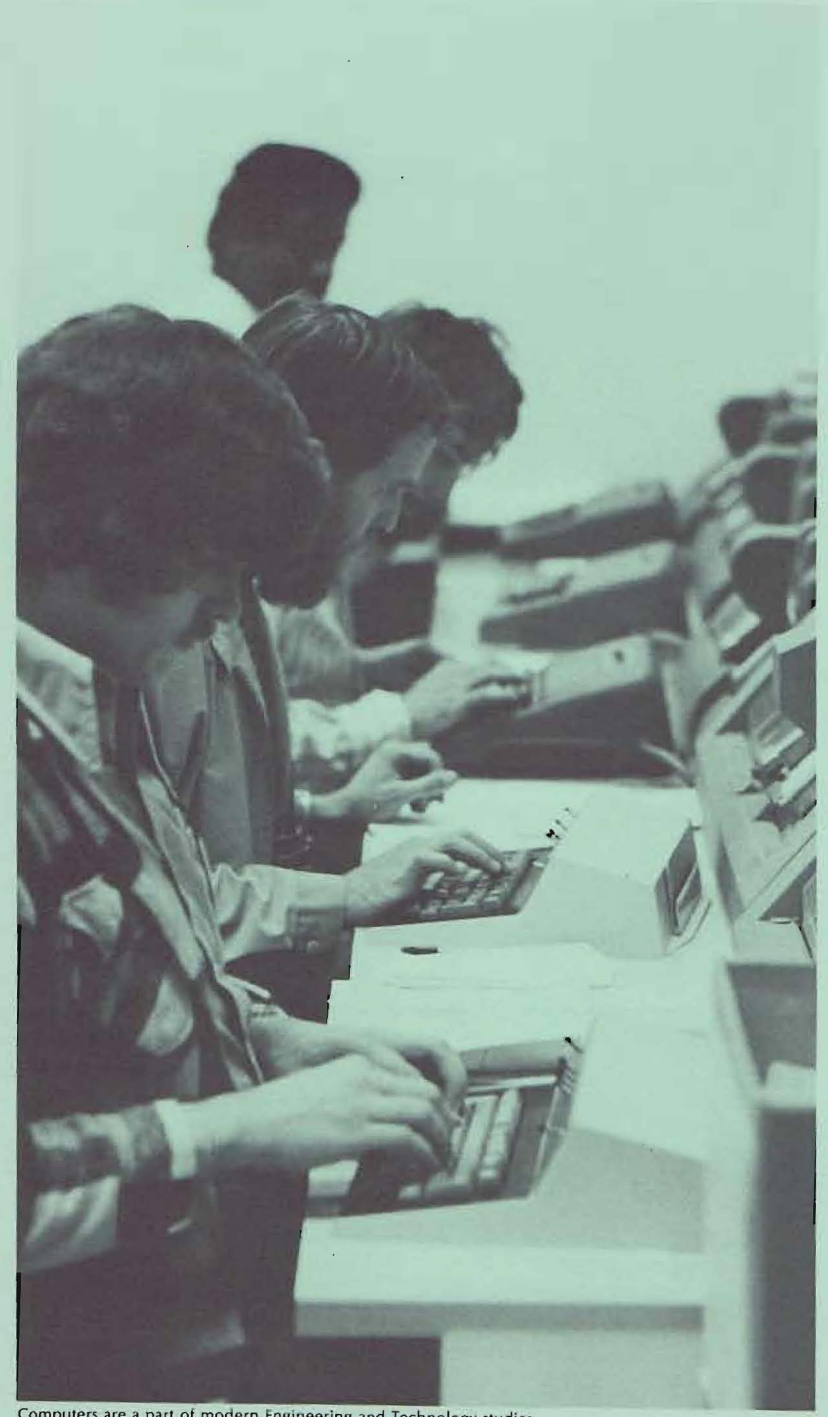
Engineering Course Offerings

IUPUI is composed of the following Academic Divisions:

Herron School of Art
School of Dentistry
School of Engineering and Technology
School of Liberal Arts
Indianapolis Law School
School of Medicine
School of Nursing
School of Science
School of Social Service
School of Physical Education
Division of Business
Division of Education
Division of Public and Environmental Affairs
University Division
Division of Allied Health Sciences



Women are enrolled in both Engineering and Technology courses



Computers are a part of modern Engineering and Technology studies