Purdue School of Engineering and Technology

Welcome to the Purdue School of Engineering and Technology!

The Purdue School of Engineering and Technology offers undergraduate and graduate programs that prepare students for careers in industry. The school is one of the largest degree-granting schools at IUPUI, with an enrollment of approximately 2,500 students. All degrees are awarded by Purdue University, with the exception of those awarded through the Department of Music & Arts Technology.

History

The School of Engineering and Technology was formed in 1972 and is the successor to Purdue University programs that began in Indianapolis in 1940. The first Purdue University courses in the city were defense training courses sponsored by the U.S. Office of Education. After World War II, the curriculum was changed from a certificate to a diploma program. Three technical-institute programs were established: drafting and mechanical technology, electrical technology, and supervision and production technology. Ten students graduated at the first commencement in 1947. Freshman engineering courses were added in 1948; the Bachelor of Science in Engineering degree was first offered in 1969.

Today the school offers undergraduate and graduate programs leading to Purdue University degrees. Several of the programs have transfer and articulation agreements with a few Indiana colleges and universities as well as with international institutions abroad.

Overview

Vision and Mission of the School

The vision of the Purdue School of Engineering and Technology at IUPUI is to be one of the best urban university leaders in the disciplines of engineering and technology.

The mission of the Purdue School of Engineering and Technology at IUPUI is to provide for our constituents:
• high quality, well-rounded, and relevant educational experiences in an urban environment;
• opportunities to develop technical proficiency, leadership, and lifelong learning skills;
• outreach and accessibility to the broader community through civic engagement;
• excellence in the pursuit of basic and applied research, scholarship, and creative activity; and
• activities that support the intellectual and economic development of business, industry, government, and community stakeholders.

The current strategic plan for the School of Engineering and Technology is located on its Web site: www.engr.iupui.edu/.

Accreditation & Licenses

- Computer Engineering Technology
- Construction Engineering Management Technology
- Electrical Engineering Technology
- Mechanical Engineering Technology
- Computer & Information Technology (*Pending*)
- Computer Graphics Technology (*Pending*)
- Mechanical Engineering
- Electrical Engineering
- Computer Engineering
- Biomedical Engineering (*Pending*)

The programs listed above are accredited by ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202, telephone 410-347-7700.

- Interior Design Technology (accredited by Council of Interior Design Accreditation (CIDA) and National Association of Schools of Art and Design (NASAD))

Contact Information

Purdue School of Engineering and Technology
Technology Building (ET) 215
799 W. Michigan Street
Indianapolis, IN 46202 (317) 274-2533 etinfo@iupui.edu

Requirements

Graduate Admission Requirements

Students who hold a baccalaureate degree from an accredited institution with a grade point average (GPA) of 3.00 on a 4.00-point scale, or with an overall “B” grade equivalent may be considered for admission to graduate degree programs in the School of Engineering and Technology. International applicants must submit official test score reports from the Educational Testing Service (ETS) for the Test of English as a Foreign Language (TOEFL) and the Graduate Record Exam (GRE) to be considered for admission.

Undergraduate Admission Requirements

Admission is based on evidence presented by individual applicants to show that they are capable of profiting from and contributing to one of the academic programs of the school. Inquiries about admission to engineering and technology programs, as well as requests for admission applications, should be addressed to the Office of Admissions, Cavanaugh Hall 129, 425 N. University Boulevard, IUPUI, Indianapolis, IN 46202-5140.

In determining the qualifications of an applicant to undergraduate engineering programs, the Office of Admissions uses the following criteria:

- Graduation from a high school accredited by a state Department of Public Instruction.
- The extent to which the student meets or exceeds the following minimum requirements:
  - High School GPA of 3.0.
  - Completion of Core 40 including chemistry and 4 years of math including trigonometry or pre-calculus.
  - Minimum SAT scores of 550 math and 480 critical reading or ACT scores of 23 math and 20 verbal.
- All applicants who have not completed a full year of college work are required to take the College

Entrance Examination Board (CECEB), Scholastic Assessment Test (SAT), or American College Test (ACT). For admission to the engineering programs, minimum SAT scores of 480 verbal (critical reading) and 550 mathematics or minimum ACT scores of 20 English and 23 mathematics are required.
- Because of a limitation on the total number of applicants that may be accepted as first-year students, out-of-state admissions may close at any time. When it becomes necessary to limit the number of Indiana residents accepted for a specific program, students will be offered admission to an alternate program or admission to the desired program for a subsequent semester.

Undergraduate Technology Admission Requirements

In determining the qualifications of an applicant to undergraduate technology programs, the Office of Admissions uses the following criteria:

- Graduation from a high school accredited by a state Department of Public Instruction.
- The extent to which the student meets or exceeds the following minimum requirements:
  - Complete Academic Honors Diploma, Core 40, or equivalent, with
    - High School GPA of 3.0 or higher, OR
    - Minimum SAT scores of 500 math and 450 verbal/critical reading, or equivalent ACT scores of 20 math and 17 verbal.

- All applicants who have not completed a full year of college work are required to take the College Entrance Examination Board (CECEB), Scholastic Assessment Test (SAT), or American College Test (ACT).
- Because of a limitation on the total number of applicants that may be accepted as first-year students, out-of-state admissions may close at any time. When it becomes necessary to limit the number of Indiana residents accepted for a specific program, students will be offered admission to an alternate program or admission to the desired program for a subsequent semester.

Transfer Students

Transfers

From IUPUI Schools, Indiana University Campuses, or Purdue University Campuses

Students wishing to transfer from these schools must have a minimum cumulative grade point average of 2.0 on a 4.0 scale and be in good academic and disciplinary standing. The required minimum cumulative grade point average may be higher in some programs. Students must follow the procedures listed below. After reviewing the transfer request and supporting materials, the school will inform students in writing of the acceptance or rejection of the application.

- IUPUI students or students in the IU system wishing to transfer into the School of Engineering and Technology must apply directly to their intended department. Transfers out of the School of Engineering and Technology must be processed by the school recorder.
- A Purdue University student from another campus must complete an official undergraduate application through the IUPUI Office of Admissions.
- If a student seeking admission to the School of Engineering and Technology previously has been dismissed for academic reasons, he or she must file a petition for readmission that will be reviewed by the Committee on Readmissions. The petition may be obtained from the Office for Academic Programs, School of Engineering and Technology, Room 215, 799 W. Michigan Street, Indianapolis, IN 46202.

From Other Colleges and Universities

Applicants transferring from colleges and universities other than Indiana University or Purdue University must fulfill the following requirements:

- An IUPUI application for undergraduate admission and a copy of high school records must be submitted to the Office of Admissions.
- An official transcript of all course work done, from all institutions previously attended, also must be forwarded to the Office of Admissions.
- For admission to an engineering or technology program, residents of Indiana must have a cumulative grade point average of at least 2.0 on a 4.0 scale, and out-of-state applicants must have an average of at least 2.5, for all courses previously taken at a recognized college or university. Transfer credits are evaluated by the Office of Admissions and distributed by the Office for Academic Programs in coordination with the department in which the student enrolls.
- There is a residency requirement to receive a degree: transfer students must complete a program of study that includes at least 32 credit hours for a bachelor's degree and at least 15 credit hours for an associate degree in the School of Engineering and Technology. For the associate degree, at least 6 out of the 15 credits are expected to be in the major. For the bachelor's degree, at least 12 out of the 32 credits are expected to be in the major at the junior level or higher.
- Individual academic programs may require that transfer students complete specific courses prior to admission with advanced standing.
- Transfer students must be in good academic and disciplinary standing at the college(s) previously attended. Students who have been dismissed for academic reasons by another college or university, or who have less than a 2.0 grade point average, must file a petition for readmission that will be reviewed by the committee on readmissions. The petition form may be obtained from the Office for Academic Programs, ET 215.

Transfer students may receive credit in the School of Engineering and Technology for successfully completed course work of equivalent amount and character from another accredited college. However, if a student changes to a different course of study in the process of transferring from another college or university, credits for certain courses may not be applicable toward requirements in the new curriculum.

Transfer credit is not granted for work done at institutions that are not fully approved by a regional accrediting

association of secondary schools and colleges. In addition to regional association approval, certain programs may require accreditation by professional organizations and/or societies before credit will be considered for transfer. Credit will not be transferred from any institution whose regional accreditation designation is A/V (Associate/Vocational-Technical).

The only exception is when agreements exist that specify courses or blocks of credit that will transfer into specific Purdue University degree programs.
Graduates of unaccredited institutions, proprietary institutions, or institutions accredited only as occupational training institutions are encouraged to review their academic plans carefully before seeking advanced credit. All prospective transfer students are encouraged to write or visit the school for further information about their opportunities.

To Other Indiana University Campuses

Indiana University credits transferred from one campus of Indiana University to another will be evaluated and accepted in terms at least as favorable as credits transferred from other accredited institutions in the United States. No review of the credits will be undertaken except on good-faith terms, using the same criteria as those used in evaluating external credits.

Special Expenses

Fees and Payment Procedures

University Fees

All fees are due and payable by the due date on the student's schedule confirmation and are subject to change without notice by action of the Trustees of Indiana University. A complete listing of all fees is published for each term in the class schedule. Extra laboratory fees may be charged when appropriate and when laboratory instruction is required.

Residency Status

The criteria for establishing in-state residency and thus qualifying for in-state fee rates are very strict. Inquiry about establishing resident status for fee purposes should be made to the registrar, who is the proper source of this information. Contact the Office of the Registrar, Cavanaugh Hall 133, 425 N. University Boulevard, IUPUI, Indianapolis, IN 46202-5144; phone (317) 274-1501 or visit http://registrar.iupui.edu/resident.html

Athletic Development Fee

This mandatory fee per semester is assessed on all students enrolled in credit courses held on campus. The athletic development fee is refundable on the same schedule as course fees upon withdrawal from campus courses. It is not assessed on students during the summer session enrollment periods.

Student Activity Fee

This mandatory fee is assessed on all students enrolling in credit courses held on campus. The student activity fee is refundable on the same schedule as course fees upon withdrawal from campus courses.

Student Technology Fee

Student Technology Fee income is used to fund technology resources that are directly accessible to students and of which students are the primary beneficiaries. Resources are interpreted to include not only technological equipment, but also personnel to support student use of the equipment. Guidelines for the allocation of Student Technology Fee funds by academic units require student participation in the planning process. Technology fees are based on a student's class standing as determined by the academic unit at the time the fees are assessed.

Late Enrollment and Late Program Change Fees

All classes are considered closed following final registration for a specific term. Schedule changes after that date are considered a special privilege and require special authorization and an additional fee. The student should refer to the appropriate class schedule for a listing of these fees.

The School of Engineering and Technology does not normally allow any student to register after expiration of the 100 percent refund period. (See "Refunds" in this section of the bulletin.)

Special Credit Fees

The Trustees of Indiana University have approved the following fee structure for special credit:

1. If the credit is awarded as a result of an examination within the first three semesters following matriculation, there is no charge.
2. If the credit is awarded as a result of an examination and the student is a first-semester transfer student, there is a nominal fee per credit hour.
3. If the credit is awarded as a result of an examination and the student does not meet either of the above conditions, the charge per credit hour is at the regular resident or nonresident rate.
4. If the credit is awarded as a result of experience or credentials, the student will be charged a nominal fee per credit hour.

Auditing Fees

An audit form must be presented to the Office of the Registrar from a student's school or division to audit a course for record. No grades or credits are received for audits. If a course is changed from credit to audit after the first week of classes, a late program change fee will be assessed.

Students who desire an official record of auditing a particular course will be charged full tuition. Written permission from the instructor must be obtained before a student may register to audit. Courses with a laboratory component may not be audited.

Other Fees

Students may also be required to pay special fees for the following services: housing, locker rental, parking, recreation, student identification card (depending on enrollment status and anticipated use), and transcript request. A complete listing of special fees is provided each term in the IUPUI *Schedule of Classes and IUPUI* Web site.

Payment Procedures

Payments must be made in cash or by bank draft, express order, postal money order, traveler's check, personal check, MasterCard, Visa, or Discover for the exact amount of fees due at the time of registration. For information

about this fee payment, refer to the IUPUI *Schedule of Classes or IUPUI* Web site www.iupui.edu.

Refunds

Refund credits are determined by the date the drop activity is processed by the IUPUI Office of the Registrar. For information about refunds, refer to http://bursar.iupui.edu/Help/default.htm.

To be eligible for a refund, the student must officially notify the Office of the Registrar at the time of withdrawal. Refund information for summer sessions and courses scheduled from 1 to 8 weeks in length is published in the *IUPUI Schedule of Classes*.

Financial Aid

It is the goal of IUPUI to encourage students in their educational endeavors and to reduce financial barriers. IUPUI recognizes that many students and their parents cannot 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 scholarships, grants, and loans.

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

Office of Scholarships and Financial Aid Cavanaugh Hall 103 425 N. University Boulevard IUPUI Indianapolis, IN 46202-5140 phone: (317) 278-FAST (278-3278) Web: http://www.iupui.edu/~finaid/

Application Procedures

Potential financial aid recipients must complete the Free Application for Federal Student Aid (FAFSA), which is available from high schools, on the Web, or at the Office of Scholarships and Financial Aid. The priority application deadline for any summer session and/or the following academic year is March 1, although applications will be processed as long as funds are available. Students who apply late should plan on finding other funds to pay for tuition and books until their financial aid applications are processed.

Eligibility

Financial aid awards are given on the basis of need as determined by the information supplied on the FAFSA. IUPUI students enrolled for 6 or more credit hours are eligible if need is demonstrated. The amount of the award will be less for part-time students than for full-time students; full-time student status is considered to be 12 or more credit hours. Only regularly admitted students and transient students from Purdue University are eligible.

Types of Aid

Financial aid is generally offered as a package consisting of a combination of scholarships, grants, loans, and/or work-study awards, although awards may vary with individual students. All awards are subject to the availability of funds.

Scholarships

Scholarships are awarded on the basis of academic achievement. Sources of scholarships may be both inside and outside IUPUI. Scholarship awards are often not based on need, and the student does not pay back the award later. An applicant will be contacted by IUPUI if you are eligible to apply for scholarships; if an application is required, it will be sent automatically.

Grants

Grants are awarded on the basis of need only and do not have to be repaid by the student.

Student Loans

Unlike scholarships and grants, loans must be repaid. Several different student loan programs are available at IUPUI. Some are based on financial need; some are not. Interest rates and maximum awards vary by program. Contact the Office of Scholarships and Financial Aid for details.

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 IUPUI Career Center, Business/SPEA Building 2010, 801 W. Michigan Street, (317) 274-2554, offers help in finding part-time jobs and maintains current information about part-time job opportunities. Students should contact this office for further information on employment assistance.

Work-Study Program

The Federal College Work-Study Program available at IUPUI was established by the Higher Education Act of 1965. The main purpose of the program is to give eligible students the chance to do paid work that will complement their academic programs and career aspirations. Students who have been admitted to IUPUI may apply through the Office of Scholarships and Financial Aid.

Veterans Benefits

Information on benefits, including Veterans Administration paid tutorial assistance and work-study opportunities, is available from the veterans affairs representative at the Office of the Registrar, Cavanaugh Hall 133, 425 University Blvd., IUPUI, Indianapolis, IN 46202-5144; (317) 274-1521 or (317) 274-1522, or visit http://veterans.iupui.edu/.

Courses

Key to Course Descriptions

The courses listed in this section will, for the most part, be offered during the 2010–02 academic years. Additional information about course schedules may be obtained from the specific departments in the school. Courses are grouped under their program subject abbreviation. Course descriptions may contain the following information, in this order: course number, course title, number of credit hours (in parentheses), number of hours of lecture per week, number of laboratory hours per week, number of hours per week for recitation (group discussion and problem solving), and prerequisites (P) and/or corequisites (C), followed by the course description. For example, under Electrical and Computer Engineering (ECE), a course description reads:

ECE 20200 Linear Circuit Analysis II (3 cr.) Class 3. P: 20100. P or C: MATH 26200. Continuation of 20100. Use of computer-aided design programs. Complex frequency plane, resonance, scaling, and coupled circuits. Two-port network parameters. Laplace transform methods.

Use of trees, general loop and nodal equations, matrix formulations.

This listing indicates that the course number is ECE 20200 with the title “Linear Circuit Analysis II” (a continuation of ECE 20100). It is worth 3 credit hours. The class meets 3 hours a week for lectures. A required prerequisite course (i.e., a course that must be completed before taking ECE 20200) is ECE 20100. Another prerequisite or corequisite (i.e., a course that must be completed at the same time as ECE 20200, if not sooner) is MATH 26200. A brief course description then follows.

The numbering system for courses reflects the following levels:
10000-29900: courses normally scheduled for freshmen and sophomores.
30000-49900: courses normally scheduled for juniors and seniors.
50000-59900: dual-level courses that may be scheduled for seniors and for graduate students for graduate credits.

Architectural Technology

ART 11700 Construction Drafting and CAD (3 cr.)
Class 1, Lab 4. C: ART 10500. Introduction to drafting and CAD fundamentals, with emphasis on architectural and civil engineering topics. Development basic drafting skills, using orthographic projections, auxiliary views, pictorial drawings, and drafting conventions.

ART 12000 Architectural Presentation (3 cr.)
Class 1, Lab 4. Three-dimensional drafting techniques including different perspective drawing techniques and techniques for production of presentation drawings for a client. Three-dimensional drafting techniques including different perspective drawings techniques and other 3-D drafting methods are covered. The course also includes rendering; shades and shadows; and coloring using pen, pencil, and color markers. Focus is on learning presentation methods rather than learning rendering techniques.

ART 15500 Residential Construction (3 cr.)
Class 2, Lab 3. P: ART 11700 and ART 16500. Wood frame residential construction through a semester project requiring planning, preliminary, and working drawings. Outside lab assignments are required.

ART 16500 Building Systems and Materials (3 cr.)
Class 2, Lab 3 Study of the structural systems used in structures. The study of properties, uses, and methods of incorporation of various construction materials in modern construction.

ART 21000 History of Architecture I (3 cr.)
Class 3. A survey of Western architecture from ancient times to the present day. Social, technological, and cultural influences on architectural styles are emphasized.

ART 22200 Commercial Construction (3 cr.)
Class 2, Lab 3. P: ART 15500. Preparation of preliminary and working drawings for an intermediate-sized commercial building. At the instructor's option, the work may be done in groups.

Biomedical Engineering

BME 22200 Biomeasurements (3 cr.)
The foundations of circuit theory are developed. Electronic instruments are used in the context of biomedical applications such as: transducers, electrodes, amplifiers; biopotentials; and medical devices such as heart pacemakers and defibrillators. Laboratory exercises explore standard equipment and its safe use in the measurement of biologically based signals. P: MATH 166. P or C: PHYS 251. Departmental permission required.

BME 24100 Introductory Biomechanics (3 cr.)
This course combines didactic lecture and laboratory and will introduce the student to the principles of biomechanics. Topics include: fundamental concepts of mechanics, force systems and couples, free body diagrams, dynamics of particles and rigid bodies, centroids and centers of gravity; second moments of area and volumes, and basic fluid mechanics. P: PHYS 15200.

BME 32200 Probability and Applications in BME (3 cr.)
Probability theory and statistical methods are developed for life science applications. Analytical tools such as hypothesis testing, estimation of moments, sampling theory, correlation and spectral analysis are developed and applied to identifying underlying processes in biological systems, developing realistic models of physiological processes, designing experiments, and interpreting biological data. P: BME 33400.

BME 33100 Biosignals and Systems (3 cr.)
This course applies mathematical analysis tools to biological signals and systems. Frequency analysis, Fourier and Laplace transforms, and state equations are used to represent and analyze continuous and discrete-time biosignals. Classic feedback analysis tools are applied to biological systems that rely on negative feedback for control and homeostasis. P: BME 22200 and MATH 26600.

BME 33400 Biomedical Computing (3 cr.)
This course explores numerical and computational approaches to analyzing biological data and solving biological problems. Students will learn to fit and interpret biological data, apply probabilistic and differential equation modeling techniques to biological processes, and assess appropriateness of numerical tools for biomedical applications. Special attention is given to the built-in analysis functions and toolboxes of MATLAB. P: ENGR 29700 and MATH 26600.

BME 35200 Cell/Tissue Behavior and Properties (3 cr.)
This course will introduce the students to the biological principles of cellular/tissue behaviors and properties. Topics include: fundamental concepts of cellular structure and tissue organization, biomolecular elements and their properties, cell shape, cell adhesion and migration, mechanotransduction, pattern formation in embryos, and stem cell and tissue regeneration. P: BIOL-K 324 and CHEM-C 106.

BME 35400 Problems in Cell/Tissue Behavior and Properties (3 cr.)

This course develops quantitative biomechanical methods to analyze cell/tissue behavior and properties and to solve biomechanical engineering problems. Through in-class exercises, students will analyze the mechanical processes and properties related to the mechanobiology of skeletal and cardiovascular tissues, mechanotransduction, and tissue regeneration. P: BME 24100. C: BME 35200.

BME 38100 Implantable Materials and Biological Response (3 cr.)
This course combines biomaterials, their biological response, and interactions between implantable materials and biological systems. Materials science of implantable materials; overview of implantable biomaterials and interactions between implants and biosystem; in vitro and in vivo biocompatibility tests; and specific examples on implant-tissue interactions, biocompatibility, and evaluation tools are presented. P: BIOL-K 101 and CHEM-C 106.

BME 38300 Problems in Implantable Materials and Biological Response (3 cr.)
This course supplements the basic science of BME 38100 with quantitative, analytical examples and problems related to fundamental engineering principles in implantable materials. Topics include: microstructure, phase transformation, processing and design issues related to major engineering materials used for implantation purposes. P: BME 24100 and CHEM-C 106. C: BME 38100.

BME 40200 BME Seminar (3 cr.)
This course explores career and professional topics in Biomedical Engineering. Topics include resumé writing, interviewing, and professional conduct; post-graduate education and life-long learning; and industrial, clinical, and research opportunities in Biomedical Engineering. P: Senior standing.

BME 40400 Ethics for Biomedical Engineers (3 cr.)
This course explores ethical issues in biomedical engineering practice, including professional ethics, medical ethics, the ethics of human and animal subject use in biomedical research, and the impact of biomedical engineering solutions on society and the environment. The BMES Code of Ethics will be presented and discussed. P: Senior standing.

BME 41100 Quantitative Physiology (3 cr.)
This course applies systems theory and explores feedforward and feedback control in the context of physiological systems. Control, frequency response, and linear systems conceps are applied to action potential generation, motor control, heart rate regulation, and other physiological processes. P: BME 33100.

BME 44200 Biofluid and Biosolid Mechanics (3 cr.)
This course explores fluid and solid mechanics in the context of the human circulatory system. Principal equations are derived from differential analysis of fluid flow, and models of characteristic flow conditions are fully analyzed. Biosolid mechanics, vessel biomechanics, and hemodynamic analysis of the circulation system will also be discussed. P: BME 35400.

BME 46100 Transport Processes in BME (3 cr.)
This course explores diffusion, heat and mass transfer, and transport processes in biological systems. Mathematical models of diffusion and transport are developed and applied to biomedically relevant problems including arterial transport, microdialysis, artificial organ design, and sustained drug delivery. P: BME 33400.

BME 49100 Biomedical Engineering Design I (3 cr.)
This course prepares students for engineering practice through a major design experience, encompassing conceptualization, requirements generation, and system and detailed design. Essential design constraints will be reviewed and applied including: safety, economic, and manufacturability. The course encompasses lectures, case studies, team formation, project assignments and generation of initial design. P: Senior standing and consent of department.

BME 49200 Biomedical Engineering Design II (3 cr.)
This course continues the design experience from BME 491 with verification, validation, and re-design of student projects. Regulatory and ethical design constraints will be discussed. Oral presentation and report writing are required. P: BME 49100.

Biomedical Engineering Technology

BMET 10500 Introduction to Biomedical Electronics Technology (1-3 cr.)
Class 1. Students will dive into the field without getting wet. To explore BMET, participants will monitor BIOMEDTALK, an e-mail chat group used by Biomedical Electronics Technicians as a forum for discussion of equipment-related issues and concerns. Students will discuss and research posted topics. Samples of topics posted in the past include hospital cell phone use and medical equipment interference from children's toys and games. Included in this course will be a visit to area hospital BMETs.

BMET 22000 Applied Human Biology for BMET (3 cr.)
Class 3. This course presents the human biology, anatomy, physiology, and medical terminology essential for biomedical equipment technicians and the devices involved in patient care. Focus is on the vocabulary necessary for effective medical communication skills in the hospital environment as part of the health care team.

BMET 24000 Introduction to Medical Electronics (3 cr.)
Class 3. P: 22000 and a fundamental knowledge of electronics. An overview of medical equipment used in the hospital and other medical environments to diagnose and treat patients. Sensors and physiological signals will be explained. Equipment found in various hospital departments and medical specialties will also be discussed. Patient safety and regulations will be emphasized.

BMET 29000 Biomedical Equipment Technician Practicum (4 cr.)
Class 3, P or C: BMET 32000. Practice working in industry as a BMET. Students work on a variety of

medical equipment and job tasks. Students receive some training in the form of inservice and orientation programs. An employer evaluation, student report and a minimum of 180 work hours are required. Students may need to successfully complete a criminal background check.

BMET 31000 Introduction to Radiography Systems (3 cr.)
Class 3. P: 22000 or equivalent and basic knowledge of electronics. The fundamentals of diagnostic radiography equipment will be explored. The principles of an X-ray system will be explained including the X-ray generation, image formation and film processing. Focus will be on both safety and quality.

BMET 32000 Biomedical Electronic Systems (4 cr.)
Class 3, Lab 3. P: 24000 and ECET 157. Hands-on study of medical instrumentation. Topics will include lasers, surgical microscopes, electrosurgical equipment, IV and PCA pumps, anesthesia delivering equipment, patient monitors, infection control and safety, NIBP equipment, defibrillators, an overview of imaging equipment and computer applications in medicine.

BMET 42000 Technology & Special Populations (3 cr.)
Class 3, P: BMET 32000 or equivalent. This course focuses on special patient populations in the clinical environment and the equipment that supplements their care. Groups would include neonates, cardiac intensive care patients, surgical patients and trauma. Emphasis is placed on medical needs and the related technologies.

BMET 44000 Codes, Regulation & Patient Safety (3 cr.)
Class 3, P: BMET 32000 or equivalent. This course explores applicable NFPA 99, JCAHO, CLIA and other regulatory agencies and their regulations governing medical equipment in the clinical environment. Case studies will be used to provide examples of interpretation and application.

BMET 47000 Special Topics in BMET (3 cr.)
Class 3, P: CHEM-C 110 and BMET 32000 or equivalent. This course will focus on present facts and discuss trends. Current journal articles and research will support the presentations.

BMET 49100 BMET Senior Project (3 cr.)
Class 3, P: Three BMET 30000 or 40000 level courses and ECET 49000. Extensive individual design and/or evaluation performed in collaboration with faculty and health care team members. Project is performed under the supervision of health care team members. Relation to the clinical environment required. Written and oral presentation of results are required.

Computer Graphics Technology

CGT 10100 Technical Graphics Lectures (1 cr.)
Class 1. An introduction to the academic and professional opportunities available in the field of technical graphics. Lecture presentations cover a wide range of material by instructors from the technical graphics program and guests. Attendance at all lectures is important, and major assignments include writing a resume and professional goals paper, readings from course textbooks, development of a personal Web page, and weekly quizzes and lectures.

CGT 10200 Graphic PC Basics (3 cr.)
This introductory course gives students hands-on experience in the graphics enhancement capabilities of standard productivity software. Students will learn and apply specialized graphics options that are often overlooked in standard Windows® office software. Emphasis will be on the efficient exploitation of the Windows® Graphical User Interface (GUI), the graphics capabilities of common productivity software, acquiring and linking graphical elements to documents, graphic file formats, and the implications of producing graphics-intensive documents.

CGT 11100 Design for Visualization and Communication (3 cr.)
Class 2, Lab 2. An introductory design course for computer graphics majors. Students develop an understanding of the basic design elements and principles, composition and typography through exercises and projects. The focus is on visual thinking, exploring the relationship between type and image, and developing multiple solutions to a given problem.

CGT 11200 Sketching for Visualization and Communication (3 cr.)
Class 2, Lab 2. This course applies fundamental computer graphics concepts of visualization, communication, and creativity within a sketching metaphor. Exercises and projects in graphic theory, problem solving, and sketching skill development provide students with activities that focus on further development within the discipline. A variety of sketching techniques are used to gather critical information and transform data into effective communication instruments.

CGT 11600 Geometric Modeling for Visualization and Communication (3 cr.)
Class 2, Lab 2. Core introductory applied computer graphics course that provides entry-level experiences in geometric modeling. Students develop geometric analysis and modeling construction techniques and processes to produce accurate computer models for graphic visualization and communication. Assignments apply graphics communication principles to problems involving visualization, coordinate systems, geometric constructions, projection theory, and database practices.

CGT 11700 Illustrating for Visualization and Communication (3 cr.)
Class 2, Lab 2. This foundation course stresses the use of pictorial illustration for visualization and communication. Various projection systems are introduced with discussion focusing on the appropriate use of view and system utilized to accentuate and provide clear communication. A variety of digital tools are used to construct, extract, and render pictorial views using vector and raster tools.

CGT 12000 Electrical and Electronic Drafting (2 cr.)
Class 1, Lab 2. P: ECET 15700. A basic course in electrical and electronic drafting, utilizing multiview and isometric drawing, sectioning, and dimensioning practices. Documentation of design through schematic

diagrams, wiring diagrams, and printed circuit board layout. Application of graphics standards for electronic, power, and industrial control circuitry.

CGT 21100 Raster Imaging for Computer Graphics (3 cr.)
Class 2, Lab 2. P: 11600 and 11700. Digital images are produced using a variety of computer technologies. Advanced color theory, surface rendering, and light control are emphasized in relation to technical illustration, hardware characteristics, and software capabilities.

CGT 21600 Vector Imaging for Computer Graphics (3 cr.)
Class 2, Lab 2. P: 21100. Full-color vector illustrations for a variety of uses are produced using computer methods. Color theory, surface analysis, and rendering techniques are emphasized as they apply to vector-based illustrations.

CGT 22100 Graphic Representation (3 cr.)
Class 1, Lab 4. An introduction to 3-D CAD modeling and rendering as applied to interior spaces and environments. Efficient 3-D surface and solid geometric modeling strategies are emphasized in the creation of structures and furniture. Basic digital lighting issues are also addressed in relation to artificial lighting schemes and mechanisms.

CGT 22600 Introduction to Constraint-Based Modeling (3 cr.)
Class 2, Lab 2. P: 11600, 11200, and MATH 151. Introduction to 2-D and 3-D geometry and techniques used in the construction of constraint-based models. Emphasis on the downstream applications of 3-D solid modeling databases.

CGT 24100 Introduction to Computer Animation (3 cr.)
Class 2, Lab 2. P: 11600, C: 21100. This course introduces the knowledge base on which digital animation and spatial graphics are founded and developed. Emphasis will be placed on developing a working knowledge of the underlying process of 3-D animation, including mechanics of 3-D geometric formats; spline, polygon mesh, and NURBS modeling; procedural mapping of raster images; simplified modeling, rendering methods; hierarchical linking; keyframe animation; thumbnail storyboarding and scripting fundamentals. .

CGT 24200 Technical Graphics for Supervision (2 cr.)
Class 1, Lab 2. An introduction to commonly encountered technical drawing practices; multiview representation, isometric pictorial, reading drawings, dimensioning practices, and working drawings. Emphasis is on technical graphics as technical communication through freehand sketching.

CGT 25100 Principles of Creative Design (3 cr.)
Class 2, Lab 2. P: 11700. This course introduces the design of the human computer interface coupled with traditional graphical design concepts applied to the creation of dynamic digital tools. Concepts are applied to multimedia and hypermedia products and the related print-based materials normally associated with them. Students learn graphic design, interface design, and information design to create effective and visually stimulating communication devices using multimedia and hypermedia tools.

CGT 26200 Introduction to Construction Graphics (3 cr.)
Class 2, Lab 2. Study of graphic solutions to problems conditioned by traditional and emerging construction document standards. Students will produce graphics using sketching and computer-assisted processes.

CGT 26700 Applications of Construction Documentation (3 cr.)
Class 2, Lab 2. P: 11200 and 11600. Principles of document standards applied to creation and distribution within the construction enterprise. Construction documents are created as products of a computer model database.

CGT 29900 Current Issues/Seminar: Portfolio Review (1-3 cr.)
Class 0-3, Lab 0-9. Hours and subject matter to be arranged by staff. Course may be repeated for up to 9 credit hours.

CGT 32100 Advanced Pictorial Representation (3 cr.)
Class 1, Lab 4. P: 22100. The importance of tone, texture, color, and entourage is stressed in the rendering of architectural interiors and exteriors.

CGT 32300 Introduction to 3-D Surface Geometry (3 cr.)
Class 2, Lab 2. P: MATH 221. Introduction to the visualization and creation of 3-D computer-generated surface models and their applications in today's manufacturing, communications, and publishing industries. Emphasis on creating, editing, and manipulating 3-D models. Efficient modeling strategies, data exchange, and orthographic view extraction are included.

CGT 32600 Manufacturing Graphics Standards (3 cr.)
Class 2, Lab 2. P: MET 24200. Introduction to ANSI drawing standard practices including section views, dimensioning and tolerances, GDT, ISO 9000, fasteners, multiview drawings, working drawings, mechanisms, ECOs, symbols, and manufacturing processes as they apply to engineering drawings.

CGT 34000 Digital Lighting and Rendering for Computer Animation (3 cr.)
Class 2, Lab 2. P: 24100. The development of a working knowledge of perspective display of three-dimensional models and the resulting effects of projected light sources on shade, shadow, color, texture, and atmospheric effects in architecture, product illustration, and animation. Emphasis will be placed on lighting design, analysis, and photorealistic simulation for commercial graphic applications.

CGT 34100 Motion for Computer Animation (3 cr.)
Class 2, Lab 2. P: 34000. An applied course covering three-dimensional computer graphic animation for graphics specialists and professionals involved in the use of technical design, time and motion study, surface texture mapping, digital lighting, color, and the technology required to produce computer animations for commercial

applications in manufacturing design, marketing, and training.

CGT 34600 Digital Video and Audio (3 cr.)
Class 2, Lab 2. P: 24100. Covers the use of digital technologies for video and audio focused toward use in multimedia, hypermedia, and animation products. Students examine the methods for creating, sampling, and storing digital video and digital audio and the constraints placed on these media assets when used for media-based products. Emphasis is placed upon the technology of digital video and audio including formats, data rates, compressors, and the advantages and disadvantages of the different technologies.

CGT 35100 Multimedia Authoring (3 cr.)
Class 2, Lab 2. P: 25100. This course introduces the many facets of interactive multimedia design and production. Students are introduced to interaction-based authoring programs used for information delivery with special attention focused on the integration of various media assets for communication. Students also concentrate on the storage, management, and retrieval of media assets in a production environment. Considerable time is spent on the systematic design of interactive media products to meet specified goals of communication.

CGT 35600 Dynamic Content Development (3 cr.)
Class 2, Lab 2. P: 25100. A course focusing on the development of hypermedia for information distribution. The course stresses development strategies for managing the brief and rapidly changing information of corporations and organizations for just-in-time distribution. Topics include intranets, extranets, networks, the World Wide Web, development languages, and other newly developed technologies.

CGT 36200 Applications of Construction Documentation II (3 cr.)
Class 2, Lab 2. P: 21600, 26600, and CIT 17500. A further study of the creation, archiving, integrating, qualifying and utilization of a computer-generated three-dimensional architectural model within a construction enterprise. The three-dimensional model, as a database, is emphasized through numerous applications.

CGT 41100 Contemporary Problems in Computer Graphics (3 cr.)
Class 3; or Class 2, Lab 2. P: senior standing. Groups will identify, design, qualify, manage, create, and present a final project relative to existing or emerging issues within computer graphics. Activities and experiences will explore related topics such as project planning and management, user expectations, project politics, interpersonal communications skills, and quality management. The course concludes with faculty, peer, and practicing professional evaluation of oral, written, and media presentations.

CGT 41500 Seminar for Senior Design Project (1 cr.)
P: senior standing. Preliminary work toward the senior design project is carried out with guidance from faculty. This course includes background research, review of previous projects, definition of project requirements, and the successful creation of a formal project proposal. The course concludes with a proposal presentation to faculty.

CGT 41600 Senior Design Project (3 cr.)
Class 3; or Class 2, Lab 2. P: 41500. This capstone course requires students to engage in a substantive endeavor directed at solving problems related to computer graphics. Activities include the creation and management of graphic systems and media assets per the requirements of the senior design proposal. Students are required to demonstrate professional attitudes and attributes in the timely completion and presentation of their project.

CGT 42300 Manufacturing Document Production and Management (3 cr.)
Class 2, Lab 2. P: 32600. An overview of relevant topics which impact manufacturing document production and control technology with an emphasis on PDM, ASP's, and extranets. This course will explore the management and presentation of graphical Web databases. Attention will be given to data transfer, file conversions, techniques for storing and retrieving databases in a variety of formats, and editing databases.

CGT 41600 Senior Design Project (3 cr.)
Class 3; or Class 2, Lab 2. P: 41500. This capstone course requires students to engage in a substantive endeavor directed at solving problems related to computer graphics. Activities include the creation and management of graphic systems and media assets per the requirements of the senior design proposal. Students are required to demonstrate professional attitudes and attributes in the timely completion and presentation of their project.

CGT 44200 Production for Computer Animation (3 cr.)
Class 2, Lab 2. P: 34100. An applied course covering advanced spline modeling techniques, lighting techniques, applied shading, motion dynamics and controllers, particle systems, application customization programming, and pre-production development and planning. In addition to developing a working knowledge of advanced techniques, a scholarly study of emerging advancements in computer animation and spatial graphic technology will be included.

CGT 44600 Digital Preproduction (3 cr.)
Class 3; or Class 2, Lab 2. P: senior standing and consent of instructor. A variety of commercial applications of technical animation and spatial graphics are analyzed and produced with special emphasis upon client development, design, organization, scripting, storyboarding, technical production, management, and evaluation.

CGT 45100 Multimedia Applicant Development (3 cr.)
Class 2, Lab 2. P: 35100. As a continuation of 35100, this course focuses on the use of authoring programs to create interactive multimedia products. Significant time is spent on intermediate to advanced programming and scripting as well as the synchronization of aural and graphical components. Students are required to plan, design, and implement a major project, and a final presentation is required.

CGT 45600 Dynamic Content Development II (3 cr.)
Class 3; or Class 2, Lab 2. P: 35600. This course presents the advanced technologies available for use on the World

Wide Web and within corporate intranet environments. Emphasis and discussion are focused on the advantages and disadvantages of these technologies as well as implementation to create unique solutions for business and industry. Strategies for planning, development, and implementation will be discussed and demonstrated.

CGT 49900 Selected Topics in Computer Graphics (1-3 cr.)
Hours and subject matter to be arranged by staff. Course may be repeated for up to 9 credit hours.

Computer & Information Technology

CIT 10600 Using a Personal Computer (3 cr.)
Class 2, Lab 2; or Class 3. This course provides an introduction to word processing, spreadsheet, and presentation software. It also includes instruction in basic computer concepts, the use of Windows operating systems, the Internet, and collaborative tools. Applications are taught through the use of problem solving tutorial assignments, projects, and tests.

CIT 11200 Information Technology Fundamentals (3 cr.)
Class 3. This course provides students with a working knowledge of the terminology, processes, and components of information systems and the application development process. Students will receive hands-on experience with the Internet and the World Wide Web, as well as state-of-the-art hardware and software.

CIT–E 12300 Internet Skills (3 cr.)
This course is designed to provide students with the skills needed to successfully use the Internet and to increase an individual's competency in the global communication environment.

CIT 14000 Programming Constructs Laboratory (3 cr.)
Class 3. This course provides students with a working knowledge of the terminology, processes, and components of information systems and the application development process. Students will receive hands-on experience with the Internet and the World Wide Web, as well as state-of-the-art hardware and software.

CIT–C 19800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

CIT 20600 Advanced Computer Applications (3 cr.)
P: CIT 10600. This course will cover the advanced topics of office applications in Word, Excel, PowerPoint, and Access, as well as establishing desktop publishing skills using Microsoft Publisher. There will be a strong emphasis on Web-driven applications. Topics include Web forms, data-driven documents, financial functions, worksheet queries, Web spreadsheets, Web databases, interactive OLE, macros, graphics, VBA, brochures, newsletters, business forms, and relational databases.

CIT 21200 Web Site Design (3 cr.)
Class 3. This course is designed to give the students an Introduction to web site design and site creation. The course involves learning current standard XHTML fundamentals, CSS and design concepts. The proper design approach for constructing Web sites and related techniques will also be covered.

CIT 21300 Systems Analysis and Design (3 cr.)
Class 3. P: CIT 14000 or CIT 21500 and P or C: CIT 21400. This course provides students with the concepts, processes, and tools of systems analysis and systems design. Object-oriented methods and tools are utilized with a focus on developingweb-based interfaces and prototypes.

CIT 21400 Introduction to Data Management (3 cr.)
Class 3. P: CIT 11200 or CIT 12000 or M118 or MATH 154 or MATH 159.Introduction to basic database development concepts. Extensive exploration of data manipulation using a relational DBMS and SQL. Students develop database applications using MS Access and SQLPlus.

CIT 21500 Web Programming (3 cr.)
Class 3. P: CIT 21200 and P or C: CIT 21400.This course will provide students with the knowledge and techniques of a variety of Web programming languages. Both client and server side languages will be examined and will include, PHP, MySQL, and JavaScript.

CIT 22000 Quantitative Analysis II (3 cr.)
Class 3. P: CIT 12000 or ECET 109 or MATH 153 or MATH-M 118. A continued investigation into problemsolving tools and techniques that focus on both hardware systems and quantitative data analysis. The course is designed for CIT majors in their second full year of study.

CIT 23300 Hardware/Software Architecture (3 cr.)
Class 2, Lab 2; or Class 3. P: CIT 11200. This course presents a detailed investigation of computer hardware and software. Looking at hardware and software components, along with several operating systems, students should enhance their knowledge of the interrelations between these components. In addition, through the use of programming examples, the student will learn about the structure of the microprocessor and microcomputer basics and gain detailed knowledge of computer components and their functions.

CIT 24200 Introduction to ASP.Net Programming (3 cr.)
Class 2, Lab 2; or Class 3. P: CIT 14000 and CIT 21200.This course will provide students with the tools and techniques to build dynamic Web sites using the ASP.Net programming environment. Students gain hands-on experience building a database-driven Web site.

CIT 27000 Java Programming (3 cr.)
Class 3. P:CIT 14000. This course is an introduction to the Java programming language. Students will learn the

syntax of the language, how to use objects, classes, and methods, and will perform programming exercises that illustrate how Java is used in stand-alone applications and applets.

CIT 28600 Operating Systems and Administration (3 cr.)
Class 2, Lab 2; or Class 3. P: (CIT 23300 or ECET 20900) AND (CIT 24200 or CIT 27000).). In this course students will learn the fundamental concepts of computer operating systems. The course will emphasize terminology and concepts of major operating systems including UNIX, DOS, and Windows.

CIT 29000 Computer Project (1-4 cr.)
Independent study for sophomore students wanting to execute a complete computer-oriented project. Course may be repeated for up to 6 credit hours.

CIT 29000 Computer Technology (1-4 cr.)
Hours, credit, and subject matter to be arranged by instructor.

CIT–C 29800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

CIT 30100 Digital Technologies for the Consumer (3 cr.)
P: Consent of Instructor. This course will provide an introduction to the consumer technologies that are pervasive and vital for today's end user. Students will learn the importance of protecting computers in cyberspace and how to apply security in homes and small businesses. Students will learn how to use various sources of information to make cost-effective choices among hardware, software, and service alternatives in today's marketplace.

CIT 30300 Communications Security and Network Controls (3 cr.)
P: CIT 30700 or ECET 28400 or consent of course coordinator. This course will provide students with an overview of the field of information security and assurance. Students will explore current encryption, hardware, software, and managerial controls needed to operate networks and computer systems in a safe and secure manner.

CIT 30600 Computer Technology Applications Capstone (3 cr.)
P: CIT 20600. This course will study how organizations incorporate and automate computer applications, web applications and web services. Students will create a capstone project and a training module for an organization focusing on the use of current emerging computer and web application technologies as well as support and communication tools.

CIT 30700 Data Communications (4 cr.)
Class 4. P: CIT 23300.This course provides the foundation for the understanding of data communication systems and computer networks. Topics include information representation and transmission, medium types and configuration, telephony, error handling, TCP/IP and internet working, and diagnostic techniques.

CIT 31000 Career Planning and Placement Seminar (1 cr.)
P: Sophomore standing. This seminar is an orientation to the job search activities and information systems and telecommunications career planning for Computer Technology students about to enter the workforce. Guest speakers offer job-hunting tips, relate their work experiences, and describe career opportunities. Students investigate their own transferable and technical skills, personal priorities, and consider how to find matching professional positions.

CIT 31200 Advanced Web Site Design (3 cr.)
Class 2, Lab 2; or Class 3. P: CIT 21200. This course covers the tools and techniques necessary to maximize the effectiveness of deploying e-commerce Web applications and address both client and server side strategies with a focus on optimal Web design strategies. Strategies focus on internal design issues such as security, reusability, usability, accessibility and architecture and external design issues such as user interfaces, load times and multimedia.

CIT 31300 Commercial Web Site Development (3 cr.)
Class 3.. P: CIT 21200 and (CIT 21500 or CIT 24200). This project-based course will have students develop a data driven web site to support business processes. Students will utilize both client and server side languages in developing the site.

CIT 32000 Quantitative Analysis III (3 cr.)
P: CIT 22000. A continuation of statistical inference introduced in Quantitative Analysis II with emphasis on confidence intervals, hypothesis testing, analysis of variance, forecasting, including linear regression and correlation, and quality control as they apply to information technology.

CIT 32700 Wireless Communication (3 cr.)
P. CIT 30700. Students will learn about the growing range of wireless technologies and their applications. The course will explore the fundamentals of each wireless technology from basic signaling properties to current and future market uses. Students will have the opportunity to gain hands-on experience with various wireless technologies.

CIT 32900 Java Server Pages (3 cr.)
Class 2, Lab 2; or Class 3. P: CIT 27000. This course will cover the programming of Java Server Pages (JSP) and Java Servlets in an e-commerce environment. Students will develop reusable e-commerce software using server-side Java components.

CIT 34600 Desktop Publishing Applications (3 cr.)
P: CIT 10600. Interdisciplinary introduction to desktop publishing technology integrating application and hardware. Students will learn desktop publishing theory and techniques to produce flyers, newsletters, brochures,

business forms, web forms, and publications with database interconnectivity. Service learning includes a complete DTP solution for a small business or not-for-profit agency.

CIT 34700 Advanced ASP.Net (3 cr.)
Class 2, Lab 2; or Class 3. P: CIT 24200. This course will apply the ASP.Net framework to e-commerce applications. Advanced ASP.Net techniques will be covered such as Web services, ADO, and reusable components.

CIT 35600 Network Operating Systems Administration (3 cr.)
P or C: CIT 28600. Design and administration of network servers and workstations. Focus on basic network concepts such as user account administration, resource allocation, security issues, and Internet service management, lecture and laboratory.

CIT 37400 Systems and Database Analysis (4 cr.)
Class 2, Lab 4. P:.CIT 21300 and CIT 21400. Intensive exploration of application and database analysis in a synergistic environment. Students engage in collaborative, project-based activities to learn about project management, requirement analysis, modeling, and prototyping employing problem solving and team-building skills. Object-oriented and data modeling tools are used to apply class concepts.

CIT 38100 Unix Programming and Administration (3 cr.)
P: CIT 35600. This course will teach students to effectively administer and develop applications in Linux/Unix. Emphasis will be on the ability to read, write and debug shell script programs. An exploration of Windows scripting languages will also be covered.

CIT 38800 Topics in Programming Languages (variable title) (3 cr.)
Class 3; or Class 2, Lab 2. P: one CIT 200-level programming language course. Varies with course content (prerequisites will be included in the semester class schedule). Since various languages may be offered under this title, this course may be repeated for a maximum of 9 hours of credit.

CIT–C 39800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

CIT 40200 Design and Implementation of Local Area Networks (3 cr.)
Class 2, Lab 2; or Class 3. P: CIT 30700 or ECET 28400. The design, implementation, and configuration of local area networks. Students install the necessary hardware and software to set up a LAN server with several clients. Students will explore topics including internetworking, network management, network performance, and security.

CIT 40600 Advanced Network Security (3 cr.)
P: CIT 30300. This course provides students with in-depth study and practice of advanced concepts in applied systems and networking security, including security policies, access controls IP security, authentication mechanisms, and intrusion diction and protection.

CIT 41000 Information Technology Ethics and Leadership (3 cr.)
P: junior standing. This course provides participants with ability to understand and analyze ethical and leadership issues in a highly dynamic IT environment. Participants also learn about legal, management, moral, and social issues of IT in a global society. The course supports the growing need to sensitize individuals concerning ethical utilization of information technology.

CIT 41200 XML-Based Web Applications (3 cr.)
Class 2, Lab 2; or Class 3. P: CIT 21200 and (CIT 21500 or CIT 24200 or CIT 26200 or CIT 27000).This course covers how to build Web applications using XML. Students will learn how to create and validate data in XML documents and how to display XML documents using Cascading Style Sheets (CSS), XSL Transformations (XSLT), and the Document Object Model.

CIT 41500 Advanced Network Administration (3 cr.)
P: CIT 35600 or consent of course coordinator. In this course students learn advanced concepts of installing, configuring, and securing various types of network servers including enterprise, Web, and mail servers. The course also covers the documentation of network systems infrastructure and the testing of hardware and software network components.

CIT 42000 Digital Forensics (3 cr.)
P: CIT 40600 and CIT 41500. This course covers the fundamentals of computer forensics and cyber-crime scene analysis. The various laws and regulations dealing with computer forensic analysis will be discussed. Students will be introduced to the emerging international standards for computer forensic analysis, as well as a formal methodology for conducting computer forensic investigations

CIT 43100 Applied Secure Protocols (3 cr.)
P: CIT 40600. This course will emphasize the applied facets of cryptography for the information assurance and security professional. By the end of the course students will be able to apply important cryptographic principles and tools to allow networks to communicate securely.

CIT 43600 Advanced E-Commerce Development (3 cr.)
Class 2, Lab 2; or Class 3. P: CIT 31200. P or C: CIT 34700 or CIT 32900. This course will allow students the opportunity to develop a data-driven e-commerce site for a small- to medium-size company.

CIT 44000 Communication Network Design (3 cr.)
Class 2, Lab 2; or Class 3. P:CIT 40200. An introduction to wide area networking (WAN), which is a technology used to extend telecommunications connectivity for information distribution over large geographic regions. Topics include architecture, design including Frame Relay and ATM, and

implementation, as well as the influence of the state and federal regulatory environments.

CIT 46000 Wireless Security (3 cr.)
P: CIT 30300 and CIT 40200. Focuses on the risks and benefits associated with wireless local area network communications as well as how the networking industry defines a secure wireless network. In addition, students gain the skills needed to properly create, configure and maintain and a secure wireless network.

CIT 47900 Database Implementation and Administration (3 cr.)
Class 2, Lab 2; or Class 3. P: CIT 21400 and CIT 28600. Extends knowledge of database concepts. Topics include physical database design, client/server implementation, and database administration. Given logical database design, students develop physical database structures and implement a database application. Students carry out database design, construction administration, and programming activities using client/server technology.

CIT 48500 Living Lab (1-6 cr.)
The Living Lab allows students to apply networking, security, database, website, and application development concepts and techniques learned from prior CIT courses to internal and/or external projects. The Living Lab emulates an industry IT department in which students work on one or more projects as part of an IT team.

CIT 49000 Senior Project (1-4 cr.)
Independent study for seniors wanting to execute a complete computer-oriented project. Course may be repeated for up to 7 credit hours.

CIT–C 49400 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

CIT–C 49800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

CIT 49900 Computer Technology (1-4 cr.)
Hours, credit, and subject matter to be arranged by instructor. CIT Internship and Cooperative Education Programs.

CIT–I 19800 Career Enrichment Internship I-V (1-5 cr.) (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

CIT–I 29800 Career Enrichment Internship I-V (1-5 cr.) (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

CIT–I 39800 Career Enrichment Internship I-V (1-5 cr.) (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

CIT–I 49400 Career Enrichment Internship I-V (1-5 cr.) (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

CIT–I 49800 Career Enrichment Internship I-V (1-5 cr.) (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

Construction Engineering Management Technology

CEMT 10400 Fundamentals of Surveying (3 cr.)
Class 2, Lab 3. P or C: MATH 15400 or MATH 15900. Fundamental concepts and practical applications related to measurement of vertical and horizontal distances and angles using the tape, level, transit, theodolite, and EDMI (total stations, electronic workbooks, laser levels, etc.). Computations of grades, traverses, areas, and curves. Basic concepts of topography and its uses. Identification of contours and drawing of topographical maps.

CEMT 10500 Introduction to Construction Technology (3 cr.)
Class 2, Lab 2. A survey of the opportunities available within the construction industry. The laboratory is utilized to learn the basics of computers, the library, and e-mail systems available on campus, and the basics of word processing, spreadsheets, and computer programming. No previous computer knowledge is necessary.

CEMT 11000 Construction Accounting (3 cr.)
Class 2, Lab 2. P: TECH 10500. Accounting fundamentals as utilized in the construction industry with a special emphasis on basic design of construction cost accounting systems as used to manage a construction company. Use of construction cost indices for labor and materials, as well as use of construction accounting for estimating

and bidding purposes. Use of accounting management software as appropriate.

CEMT 11000 Construction Materials and Systems (3 cr.)
Class 2 + Lab 2. Introduction to common construction terminology, materials, methodologies, and structural systems as they relate to buildings, industrial facilities, and infrastructure. Selection of construction materials (wood, steel, concrete, and masonry) and methods for diverse applications. Site visits for experiential learning.

CEMT 12500 Construction Visualization (3 cr.)
Class2 + Lab 2. Introduction to extraction and interpretation of information from construction documents as they relate to diverse types of construction projects including heavy civil, highways, utilities, water, storm-water and sewer construction, other infrastructure construction and buildings. Lab work including blue print reading, plots, and construction symbols interpretation for diverse undertakings.

CEMT 16000 Statics (3 cr.)
Class 3. P: MATH 15400 or MATH 15900 or equivalent. Forces acting on bodies at rest, including coplanar, concurrent, and nonconcurrent systems. Includes centroids, moments of inertia, and friction.

CEMT 21500 Mechanical and Electrical Systems (4 cr.)
Class 4. P: 12000 and Math 15300. Methods for design, construction and inspection of meachanical and electrical systems for buildings. Emphasis on heating and cooling loads, equipment selection, duct and pipe sizing, codes, safety, installation, inspection, commissioning, and estimating. Responsibilities of the general contractor for HVAC (heating, ventilating, and air-condtioning) and plumbing work.

CEMT 26000 Strength of Materials (3 cr.)
Class 3. P: 16000. C: 26700. Stress-strain relationships of engineering materials; composite analysis; shear forces and bending moments in beams; analysis and design of steel and wood beams and columns, beam deflections, and statistically indeterminate beam analysis.

CEMT 26700 Materials Testing (2 cr.)
Class 1, Lab 3. C: 26000. P: 16000. Laboratory and field testing of structural materials to determine their mechanical properties and behavior under load. Materials included are steel, aluminum, concrete, wood, and asphalt.

CEMT 27500 Applied Civil Engineering Drafting (3 cr.)
Class 2, Lab 3. P: TECH 10400 and Math 15300. Preparation of structural construction drawings for buildings, bridges, roads, and topographic drawings.

CEMT 28000 Quantity Survey (3 cr.)
Class 2, Lab 3. P: 12000 , 27500. A study of methods to estimate quantities of materials required in construction. Practice in making quantity surveys.

CEMT 30200 Construction Law and Ethics (3 cr.)
Class 3. P: 12000 and Junior Standing. Practical focus on key legal and ethical issues applicable to the construction industry and how to manage them. Laws related to construction work, contractual relationships and strategies, torts, liabilities, bonding, insurance, risk management, dispute avoidance and resolution, liens, partnering, and ethics are among topics covered.

CEMT 31200 Construction and Route Surveying (3 cr.)
Class 2, Lab 3. P: 10400. Field procedures for construction and route surveying, including highway, street, sewer, and bridge layout. Route surveying including vertical and horizontal curves, curve design, survey for streets and subdivisions, earthwork, and profiles/sections using both theodolite and electronic distance measuring (EDM) equipment. Computation of errors and coordinates and use of appropriate software.

CEMT 33000 Construction Field Operations (3 cr.)
Class 3. P: 26000, 31200, 34200, 48400, MATH 22100 and PHYS 21800. Study of types and uses of construction equipment and machinery in relation to diverse field operations. Analysis of equipment productivity and costs.

CEMT 34100 Construction Scheduling and Project Control (3 cr.)
Class 2, Lab 3. P: 34200. A study of the use of computers for creating, presenting, revising, and updating construction schedules, and in using the schedule and other programs to assist in managing a construction project.

CEMT 34200 Construction Cost and Bidding (3 cr.)
Class 2, Lab 3. P: 28000 Course includes a study of the methods of estimating costs for labor, material, equipment, and direct overhead for construction projects; how to establish markups for indirect overhead and profit; procedures for setting up a computerized estimating system; and conceptual estimating procedures.

CEMT 34700 Construction Contract Administration and Specifications (3 cr.)
Class 2, Lab 2. P: 12000 and Junior Standing. Relationship between all parties involved in the construction process. Analysis of contracts, the general and special conditions of the contract, specifications and their purpose/intent, standard specifications, adaptation of selected provisions from standard specifications, and delineation of special supplemental conditions.

CEMT 35000 Construction Project Cost and Production Control (3 cr.)
Class 3:. P: 33000 and 34100. A study of the contractor's record-keeping procedures and forms from estimate breakdown to completion of the project, with a review of current methods of production control.

CEMT 39000 Construction Experience (1 cr.)
P: 28000, TCM 22000, TCM 34000. Minimum of 10 weeks of work experience in the construction industry, with at least five weeks' experience in the field. Written report of this experience. See department chair about detailed requirements for this course. Experience work needs to be completed before signing up for the course.

CEMT 43000 Soils and Foundations (3 cr.)
Class 2, Lab 3. P: 26000, 31200, 34200, 33000, 48400, 48600, MATH 22100, PHYS 21800. Measurement of technical properties of soils in situ or in the laboratory, classification for engineering and construction purposes. Soil exploration, subsurface investigation, and soil reports; concept of bearing capacity; shallow and deep foundations and retaining wall, their analysis, and construction aspects. Soil-structure interaction in terms of construction, settlement, and structural service issues.

CEMT 44700 Construction Project Management (3 cr.)
Class 3. P: 33000. A study of construction organizations, their forms and functions, project management procedures and documents, and financial management within a construction organization. Subjects appropriate for those working within a construction organization will be emphasized. Role playing may be incorporated.

CEMT 45200 Hydraulics and Drainage (3 cr.)
Class 3, P: 26000, 31200, 34200, 48400, MATH 22100, PHYS 21800. Basic hydrostatics: fundamental concepts of fluid flow in pipes and open channels; methods of estimating storm-water runoff; sizing of culverts, storm and sanitary sewers, and open channels.

CEMT 45500 Construction Safety and Inspection (3 cr.)
Class 3. P: 34700, Junior Standing. A study of safety and inspection requirements for construction sites and projects. Accident record keeping, reporting; requirements of the OSHA code; inspection for safety and hazards, environmental issues, and quality; risk control; and management issues related to these. Development and implementation of company safety and hazard communication and inspection programs.

CEMT 48400 Wood, Timber, and Formwork Design (3 cr.)
Class 3. P: 26000. Fundamentals of wood and timber design, including wall, beams, columns, slabs, and forms for special shapes.

CEMT 48600 Reinforced Concrete Design and Construction (3 cr.)
Class 3. P: 48400. The fundamentals of reinforced concrete design and analysis. Survey of concrete structural systems and concrete construction methods and procedures.

CEMT 49400 Engineering Economics for Construction (3 cr.)
Class 3. P: senior standing and 34200. Introduction to engineering economy and its methods related to time value of money. Economical evaluation and comparison of alternatives considering costs, returns, interest, taxes, and probability in a time span; determining feasibility, break-even points, and rate of return. Cost indices for construction.

CEMT 49900 Construction Technology (1-4 cr.)
Hours, subject matter, and credit to be arranged by staff. Course may be repeated for up to 9 credit hours.

CEMT–C 19800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

CEMT–C 29800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

CEMT–C 39800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

CEMT–C 49600 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

CEMT–C 49800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

CEMT–I 19800 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

CEMT–I 29800 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

CEMT–I 39800 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career

experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

CEMT–I 49600 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

CEMT–I 49800 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

Electrical & Computer Engineering

ECE 20100 Linear Circuit Analysis (3 cr.)
Class 3. P or C: MATH 261 and PHYS 25100. Recommended C: 20700. Volt-ampere characteristics for circuit elements; independent and dependent sources; Kirchhoff's laws and circuit equations. Source transformations; Thevenin's and Norton's theorems; superposition. Transient response of resistor capacitor (RC), resistor inductor (RL), and resistor inductor capacitor (RLC) circuits; sinusoidal steady-state and impedance. Instantaneous and average power.

ECE 20200 Linear Circuit Analysis II (3 cr.)
Class 3. P: 20100. P or C: MATH 26200. Continuation of 201. Use of computer-aided design programs. Complex frequency plane, resonance, scaling, and coupled circuits. Two-port network parameters. Laplace transform methods. Use of general loop and nodal equations, matrix formulations.

ECE 20400 Introduction to Electrical and Electronic Circuits (4 cr.)
Class 3. Lab 1. P: Physics 25100. Students will learn basics of electrical and electronic circuits including introduction to analog and digital electronic circuits. Measurement of electrical signals using meters, probes, and oscilloscopes are covered in the laboratory component of the course. Circuits are designed for minimum hardware with emphasis on understanding analog and digital electronics with practical use of digital and analog microchips. Non-ECE majors who complete this course can continue the digital course sequence offered by the ECE department including microprocessor systems and interfacing, and digital signal processing. No credit will be given for ECE majors.

ECE 20700 Electronic Measurement Techniques (1 cr.)
Lab 3. P or C: 20100. Experimental exercises in the use of laboratory instruments. Voltage, current, impedance, frequency, and waveform measurements. Frequency and transient response. Use of operational amplifiers in instrumentation systems.

ECE 20800 Electronic Devices and Design Laboratory (1 cr.)
Lab 3. P: 20700. C: 25500. Laboratory experiments in design and measurement with analog devices. Applications include single-stage and multistage bipolar and FET amplifiers, operational amplifier applications, differential amplifiers, and active filters.

ECE 21000 Sophomore Seminar (1 cr.)
A lecture series on ECE Department curriculum-related topics, electrical and computer engineering systems, skills, and career topics.

ECE 25500 Introduction to Electronics Analysis and Design (3 cr.)
Class 3. P: 20100. Recommended C: 20800. Diode, bipolar transistor, and field effect transistor (FET) circuit models for the design and analysis of electronic circuits. Single-stage and multistage analysis and design. Computer-aided design calculations, amplifier operating point design and frequency response of single and multistage amplifiers. High-frequency and low-frequency designs are emphasized.

ECE 26100 Engineering Programming Lab (1 cr.)
Introduction to problem solving using software tools ,in particular the C programming language.

ECE 26300 Introduction to Computing in Electrical Engineering (3 cr.)
Introduction to Computing in Electrical Engineering. An introductory course in computing programming with an emphasis on program decomposition and program structure. The objective of the course is to introduce the student to problem solving using high-level languages. The students are also introduced to number concepts fundamental in electrical engineering. Programming will be in "C" in order to develop a structured approach to problem solving. Problems drawn from the field of electrical engineering will require no prior engineering knowledge.

ECE 26400 Advanced C Programming (2 cr.)
Class 2. P: basic knowledge of the UNIX operating system and an introductory C programming course. C programming knowledge should include basic syntax, control structures, and file I/O, as well as experience in declaring and using functions. Continuation of a first programming course. Topics include files, structures, pointers, and the proper use of dynamic data structures.

ECE 27000 Digital Logic Design (4 cr.)
Class 3, Lab 1. P: 20700 and knowledge of electrical circuits. Introduction to logic design, with emphasis on practical design techniques and circuit implementation. Topics include Boolean algebra; theory of logic functions; mapping techniques and function minimization; logic equivalent circuits and symbol transformations; electrical characteristics; propagation delays; signed number notations and arithmetic; binary and decimal arithmetic logic circuits; theory of sequential circuits; timing diagrams; analysis and synthesis of SR-, D-, T-, and JK-based sequential circuits; clock generation circuits; algorithmic state machine method of designing sequential circuits. A series of logic circuit experiments using TTL

and CMOS integrated circuits for combination of logic and sequential circuits. A final project is required.

ECE 28200 UNIX Programming for Engineers (1 cr.)
Class 0, Lab 2. P: 26400 Introduction to the UNIX operating system, including the UNIX file system, as well as UNIX tools and utilities. Introduction to Shell Programming. The emphasis will be on how these tools/ utilities are utilized in the Computing Engineering field

ECE 30100 Signals and Systems (3 cr.)
Class 3. P: 20200 and MATH 26200. Signal and system representation. Fourier series and transforms, sampling and discrete Fourier transforms. Discrete-time systems, difference equation, Z-transforms. State equations, stability, characteristic values and vectors. Continuous-time systems, time and frequency domain analysis. Continuous systems with sampled inputs.

ECE 30200 Probabilistic Methods in Electrical Engineering (3 cr.)
Class 3. P or C: 30100. An introductory treatment of probability theory, including distribution and density functions, moments, and random variables. Applications of normal and exponential distributions. Estimation of means and variances. Introduction to random processes, correlation functions, spectral density functions, and response of linear systems to random inputs.

ECE 30500 Semiconductor Devices (3 cr.)
Class 3. P: 25500, MATH 26200, and PHYS 25100. Materials- and phenomena-based examination of devices, emphasizing the how and why of solid-state device operation.

ECE 31100 Electric and Magnetic Fields (3 cr.)
Class 3. P: MATH 26200 and PHYS 25100. Continued study of vector calculus, electrostatics, and magnetostatics. Maxwell's equations, introduction to electromagnetic waves, transmission lines, and radiation from antennas. Students may not receive credit for both 311 and PHYS 330.

ECE 32100 Principles of Electromechanical Energy Conversion (3 cr.)
Class 3. P: ECE 20200. C: ECE 31100. The general theory of electromechanical motion devices relating to electric variables and electromagnetic forces. Basic concepts and operational behavior of DC, induction, brushless DC, and stepper motors used in control applications.

ECE 32600 Engineering Project Management (3 cr.)
Project management is an important skill that is needed in the private and public sectors as well as specialty businesses. This course explores the challenges facing today's project managers and provides a broad understanding of the project management environment focused on multiple aspects of the project.

ECE 32700 Engineering Economics (3 cr.)
Engineering economics is the application of economic techniques to the evaluation of design and engineering alternatives. The role of engineering economics is to assess the appropriateness of a given project, estimate its value, and justify it from an engineering standpoint. This course covers the time value of money and other cash-flow concepts, reviews economic practices and techniques used to evaluate and optimize engineering decisions, and discusses the principles of benefit-cost analysis.

ECE 34000 Simulation, Modeling, and Identification (3 cr.)
Class 2, Lab 3. P: 20700 and 30100. Investigation and evaluation of design problems through simulation of systems described by ordinary differential and difference equations. Development of simulation models from physical parameters and from experimental data. Topics include continuous, discrete, and hybrid models of electrical, mechanical, and biological systems. Laboratory experiences demonstrate concepts studied in text and lecture.

ECE 35900 Data Structures (3 cr.)
Class 3. P: ENGR 19700. An introductory course in computer engineering, with emphasis on data structure and program design using the C language. The classical concepts of structured programming such as stack, queue, linked list, tree, recursion, sorting, and searching. Applications of structured programming in engineering.

ECE 36200 Microprocessor Systems and Interfacing (4 cr.)
Class 3, Lab 3. P: 26600, 26700, and ENGR 19700. An introduction to basic computer organizations, microprocessor instruction sets, assembly language programming, the design of various types of digital as well as analog interfaces, and microprocessor system design considerations. Laboratory provides practical hands-on experience with microprocessor software application and interfacing techniques. Design and implementation of a simple three-bus computer; detailed study of a particular microcomputer architecture and instruction set (Motorola 6809); assembly language programming techniques; system control signals and I/O port design and handshaking protocols; interrupt control systems; LSI parallel and serial interfaces; analog data and control interfaces.

ECE 36500 Introduction to the Design of Digital Computers (3 cr.)
Class 3. P: 36200. The hardware organization of computer systems: instruction set selection, arithmetic/logic unit design, hardwired and microprogrammed control schemes, memory organization, I/O interface design. Computer simulation of digital systems.

ECE 36900 Discrete Mathematics for Computer Engineering (3 cr.)
Class 3. P: 27000. Introduction to discrete mathematical structure and finite-state machines. Topics include foundation of discrete mathematics, groups and semi-groups, group codes in computer systems, basic model of finite-state machines, state and machine identification experiments, regular expressions, and complexity.

ECE 38200 Feedback System Analysis and Design (3 cr.)
Class 3. P: 30100 or ME 33000 or equivalent. Classical concepts of feedback system analysis and associated

compensation techniques. In particular, the root locus, Bode diagram, and Nyquist criterion are used as determinants of stability.

ECE 40100 Engineering Ethics and Professionalism (1 cr.)
Class 1. P: senior standing. Some ethical, social, political, legal, and ecological issues that practicing engineers may encounter. (40100 and ME 40100 are cross-listed courses; students will not get credit for both 40100 and ME 40100.)

ECE 40800 Operating Systems and System Programming (3 cr.)
Class 3. P: CSCI 36200, ECE 36500. Students will learn to design and construct operating systems for both individual computers and distributed systems, and to apply and utilize operating system functionality to their application development. The course will cover basic concepts and methods for managing processor, main memory, storage, and network resources, including their system functions. Detailed examples are taken from a number of operating systems, emphasizing the techniques used in networked UNIX and embedded Linux.

ECE 41000 Introduction to Digital Signal Processing (3 cr.)
Class 2, Lab 3. P: 30100. P or C: 36200. An introductory treatment of digital signal processing algorithms and implementation using high-speed digital signal processors. Sampling, architecture, addressing modes and instruction set of digital signal processors, discrete Fourier transform, fast Fourier transform, and digital filtering.

ECE 41700 Multimedia Applications (3 cr.)
Class 3. P: 30100 and 36500. An introductory treatment of multimedia algorithms and implementation using high-speed multimedia processors. Detailed discussion of architecture, addressing modes and instruction set of multimedia processors, entropy coding, transform coding, speech compression, image compression, and video compression.

ECE 42100 Advanced Digital System Design (3 cr.)
Class 3. P: ECE 27000, ENGR 19700. Advanced topics in digital design. Boolean logic. Logic optimization, VLSI and ASIC design basics. Design. Simulation. Placement and routing. Logic synthesis. FPGA structure. FPGA implementation. FPGA design flow. Verilog and VHDL coding.

ECE 42400 Electromechanical Systems and Applied Mechatronics (3 cr.)
Class 3. P ECE 30100. Design, optimization, and control of electromechanical and mechatronic systems. Comprehensive dynamic analysis, modeling, and simulation of electric machines, power electronics, and sensors. Application of advanced software and hardware in mechatronic systems design and optimization.

ECE 44000 Transmission of Information (4 cr.)
Class 3, Lab 3. P: 30100 and 30200. Analysis and design of analog and digital communication systems. Emphasis on engineering applications of theory to communication system design. The laboratory introduces the use of advanced engineering workstations in the design and testing of communication systems.

ECE 46800 Introduction to Compilers and Translation Engineering (3 cr.)
Class 3. P: 35900, 36200, and 36500. Design and construction of compilers and other translators. Compilation goals, organization of a translator, grammars and languages, symbol tables, lexical analysis, syntax analysis (parsing), error handling, intermediate and final code generation, assemblers, interpreters, and an introduction to optimization/parallelization. Emphasis on engineering, from scratch, a compiler or interpreter for a small programming language, typically a C or Pascal subset. Projects involve implementation (and documentation) of such a system using C on UNIX.

ECE 47100 Embedded Microcontroller, Microprocessor, and DSP-Based Systems (3 cr.)
Class 3. P: 36200 and ENGR 19700. A structured approach to the development and integration of embedded microcontroller/microprocessor/DSP-based systems. The course provides students with design experience of embedded systems. The course covers the microprocessor selection, the configuration of peripheral components, and the hardware abstraction techniques. The course also covers the C programming techniques for embedded systems and using a fixed point microprocessor for floating point calculations.

ECE 48300 Digital Control System Analysis and Design (3 cr.)
Class 3. P: 38200. An introduction to real-time computer-controlled systems analysis and design in both frequency domain and state space. Sampling theory and its effect on digital control design. Implementation, application, and industrial practice of digital control using digital signal processors and other microprocessors. Matlab/Simulink and its toolboxes are used. Regular computer and lab assignments; final design project required.

ECE 48700 Senior Design I (1 cr.)
P: Senior Standing and intent to graduate within 2 semesters. A real-life experience in engineering problem solving in a group setting from identification, planning and execution to professional-quality written and oral presentations. This is the first semester of a two semester course sequence.

ECE 48800 Senior Design II (2 cr.)
P: Senior Standing and intent to graduate within 1 semester1. A real-life experience in engineering problem solving in a group setting from identification, planning and execution to professional-quality written and oral presentations. This is the second semester of a two semester course sequence.

ECE 48900 Introduction to Robotics (3 cr.)
Class 3. P or C: 38200. Homogeneous transformations; kinematics of manipulator arms; dynamic equations using Newton-Euler and Euler-Lagrange formulations; inverse kinematics; trajectory generation; task planning; manipulator control; robot languages; robot sensing

and vision; and industrial applications of robots. Lab experiments and a final project are required.

ECE 49100 Engineering Design Project (1-2 cr.)
P: senior standing and consent of a faculty sponsor. The student selects an engineering design project and works under the direction of the faculty sponsor. Suitable projects may be from the local industrial, municipal, state, and educational communities. May be repeated for a maximum of 4 credit hours.

ECE 49500 Selected Topics in Electrical Engineering (1-4 cr.) Engineering topics.

ECE 49600 Electrical Engineering Projects (ARR cr.) P: consent of instructor. Hours and credits to be arranged.

ECE 51500 Software Engineering for Embedded Systems (3 cr.)
P: CSCI 36200 or graduate standing. This course teaches the object-oriented software analysis and design for embedded systems. Unified Modeling Language and Shlaer/Mellor methodology will be studied. Projects will be assigned, which lead the students through the information gathering, problem analysis, model design, and model implementation cycles. The hardware/software integration will also be covered.

ECE 53600 Introduction to Computational Intelligence (3 cr.)
Class 3. P: C programming skills; graduate standing or permission of instructor. Basic concepts in theory and paradigms for neural networks, evolutionary computation, and fuzzy logic; algorithms and applications for hybrids of these tools known as computational intelligence are explored. Topics include artificial neural networks, fuzzy systems, and evolutionary computation. Implementations of a number of paradigms are presented, including particle swarm optimization. Applications to various areas such as biomedical engineering and non-linear control are examined.

ECE 53700 Multimedia Applications (3 cr.)
Class 2, Lab 2. P: 301 and 362. Treatment of multimedia algorithms and implementation using high-speed multimedia processors. Detailed discussion of entropy coding, transform coding, speech compression, image compression, video compression and architecture, addressing modes, and instruction set of multimedia processors.

ECE 53800 Digital Signal Processing I (3 cr.)
Class 3. P: 30100 and 30200 or equivalent. Theory and algorithms for processing of deterministic and stochastic signals. Topics include discrete signals, systems, transforms, linear filtering, fast Fourier transforms, nonlinear filtering, spectrum estimation, linear prediction, adaptive filtering, and array signal processing.

ECE 54400 Digital Communications (3 cr.)
Class 3. P: 44000 or graduate standing. Introduction to digital communication systems and spread spectrum communications. Analog message digitization, signal space representation of digital signals, binary and M-ary signaling methods, detection of binary and M-ary signals, comparison of digital communication systems in terms of signal energy and signal bandwidth requirements. The principal types of spread-spectrum systems are analyzed and compared. Application of spread spectrum to multiple-access systems and to secure communication systems is discussed.

ECE 54700 Introduction to Computer Communication Networks (3 cr.)
Class 3. P: 30200 or equivalent. A qualitative and quantitative study of issues in design, analysis, and operation of computer communication and telecommunication networks as they evolve toward the integrated networks of the future, employing both packet and circuit-switching technology. Packet and circuit switching, the OSI standards for architecture and protocols, elementary queuing theory for performance evaluation, random access techniques, local area networks, reliability and error recovery, and integrated networks.

ECE 55400 Electronic Instrumentation and Control Circuits (3 cr.)
Class 3. P: 25500 and 30100 or graduate standing. Analysis and design of special amplifiers, pulse circuits, operational circuits, DC amplifiers, and transducers used in instrumentation, control, and computation.

ECE 55900 MOS VLSI Design (3 cr.) Class 3. P: 30500 and 36500. Introduction to most aspects of large-scale MOS integrated circuit design, including device fabrication and modeling; useful circuit building blocks; system considerations; and algorithms to accomplish common tasks. Most circuits discussed are treated in detail, with particular attention given those whose regular and/or expandable structures are primary candidates for integration. All circuits are digital and are considered in the context of the silicon-gate MOS enhancement-depletion technology. Homework requires the use of existing IC mask layout software; term projects assigned.

ECE 56300 Programming Parallel Machines (3 cr.)
Class 3. P: 26400 and 46300. Examines how to program parallel processing systems. Various parallel algorithms are presented to demonstrate different techniques for mapping tasks onto parallel machines. Parallel architectures to be considered are: SIMD (synchronous), MIMD (asynchronous), and mixed-mode (SIMD/MIMD hybrid). Machines that represent these classes to be used in the course are the MasPar MP-1 (SIMD); nCUBE 2 (MIMD); and PASM (mixed-mode). There will be three programming projects, one on each machine. The similarities and differences among the machines and their languages will be discussed.

ECE 56500 Computer Architecture (3 cr.) Class 3. P: 36500 or graduate standing. An introduction to problems of designing and analyzing current machine architectures. Major topics include performance and cost analysis, pipeline processing, vector machines and numerical applications, hierarchical memory design, and multiprocessor architectures. A qualitative approach allowing a computer system designer to determine the extent to which a design goal is emphasized.

ECE 56600 Microprocessor System Design (3 cr.)
Class 3. P: 36500 or equivalent. An overview of advanced-architecture CISC microprocessors and their associated

support components, with emphasis on incorporating these devices into both general-purpose and embedded board-level designs for multi-microprocessor systems utilizing open-architecture system buses. Survey of 32-bit CISC microprocessor, memory management, floating point support, advanced peripherals, PLD-base "glue logic" design, performance evaluation, IECEE-standard open-architecture system buses, and various pertinent interface and networking standards. Design experience is gained through a comprehensive, semester-long project.

ECE 56900 Introduction to Robotic Systems (3 cr.) Class 3. P: 38200. Basic components of robotic systems; selection of coordinate frames; homogeneous transformations; solutions to kinematics of manipulator arms; velocity and force/torque relations; dynamic equations using Euler-Lagrange formulation; digital simulation of manipulator motion; motion planning; obstacle avoidance; controller design using torque method; and classical controllers for manipulators. Lab experiments and final project required.

ECE 57000 Artificial Intelligence (3 cr.) P: 35900 or equivalent. Basic understanding of data structures, including the proper use of arrays, lists, trees, and queues. Understanding of searching and sorting concepts. Basic understanding of probability and statistics, including Bayes rule, statistical tests of significance, and normal distribution.

ECE 57400 Software Engineering Methodology (3 cr.) Class 3. P: 35900 or equivalent. Life-cycle models, software planning, software analysis, software design including data flow and data structure design, software testing methods, and software documentation. Software design project required.

ECE 58000 Optimization Methods for Systems and Control (3 cr.) Class 3. P: consent of instructor or graduate standing. Introduction to optimization theory and methods, with applications in systems and control. Nonlinear unconstrained optimization, linear programming, nonlinear constrained optimization, various algorithms and search methods for optimizations, and their analysis. Examples from various engineering applications are given.

ECE 59100 Parallel Processing (3 cr.) P: consent of instructor. The course is comprehensive study of parallel processing techniques, parallel programming and performance tuning Topics covered include: fundamental of parallel, concurrent and distributed processing systems, performance and limitations of these systems, and parallelism paradigms. In addition to these topics the software needs and support for parallel processor systems are covered in details. This includes programming languages, simulation and tracing tools.

ECE 59500 Selected Topics in Electrical and Computer Engineering (3 cr.)

ECE 60000 Random Variables and Signals (3 cr.) Class 3. Graduate standing. Engineering applications of probability theory. Problems of events, independence, random variables, distribution and density functions, expectations, and characteristic functions. Dependence, correlation, and regression; multivariate Gaussian distribution. Stochastic processes, stationarity, ergodicity, correlation functions, spectral densities, random inputs to linear systems, Gaussian processes.

ECE 60200 Lumped System Theory (3 cr.) Class 3. P: 30100. P or C: MATH 511 or consent of instructor. An investigation of basic theory and techniques of modern system theory, emphasizing linear state model formulations of continuous- and discrete-time systems in the time and frequency domains. Coverage includes notion of linearity, time invariance, discrete- and continuous-times state models, canonical forms, associated transfer functions and impulse response models, the state transition matrix, the Jordan form, controllability, observability, and stability.

ECE 60800 Computational Models and Methods (3 cr.) Class 3. Graduate standing . Computation models and techniques for the analysis of algorithm complexity. The design and complexity analysis of recursive and nonrecursive algorithms for searching, sorting, and set operations; graph algorithms; matrix multiplication; polynomial evaluation; FFT calculations; and NP-complete problems.

ECE 62700 Introduction to Cryptography and Secure Communication (3 cr.) Class 3. P: Graduate standing. This course introduces the basic concepts of cryptography, emphasizing both privacy and integrity. Various cipher systems and cryptographic tools are presented including stream ciphers, block ciphers, public-key ciphers (RSA, El Gamal and others), has functions, message authentication codes and digital signature systems. Methods used to attack the cipher systems are discussed. As well as how the cryptographic tools are used in today's communication systems.

ECE 63700 Digital Image Processing I (3 cr.) Class 3. P: 30200 and 53800, or equivalent. Introduction to digital image-processing techniques for enhancement, compression, restoration, reconstruction, and analysis. 2-D signals and systems; sampling and scanning; random fields; discrete cosine transform; discrete Karhunen-Loeve transform; grayscale transformations; linear, ranked order, and morphological filters; human vision, printing, and display of images; entropy-based compression; vector quantization; block truncation coding; transform coding; predictive coding; image degradation models; Wiener filter; constrained deconvolution; computed tomography; edge detection; shape representation; and segmentation.

ECE 64500 Estimation Theory (3 cr.) Class 3. P: 60000. The basic estimation theory commonly applied in communications and signal-processing systems. Covers basic theory and concepts, linear estimation, and special topics. Applications in the communications sciences considered throughout.

ECE 64900 Speech Processing by Computer (3 cr.) Class 3. P: 30100. (knowledge of basic digital signal processing: time and frequency domains, Fourier and Z-transforms, convolution, knowledge of C or FORTRAN on UNIX). Models of the vocal tract; identification and extraction of speech features; speech transmission and compression systems; the recognition of speech and speakers by computers; control of speech synthesizers. Computer project required.

ECE 66200 Pattern Recognition and Decision Making Processes (3 cr.) Class 3. P: 30200. Introduction to the basic concepts and various approaches of pattern recognition and decision making process. The topics include various classifier designs, evaluation of classifiability, learning machines, feature extraction and modeling.

ECE 66800 Introduction to Artificial Intelligence (3 cr.) Class 3. P: 60000 or consent of instructor. This course consists of four parts: the first part deals with heuristic search and shows how problems involving search can be solved more efficiently by the use of heuristics; how in some cases it is possible to discover heuristics automatically; knowledge representation and deduction, with emphasis on predicate calculus and associated concepts such as resolution and unification. The last part of the course will deal with the design of a small-scale reasoning framework using the paradigm of logic programming.

ECE 68000 Modern Automatic Control (3 cr.) Class 3. P: 60200 or consent of instructor. Theoretical methods in optimal control theory. Topics include the calculus of variations and the Pontryagin minimum principle with applications to minimum energy problems. Geometric methods will be applied to the solution of minimum time problems. Computational methods, singular problems, observer theory, and sufficient conditions for existence of solutions are also discussed.

ECE 68500 Introduction to Robust Control (3 cr.) Class 3. P: 60200 or equivalent. Introduction to the analysis and design of robust feedback control systems. Modeling and paradigms for robust control. Robust stability and measures of robust performance. Analysis of and design for robust stability and performance.

ECE 69600 Advanced Electrical Engineering Projects (VAR cr.) Individual research projects to be approved by the supervising faculty member before registering for the course. An approved written report must be filed before credit is given. (This course cannot be used on a Ph.D. plan of study for the primary area.)

ECE 69800 Research (M.S. thesis) (1-6 cr.) Research for M.S. thesis.

ECE–C C19900 Cooperative Education Practice I-V (1-5 cr.) P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and preparedness for an intended career with a business, industry, or government agency. A comprehensive written report on the co-op practice is required.

ECE–C 29900 Cooperative Education Practice I-V (1-5 cr.) P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and preparedness for an intended career with a business, industry, or government agency. A comprehensive written report on the co-op practice is required.

ECE–C 39900 Cooperative Education Practice I-V (1-5 cr.) P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and preparedness for an intended career with a business, industry, or government agency. A comprehensive written report on the co-op practice is required.

ECE–C 49400 Cooperative Education Practice I-V (1-5 cr.) P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and preparedness for an intended career with a business, industry, or government agency. A comprehensive written report on the co-op practice is required.

ECE–C 49900 Cooperative Education Practice I-V (1-5 cr.) P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and preparedness for an intended career with a business, industry, or government agency. A comprehensive written report on the co-op practice is required.

ECE–I 19900 Career Enrichment Internship I-V (1-5 cr.) P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's preparedness for entering an initial or second career. A comprehensive written report on the internship experience is required.

ECE–I 29900 Career Enrichment Internship I-V (1-5 cr.) P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's preparedness for entering an initial or second career. A comprehensive written report on the internship experience is required.

ECE–I 39900 Career Enrichment Internship I-V (1-5 cr.) P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's preparedness for entering an initial or second career. A comprehensive written report on the internship experience is required.

ECE–I 49400 Career Enrichment Internship I-V (1-5 cr.) P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's preparedness for entering an initial or second career. A comprehensive written report on the internship experience is required.

ECE–I 49900 Career Enrichment Internship (1-5 cr.) P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's preparedness for entering an initial or second career. A comprehensive written report on the internship experience is required.

Electrical and Computer Engineering Technology

ECET 10700 Introduction to Circuit Analysis (4 cr.) Class 3, Lab 2. P Math 602 placement test of 45 or above. A study of voltage, current, power, and resistance; and Ohm's law, Kirchhoff's circuit laws, and network

theorems. Circuit studies cover electronic devices: diodes, transistors, and operational amplifiers. Physical features of capacitance and inductance and their effects in transient circuits and in a-c circuits are covered. The laboratory provides experience with electronic instrumentation and circuit simulation.

ECET 10900 Digital Fundamentals (3 cr.)
Class 2, Lab 2. P or C: MATH 11100 or higher or consent of instructor. A study of logic gates, binary arithmetic codes, Boolean algebra, mapping, adders, comparators, decoders, encoders, multiplexers, and demultiplexers. Small Scale (SSI) and Medium Scale (MSI) integrated circuits and programmable logic devices are used to develop combinational and sequential circuits.

ECET 11600 Electrial Circuits (4 cr.)
Class 3, Lab 2. P or C: MATH 15300. A study of d-c and a-c circuits. This course covers circuit components, R, L, and C; voltage; current; power; Ohm's law; Kirchhoff's laws; series and parallel circuits; electrical measurements; sinusoidal voltages; currents; impedances; transformers; motors; polyphase systems, and the National Electrical Code. This course is a service course offered for non-ECET majors.

ECET 15500 Digital Fundamentals II (3 cr.)
Class 2, Lab 2. P: ECET 10900. Sequential logic circuits, flip-flops, counters, programmable device logic, shift registers, logic families and introductory computer concepts.

ECET 15700 Electronics Circuit Analysis (4 cr.)
Class 3, Lab 2. P: 10700 and MATH 15300. A study of rectification, capacitive filters, IC regulated power supplies, transistor biasing techniques, dependent sources, operational amplifiers, and IC fabrication. Circuit fundamentals such as Kirchhoff's laws are utilized in the analysis and design of circuits. Computer-aided analysis of circuits is used.

ECET 16400 Applied Object-oriented Programming (3 cr.)
Class 2, Lab 2. P or C: MATH 15300. Problem solving and computing with emphasis on electrical engineering technology applications. Introduction to an object programming language as applied to solving electrical technology problems.

ECET 20700 AC Electronics Circuit Analysis (4 cr.)
Class 3, Lab 2. P or C: 15700 and MATH 15400. A study of a-c circuits, including the j operator, phasors, reactance, and impedance. Circuit laws, network theorems, and the fundamental concepts of Fourier analysis are applied and used in the study of topics such as passive filters, IC filters, amplifiers, resonant circuits, single-phase and three-phase circuits, and elementary magnetic circuits.

ECET 20900 Introduction to Microcontrollers (4 cr.)
Class 3, Lab 2. P: 10900 and P or C: ECET 16400 or CIT 26200 or CIT 27000. An introduction to microprocessor hardware and software, focusing on embedded control applications. Assembly language programming, linking, input/output techniques, debugging, memory, timing and peripheral devices are studied. C programming of microcontrollers is introduced.

ECET 23100 Electrical Power and Controls (4 cr.)
Class 3, Lab 2. P: 10900 and 15700. An introduction to transformers, induction motors, and single-phase and three-phase power systems, motor control devices, programmable logic controllers, PLC input and output devices, and PLC communications.

ECET 28400 Computer Communications (4 cr.)
Class 3, Lab 2. P: 10700. An introductory course in data communication systems. The hardware and software issues in computer communications are studied. Emphasis is on hands-on experience in computer communications, such as cabling, use of communication devices and media, choice of networking topologies, protocols, and platforms.

ECET 30200 Introduction to Control Systems (4 cr.)
Class 3, Lab 2. P: 23100. A continuation of the study of industrial controls including on-off, open-and closed-loop control systems, and analog-based systems. Major topics include relay controls, PLC, controls, HMI and open-PC controls, and networking.

ECET 30400 Intro to Communications Systems (4 cr.)
Class 3, Lab 2. P: 20700 and MATH 22200 . The theory and techniques of transmitting information (voice, music, data, etc) with wireless systems. This includes signal analysis, AM, FM, PM modulation techniques, transmitters, receivers, networks, filters and antennas through the VHF frequency spectrum. In addition, transmission lines, wireless communication, digital communication and special topics of current interest are introduced.

ECET 30700 Analog Network Signal Processing (4 cr.)
Class 3, Lab 2. P: 20700 and MATH 22100. An advanced course in network analysis that stresses network theorems and solutions of time-domain and frequency-domain problems. Software techniques to solve mathematical problems are employed.

ECET 30900 Advanced Embedded Microcontrollers (4 cr.)
Class 3, Lab 2. P: 20900. A study of the advanced applications of embedded microcontrollers, including use of programmable counter/timer arrays, interrupts, multi-tasking, analog interfaces, hardware abstraction, real-time operating systems, and peripheral device drivers.

ECET 33100 Generation and Transmission of Electrical Power (4 cr.)
Class 3, Lab 2. P: 20700 and 23100. A study of the generation and transmission of electrical energy. Includes modeling and analysis of synchronous alternators, transformers, and transmission lines, plus analytical and computer methods of solving load flow and fault conditions on balanced and unbalanced three-phase systems. Techniques used by utilities for protection and economic operation of power systems are introduced.

ECET 35100 Instrumentation Applications for Technology (4 cr.)

Class 3, Lab 2. P: Math 22100 and ECET 11600 or ECET 10700. Introduction to eh basic concepts and terminology of instruments. This course covers the procedures and techniques essential to measurement of physical quantities (such as pressure, flow, temperature, and level measurement) and analysis of that data. Students will use data acquisition systems and computer control software to complete laboratory exercises.

ECET 35700 Real-Time Digital Signal Processing (4 cr.)
Class 3, Lab 2. P: 20900 and Math 22100 and P or C: Math 222. Architecture, instruction set, and hardware and software development tools associated with a fixed-point general-purpose DSP processor. Fundamental principles associated with the processing of discrete-time signals and common applications such as waveform generation, FIR and IIR digital filtering, and DFT-and FFT-based spectral analysis and filtering are covered.

ECET 36000 CIM in Electronics Manufacturing (4 cr.)
Class 3, Lab 2. P: 15700. Manufacture and assembly of printed circuit boards; component selection, board layout, soldering and testing. Emphasis is on high-volume, state-of-the-art manufacturing processes, including surface-mount technology (SMT). Laboratory projects include CAD circuit board layout, automatic assembly equipment, thermal characteristics of circuit boards, process design, and SPC techniques.

ECET 37100 Automation, Instrumentation, and Process Control (4 cr.)
Class 2, Lab 4. P: 16400 and 23100. A project-oriented course combining key areas of automation, instrumentation, and process control. The course covers automatic testing, computer interfacing, data collection, robotic controls, programmable logic controllers, and graphical process control software. A final project is an integrated system.

ECET 38100 Electrical Distribution Systems (4 cr.)
Class 3, Lab 2. P: 20700 and 23100. A study of the design and operation of electric distribution systems. Estimated demand calculations, energy conservation, faults on power systems, power quality, power factor improvement, electric rates, voltage drops, protective devices, illumination, and the applicable portions of the National Electrical Code. Both new facilities and additions to existing facilities are included.

ECET 40300 Data Communications and Telecommunications (4 cr.)
Class 3, Lab 2. P: 28400 or CIT 30700. Focus on techniques and applications in data and telecommunications. Topics include telecommunication networks, various digital communication systems, noise performance, data networks, and protocols. Also included are serial and parallel transmission, multiplexing, modems, interfacing, and troubleshooting techniques. The laboratory covers both analog and digital/data communications circuits.

ECET 41700 Advanced Digital Systems Design with VHDL (4 cr.)
Class 3, Lab 2. P: 15500 and 15700. A study of Field Programmable Gate Arrays (FPGAs) and complex programmable logic using VHDL, finite-state-machine analysis and design, high-speed digital design considerations, memory systems, digital and analog devices, and A/D and D/A conversion.

ECET 34300 PC Systems II (4 cr.)
Class 3, Lab 2. P: ECET 20900 and: 16400 or CIT 27000, or CIT 26200. Real-time, PC-based operating systems. Programming Graphical User Interfaces for control applications using an object-oriented language. Embedded PC hardware, busses, and peripheral programming. Writing device drivers.

ECET 45300 Topics in Telecommunications (4 cr.)
Class 3, Lab 2. P: 28400. An advanced course in telecommunications that introduces and evaluates state-of-the-art systems, services, and applications for current and emerging networking technologies.

ECET 48300 Network Fundamentals with Microcontrollers (4 cr.)
Class 3, Lab 2. P: 28400. A study of computer networks and industrial network applications. Network protocols, media, and system software are examined. The focus is on the usage of data communication techniques and their applications in the industrial environment. In the laboratory students use utilities to examine different network protocols, configuring network software, using test equipment for analyzing and troubleshooting networks.

ECET 49000 Senior Design Project Phase I (1 cr.)
P: three 30000- or 40000-level ECET electives. Extensive individual design and development performed in consultation with faculty. Collaboration with industry is encouraged. Evidence of extensive and thorough laboratory work is required. Written and oral presentations are emphasized. Capstone experiences are included as integral parts.

ECET 49100 Senior Design Project Phase II (2 cr.)
P: 49000. P or C: TCM 37000. A continuation of 49000.

ECET 49300 Ethics and Professionalism in Technology (1 cr.)
P: Senior Standing. Factors involved in the ethical decision making in engineering and technology professions on both a local and global scale will be presented. Workplace issues such as socio-economic and cultural differences, professionalism, ethical codes, employee and community safety, whistle blowing, diversity and sexual harassment will be discussed. Case studies will guide student activities.

ECET 49900 Electrical and Computer Engineering Technology (1-9 cr.)
Class 0-4, Lab 2-9. Hours and subject matter to be arranged by staff.

ECET–C 29100 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic

program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

ECET–C 29200 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

ECET–C 39300 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

ECET–C 39400 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

ECET–C 39500 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

ECET–I 29100 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

ECET–I 29200 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

ECET–I 39300 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

ECET–I 39400 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

ECET–I 39500 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

Freshman Engineering

TECH 10200 Discovering Technology (1 cr.)
Designed to help students develop habits and skills that will benefit them in a college environment. An emphasis is placed on skills that will aid students in their pursuit of an engineering/technology degree; such as computer skills and problem solving.

TECH 10400 Technical Graphics Communications (3 cr.)
This course is an introduction to the graphic language used to communicate design ideas using CAD. Topics include: Sketching, multiview drawings, auxiliary views, sections views, pictorial views and dimensioning practices as well as an introduction to three-dimensional modeling, lighting and rendering.

TECH 10500 Introduction to Engineering Technology (3 cr.)
Introduction to the different disciplines incorporated in engineering technology as well as the skill set needed to be a successful student in engineering technology. Focus will be on individual and professional development, problem identification, developing analytical skills, time and resource management, project planning, design, implementation and evaluation, and oral and written communication in the engineering technology profession.

ENGR 19500 Selected Topics in Engineering I (0-3 cr.)
Selected topics in general or interdisciplinary engineering.

ENGR 19500 Introduction to the Engineering Profession (1 cr.) Class 1. P: none. This course introduces students to the engineering profession and to campus resources. The course is designed to help students develop essential communication and thinking skills along with the study and time-management skills needed for success in studying engineering. Collaborative techniques used in engineering practice are utilized.

ENGR 19600 Introduction to Engineering (3 cr.) Class 2, Lab 2. C: MATH 15400 or 15900 or equivalent. An overview of the engineering profession and methodologies of engineering design. Students develop skills using computer-aided design and simulation software for engineering systems. Projects and homework are implemented and tested in a laboratory environment. The course also introduces the students to standard computer

application software and university network and software resources.

ENGR 19700 Introduction to Programming Concepts (3 cr.)
Class1, Lab 2. C: MATH 16500. Basic concepts and applications of software programming for solving engineering problems. Topics include techniques for developing structured algorithms, data input and output, conditional statements, loops, recursion, functions, arrays, and elementary concepts in mathematical programming. Examples, homework, and applications of programming concepts make extensive use of the C programming language.

ENGR 29700 Computer Tools for Engineering (1 cr.)
Class 1. P: ENGR 19700. Introduction to the use of Matlab for solving engineering problems. Topics include computational methods, data input and output, plotting and curvefittting, functions, conditional statements, loops, and introduction to Matlab toolboxes.

Industrial Engineering Technology

IET 10400 Industrial Organization (3 cr.)
Class 3. A detailed survey of organizational structure: operations, finances, marketing, accounting, management, planning, control, personnel, quality, safety, wages, policy, and the human factors necessary for effective management.

IET 15000 Quantitative Methods for Technology (3 cr.)
Class 3. P: MATH 15900. Application of statistical techniques to typical problems in technology. Topics include data collection, descriptive statistics calculation, hypothesis testing, sampling, continuous and discrete distribution, probability, ANOVA, and related topics. The course also introduces the use of spreadsheet and other software to solve statistical calculations. Introduction to SPC is included. Basic metrology, concepts of gage and meter calibration calculations, instrument linearity, repeatability, reproducibility, sensitivity, precision, and instrument control are included.

IET 20400 Maintaining Quality (3 cr.)
Class 2, Lab 2. P: MATH 15300 and MATH 15400, or MATH 15900. 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 levels of quality acceptance.

IET 24000 Quality Techniques for Electronics Manufacturing (3 cr.)
P: 150. Survey of contemporary quality concepts and techniques. Topics include total quality management philosophy, process improvement, vendor certification, quality systems, ISO 9000 documentation, electronics industry quality applications, SPC, introduction to design experiments, basic reliability concepts, testing, and related topics. Team approaches to quality improvement and the application of the basic quality tools to improve processes are covered.

IET 30000 Metrology for Quality Assurance (3 cr.)
Class 2, Lab 2. P: MET 10500 and MATH 15900 or equivalent. An analysis of the basic principles of linear and geometric dimensional metrology. Topics include basic measuring instruments; mechanical, electronic, pneumatic, and optical measuring instruments; quality data acquisition systems; coordinate measuring machines; attribute gaging; geometric functional gaging; surface integrity determination; and geometric profile measurement.

IET 30100 Cost Evaluation and Control (3 cr.)
Class 3. Designing, installing, and improving standard cost systems in industry, including the establishment of basic standards. Development of the mechanics of operating control reports using principles of management by exception. Emphasis on use of electronic data processing for establishing and analyzing production cost standards.

IET 30100 Cost Evaluation and Control (3 cr.)
Class 3. Designing, installing, and improving standard cost systems in industry, including the establishment of basic standards. Development of the mechanics of operating control reports using principles of management by exception. Emphasis on use of electronic data processing for establishing and analyzing production cost standards.

IET 35000 Engineering Economy (3 cr.)
Class 3. P: MET 10500. Examines the concepts and techniques of analysis useful in evaluating the worth of systems, products, and services in relation to their cost. The objective is to help students grasp the significance of the economic aspects of engineering and to become proficient in the evaluation of engineering proposals in terms of worth and cost. Project analysis will require computer proficiency. Not open to students who have credit for IET 25000.

IET 36400 Quality Control (3 cr.)
Class 3. 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 37400 Nondestructive Testing (3 cr.)
Class 2, Lab 2. Study of industrial X-ray and ultrasonic inspection, surface penetrant inspection, magnetic particle and holography applications, and laser interferometry.

IET 45400 Statistical Process Control (3 cr.)
Class 3. P: 15000. Design and analysis of statistical process control charts and industrial sampling plans. Not open to students who have credit for 35400.

IET 47400 Quality Improvement of Products and Processes (3 cr.)
Class 3. P: 45400 or consent of instructor. Introduction to experimental design to improve products or processes. Topics include fractional factorial experiments, response curves, experimental noise, orthogonal arrays, and ANOVA. DOE using classical and Taguchi techniques. Introduction to QFD, FEMQ, and Six Sigma for quality improvements.

Interior Design Technology

INTR 10300 Introduction to Interior Design (3 cr.)
Class 2, Lab 2. An overview of the field of interior design, its history, and theory. An application of the principles and elements of interior design. design process, basic hand drafting, lettering, finish and color board construction/ layout is included. This course is for those who are seeking or considering a degree in Interior Design.

INTR 12400 Space Planning for Interiors (3 cr.)
Class 2, Lab 2. P: INTR 10300. Introduction to the fundamentals of design for human activity, standards for space, programming, and graphic communication. Introduction to codes, ADA guidelines and Universal Design. Manual drafting/drawing.

INTR 12500 Color and Lighting of Interiors (3 cr.)
Class 3. P: INTR 10300 and HER E109. An extensive study of textiles: fiber types, yarn production, fabric construction, finishing, coloring, and printing. Focus of application of textiles for use in residential and commercial interiors.

INTR 15100 Textiles for Interiors (3 cr.)
Class 3. P: INTR 10300 and HER E109. An extensive study of textiles: fiber types, yarn production, fabric construction, finishing, coloring, and printing. Focus of application of textiles for use in residential and commercial interiors.

INTR 20200 Interior Materials and Applications (3 cr.)
Class 2, Lab 2. P: INTR 10300 and ART 165. Analyzes information related to use and specification of surfacing materials applied in interior design projects. The role of green design is introduced, and ecological issues are integrated into each category of materials analyzed.

INTR 20400 History of Interiors and Furniture (3 cr.)
Class 3. A survey of historical development of interiors, furniture, and decorative arts from early history to 1800 (early neoclassic). Emphasis is on design motifs, ornamentation, and furniture styles.

INTR 22400 Residential I, Kitchen and Bath (3 cr.)
Class 2, Lab 2. P: INTR 12400 and INTR 20200. This studio class emphasizes the design of kitchen and bath spaces, including working drawings, NKBA guidelines, casegoods, appliances, fixtures, floor plans, and elevations. 3D models and client presentations will also be covered.

INTR 22500 Three-Dimensional Interior Design Studio (3 cr.)
Class 2, Lab 2. P: INTR 12400, 12500, and ART 155. This studio class includes the fundamentals of three-dimensional design, detailing and documentation along with 3D thinking and visualization of design solutions sensitive to functional, ergonomic and aesthetic objectives.

INTR 22600 Commercial Systems I (3 cr.)
Class 2, Lab 2. P: INTR 12400, 12500, 20200 and ART 155. This studio course emphasizes the elements used in development of non-residential space. Studies include technological and building requirements, programming, ADA guidelines, material selection and presentation, building and life-safety codes, square footage and space planning standards.

INTR 30400 History of American Interiors and Furniture (3 cr.)
Class 3. P: INTR 20400. The survey of historical development of interiors, furniture, and decorative arts beginning with 1800 late Neoclassic and American Federal through the 20th Century. Emphasis is on design motifs, ornamentation, and furniture styles.

INTR 32400 Residential Interior Design Studio II (3 cr.)
Class 2, Lab 2. P: INTR 22400, 22500 and MATH 153. The studio class will emphasize the design of residential space, recognizing design development as a process. Programming and space planning, schematic and design development, working drawings, plans, decorative elements, finish and material selection, budget and client presentations will also be covered.

INTR 32500 Environmental Lighting and Design (3 cr.)
Class 2, Lab 2, P: INTR 22600 and MATH 153. The study and practice of interior lighting fundamentals with an emphasis on environmentally efficient lighting systems and energy economy. Through the design process and execution of luminaire layouts, students will examine the visual process, lamp and luminaire selection, calculation methods, lighting controls and evaluation of effective solutions.

INTR 32600 Commercial Interior Design Studio II (3 cr.)
Class 2, Lab 2, P: INTR 22600 and MATH 153.
This studio course emphasizes the elements used in development of nonresidential space. Studies include technological and building requirements; building and life-safety codes, ADA guidelines, square footage and space planning standards, material selection and construction documentation. Heavy emphasis on the planning of systems furniture.

INTR 39000 Interior Design Internship (3 cr.)
P: Junior standing.. Minimum of 200 hours of work experience in the Interior Design field in a position and firm approved by the instructor. Written report of the experience.

INTR 42600 Health Care Design Studio (3 cr.)
Class 2, Lab 2 P: INTR 32600. This studio course emphasizes the principles and process of design for health care related facilities. Additionally, students will require working knowledge of codes and barrier free guidelines specific to health care issues in designing such spaces and buildings. Wayfinding, security, human behavior, material selections, specifications, presentations and documentation are also examined.

INTR 42800 Interior Design Capstone Design Project (3 cr.)
Class 2, Lab 2 P: INTR 39000. C: INTR 48000. In this B.S. Capstone course the designer tackles a semester long advanced design problem by applying the design process from project obtainment through construction

documents. This class is team-taught, and must be taken in conjunction with INTR 480.

INTR 45200 Interior Building Systems (3 cr.)
Class 2, Lab 2 P: ART 222 and INTR 32500. A survey course of building systems that covers the design implications of heating, air-conditioning, plumbing, and electrical systems of both residential and commercial buildings.

INTR 48000 Senior Thesis Project (3 cr.)
C: INTR 42800. An instructor mentored research and application project relative to the Design Technology major from initial client consultation through programming, schematic design, design development, and appropriate contract documents. This class is team-taught, and must be taken in conjunction with INTR 42800.

INTR 49500 Sustainable Design in Engineering and Technology (3 cr.)
Class 3 P: INTR 32500. Students will create industrial, ecological solutions with their unique disciplines. A theoretical framework on Green Design is used to identify and apply LEED concepts while working on multidisciplinary teams. Environmental concerns for better air quality and other global environment issues are explored.

Mechanical Engineering

ME 20000 Thermodynamics I (3 cr.) Class 3. P: PHYS 15200. P or C: MATH 26100. First and second laws, entropy, reversible and irreversible processes, properties of pure substances. Application to engineering problems.

ME 26200 Mechanical Design I (3 cr.)
Class 2, Lab 2. P: ME 27000. P or C: ENGR 29700. The basic concepts of mechanical design are introduced with emphasis on use of computer-aided design techniques. Applications are chosen from the area of linkage and mechanism design. Lab involves implementation of computer techniques in solving mechanical design problems.

ME 27000 Basic Mechanics I (3 cr.)
Class 3. P: PHYS 15200. P or C: MATH 26100. Fundamental concepts of mechanics, force systems and couples, free body diagrams, and equilibrium of particles and rigid bodies. Distributed forces; centroids and centers of gravity of lines, areas, and volumes. Second moment of area, volumes, and masses. Principal axes and principal moments of inertia. Friction and the laws of dry friction. Application to structures and machine elements, such as bars, beams, trusses, and friction devices.

ME 27200 Mechanics of Materials (4 cr.)
Class 3, Lab 2. P: ME 27000. 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. Experiments include testing of mechanical properties and failure analysis.

ME 27400 Basic Mechanics II (3 cr.)
Class 3. P: 270. P or C: MATH 26600. Kinematics of particles in rectilinear and curvilinear motion. Kinetics of particles, Newton's second law, energy, and momentum methods. Systems of particles, kinematics and plane motion of rigid bodies, forces and accelerations, energy and momentum methods. Kinetics, equations of motions, energy and momentum methods for rigid bodies in three-dimensional motion. Application to projectiles, gyroscopes, machine elements, and other engineering systems.

ME 31000 Fluid Mechanics (4 cr.)
Class 3, Lab 2. P: ME 20000 and MATH 26600. P or C: ME 27400. Continua, velocity fields, fluid statics, basic conservation laws for systems and control volumes, dimensional analysis. Euler and Bernoulli equations, viscous flows, boundary layers, flows in channels and around submerged bodies, and one-dimensional gas dynamics.

ME 31400 Heat and Mass Transfer (4 cr.)
Class 3, Lab 2. P: ME 31000. Fundamental principles of heat transfer by conduction, convection, and radiation; mass transfer by diffusion and convection. Application to engineering situations.

ME 32600 Engineering Project Management (3 cr.)
Class 3. P: Sophomore standing. Project management is an important skill that is needed in the private and public sectors as well as specialty businesses. This course explores the challenges facing today's project managers and provides a broad understanding of the project management environment focused on multiple aspects of the project.

ME 32700 Engineering Economics (3 cr.)
Class 3. P: Sophomore standing. Engineering economics is the application of economic techniques to the evaluation of design and engineering alternatives. The role of engineering economics is to assess the appropriateness of a given project, estimate its value, and justify it from an engineering standpoint. This course covers the time value of money and other cash-flow concepts, reviews economic practices and techniques used to evaluate and optimize engineering decisions, and discusses the principles of benefit-cost analysis.

ME 33000 Modeling and Analysis of Dynamic Systems (3 cr.)
.) Class 3. P: ECE 204 and MATH 262 P or C:. 340.Introduction to dynamic engineering systems; electrical, mechanical, fluid, and thermal components; linear system response; Fourier series and Laplace transform.

ME 34000 Dynamic Systems and Measurements (3 cr.)
Class 2, Lab 2. P or C: ME 33000 and STAT Elective. Modeling and formulation of differential equations for dynamic systems, including mechanical vibratory systems, thermal systems, fluid systems, electrical systems, and instrumentation systems. Analysis of dynamic systems and measuring devices including transient response and frequency response techniques, mechanical systems, transducers, and operational amplifiers. Consideration of readout devices and their responses to constant, transient, and steady-state sinusoidal phenomena. Calibration and

data analysis techniques are introduced. Both analog and digital computation are included.

ME 34400 Introduction to Engineering Materials (3 cr.) Class 3. P: Junior standing in engineering. Introduction to the structure and properties of engineering materials, including metals, alloys, ceramics, plastics, and composites. Characteristics and processing affecting behavior of materials in service.

ME 37200 Mechanical Design II (4 cr.) Class 3, Lab 2. P: ME 26200, 27200, and 27400. Type and dimensional synthesis of mechanisms. Vector loop approach. Numerical methods and graphical techniques. Computer-aided design techniques. Cams and gears. Static and dynamic balancing. Strength design for mechanisms and robotics. Reliability principles.

ME 40100 Engineering Ethics and Professionalism (1 cr.) Class 1. P: Senior standing. Some ethical, social, political, legal, and ecological issues that a practicing engineer may encounter. Students may not receive credit for both ECE 401 and ME 401.

ME 40200 Biomechanics of the Musculoskeletal System (3 cr.) Class 3. P: ME 27200. Mechanical design of organisms, with emphasis on the mechanics of the musculoskeletal system. Selected topics in prosthesis design and biomaterials; emphasis on the unique biological criteria that must be considered in biomechanical engineering design.

ME 40500 Seminar &Fundamentals of Engineering Review (1 cr.) Class 1. P: ME 34400, 37200, and Senior Standing. P or C: ME 48200. A seminar series on mechanical engineering career options and guidance, professional development and licensing, and preparation for the Fundamentals of Engineering (FE) examination.

ME 41400 Thermal-Fluid Systems Design (3 cr.) Class 3. P: ME 26200 and STAT Elective. P or C: ME 31400. Application of basic heat transfer and fluid flow concepts to design of the thermal-fluid systems. Emphasis on design theory and methodology. Design experience in thermal-fluid areas such as piping systems, heat exchangers, HVAC, and energy systems. Design projects are selected from industrial applications and conducted by teams.

ME 43000 Power Engineering (3 cr.) Class 3. P: ME 20000. Rankine cycle analysis, fossil-fuel steam generators, energy balances, fans, pumps, cooling towers, steam turbines, availability (second law) analysis of power systems, energy management systems, and rate analysis.

ME 43300 Principles of Turbomachinery (3 cr.) Class 3. P: ME 20000 and 310. Unified treatment of principles underlying fluid mechanic design of hydraulic pumps, turbines, and gas compressors. Similarity and scaling laws. Cavitation. Analysis of radial and axial flow machines. Blade element performance. Radial equilibrium theory. Centrifugal pump design. Axial compressor design.

ME 44600 CAD/CAM Theory and Application (3 cr.) Class 2, Lab 2, P: ME 26200, ENGR 19600, and ENGR 29700, or consent of instructor. Introduction to computer-aided design (CAD) and computer-aided manufacturing (CAM) theory and applications. Topics include CAD/CAM systems and integration, geometric modeling, process planning, and tool path generation, CAD/CAM interfacing with CNC (computer numerically controlled) machines, machining, and CNC programming. Projects involve CAD/CAM-based product development cycle. Hands-on experience is attained through laboratory experiment and actual CNC manufacturing.

ME 45000 Introduction to Computer-Aided Engineering (3 cr.) Class 3. P: ME 26200 and 27200. Introduction to the use of finite element methods for analysis and design. Applications involving stress analysis and heat transfer of solids. The use of existing software and hardware for computer-aided engineering.

ME 45800 Composite Materials (3 cr.) Class 3. P: ME 27200. Potential applications of composite materials. Basic concepts of fiber reinforced composites, manufacturing, micro and macro-mechanics, and static analysis of composite laminates. Performance (fatigue and fracture) and their application to engineering design.

ME 46200 Capstone Design (4 cr.) Class 3. P: ME 34400 and 37200. P or C: ME 40500, 41400 and 48200. Concurrent engineering design concept is introduced. Application of the design is emphasized. Design problems from all areas of mechanical engineering are considered.

ME 47200 Advanced Mechanics of Materials (3 cr.) Class 3. P: ME 27200 and MATH 26600. Studies of stresses and strains in three-dimensional elastic problems. Failure theories and yield criteria. Bending of curved beams. Torsion of bars with noncircular cross sections. Beams on elastic foundation. Energy methods. Selected topics. Students may not receive credit for both 47200 and 55000.

ME 47400 Vibration Analysis (3 cr.) Class 3. P: ME 27200, 27400, and 33000. Introduction to simple vibratory motions, such as undamped and damped free and forced vibrations, vibratory systems with more than one degree of freedom, Coulomb damping, transverse vibration of beams, torsional vibration, critical speed of shafts, and applications.

ME 48200 Control System Analysis and Design (3 cr.) Class 3. P: ME 34000 or equivalent. Classical feedback concepts, root locus, Bode and Nyquist techniques, state-space formulation, stability, design applications. Students may not receive credit for both 482 and ECE 382.

ME 49100 Engineering Design Project (1-2 cr.) P: senior standing and consent of a faculty sponsor. The student selects an engineering design project and works under the direction of the faculty sponsor. Suitable

projects may be from the local industrial, municipal, state, and educational communities. May be repeated for up to 4 credit hours.

ME 49700 Selected Topics in Mechanical Engineering (3 cr.)
P: Senior standing and consent of instructor. Topics of contemporary importance or of special interest that are outside the scope of the standard undergraduate curriculum can be offered temporarily under the selected topics category until the course receives a permenant number.

ME 50000 Advanced Thermodynamics (3 cr.) Class 3. P: ME 31000. The empirical, physical basis of the laws of thermodynamics. Availability concepts and applications. 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 50400 Automotive Control (3 cr.)
Class 3. P: ECE 382 or ME 482 or equivalent, and familiarity with MATLAB. Concepts of automotive control. Electro-mechanical systems that are controlled by electronic control modules via an appropriate algorithm (such as fuel injection timing control, emission control, transmission clutch control, anti-lock brake control, traction control, stability control, etc.). In-depth coverage on modeling and control of these automotive systems. MATLAB/SIMULINK modeling and simulation.

ME 50500 Intermediate Heat Transfer (3 cr.)
Class 3. P: ME 31400. Heat and mass transfer by diffusion in one-dimensional, two-dimensional, transient, periodic, and phase change systems. Convective heat transfer for external and internal flows. Similarity and integral solution methods. Heat, mass, and momentum analogies. Turbulence. Buoyancy-driven flows. Convection with phase change. Radiation exchange between surfaces and radiation transfer in absorbing-emitting media. Multimode heat transfer problems.

ME 50900 Intermediate Fluid Mechanics (3 cr.)
Class 3. P: ME 31000. Fluid properties, basic laws for a control volume, kinematics of fluid flow, dynamics of frictionless incompressible flow, basic hydrodynamics, equations of motion of viscous flow, viscous flow applications, boundary layer theory, wall turbulence, and lift and drag of immersed bodies.

ME 51000 Gas Dynamics (3 cr.) Class 3. P: ME 31000. Flow of compressible fluids. One-dimensional flows including basic concepts, isentropic flow, normal and oblique shock waves, Rayleigh line, Fanno line, and simple waves. Multidimensional flows including general concepts, small perturbation theory for linearized flows, and method of characteristics for nonlinear flows.

ME 52400 Introducation to Renewable Energy (3 cr.)
Class 3. P: ME 31000. This is an introductory course on the theory and applications of renewable energy. Energy is becoming increasingly more important in the economic development of our societies. The combination of limited fossil and nuclear fuel supply together with concerns on pollution and global warming has put the development of clean and renewable energy to the forefront of future human endeavor. It has long been recognized that human activities are the cause of many global problems, such as air and water pollution, global warming, fuel shortage, etc., that we face today, and if unchecked, can bring disastrous outcomes to the globe and human beings. In addition, the limited fossil fuel resources and its impact on economy and national security point to an urgent need to develop alternative renewable energy sources. Sustainability, i.e., the ability to achieve economic prosperity while protecting the natural systems of the planet, and providing a higher quality of life for its people, is a crucial issue for all nations now and for the foreseeable future. As the recent energy shortage and energy price increase indicate, renewable energy will be at the forefront of the effort to develop a sustainable economy. Engineers of the future will have to grapple with this energy problem for a long time to come, whether they want to or not, and it is important that the universities prepare them for this task, and this course is offered for this exact purpose. Both graduate and undergraduate research and education, and community outreach in the renewable energy area will accompany the growth in research activities in this area. An introductory course in renewable energy will serve the university's mission in research, education, and outreach.

ME 52500 Combustion (3 cr.) Class 3. P: ME 31000 and CHEM-C 105. Physical and chemical aspects of basic combustion phenomena. Classification of flames. Measurement of laminar flame speeds. Factors influencing burning velocity. Theory of flame propagation. Flammability, chemical aspects, chemical equilibrium. Chain reactions. Calculation and measurement of flame temperature. Diffusion flames. Fuels. Atomization and evaporation of liquid fuels. Theories of ignition, stability, and combustion efficiency.

ME 54600 CAD/CAM Theory and Application (3 cr.)
Class 2, Lab 2, P: ME 26200, ENGR 19600, and ENGR 29700, or consent of instructor. Introduction to computer-aided design (CAD) and computer-aided manufacturing (CAM) theory and applications. Topics include CAD/CAM systems and integration, geometric modeling, process planning, and tool path generation, CAD/CAM interfacing with CNC (computer numerically controlled) machines, machining, and CNC programming. Projects involve CAD/CAM-based product development cycle. Hands-on experience is attained through laboratory experiment and actual CNC manufacturing.

ME 55000 Advanced Stress Analysis (3 cr.)
Class 3. P: ME 27200 and MATH 26600. Studies of stresses and strains in three-dimensional problems. Failure theories and yield criteria. Stress function approach to two-dimensional problems. Bending of nonhomogeneous asymmetric curved beams. Torsion of bars with noncircular cross sections. Energy methods. Elastic stability. Introduction to plates. Students may not receive credit for both ME 472 and ME 550.

ME 55100 Finite Element Analysis (3 cr.)
Class 3. P: Graduate standing or consent of instructor. Concepts of finite elements methods; formulations for different engineering problems and their applications. Variational methods, the finite element concept, and

applications in stress analysis, dynamics, fluid mechanics, and heat transfer.

ME 55200 Advanced Applications of Finite Element Method (3 cr.)
Class 3. P: ME 55100 or equivalent. Various algorithms for nonlinear and time-dependent problems in two and three dimensions. Emphasis on advanced applications with problems chosen from fluid dynamics, heat transfer, and solid mechanics areas. Independent project required.

ME 55800 Composite Materials (3 cr.) Class 3. P: **ME** 27200. Potential applications of composite materials. Basic concepts of fiber-reinforced composites. Manufacturing, micro- and macro-mechanics, and static analysis of composite laminates. Performance (fatigue and fracture) and its application to engineering design

ME 56000 Kinematics (3 cr.) Class 3. P: 37200. Geometry of constrained-plane motion with application to linkage design. Type and number synthesis, size synthesis. Path curvature, inflection circle, cubic of stationary curvature. Finite displacements, three- and four-separated positions. Graphical, analytical, and computer techniques.

ME 56200 Advanced Dynamics (3 cr.) Class 3. P: 372 or consent of instructor. Dynamics of multiple-degrees-of-freedom mechanical systems. Holonomic and nonholonomic constraints. Lagrange's equations of motion. Hamilton's principle for holonomic systems. Kinematics and kinetics of rigid-body motion, including momentum and energy methods, linearized equations of motion. Classification of vibratory systems: gyroscopic, circulatory forces. Stability of linear systems: divergence and flutter. Applications to gyroscopes, satellite dynamics, etc.

ME 56300 Mechanical Vibrations (3 cr.)
Sem. 1. Class 3. P: ME 27200, ME 27400 and ME 33000 or equivalent. Review of systems with one degree of freedom. Lagrange's equations of motion for multiple-degree-of-freedom systems. Matrix methods. Transfer functions for harmonic response, impulse response, and step response. Convolution integrals for response to arbitrary inputs. Principle frequencies and modes. Applications to critical speeds, measuring instruments, isolation, torsional systems. Nonlinear problems. Mechanics staff.

ME 56900 Mechanical Behavior of Materials (3 cr.)
Class 3. P: 34400 or equivalent. How loading and environmental conditions can influence the behavior of materials in service. Elastic and plastic behavior, fracture, fatigue, low- and high-temperature behavior. Introduction to fracture mechanics. Emphasis is on methods of treating these conditions in design.

ME 58100 Numerical Methods in Mechanical Engineering (3 cr.)
Class 3. P: ME 31400 and 37200. The solution to problems arising in mechanical engineering using numerical methods. Topics include nonlinear algebraic equations, sets of linear algebraic equations, eigenvalue problems, interpolation, curve fitting, ordinary differential equations, and partial differential equations. Applications include fluid mechanics, gas dynamics, heat and mass transfer, thermodynamics, vibrations, automatic control systems, kinematics, and design.

ME 59700 Mechanical Engineering Projects I (3 cr.) P: Graduate standing. Individual advanced study in various fields of mechanical engineering. May be repeated for up to 6 credit hours.

ME 61400 Computational Fluid Dynamics (3 cr.)
Class 3. P: ME 58100 or equivalent; ME 50900 or 51000 or equivalent; or consent of instructor. Application of finite difference methods, finite element methods, and the method of characteristics for the numerical solution of fluid dynamics problems. Incompressible viscous flows: vorticity transport equation, stream function equation, and boundary conditions. Compressible flows: treatment of shocks, implicit and explicit artificial viscosity techniques, and boundary conditions. Computational grids.

ME 69700 Mechanical Engineering Projects II (3 cr.)
P: Graduate standing. Individual advanced study in various fields of mechanical engineering. May be repeated for up to 6 credit hours.

ME 69800 Research (M.S. Thesis) (1-6 cr.)
P: M.S. student standing with thesis option. Research credit for students in M.S. thesis option.

ME 69900 Research (Ph.D. Thesis) (1-6 cr.)
P: Ph.D. student standing. Research credit for Ph.D. thesis.

ME–C 18400 Cooperative Education Practice I-V (1 cr.)
P: Sophomore standing, a minimum GPA of 2.7, and program advisor approval. A semester or summer of related career experiences designed to enhance the student's preparedness for an intended career with a business, industry, or government agency. A comprehensive written report on the internship practice is required.

ME–C 28400 Cooperative Education Practice I-V (1 cr.)
P: Sophomore standing, a minimum GPA of 2.7, and program advisor approval. A semester or summer of related career experiences designed to enhance the student's preparedness for an intended career with a business, industry, or government agency. A comprehensive written report on the internship practice is required.

ME–C 38400 Cooperative Education Practice I-V (1 cr.)
P: Sophomore standing, a minimum GPA of 2.7, and program advisor approval. A semester or summer of related career experiences designed to enhance the student's preparedness for an intended career with a business, industry, or government agency. A comprehensive written report on the internship practice is required.

ME–C 48300 Cooperative Education Practice I-V (1 cr.)
P: Sophomore standing, a minimum GPA of 2.7, and program advisor approval. A semester or summer of related career experiences designed to enhance the student's preparedness for an intended career with a business, industry, or government agency. A

comprehensive written report on the internship practice is required.

ME–C 48400 Cooperative Education Practice I-V (1 cr.)
P: Sophomore standing, a minimum GPA of 2.7, and program advisor approval. A semester or summer of related career experiences designed to enhance the student's preparedness for an intended career with a business, industry, or government agency. A comprehensive written report on the internship practice is required.

ME–I 18400 Career Enrichment Internship I-III (1 cr.)
P: Sophomore standing, a minimum GPA of 2.3,and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's preparedness for entering an initial or second career. A comprehensive written report on the internship experience is required.

ME–I 28400 Career Enrichment Internship I-III (1 cr.)
P: Sophomore standing, a minimum GPA of 2.3,and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's preparedness for entering an initial or second career. A comprehensive written report on the internship experience is required.

ME–I 38400 Career Enrichment Internship I-III (1 cr.)
P: Sophomore standing, a minimum GPA of 2.3,and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's preparedness for entering an initial or second career. A comprehensive written report on the internship experience is required.

Mechanical Engineering Technology

MET 11100 Applied Statics (3 cr.)
Class 2, Lab 2. P: 10500. C: MATH 15400. A study of force systems, resultants and equilibrium, trusses, frames, centroids of areas, and center of gravity of bodies.

MET 11200 Applied Mechanisms (3 cr.)
Class 3; or Class 1, Lab 5. P: CGT 11000 and MATH 15100 or equivalent. An analysis of motions, displacements, velocities, instant centers, cams, linkages, and gears.

MET 14200 Manufacturing Processes (3 cr.)
Class 2, Lab 3; or Class 3. P: 14100. Basic casting, forming, and joining processes are surveyed. The course emphasizes the selection and application of various processes.

MET 14200 Production Design and Specifications (3 cr.)
Class: 2, Lab: 2. P: TECH10400 or CGT11000, TECH10500 or MET10500 (Or Instructors Consent). The design, evaluation, and documentation of engineering specifications required for manufacturability and assembly are introduced. Emphasis is on CAD-based details, assemblies, design layouts, equipment installations and related industrial practices.

MET 20500 Production Drawing and CAD II (3 cr.)
Class: 2, Lab: 2. P: TECH10400 or CGT11000 (Or Instructors Consent). Application of 3D modeling referenced from engineering drawings (assembly and detail drawings). Topics include: 3D solid modeling, solids editing, lighting and rendering.

MET 20900 Three-Dimensional NURBS Modeling (3 cr.)
Class: 2, Lab: 2. P: TECH10400 or CGT11000 (Or Instructors Consent). Introduction to 3D geometric modeling using NURBS-based CAD modeling. Emphasis on creating, editing, manipulating and presenting 3D conceptual and production models. Efficient modeling strategies, data exchange and an overview of down-stream applications is included.

MET 21100 Applied Strength of Materials (4 cr.)
Class 3, Lab 2; or Class 4. P: 11100 and 16300 or 16000. C: MATH 22100. The principles of strength, stiffness, and stability are introduced and applied primarily to mechanical components.

MET 21300 Dynamics (4 cr.)
Class 2, Lab 2; or Class 3. P: 11100. C: MATH 22100. Kinematics and kinetics principles of rigid-body dynamics are introduced. Emphasis is on the analysis of bodies in plane motion.

MET 21400 Machine Elements (3 cr.)
Class 3. P: 21100 and PHYS 21800. The theories and methods of statics, dynamics, and strength of materials applied to the selection of basic machine components. The course will develop the fundamental principles required to select the individual elements making up a machine.

MET 23000 Fluid Power (3 cr.)
Class 2, Lab 2; or Class 3. P: 11100, PHYS 21800. This course consists of the study of compressible and incompressible fluid statics and dynamics as applied to hydraulic and pneumatic pumps, motors, transmissions, and controls.

MET 24000 Basic Foundry (3 cr.)
Class 2, Lab 2. P: 14100 and 14200. Casting processes of the past, present, and future. Special emphasis on developing problem-solving skills in using cast parts in manufacturing. Lectures, reading assignments, audiovisual presentations, demonstrations, and field trips. Assignment sheets with study questions are used in preparing students for discussion sessions and tests. Each student must also research and write a five-page paper on some aspect of the foundry industry or give a demonstration in the laboratory.

MET 24200 Manufacturing Processes II (3 cr.)
Class 2, Lab 2. P: MET 14100, MATH 15900 or 15400 or MET 16200, CIT 13500 or MET 16300. This course surveys the manufacturing processes and tools commonly used to convert cast, forged, molded, and wrought materials into finished products. It includes the basic mechanisms of material removal, measurement, quality control, assembly processes, safety, process planning,

and automated manufacturing. Not open to students having credit for 135 or 281.

MET 27100 Programming for Numerical Control (3 cr.)
Class 2, Lab 2. P: 24200 and MATH 15900 or consent of instructor. An introduction to manual, conversational, and computer-aided programming. Incremental and absolute programming systems. Machine-based conversational languages and computer-aided programming languages.

MET 28200 Introduction to Plastics (3 cr.)
Class 2, Lab 3. P: 14100 and 14200. A survey of the plastics industry, including a study of materials with reference to their properties, processing, and uses. Fabrication, finishing, and fastening methods; plastic product design.

MET 29900 Mechanical Engineering Technology (1-3 cr.)
Class 0-3, Lab 0-9. Hours and subject matter to be arranged by staff. Primarily for third- or fourth-semester students with special aptitudes. Course may be repeated for up to 9 credit hours.

MET 30500 Computer-Aided Design with Applications (3 cr.)
Class: 2, Lab: 2. P: TECH10400 or CGT11000 (Or Instructors Consent). This course provides advanced study of computer-aided drafting and design utilizing current industrial computer-aided design systems. The courses covers the use of these systems in three dimensional and parametric modeling applicaitons.

MET 31000 Computer-Aided Machine Design (3 cr.)
Class 2, Lab 2. P: 21400. Introduction to the use of specialized programs to analyze machine components such as shafts, linkages, springs, and cams. Use of finite element analysis to analyze mechanical systems.

MET 32800 CAD/CAM for Mechanical Design (3 cr.)
Class: 2, Lab: 2 plus 1 arranged. P: TECH 10400 or CGT 11000, TECH10500 or MET 10500 (Or Instructor's Consent). Basic operations of mechanical design-drafting. A PC CAD (2D and 3D) laboratory-centered course introducing the basic steps involved in the geometric design of mechanical parts. This class provides an overview and continues into a detailed investigation of parametric modeling. Parametric modeling concepts will be applied to problems using standard industrial practices. Students must possess a solid background in engineering or technical graphics

MET 33800 Manufacturing Processes (4 cr.)
Class (3) Lab (2). P: MATH 15400. C: MET 34800. Course Covers basic fabrication and material removal manufacturing processes. Areas studied include casting, forging, material joining, forming, basic metal removal mechanisms, automated manufacturing processes, dimensional metrology for quality control and manufacturing process planning. The course emphasizes the selection and application of the various manufacturing processes

MET 34000 Piping and Plumbing Design (3 cr.)
Class 3. P: 22000. Design of plumbing systems, including losses in pipes, fittings, nozzles, orifices, etc. Includes steam, water, and oil systems. Piping handbooks and catalogs are used in conjunction with the State of Indiana Plumbing Code.

MET 34800 Engineering Materials (4 cr.)
Class (3) Lab (1) P: CHEM-C 101 and CHEM-C 121. This course gives an overview of the material families of metals, polymers, ceramics, and composites. Emphasis is placed on the structure, properties, and design selection for these materials for engineering applications. Problem-solving skills are developed in the areas of materials selection, evaluation, measurement, and testing. A laboratory component is included for hands-on experiences of exploring and testing properties of different families of materials, and selection of the materials for engineering applications.

MET 35000 Applied Fluid Mechanics (3 cr.)
Class 3. P: 11100 and 22000. The fundamentals of fluid mechanics, including properties of fluids; pressure; hydrostatic force on submerged areas; kinematics and dynamics of fluid flow; friction and sizing of pipes; selection of pumps.

MET 36000 Heating, Ventilating, and Air Conditioning I (3 cr.)
Class 3; or Class 2, Lab 2. P: 22000. Investigation of basics required to design heating and ventilating systems. Heat loss, humidification, duct design, equipment selection, and solar heating. Codes and standards emphasized.

MET 37400 Technical Sales (3 cr.)
Class 3. A study of the principles and practices of selling technical products and/or services. The course covers product knowledge, buying motives, the phases of a sale, ethical and legal aspects, synergistic selling, and career opportunities in technical sales. Utilizes role playing.

MET 38800 Thermodynamics & Heat Power (4 cr.)
Class: 2, Lab 1. P: PHYS 21800 and MATH 22100. Course provides the engineering technology student with an introduction to the principles of thermodynamics and heat transfer. Basic thermodynamic processes are used to evaluate the performance of energy based systems such as internal combustion engines, power plants, and refrigeration equipment.

MET 41400 Design of Mechanical Projects (3 cr.)
Class 1, Lab 4. P: Senior Standing. Application of the fundamental principles of mechanical, hydraulic, and electrical technology to the design of mechanical systems. Discussion of the design process and continuation of topics in the design of machine elements. A semester design project is required.

MET 42600 Internal Combustion Engines (3 cr.)
Class 2, Lab 3. P: 22000. A study of the spark ignition, compression ignition, and continuous-burning internal combustion engines.

MET 42800 Advanced CAD for Mechanical Design and Drafting (3 cr.)

Class 2, Lab 3. P: 32800 or equivalent. Mechanical and geometric modeling of complex surfaces, with manufacturing emphasis using wire-frame and shaded imaging techniques.

MET 49700 Senior Project (3 cr.)
Class 2, Lab 2. Directed work on individual projects for senior mechanical technology students.

MET 49900 Mechanical Engineering Technology (1-4 cr.)
Class 0-4, Lab 0-9. Hours and subject matter to be arranged by staff. Course may be repeated for up to 9 credit hours.

MET–C 19800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

MET–C 29800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

MET–C 39800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

MET–C 49600 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

MET–C 49800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

MET–I 19800 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

MET–I 29800 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

MET–I 39800 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

MET–I 49600 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

MET–I 49800 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

Motorsports Engineering Technology

MSTE 21000 Statics and Dynamios (4 cr.)
Class 4. P: Math 166 and PHYS 152 or permission of instructor. This course studies the analysis of systems in static equilibrium, systems in dynamic equilibrium, simple vibratory systems and provides for the study of either vehicle dynamics or vibrations.

MSTE 27200 Introduction to Motorsports (3 cr.)
Class 3. This course provides an introduction to the Motorsports Industry, including careers available, the organization and history of the industry, and technology development that has occurred due to the industry. A student project is required.

MSTE 29700 Computer Modeling for Motorsports (1 cr.)
Class 3. P: MET 27200 or permission of instructor. This course studies basic business and management concepts as applied to the unique environment of the Motorsports Industry.

MSTE 31000 Business of Motorsports I (3 cr.)
Class 3. P: MET 27200 or permission of instructor. This course studies basic business and management concepts as applied to the unique environment of the Motorsports Industry.

MSTE 31100 Business of Motorsports II (3 cr.)
Class 3. P: MSTE 31000. This course studies complex business, public relations, and management relationships

including case studies from the unique environment of the Motorsports Industry.

MSTE 31100 Motorsports Design I (3 cr.)
Class 3. P: MSTE 31000 and MSTE 21000 and MSTE 29700 or permission of instructor. This course explores the design concepts and approaches of the Motorsports Industry, creating connectivity between the courses of the first two years of the Motorsports Engineering BS Program and preparing students for internships in industry. A student project is required.

MSTE 33000 Data Acquisition in Motorsports (3 cr.)
Class 3. P: ECE 20400 or permission of instructor. This course explores instrumentation, data acquisition, data reduction, and data analysis within the Motorsports Industry.

MSTE 33100 Data Acquisition in Motorsports II (3 cr.)
Class 3. P: MSTE 33000 and MSTE 34000. This course provides an in-depth discussion to instrumentation, data acquisition, data reduction, and data analysis within the Motorsports Industry featuring case studies. Requires a student project.

MSTE 34000 Dynamic Systems and Signals (3 cr.)
Class 3. P: MSTE 21000 and Math 26600 or permission of instructor. Modeling and formulation of differential equations for dynamic systems, including mechanical vibratory systems, thermal systems, fluid systems, electrical systems and instrumentation systems. Analysis of dynamic systems and measuring devices including transient response and frequency response techniques, mechanical systems, transducers, and operational amplifiers. Consideration of readout devices and their responses to constant, transient, and steady-state sinusoidal phenomena. Calibration and data analysis techniques are introduced. Both analog and digital computation are included.

MSTE 35000 Computer Aided Design & Manufacturing (3 cr.)
Class 3. P: MSTE 29700 or permission of instructor. This course studies modeling and analysis techniques to aid design in the Motorsports Industry.

MSTE 36000 Control Systems Analysis and Design (3 cr.)
Class 3. P: MSTE 21000 and MSTE 34000 or ME 34000 or permission of instructor. This course studies classical feedback concepts, Bode and Nyquist plots, state space formulation, and stability for control system designs.

MSTE 41400 Motorsports Design II (3 cr.)
Class 3. P: MSTE 31100 and MSTE 33100 and MSTE 35000 and MSTE 32000. This is the culminating course in the Motorsports Engineering program, typing together concepts from all the other courses in the curriculum, and requires a capstone design project representative of a real world project within the Motorsports Industry.

MSTE 42000 Automotive Control (3 cr.)
Class 3. P: MSTE 36000 or permission of instructor. This course studies the applications of classical control systems design to the needs of the automotive and motorsports industries.

MSTE 42600 Internal Combustion Engines (3 cr.)
Class 3. P: ME 20000 or equivalent or permission of instructor. This course covers the fundamentals of internal combustion engine design and operation, with a focus on high performance.

MSTE 47200 Vehicle Dynamics (3 cr.)
Class 3. P: MSTE 21000 or ME 27400 or equivalent or permission of instructor. The course provides a study of vehicle chassis, suspension, and aerodynamic systems with a focus on high performance.

MSTE I41000 Motorsports Internship (1-3 cr.)
Sophomore standing and program advisor approval. A semester or summer of external, full-time related career experiences designed to enhance the student's preparedness for entering an initial or second career. A comprehensive written report on the internship experience is required.

Music and Arts Technology

MUS–A 110 Basic Musicianship and Technology I (6 cr.)
Musicianship and Technology I is the first component of a four-semester sequence in comprehensive musicianship. The courses in this sequence provide the major fundamentals of theory, history, and applied music skills while utilizing basic music technology. The semester is divided roughly into seven two-week units. Each unit shall focus on one broad topic and related skill set. All topics shall be explored from an analytical, historical, and hands-on perspective. Course material shall incorporate an array of styles, genres, and cultural influences. For music majors only. Prerequisite: Placement test taken one week prior to fall semester.

MUS–A 120 Basic Musicianship and Technology II (6 cr.)
Musicianship and Technology II is the continuation of the four-semester sequence in comprehensive musicianship. Concepts introduced in Musicianship and Technology I shall explored with greater depth and sophisticated application. Several new topics, such as voice leading and modulations, shall be included. All topics shall be explored from an analytical, historical, and hands-on perspective. Course material shall incorporate an array of styles, genres, and cultural influences. For music majors only. Prerequisite: Basic Musicianship and Technology I and/or consent of instructor.

MUS–A 210 Advanced Musicianship and Technology I (6 cr.)
Musicianship and Technology III is the continuation of the four-semester sequence in comprehensive musicianship. Concepts introduced in Musicianship and Technology I-II shall be explored with greater depth and sophisticated application. Several new topics, such as counterpoint, mode mixture, and enharmonic transformation, shall be included. All topics shall be explored from an analytical, historical, and hands-on perspective. Course material shall incorporate an array of styles, genres, and cultural influences. For music majors only. Prerequisites: **Basic**

Musicianship and Technology I and II (A11000 and A12000) and/or consent of instructor.

MUS–A 220 Advanced Musicianship and Technology II (6 cr.)
Musicianship and Technology IV is the conclusion of the four-semester sequence in comprehensive musicianship. Concepts introduced in Musicianship and Technology I-III shall be explored with greater depth and sophisticated application. Several new topics, such as composition and cellular organization shall be included. All topics shall be explored from an analytical, historical, and hands-on perspective. Course material shall incorporate an array of styles, genres, and cultural influences. Music majors only. Prerequisites: Basic Musicianship and Technology I and II (A11000 and A12000) and Advanced Musicianship and Technology I (A21000) and/or consent of instructor.

MUS–B 110 Horn Elective/Secondary (2 cr.) Private French horn lessons, 50 minutes each week. Additional applied fee. Time scheduled with instructor. Interview/ audition required.

MUS–B 120 Trumpet/Cornet Elective/Secondary (2 cr.)
Private trumpet/cornet lessons, 50 minutes each week. Additional applied fee. Time scheduled with instructor. Interview/ audition required.

MUS–B 200 Horn (2 cr.) Private French horn lessons, 30-50 minutes each week. Additional applied fee. Time scheduled with instructor. Students must provide instrument.

MUS–B 220 Trumpet and Cornet (1-2 cr.)
Private trumpet and cornet lessons, 30-50 minutes each week. Additional applied fee. Time scheduled with instructor. Students must provide instrument.

MUS–D 100 Percussion Elective/Secondary (2 cr.)
Individual percussion lessons, 50 minutes each week. Additional applied fee. Time scheduled with instructor. Interview/audition required.

MUS–D 200 Percussion Instruments (1-2 cr.)
Private percussion lessons, 30-50 minutes each week. Additional applied fee. Time scheduled with instructor. Students must provide instrument.

MUS–E 241 Introduction to Music Fundamentals (2 cr.)
Learn the basics of music reading, rhythm games, singing, keyboard skills, children's songs, and use of classroom instruments. Designed for, but not limited to, elementary education majors and others interested in using music as a learning tool.

MUS–E 400 Undergraduate Readings in Music Education (1-2 cr.)

MUS–E 536 Workshop: Music Business Marketing (3 cr.)
An in-depth, behind-the-scenes look at today's commercial music and entertainment industries; this is Marketing 101 for anyone who wants to make a living in music; learn marketing and publicity skills for career advancement in the music industry.

MUS–E 536 Workshop: History of Jazz Since 1950 (3 cr.) Jazz was America's first worldwide popular music. This course emphasizes Jazz as a means to better understand the history and culture of America through examining the influences, styles, and major performers and composers from Armstrong and Ellington to Coltrane and Marsalis.

MUS–E 536 Workshop: Social Network Web 2.0 and Beyond (3 cr.)
Departmental consent required. Call (317) 278-3264 for more information.

MUS–E 536 Introduction to the Business of Music (3 cr.)
Introduction to the business aspects of producing and selling music. The main objectives are to discuss marketing for aspiring talent (singers, players, and songwriters) and take a look at "behind the talent" jobs in the music industry. Emphasis will be on entrepreneurship as the key to success. For graduate credit, an additional 1,000-word research paper is required.

MUS–E 536 Workshop: IUPUI Jazz Ensemble (2 cr.)
This ensemble rehearses weekly and performs periodically on campus and at other local venues. A major concert is performed at the end of each semester. Authorization and audition are required.

MUS–E 536 Workshop: Graduate Music Technology Seminar (1-3 cr.)
IUPUI focuses on implementing computer, MIDI keyboards, and multimedia into the music curriculum. Also used for campus leaders speaking on topics of media, instructional technology, distance learning, and multimedia; plus leading music technology guests.

MUS–E 536 Workshop: Podcast Music Techniques (3 cr.)
Students will have the skills and knowledge to produce a high quality music related podcast in a variety of formats with segments and transitional elements and will be cognizant of legal issues regarding podcasts and how to minimize potential licensing issues. Consent of instructor. Call (317) 278-3264 for more information.

MUS–E 536 Workshop: Telematic Performing Ensemble (1-3 cr.)
Telematic art synthesizes traditional mediums of live music, dance, drama, and visual arts with interactive, hypermedia, and performance content in a networked context utilizing various formats of the Internet2 network. The resulting productions connect media-rich spaces and experiences to the real world using modern communication systems to create powerful and evocative experiences. The Telematic Group will produce performances using eclectic combinations to achieve artistic goals that interweave aesthetic creativity with technological inquiry. The purpose of this group is to engage significant, complex issues of culture and learning through the creation and performance of distributed, multi-disciplinary artistic works. Department consent required. Call (317) 278-3264.

MUS–E 536 Workshop: Musical Theatre Forum (3 cr.)

This course touches on theatre production. Consent of instructor. Call (317) 278-3264 for more information.

MUS–E 536 Workshop: Acting for Musical Theatre (3 cr.)
This course introduces singers interested in musical theatre performance to the practical dramatic skills necessary to perform effectively in musical theatre productions. Departmental consent required. Call (317) 278-3264 for more information.

MUS–E 536 Special Workshop in Music Education (1-3 cr.)

MUS–E 536 Special Workshop in Music Education: Computer Music Technology Workshop (2-3 cr.) non-standard. Participants will work with a wide range of instructional software in PC and Macintosh formats, including the complete music software library and the latest versions of software from Cakewalk, Sibelius, Sonic Foundry, and PG Music. Call 278-3264 for more information.

MUS–E 536 Workshop: Website Design for Musicians (3 cr.)
Individuals will learn the techniques of creating their own music website. Departmental consent required. Call (317) 278-3264 for more information.

MUS–F 40000 Seminar/Variable Topics (2 cr.)

MUS–F 45100 Chamber Ensemble (1 cr.)
Course will include small performing ensembles and may include the following: flute, oboe, bassoon, clarinet, strings, piano, voice and french horn. Performance at the end of the semester is required.

MUS–L 100 Guitar Elective/Secondary (2 cr.) Individual guitar lessons, 50 minutes each week. Additional applied fee. Time scheduled with instructor. Interview/audition required.

MUS–L 101 Beginning Guitar Class (2 cr.)
Fundamentals of contemporary guitar playing, with emphasis on simple songs and chords; acoustic guitar required for class and practice.

MUS–L 102 Intermediate Guitar Class (2 cr.) P: L10100 and/or ability to read music and play chord structures proficiently. Builds on knowledge learned in L10100; ability to reach chord notation, rhythms, and music notation necessary; acoustic guitar required for class and practice.

MUS–L 103 Advanced Guitar Class (2 cr.)
P: L10100 or permission of instructor. Study of advanced techniques, including open tunings and slide guitar. A section for classical guitar is also available under this number.

MUS–L 153 Introduction to Music Therapy (3 cr.)
Introduction to the influence of music on behavior, the healing properties of music, the use of music therapy with a variety of populations, and the development of the music therapy profession. Includes an introduction to the clinical process and music therapy procedures as well as participation in experiential activities and observations of music therapy sessions.

MUS–L 200 Guitar (1-2 cr.)
Private guitar lessons, 30-50 minutes each week. Additional applied fee. Time scheduled with instructor. Students must provide instrument. Only 1 credit per semester will count towards BMST degree.

MUS–L 253 Music Therapy Observation Practicum (1 cr.) P: Consent of instructor. Observation of professional music, recreation, and occupational therapy groups in a variety of settings with client populations of varying needs.

MUS–L 254 Music Therapy Practicum I (1 cr.) P: X29800. Students provide services to individual client in campus clinic or at local agency. Emphasis on acquiring skill in conducting music therapy assessments. Two or more hours per week and attendance at weekly seminar. May be repeated. Liability insurance required.

MUS–L 340 Music Therapy in Health Care (3 cr.) Study of music therapy methods and materials commonly used in assessment and treatment with adults and children in health care settings with an emphasis on older adult and rehabilitation services, wellness and stress management, pain management, and spiritual issues.

MUS–L 353 Music Therapy Practicum II (1 cr.) P: L25400. Students provide music therapy services to an individual client or group with emphasis on developing treatment interventions and plans. Two or more hours per week and attendance at a weekly seminar. May be repeated. Liability insurance required.

MUS–L 354 Music Therapy Practicum III (1 cr.) P: L35300. Students provide music therapy services to a group of clients in a local agency with an emphasis on assessment, treatment, planning, and evaluation. Involves three or more hours per week and attendance at a weekly seminar. May be repeated. Liability insurance required.

MUS–L 410 Administrative and Professional Issues in Music Therapy (3 cr.) Study of government and professional guidelines that influence music therapy services and documentation practices. Includes administrative skills such as proposal writing, public relations, budgeting, staff relationships, interviewing, program development, and professional ethics.

MUS–L 418 Psychology of Music (3 cr.)
P: Consent of instructor. Introduction to the physical, psychological, and physiological aspects of sound and music. Survey of the theories related to sound production, acoustics, music perception and learning, and the effects of sound and music on the behavior of humans. Overview of music psychology research, and the scientific method, and research techniques.

MUS–L 419 Research in Psychology of Music (3 cr.)
Overview and implementation of research methods, statistics, and techniques applied to psychology of music principles. Includes completion of experimental project related to psychology of music or musical behavior.

MUS–L 420 Clinical Processes in Music Therapy (3 cr.) P: L15300 or consent of instructor. Overview of the influence of music on behavior and the use of music

in treatment plans with clients. Includes principles of behavior therapies as they apply to the music therapy clinical treatment process.

MUS–L 421 Music Therapy Psychiatric Practicum (1 cr.) P: L35400. Students provide music therapy services in a hospice or medical setting with an emphasis on conducting music therapy in a single-session format. Involves three or more hours per week and attendance at a weekly seminar. May be repeated. Liability insurance required.

MUS–L 422 Music Therapy Theories and Techniques (3 cr.) P: L42000 or permission of instructor. Study of philosophies, theories, and techniques of various music therapy, music education, and counseling models, including Analytic, Creative, and Orff music therapy. Emphasis on the integration of models to develop personal philosophies and theories of music therapy practice.

MUS–L 424 Music Therapy Internship (2 cr.) P: All degree course work must be completed prior to registration.

MUS–M 110 Special Topics in Music for Non-Music Majors (var. cr.)
This is a variable topics class. At IUPUI, some of the topics could include the following:
Music and Computers (3 cr.), Studio Music Lab (2 cr.) , IUPUI Percussion Ensemble (1 cr.), Laptop Orchestra (2 cr.), Understanding Jazz (1 cr.-5 weeks), Understanding the Orchestra (1 cr.-5 weeks), Sight Singing & Ear Training (1 cr.), Flute Repertoire Class (2 cr.), IUPUI Guitar Ensemble (1 cr.), or Music of Louis Armstrong (1 cr.-5 weeks).

MUS–M 174 Music for the Listener (3 cr.) A survey course covering traditional and modern music styles of the last 1,000 years. Learn how to listen to music, instruments, and musical forms. No prior music experience required. Offered on campus and through the Web.

MUS–M 394 Survey of African American Music (3 cr.) A survey and exploration of black music from its African origins to the present, with special emphasis on its social, economic, and political impact.

MUS–N 512 Foundations of Music Productions (3 cr.) P: consent of instructor. Examines foundations and principles of music production. Topics include publishing, print media, music composition, methods, textbooks, multimedia, computer and electronic transmission of computer imaging, sound, and video. Other aspects covered are broadcast media; televideo graphics; background audio; script credit approval; clearances; recording; CD audio; sampling and reproduction of sound and images; multimedia; and computer applications, including network and broadband transmission of media. Business affairs, arts management, live performance, and legal aspects of the commercial music industry are assessed.

MUS–N 513 Principles of Music Technolog (3 cr.) P: consent of instructor. Examines theories and research in the use of computer technology with special focus on curriculum design and implementation of music technology in the classroom; learning and training theory paradigms applied to music technology; technology selection and assessment for learner-centered, individualized instruction and training; implementation and resource allocation; assessment designs for specific instructional models; technology and assessment database manipulation; curriculum design and media-optimized instruction; training curriculum models; and multimedia motivation.

MUS–N 514 Music Technology Methods (3 cr.) P: consent of instructor. An in-depth study of sequencing and music notation technology. This course also explores the history of Music Instrument Digital Interface (MIDI) development and related uses of MIDI with multimedia, including history and development of music; computer graphics and video technology; multimedia methods and techniques applied to training and instruction; music applications of sound-based stimuli in methods; graphic design applications for visual stimuli; video graphics; and storyboard methods. Current and emerging digital arts technologies will be assessed.

MUS–N 515 Multimedia Design Application in the Arts (3 cr.) P: consent of instructor. Presents the principles and fundamentals of instructional design and design techniques using authoring tools on PC, Macintosh, and emerging computer platforms. Included are storyboarding, planning, and organization of scripts; the use of current technology, computers, video, and digital arts equipment; computer-assisted design and project planner software tools; and management of design team concepts. Also includes design parameters for CD-ROM and videodisc production.

MUS–N 516 Advanced Interactive Design Applications in the Arts (3 cr.) P: N515 or consent of instructor. Incorporates extensive analysis and use of computer and multimedia authoring tools intended for specific educational applications. Project management and programming team organization; media management and selection criteria for digital arts media development; task analysis and instructional sequencing applied to training and instruction; and assessment modeling and feedback schedules for intrinsic motivation of students and trainees are examined.

MUS–N 517 Internship in Arts Technology (3 cr.) P: N516 or consent of instructor. An internship program for students to work with and learn from experts in arts technology fields who are developing and using new applications in commercial and educational settings. Requirements for interns include the development of a technology project proposal; interview, resume, and project presentation; on-site intern residency; project report; and oral and media presentation of project outcomes.

MUS–N 518 Arts Technology Development Project (3 cr.) Students create and orally present a multimedia teaching/training project that combines one or more of several elements of music technology including CD-ROM, videodisc, digital audio and video, and MIDI. Requirements include technology project proposal development, oral presentation of proposal, research and development of project, project final report, and oral and media presentation of project.

MUS–N 519 Digital Sound Design for Multimedia I (3 cr.) P: M110, N514, or consent of instructor. Digital

sound design and multimedia applications result in use of advanced Digital Audio Workstations and advanced software systems. Digital software-based sampling, synthesis, and multitrack recording systems will be mastered, including Pro-Tools, CuBase, and experimental music systems. Lab time in Digital Sound Design Studio required.

MUS–N 520 Digital Sound Design for Multimedia II (3 cr.) P: M110, N514, N519, or consent of instructor. Advanced applications of MIDI and next-generation sound file formats for producing soundtracks, multimedia events, and collaborative composition over the Internet.

MUS–N 521 Research Methods in Music and Multimedia (3 cr.) P: consent of instructor. Introduction to the underlying principles and concepts of technology-based studies in the arts. Emphasis on the integration of scientific methodology, descriptive and inferential techniques, and multimedia instrumentation in project development.

MUS–N 522 Techniques for Music Performance, Teaching, and Production at a Distance (3 cr.) P: consent of instructor. Methods for collaborative music performance, teaching, and production over the Internet. Examination of real-time interactive processes for music presentations, instructional delivery, videoconferencing, and multimedia development.

MUS–N 530 Philosophy and Theory in Music Therapy (3 cr.)
P: consent of instructor. Philosophical and theoretical foundations of the use of music in therapy. Philosophical positions concerning science, knowledge development, theory construction, and values augment critical-thinking skills. Theories, models, and conceptual frameworks guide to topical inquiry.

MUS–N 531 Music Therapy Quantitative and Qualitative Research (3 cr.) P: consent of instructor. Applications of scientific methodology to music therapy theory and practice. Philosophical differences between qualitative and quantitative research paradigms, integration of theoretical concepts and practice standards with scientific research proposals, and technological advances in research data collection and intervention delivery will be covered.

MUS–N 532 Music in Medicine (3 cr.) P: consent of instructor. A survey of literature describing medical applications of music. Students have the opportunity to collaborate with health care professionals who work with various client populations.

MUS–N 533 Advanced Clinical Techniques in Music Therapy (3 cr.)
P: consent of instructor. Articulation, testing, and refining of theoretically derived music therapy protocols with a client population of choice. Students will work in consultation with music therapy, nursing, and medical staff.

MUS–N 600 Thesis in Music Therapy (3 cr.)

MUS–P 100 Piano Elective/Secondary (2 cr.) Individual piano lessons, 50 minutes each week. Additional applied fee. Time scheduled with instructor. Interview/audition required.

MUS–P 110 Beginning Piano Class 1 for Non-Music Majors (2 cr.) Learn keyboard and music reading skills; must have access to out-of-class keyboard for practice. Classes meet in Clavinova lab. For students with no piano experience.

MUS–P 120 Beginning Piano Class 2 for Non-Music Majors (2 cr.) P: P110 or permission of instructor. Builds on skills acquired in P110.

MUS–S 110 Violin Elective/Secondary (2 cr.) Individual violin lessons, 50 minutes each week. Additional applied fee. Time scheduled with instructor. Interview/audition required.

MUS–S 120 Viola Elective/Secondary (2 cr.) Individual viola lessons, 50 minutes each week. Additional applied fee. Time scheduled with instructor. Interview/audition required.

MUS–S 200 Violin (1-2 cr.)
Private violin lessons, 30-50 minutes each week. Additional applied fee. Time scheduled with instructor. Students must provide instrument. Only 1 credit per semester will count towards BMST degree.

MUS–S 220 Viola (1-2 cr.)
Private viola lessons, 30-50 minutes each week. Additional applied fee. Time scheduled with instructor. Students must provide instrument. Only 1 credit per semester will count towards BMST degree.

MUS–U 320 Seminar: Afro-Cuban Percussion Ensemble (1 cr.)
P: consent of instructor. Builds on skills acquired from M110 Urban Drum Experience Class I and II High level of tone development achieved on all hand drums. Performance skills increased on all other Latin instruments. Students learn to play various styles on each instrument.

MUS–U 355 Music and Exceptionalities (4 cr.) P: L15300 or the equivalent experience; sophomore standing or the permission of the instructor. Basic accompaniment skills on the autoharp, guitar, or piano are desirable prerequisites. Introduction to using therapeutic and recreational music activities with individuals who have special needs. Includes development of skills in planning and adapting music activities for specific goals, sequencing and leading music experiences, and structuring experiences to facilitate participant success.

MUS–V 100 Voice Elective/Secondary (2 cr.) Individual voice lessons, 50 minutes each week. Additional applied fee. Time scheduled with instructor. Interview/audition required.

MUS–V 101 Voice Class 1 (2 cr.) Introductory aspects of voice, basic vocal techniques, and a wide variety of vocal styles and literature; students perform solo and ensemble singing. No previous music experience required.

MUS–V 200 Voice (1-2 cr.)
Private voice lessons, 30-50 minutes each week. Additional applied fee. Time scheduled with instructor. Only 1 credit per semester will count towards BMST degree.

MUS–W 110 Flute/Piccolo Elective/Secondary (2 cr.) Individual flute/piccolo lessons, 50 minutes each week. Additional applied fee. Time scheduled with instructor. Interview/audition required.

MUS–W 150 Saxophone Elective/Secondary (2 cr.) Individual saxophone lessons, 50 minutes each week. Additional applied fee. Time scheduled with instructor. Interview/audition required.

MUS–W 200 Flute and Piccolo (2 cr.) Private flute and piccolo lessons, 30-50 minutes each week. Additional applied fee. Time scheduled with instructor. Students must provide instrument. Only 1 credit per semester will count towards B.S.M.T. degree.

MUS–W 250 Saxophone (1-2 cr.) Private saxophone lessons, 30-50 minutes each week. Additional applied fee. Time scheduled with instructor. Students must provide instrument. Only 1 credit per semester will count towards B.S.M.T. degree.

MUS–X 040 University Instrumental Ensembles (2 cr.) Indianapolis Philharmonic Orchestra. Admission by audition only.

MUS–X 040 University Instrumental Ensembles (1-2 cr.) IUPUI Jazz Ensemble. Music of the Big Band era. This class is contingent upon enrollment of full instrumentation. Enrollment limited. Audition/interview required.

MUS–X 040 University Instrumental Ensemble (1 cr.) IUPUI Pep Band. The Pep Band is organized in the fall and performs at home basketball games in the spring. Open to all students who play a band instrument.

MUS–X 040 University Instrumental Ensemble (1 cr.) Scottish Rite Orchestra.

MUS–X 070 University Choral Ensembles (1-2 cr.) The following vocal ensembles are available: University Choir (1 cr.) and Indianapolis Symphonic Choir (2 cr., authorization and audition required).

MUS–X 298 Music Therapy Pre-Practicum Exam (0 cr.) P: L15300 or concurrent enrollment in L15300 and consent of instructor. An assessment of vocal skills, accompaniment techniques, and functional music skills required for practica courses. Includes song leadership, vocal technique, and accompaniment skills on autoharp, guitar, piano, Q-chord, and basic percussion instruments. Required of all music therapy and equivalency students.

MUS–X 341 Guitar Ensemble (1 cr.) The mission of the IUPUI Guitar Ensemble is to bring together guitar players of all abilities and styles in a friendly, non-intimidating environment.

MUS–X 350 Jazz Ensemble (1 cr.) Music of the Big Band and Jazz Band era.

MUS–X 351 Jazz Chamber Ensemble (1 cr.) Jazz Combo.

MUS–X 430 Electronic Music Ensemble (1 cr.) Course offers experiences in learning the world of electronic music techniques.

MUS–X 490 Electronic Music Ensemble (1 cr.) Course offers experiences in learning world percussion techniques. No instrument required.

MUS–Z 100 The Live Musical Performance (2 cr.) Examines the approach to attending live performances of music (large ensembles, chamber ensembles, solo recitals, and other multimedia performances). Students attend live performances and discuss music performances by genre to develop critical listening skills.

MUS–Z 111 Introduction to Music Theory (3 cr.) A study of fundamentals of the language and notation of music: listening, music reading and writing, and the elements of music as used in a variety of genres. Open to all students interested in a general background in music. Recommended for singers, instrumentalists, and keyboard players.

MUS–Z 201 History of Rock 'n' Roll Music (3 cr.) Survey of major trends, styles, and genres of rock music of the 1950s and 1960s, focusing on the work of artists and groups who have proved to have the most enduring significance.

MUS–Z 211 Music Theory II (3 cr.) P: successful completion of Z11100 Introduction to Music Theory or consent of instructor. Overview of part writing, musical form, harmonic analysis, and modulation. Intermediate aural skills including harmonic and melodic dictation.

MUS–Z 301 History of Rock Music—'70s and '80s (3 cr.) Survey of trends and styles in rock music of the '70s and '80s. Focuses on the artists and groups who have shaped the music of yesterday, today, and tomorrow.

MUS–Z 311 Music Theory III (3 cr.) P: successful completion of Z211 or consent of instructor. Overview of modulation, chromatic harmony, atonal composition, and serial composition. Advanced aural skills.

MUS–Z 315 Music for Film (3 cr.) A survey of the music and sound of movie soundtracks. Class will feature film segments, which are analyzed to see how music textures, tempos, and structures affect the plot.

MUS–Z 317 Computer Music Composition I (3 cr.) Students with an understanding of music sequencing and notation software learn to apply music composition techniques to electronic and computer music. Basic MIDI tools are applied to composition. The course is project-based and requires a performance of student compositions and arrangements as a final project.

MUS–Z 318 Computer Music Composition II (3 cr.) Students with introductory music composition techniques in electronic and computer music advance to sampling and looping technologies, and synchronizing digital music to video and film. The course is project-based and requires a performance of student compositions and arrangements as a final project.

MUS–Z 320 Special Topics in Popular Music (3 cr.) This is a variable topics class in popular music. At IUPUI, some of the topics could include the following: Music Business Marketing, Music Theory IV, Women Musicians,

History of American Popular Music, Music of Jimi Hendrix, and Telematic Performing Ensemble.

MUS–Z 320 Special Topics in Music (Variable Title) (3 cr.)
Introduction to Business of Music (3cr)

An in-depth, behind-the-scenes look at today's commercial music and entertainment industries; this is Marketing 101 for anyone who wants to make a living in music; learn marketing and publicity skills for career advancement in the music industry.

Music of Elvis Presley (3cr)

The music of Elvis Presley involves discussion of Elvis Presley's music, including influences and innovations. Also discussed is the impact of Elvis Presley on modern popular music.

Foundations of Music Production (3cr)

This class examines foundations and principles of music production. Consent of instructor. Call (317) 278-3264 for more information.

Musical Theatre Audition (3cr)

Department consent required. Call (317) 278-3264 for more information.

Global Music Journey (3cr)

Explore the diversity of musical traditions found throughout the world by studying the various means of transmission, musical instruments, musical meaning, musical sound, as well as the rituals and myths commonly associated with an assortment of music cultures. Previous musical training is not required. Pre-requisite M174. WEB

Telematic Performing Ensemble (3cr)

Telematic art synthesizes traditional mediums of live music, dance, drama and visual arts with interactive, hypermedia, and performance content in a networked context utilizing various formats of the Internet2 network. The resulting productions connect media-rich spaces and experiences to the real world using modern communication systems to create powerful and evocative experiences. The Telematic Group will produce performances using eclectic combinations to achieve artistic goals that interweave aesthetic creativity with technological inquiry. The purpose of this group is to engage significant, complex issues of culture and learning through the creation and performance of distributed, multi-disciplinary artistic works. Department consent required. Call (317) 278-3264.

Jazz Improv I (3cr)

Introduction to Jazz Improvisation including Jazz theory, chord recognition and Jazz vocabulary. Consent of instructor. Call (317) 278-3264 for more information.

Early Childhood Music Learning (3cr)

Students will be required to travel to Merrillville, Indiana for 3 class meetings during the semester: August 25, Oct. 13 and Dec 8 each meeting will be held from 6:00PM-9:00PM.

Women Musicians (3cr)

This class studies the lives and music of representative women composers and performers from Medieval Period to the 21st Century.

Music of Jimi Hendrix (3cr)

The music of Jimi Hendrix involves discussion of Hendrix's music, including influences and innovations. Also discussed is the impact of Jimi Hendrix on modern popular music.

History of American Pop Music (3cr)

This is a variable topics class in popular music. A general description includes, but is not limited to, the following: This class examines the cultural content of music by defining "popular" and by examining various decades of music in America from the 1600 to the present day.

Website Design for Musicians (3cr)

Individuals will learn the techniques of creating their own music website. Departmental consent required. Call (317) 278-3264 for more information.

Digital Sound Design for Multimedia (3cr)

Digital sound design and multimedia applications result in use of advanced Digital Audio Workstations and advanced software systems. Consent of instructor. Call (317) 278-3264 for more information.

Podcast Music Techniques (3cr)

Students will have the skills and knowledge to produce a high quality music related podcast in a variety of formats with segments and transitional elements and will be cognizant of legal issues regarding podcasts and how to minimize potential licensing issues. Department consent required. Call (317) 278-3264 for more information.

Steel Pan Techniques (3cr)

The objective of the IUPUI Steel Band Techniques class is to give the students the opportunity to explore the instrumentation, styles, excitement, and techniques of island music through performance. The groups repertoire will include calypso, reggae, jazz, pop, and classical selections. Call (317) 278-3264 for more information.

Hip Hop Music and Culture (3cr)

This course examines the cultural and musical phenomenon that is hip hop. Discussions will include the influences and history of early hip-hop, controversies, creativity and innovation, and the appropriation of hip-hop into the music industry.

MUS–Z 340 Introduction to the Music Busines (3 cr.) An introduction to the business aspects of the music industry. Recording companies, artists, contracts, and music production; copyright, licensing, and publishing; book agents, promotions, live performances, and performing arts organizations.

MUS–Z 373 The American Musical: Context and Development (3 cr.) The origins of the American musical:

its societal impact and its development from vaudeville and European operetta to the rock musicals of today.

MUS–Z 374 Contemporary Broadway Musicals (3 cr.) An exploration of the Broadway musical with a focus on contemporary trends. American rock musicals, revivals, and British and European productions. Study of contemporary producers, composers, lyricists, choreographers, and directors.

MUS–Z 390 Jazz for Listeners (3 cr.) The course focuses on how to listen to jazz and what to listen for in jazz. In addition, students will survey and learn how to recognize various historical styles of jazz and major figures who have contributed to the jazz tradition. Live examples and performances in and out of class are a regular part of classes.

MUS–Z 393 History of Jazz (3 cr.) Emphasis on jazz as a way to better understand the history and culture of America by examining the periods, major performers and composers, trends, influences, stylistic features, and related materials.

MUS–Z 393 History of Jazz (3 cr.)
Jazz was America's first worldwide popular music. This course emphasizes Jazz as a means to better understand the history and culture of America through examining the influences, styles and major performers and composers from Armstrong and Ellington to Coltrane and Marsalis.

MUS–Z 401 Music of the Beatles (3 cr.) An in-depth, song-by-song look at the music, lives, and times of the Beatles. The course focuses on the music and is aimed at heightening student listening skills as well as fostering a deeper appreciation for the Beatles' recordings.

Organizational Leadership & Supervision

OLS 10000 Introduction to Organizational Leadership and Supervision (1 cr.)
Class 1. This class offers a general introduction to the OLS program. It also covers the purposes and practices relevant to front-line supervisors, managers, and leaders at all organizational levels. Students are given an opportunity to meet the OLS faculty, learn about OLS degrees, related technology courses, and other general education and elective classes.

OLS 25200 Human Behavior in Organizations (3 cr.)
Class 3. Study of individual and group behavior in organizations. Special emphasis on typical supervisory relationships.

OLS 26300 Ethical Decisions in Leadership (3 cr.)
Class 3. P: ENG W131 or equivalent. This class is for students interested in discussing and contemplating the difficult legal and ethical situations facing managers in all sizes and types of organizations. Students in this class will read and discuss a variety of writings on ethics in the workplace and also analyze both written and videotaped legal/ethical scenarios.

OLS 27400 Applied Leadership (3 cr.)
Class 3. Introduction to and overview of the fundamental concepts of supervision. Emphasis on the supervisor's major functions and essential areas of knowledge, relations with others, and personal development.

OLS 32700 Leadership for a Global Workforce (3 cr.)
Class 3. P: 25200, 27400, ENG W131, and COMM R110 or consent of the OLS department. This course is for present and future leaders interested in the increasingly diverse global workforce. The course will present a variety of leadership issues including expatriate assignments, international business strategies and their cultural and managerial impact, and a review of business practices around the world.

OLS 32800 Principles of International Management (3 cr.)
Class 3. P: 32700. This course is a survey of issues relating to international management and international enterprise. The goal is to help students understand the principles and practices involved in managing across national boundaries so that they can be more effective leaders and managers-both domestically and internationally.

OLS 33100 Occupational Safety and Health (3 cr.)
Class 3. Aspects of occupational safety and health that are essential to the first-line supervisor. Emphasis on economic, legal, and social factors related to providing a safe and healthful working environment.

OLS 36800 Personal Law (3 cr.)
Class 3. This course covers topics such as discrimination based on sex, age, national origin, or handicap; recruitment and selection; affirmative action; rights of union and nonunion employees; Fair Labor Standards Act; Equal Pay Act and comparable worth; employee benefits plans; unemployment compensation; and right to discharge.

OLS 37100 Project Management (3 cr.)
Class 3. P: ENG W131, Math 11100. This course provides the basics of the project management discipline and allows the student to apply these skills in team-based situations.

OLS 37300 Case Studies in Leadership (3 cr.)
Class 3. P: 25200 or consent of instructor. Analysis of selected case studies with emphasis on attitudes, philosophies, and responsibilities of leaders in relationship to peers, followers, and superiors.

OLS 37500 Training Methods (3 cr.)
P: 25200 and 27400 or consent of department. This course teaches the fundamentals of the design facilitation and evaluation of formal training and development programs. Understanding the way people learn jobs skills is emphasized.

OLS 37800 Labor Relations (3 cr.)
This course teaches the regulations concerning management, labor, the collective bargaining agreement, and grievance and arbitration procedures.

OLS 38300 Human Resource Management (3 cr.)

This course teaches an overview of the human resource function in organizations today. Case studies are used to explore applications of human resource principles.

OLS 39000 Leadership Theories and Processes (3 cr.)
Class 3. P:OLS 32700; OLS majors must have all 100/200-level coursework completed prior to enrollment in OLS 39000 include 6.0 credit hours of math above 11100. Upon completion of this class students will have read about, contemplated, viewed, and discussed a variety of modern leadership theories and approaches based on current issues.

OLS 39900 Special Topics (3 cr.)
Hours and subject matter to be arranged by staff. Primarily for upper-division majors with specific interests and aptitudes. May be repeated for up to 6 credit hours.

OLS 41000 Survival Skills in Organizational Careers (3 cr.)
Class 3. P: ENG W131, COMM R110, TCM 22000, OLS 49000 (enrollment in or completion of TCM 32000Serves as the profession development capstone experience for baccalaureate students in the Department of Organizational Leadership and Supervision. Students will develop an approved research project proposal. 41000 provides the proposal for the 49000 senior research project. 41000 may not be taken concurrently with 49000.

OLS 45400 Gender and Diversity in Management (3 cr.)
P: OLS 25200. This course introduces cultural-based training to increase self-awareness on diversity related issues such as stereotyping and cross-cultural differences such as how to communicate and respond to differences in the workplace.

OLS 47600 Compensation Planning and Management (3 cr.)
Class 3. Focuses on the management of employee compensation. Examines the current state of compensation management and implications of recent theoretical and research developments related to compensation decisions. Gives each student the opportunity to develop a compensation package.

OLS 47700 Conflict Management (3 cr.)
This course provides students with a firm understanding of the theory and context as they relate to front-line supervision and managing conflict in the workplace including communicating with others, collaborating, negotiating effective outcomes, mediating disputes, leading teams, and handling employee relations issues.

OLS 47900 Staffing Organizations (3 cr.)
Class 3. A detailed look at the recruiting function of organizations to give the student a sense of the challenges of recruiting qualified employees.

OLS 48700 Leadership Philosophy (3 cr.)
Class 3. P: 252 and 274/374. This course facilitates the understanding and practice of various leadership roles required in supervisory situations. Students, through applying group dynamics and leadership theory, will develop new skills, capabilities, and understandings. Students will have fundamental shifts in their thinking about traditional leadership and in their ability to function in new leadership styles.

OLS 49000 Senior Research Project (3 cr.)
P: OLS major, TCM 32000, senior standing, OLS 41000, and consent of instructor. Using proposals developed in 41000 and TCM 32000, students will complete and present a comprehensive senior research project. As part of this project students will be expected to carefully, thoroughly, and logically analyze information, ideas, and research data.

OLS–C 19600 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

OLS–C 19800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

OLS–C 29800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

OLS–C 39800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

OLS–C 49800 Cooperative Education Practice I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's academic program and intended career with a business, industry, or government agency. A comprehensive written report on the practice is required.

OLS–I 19600 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

OLS–I 19800 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

OLS–I 29800 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

OLS–I 39800 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

OLS–I 49800 Career Enrichment Internship I-V (1-5 cr.)
P: sophomore standing and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's readiness for entering an initial or a second career. A comprehensive written report on the internship experience is required.

Technical Communication

TCM 19900 Selected Topics: Technical Communication (1-3 cr.)
Hours and subject matter to be arranged by faculty.

TCM 22000 Technical Report Writing (3 cr.)
Class 3. P: ENG W131 or equivalent. Extensive application of the principles of clear writing in business and industry with emphasis on audience, organization of ideas, and a concise writing style.

TCM 29900 Selected Topics: Technical Communication (1-3 cr.)
Hours and subject matter to be arranged by faculty.

TCM 32000 Written Communication in Science and Industry (3 cr.)
Class 3. P: ENG W131 or equivalent; junior standing or consent of instructor. Analysis of current writing practices in technology and science, especially in organizational settings. Practice in designing and preparing reports for a variety of purposes and audiences.

TCM 34000 Correspondence in Business and Industry (3 cr.)
Class 3. P: ENG W131 or equivalent. The development and application of strategies and skills for writing emails, memos, and letters for business and industry in technology and engineering. Applications may include resumes and letters of application, informational and persuasive documents, and in-house memoranda.

TCM 35000 Visual Elements of Technical Documents (3 cr.)
Class 3. P: TCM 22000, 32000 or consent of instructor. Methods and principles of illustrating technical reports and manuals, the role of the technical writer in the company, basics of visual design, visuals for manuals, visualization of technical data, and modern technology available to technical writers.

TCM 36000 Communication in Engineering Practice (2 cr.)
Class 1, Recitation 2. P: ENG W131 and COMM R110 or equivalents; junior standing or consent of instructor. The application of rhetorical principles to written and oral communication in the engineering professions. Planning, drafting, and revising professional engineering reports; planning and delivering oral presentations; organizing information; developing persuasive arguments.

TCM 37000 Oral Practicum for Technical Managers (3 cr.)
Class 3. P: COMM R110 with a grade of C or higher. The practical application of effective listening and speaking skills in situations typical for managers and supervisors in technology and engineering. Applications may include one-to-one conversations in supervisory management, such as hiring interviews and performance reviews; technical training programs; group discussions in work units, committees, and task forces; informal presentations, including program and status reports; formal technical presentations; communication in international industrial environments.

TCM 38000 Technical Communication in the Healthcare Professions (3 cr.)
Class 3. P: ENG W131. Focuses on the writing demands of the healthcare industry and so includes principles of clear writing, concise style, and organized ideas. Students examine and write documents for audiences in their medical and clinical organizational contexts.

TCM 39500 Independent Study in Technical Communication (1-3 cr.)
P: Consent of instructor. Individualized project approved by instructor consenting to direct it and by program director. Credit varies with scope of the project. May be repeated for a total of 4 credit hours.

TCM 39900 Selected Topics: Technical Communication (1-3 cr.)
Hours and subject matter to be arranged by faculty. May be repeated for up to 6 credit hours.

TCM 42000 Field Experience in Technical Communication (1-3 cr.)
P: Consent of instructor. Full- or part-time work in technical communications, supervised by a qualified professional in the cooperating organization and a faculty advisor. Requires periodic written and oral reports and final written and oral reports on work experience and assigned readings. Credit varies with scope of projects. Meets RISE criteria. May be repeated for a total of 4 credit hours.

TCM 42500 Managing Document Quality (3 cr.)
Examines and applies principles of creating technical publications with a focus on quality management of the process. Students will create effective publications by identifying and intervening in crucial points in the

documentation cycle - planning, researching, designing, drafting, reviewing, testing, and revising.

TCM 43500 Portfolio Preparation (1 cr.)
P: Consent of instructor. Preparation of professional portfolio for review by representatives from local industry. Includes readings and development of a professional career plan.

TCM 45000 Research Approaches for Technical and Professional Communication (3 cr.)
Examines quantitative and qualitative research techniques practiced by professionals working in technical and business communication. It explores both primary (i.e., field) and secondary (i.e., library) research approaches for learning about content, audience, and publication design.

TCM 46000 Engineering Communication in Academic Contexts (2 cr.)
Class 1, Recitation 2. P: ENG W131 and COMM R110 or equivalents; senior or graduate standing or consent of instructor. Analysis of situations and genres of written and oral communication of engineering information in academic contexts. Application of rhetorical principles in preparing and delivering written and oral presentations of engineering information.

TCM 49900 Selected Topics: Technical Communication (1-3 cr.)
Hours and subject matter to be arranged by faculty. May be repeated for up to 6 credit hours.

General Requirements

To earn a Bachelor of Science in Engineering (B.S.E.), Bachelor of Science in Biomedical Engineering (B.S.B.M.E.), Bachelor of Science in Computer Engineering (B.S.Cmp.E.), Bachelor of Science in Electrical Engineering (B.S.E.E.), or Bachelor of Science in Mechanical Engineering (B.S.M.E.), students must satisfy the following requirements. Requirements for graduation include receiving credit in all required courses: at least 130 credit hours in the biomedical engineering program, 129 credit hours in the computer engineering program, 129 credit hours in the electrical engineering program, 131 credit hours in the engineering management program, 130 credit hours in the interdisciplinary engineering program, or 130 credit hours in the mechanical engineering program.

Each student must have an approved plan of study that lists all courses for the specific degree program. Students should prepare their plans of study for approval during the junior year. If a student wants to deviate from the published curricula, written permission of the administrator of the program is required.

Additional requirements include the following:
1. Students must complete the program of study for the degree by resident course work, by examination, or by credit accepted from another institution. The dean may refuse to accept as credit toward graduation any course that was completed 10 or more years previously, and former students will be notified of all such decisions upon reentering. Substitution of courses required for graduation may be made by the dean of the school.
2. Students must complete at least two semesters of resident study at IUPUI, and they must complete at least 32 credit hours of appropriate course work, of which 12 credit hours must be completed in the major at the junior level or higher. Students are also expected to complete the senior year in residence: however, with the approval of the dean, students who have had at least four semesters of resident study may complete a maximum of 20 credit hours of the senior year in another approved college or university. For the purpose of this rule, two summer sessions are considered equivalent to one semester.
3. Students must be registered in the School of Engineering and Technology, either in residence or in absentia, during the semester or summer session immediately preceding the awarding of the degree.
4. Students must have an index of 2.0 in required engineering courses in addition to an overall graduation index of 2.0 for all courses on the approved plan of study. Students who have completed all other requirements for a bachelor's degree but have failed to meet the minimum graduation index may register for additional courses, with the approval of an authorized representative of the dean, after a review of their record. The additional courses may not exceed 20 credit hours. Students may take a maximum of 9 of the 20 credit hours in another approved college or university, provided the courses are approved in advance and in writing by an authorized representative of the dean of the School of Engineering and Technology. A copy of the approval must be filed in the office of the engineering and technology recorder. Credit in these additional courses must be established within five years of the date on which all other degree requirements were met. Students will have fulfilled the requirements for graduation if graduation indexes, including extra courses, equal or exceed the minimum specified at the time when all other graduation requirements were satisfied.
5. Applicants for a second bachelor's degree, after they are admitted to the second bachelor's degree program, must complete at least 32 credit hours of appropriate course work, of which 12 credit hours must be completed in the major at the junior level or higher.
6. Courses taken under the Pass/Fail option and courses taken by correspondence may not be used to fulfill graduation requirements for engineering students.

Undergraduate Technology Requirements

Associate Degree

To earn an Associate of Science (A.S.) degree, students must satisfy the following requirements:
1. Students must complete the plan of study for the degree by resident course work, by examination, or by credit accepted from another institution. The dean of the school may refuse to accept as credit toward graduation any course that was completed 10 or more years previously, and former students will be notified of all such decisions upon reentering. Substitutions of courses required for graduation may be made by the dean of the School of Engineering and Technology.
2. Students must complete at least two semesters of resident study at IUPUI, and they must complete at least 15 credit hours of appropriate course work, of which 6 credit hours must be in the major. Students are generally expected to complete the entire second year in residence; however, with the approval of the dean of the school, students who have at least three semesters of resident study may complete a maximum of 16 credit hours of the

second year in another approved college or university. For the purpose of this rule, two summer sessions are considered equivalent to one semester.
3. Students must be registered in the School of Engineering and Technology, either in residence or in absentia, during the semester or summer session immediately preceding the award of the degree.
4. Students must have a minimum graduation index of 2.0. Students who have completed all other requirements for an A.S. degree but have failed to meet the minimum graduation index (the average of grades earned in courses required for a degree) may register for additional courses, with the approval of an authorized representative of the dean of the school, after a review of their record. These additional courses may not exceed 10 credit hours, and credit in these courses must be established within three years of the date on which all other degree requirements were met. Students will have fulfilled the requirements for graduation if their graduation indexes, including the extra courses, equal or exceed the minimum specified at the time when all other graduation requirements were satisfied.
5. Applicants for a second A.S. degree must complete at least 15 credit hours at IUPUI of appropriate course work after admission to the second associate degree program. At least 6 of the 15 credit hours must be completed in the major. A second associate degree may not be earned in the same program.

Bachelor's Degree

To earn a Bachelor of Science (B.S.) degree, students must satisfy the following requirements.
1. Students must complete the program of study for the degree by resident course work, by examination, or by credit accepted from another institution. The dean may refuse to accept as credit toward graduation any course that was completed 10 or more years previously, and former students will be notified of all such decisions upon reentering. Substitution of courses required for graduation may be made by the dean of the school.
2. Students must complete at least two semesters of resident study at IUPUI, and they must complete at least 32 credit hours of appropriate course work, of which 12 credit hours are required to be in the major at the junior level or higher. Students are generally expected to complete the senior year in residence; however, with the approval of the dean, students who have had at least four semesters of resident study may complete a maximum of 20 credit hours of the senior year in another approved college or university. For the purpose of this rule, two summer sessions are considered equivalent to one semester.
3. Students must be registered in the School of Engineering and Technology, either in residence or in absentia, during the semester or summer session immediately preceding the awarding of the degree.
4. Students must have a minimum graduation index of 2.0. Students who have completed all other requirements for a bachelor's degree but have failed to meet the minimum graduation index may register for additional courses, with the approval of an authorized representative of the dean, after a review of their record. The additional courses may not exceed 20 credit hours. Students may take a maximum of 9 of the 20 credit hours in another approved college or university, provided the courses are approved in advance and in writing by an authorized representative of the dean of the School of Engineering and Technology. A copy of the approval must be filed in the Office of the Recorder. Credit in these additional courses must be established within five years of the date on which all other degree requirements were met. Students will have fulfilled the requirements for graduation if graduation indexes, including extra courses, equal or exceed the minimum specified at the time when all other graduation requirements were satisfied.
5. Applicants for a second bachelor's degree must complete at IUPUI at least 32 credit hours of appropriate course work after they are admitted to the second bachelor's degree program. At least 12 of the 32 credit hours must be completed in the major at the junior level or higher.

Engineering and Technology Minors

Minimum criteria for academic minors offered within the School of Engineering and Technology will include an overall 2.0 GPA; a grade of C– or above for each course required for the minor; and at least one-half of the required courses for the minor must have been completed in residency at IUPUI. Any courses (e.g., Web-based courses or courses via the Internet) delivered by an IUPUI school are considered to be residence courses for this purpose. The academic requirements for each minor offered by the school will consist of at least 21 semester hours.

Certificate Programs

Students who are seeking one of the certificate programs offered by the School of Engineering and Technology must qualify for admission under the published criteria of the academic unit at IUPUI and must complete at least one-half of the required courses at IUPUI. Any courses (e.g., Web-based courses or courses via the Internet) delivered by an IUPUI school are considered to be residence courses for this purpose.

Internship and Cooperative Education Programs

Good career opportunities almost always require previous work experience. While earning a degree at the Purdue School of Engineering and Technology, Internship and Cooperative Education Programs provide essential opportunities to launch a career.

The lessons that students learn in classes and laboratories receive their ultimate test through the school's cooperative education, internship, professional work experience, and international student exchange programs. The school interacts with a broad variety of area companies to provide the technical experience required to succeed in today's globally competitive economic markets.

The Cooperative Education Program (Co-op) is a five-year professional development experience, designed to combine practical on-the-job experiences with the classroom training of a four-year college curriculum; the Internship Program allows students to work full time or part time for an employing organization while simultaneously taking courses during one semester. This internship program allows flexibility for students who wish to obtain work experience, but are not able to take

a semester away from school as is required in the co-op program.

The greater metropolitan Indianapolis community offers a number of employment enrichment opportunities through extensive professional, governmental, and manufacturing resources. Our community resources provide rich, practical, well-paid professional opportunities generally unavailable at residential campuses.

After students have satisfactorily completed the first year of the academic program, they have a choice of employment programs to meet their needs.

Eligibility

To be eligible for one of the Internship/Cooperative Education Programs, a student must:

1. be admitted to the Purdue School of Engineering and Technology, IUPUI;
2. be enrolled in one of the academic programs offered by the school;
3. continue in one of the school's Bachelor of Science degree programs;
4. have satisfactorily completed the first year of an academic program;
5. meet and maintain minimum GPA requirements;
6. register for the appropriate Employment Enrich-ment Programs course before each work period;
7. satisfactorily complete the work period requirements;
8. attend a co-op/internship orientation session.

During periods of professional employment, students will earn a competitive salary and might also earn academic credit toward the bachelor's degree. The amount and distribution of credit is determined by the student's academic department. For further information, contact the Office of Student Placement Services, Engineering and Technology Building (ET) 141, 799 W. Michigan Street, IUPUI, Indianapolis, IN 46202-5160; (317) 274-0805.

Undergraduate

The School of Engineering and Technology is unique in offering programs in both engineering and engineering technology. What is the difference between the two areas? Engineering students learn the principles and theories needed to plan, design, and create new products and are more likely to use broad analytical skills in achieving engineering solutions. Engineering technology students learn technical methods and practices to become experts who apply technology to solve industrial problems.

Undergraduate Engineering Degree Programs

Programs for full-time students pursuing bachelor's degrees in engineering are presented in this section. The admission requirements, curricula, graduation requirements, and course descriptions of each program listed are those that were in effect at the time of printing and may subsequently change. Students are encouraged to obtain the latest course and curriculum information from their academic advisors.

The following undergraduate engineering degree programs are available in the School of Engineering and Technology:

- Bachelor of Science in Biomedical Engineering (BSBME)
- Bachelor of Science in Computer Engineering (BSCmpE)
- Bachelor of Science in Electrical Engineering (BSEE)
- Bachelor of Science in Engineering (BSE)
- Bachelor of Science in Mechanical Engineering (BSME)
- Bachelor of Science in Motorsports Engineering (BSMSTE)

Undergraduate Engineering Curriculum

All the undergraduate engineering curricula in this bulletin are presented as four-year programs. Well-qualified students with excellent high school preparation should be able to complete all requirements in four years or less. Students with gaps in their high school preparation or those who participate in the Cooperative Education Program may require more time to complete their degrees. Other students may adjust their semester credit loads to maintain employment or for other reasons. Programs can be tailored for part-time and evening students, as classes are scheduled for both day and evening. Part-time and evening students are urged to consult their advisors to avoid future scheduling problems.

It is important for students to recognize that some flexibility is provided in each of the curricula to allow for individual differences in backgrounds and academic goals. It is the student's responsibility to consult with an academic advisor to design a program to fit personal needs.

Creative accomplishment in an engineer's career often derives from an education that stresses major ideas and fundamental concepts of engineering rather than specific technologies. The engineering curricula provide wide experience in the mathematical, physical, and engineering sciences as well as in the social sciences and the humanities. In this way the student obtains both thorough training in engineering and a well-rounded education. Such an approach provides the best preparation for the engineer, who must envision and develop the technologies of the future and deal with scientific advances.

Engineers are responsible for translating the ever-expanding reservoir of scientific knowledge into systems, devices, and products and for further expanding knowledge. To meet these responsibilities, those who are learning to be engineers must not only master the ideas of others but must also originate new ideas. Moreover, although engineers deal extensively with facts and scientific fundamentals as a matter of course, they cannot rely on these alone. Engineers inevitably face decisions that cannot be made on the basis of technical skill, but that require a broad understanding of human values and behavior as developed by studies in the social sciences and humanities. They must also be able to accommodate situations where judgment and wisdom, combined with scientific knowledge or technical skill, can provide a solution.

Minor in Business for Engineering Students

The Indiana University Kelley School of Business and the School of Engineering and Technology have established a minor in business for engineering students. To qualify for the minor, students must meet course prerequisites and entrance requirements. In certain cases, substitutions are permitted for some requirements. Please consult with a Kelley School of Business academic advisor for more

information: (317) 274-2147. Application deadlines are March 1 for the summer and fall semesters, and October 1 for the spring semester. Applications are available in the undergraduate office, Indiana University Kelley School of Business, Business/SPEA Building 3024.

Freshman Engineering Program

Director of Freshman Engineering: N. Lamm
Senior Lecturer: P. Orono
Lecturer: P. Gee
Freshman Engineering: J. Meyer

All qualified students interested in pursuing an engineering degree at IUPUI are admitted to the Freshman Engineering Program. This includes second-degree and transfer students as well as beginning students.

While in this program, beginning students complete the basic sequence of courses common to all engineering majors. These courses include calculus I and II, chemistry and physics for science and engineering majors, English composition, and public speaking. Freshman engineering courses taken by all students include: ENGR 195 Introduction to the Engineering Profession, ENGR 196 Introduction to Engineering, and ENGR 197 Introduction to Programming Concepts. The Freshman Engineering Program provides students with an opportunity to explore the various engineering disciplines before making a commitment to a specific curriculum.

Transfer and second-degree students remain in Freshman Engineering until the evaluation of their transfer credits is completed.

The Office of Freshman Engineering has a full-time staff available year round. Prospective students and their families are invited to contact the Office of Freshman Engineering regarding any questions they may have concerning engineering and the engineering degree programs offered at IUPUI. The advisors in freshman engineering provide academic counseling and advising to prospective and continuing students. New students in engineering receive individualized attention while completing the basic core of freshman engineering courses. Transfer and second-degree students likewise work closely with freshman engineering advisors until all transfer credit issues are resolved. The office has an open-door policy, and students are encouraged to consult with advisors about any issues that might affect their academic progress.

Technology Degree Programs

The School of Engineering and Technology offers a variety of technology programs at the associate and bachelor's degree levels. Programs for full-time students pursuing these technology departments are presented in this section. Although the school sets the normal length of time needed to complete each degree program, the required time may vary for individual students. For example, well-qualified students with excellent high school preparation may complete a program in less than the length of time indicated. Other students who decide to combine cooperative (co-op) education or internships with their course work may take more time to complete all degree requirements. Students may adjust their course loads for job or personal reasons, and plans of study can be tailored to meet the needs of part-time and evening students. Needing to study over a longer time should be no obstacle to completing the program successfully.

Associate of Science

Science and technology activities range from the applied and practical to the highly theoretical and abstract. At one extreme are the theoretical scientists; at the other are the mechanics, draftspersons, and service personnel. Within this spectrum, educational backgrounds include doctoral degrees, master's degrees, bachelor's degrees, and associate degrees at the university level, as well as certificates and diplomas from other postsecondary educational and training institutions.

The Associate of Science degree offered in the School of Engineering and Technology at IUPUI is awarded upon successful completion of two years of university-level study in applied science. Graduates of these programs are called technicians.
Technicians' jobs require applying technical knowledge and skills and, normally, the manipulative skills necessary to perform technical tasks.

Technicians have considerable knowledge of the materials and processes involved and are equipped with the ability to apply the principles of physical and biological sciences, generally using instruments rather than tools. Their job contribution is mainly through mental activity, combined with applied skills. In many organizations the technician can move up in the organization to higher levels of responsibility, if he or she is capable and is willing to pursue further education.

The following associate degree programs are offered by the School of Engineering and Technology at IUPUI:

Architectural Technology: Department of Design & Communication Technology
Biomedical Engineering Technology: Department of Engineering Technology
Interior Design: Department of Design & Communication Technology

Bachelor of Science

The Bachelor of Science degree is awarded under the "two-plus-two" education plan. A student following this plan first earns an associate degree in two years and then may complete a bachelor's degree after two more years. Transfer students must meet all departmental requirements.

A student is awarded an Associate of Science degree upon successful completion of the two-year program. This degree indicates that the person who receives it is educated at the technician level. These individuals may go directly into the work force, or they may decide to continue their studies.
Students who want to continue may be admitted for an additional two years of bachelor's-level study in the various technology programs. Students who successfully complete such a program are awarded a Bachelor of Science degree, which provides the basis for increased job responsibility.

The following technology bachelor's degree programs are available to qualified students:

- Biomedical Engineering Technology: Department of Engineering Technology

- Computer Engineering Technology: Department of Engineering Technology
- Computer Graphics Technology: Department of Design & Communication Technology
- Computer & Information Technology: Department of Computer, Information, & Leadership Technology
- Construction Engineering Management Technology: Department of Engineering Technology
- Electrical Engineering Technology: Department of Engineering Technology
- Interior Design Technology: Department of Design & Communication Technology
- Mechanical Engineering Technology: Department of Engineering Technology
- Music Technology: Department of Music and Arts Technology
- Organizational Leadership and Supervision: Department of Engineering Technology

For more specific information, see the advisors in the respective departments

* Jointly offered with Purdue University, West Lafayette.
** See Department of Music & Arts Technology section of this bulletin.

Awards & Scholarships

The Purdue School of Engineering and Technology offers scholarships through IUPUI's Office of Student Scholarships. Early admission to IUPUI is the best way to be assured of scholarship opportunities. The Purdue School of Engineering and Technology offers scholarships to incoming freshmen and continuing students. Most scholarships are merit-based awards offered at the departmental level, but some are designated specifically for new students, or for minority, women, and other students from underrepresented populations. The following is a list of some available scholarships. For additional information, please consult the Beginning Freshman Admissions Guide and Financial Aid Information published by the Office of Admissions, or contact the Office of the Dean.

Scholarships for New Students

- General Engineering and Technology Scholarship
- Minority Engineering Advancement Program (MEAP)
- Women in Engineering and Technology

Scholastic Recognition

Dean's List

All undergraduate students in the School of Engineering and Technology who complete at least 6 credit hours during a semester, who have a semester grade point average of 3.8 or higher, a cumulative GPA of 2.5 or higher, and who are approved by the program faculty are placed on the Dean's List. These honor students receive certificates from the Dean recognizing their meritorious efforts.

Graduation with Distinction

By awarding degrees "With Distinction" or "With Highest Distinction" the School of Engineering and Technology recognizes the outstanding scholastic achievement of selected associate and bachelor's degree candidates.

Distinction at graduation is awarded on the basis of all course work taken for letter grades. Individuals must complete all the requirements for their field of study and meet the following conditions:

- A candidate for the bachelor's degree with distinction must have earned at least 65 hours of credit in the Purdue University or Indiana University system. A candidate for an associate degree with distinction must have earned at least 35 hours of credit in the Purdue University or Indiana University system.
- Honors are awarded according to the following cumulative semester grade point averages:
  - Top 10 percent—With Distinction
  - Top 30 percent of the top 10 percent—With Highest Distinction

Note: For the purpose of determining graduation honors, the calculated cumulative semester grade point average includes all courses taken for a grade in either the Purdue or the Indiana University system, regardless of when the courses were taken.

Students who are awarded their degrees with distinction receive corresponding diplomas and are given special recognition during the annual Commencement exercise.

Degree Programs

Engineering Degree Programs

- Bachelor of Science in Biomedical Engineering (BSBME)
- Bachelor of Science in Computer Engineering (BSCmpE)
- Bachelor of Science in Electrical Engineering (BSEE)
- Bachelor of Science in Engineering (BSE)
- Bachelor of Science in Mechanical Engineering (BSME)
- Bachelor of Science in Motorsports Engineering (BSMSTE)

Technology Degree Programs

Associate of Science (A.S.) degrees with a major field of study in one of the following:

- Architectural Technology
- Biomedical Engineering Technology
- Interior Design Technology

Bachelor of Science (B.S.) degrees with a major field of study in one of the following:

- Biomedical Engineering Technology
- Computer Engineering Technology
- Computer Graphics Technology
- Computer & Information Technology
- Construction Engineering Management Technology
- Electrical Engineering Technology
- Interior Design Technology
- Mechanical Engineering Technology
- Music Technology
- Organizational Leadership and Supervision

Graduate Programs

Andrew Hsu, Associate Dean for Research and Graduate Programs

The School of Engineering and Technology offers five graduate degrees at the M.S. level: Master of Science in Biomedical Engineering (M.S.Bm.E.), Master of Science in Electrical and Computer Engineering (M.S.E.C.E.), Master of Science in Mechanical Engineering (M.S.M.E.), Master of Science in Engineering (M.S.E.), and Master of Science (M.S.).

Qualified students may pursue Ph.D. degrees in biomedical engineering, electrical and computer engineering, or mechanical engineering at IUPUI through programs jointly administered with the respective schools at Purdue University, West Lafayette. Students are usually expected to complete the M.S.E.C.E. or M.S.M.E. before pursuing the Ph.D. degree.

Students completing a master's or doctoral degree in engineering will be prepared to enter the work force at a high level of responsibility and expertise. Knowledge of the dynamics of expanding new technologies and the strategic importance of high productivity prepares master's degree graduates to advance rapidly in today's business and industries.

Graduate courses are usually offered on the IUPUI evening schedule. The programs are designed to meet the needs of part-time students employed in the Indianapolis area, as well as traditional students who are preparing for careers in research.

For more information, call (317) 278-4960, send e-mail to et_grad@iupui.edu, or see the Web site: www.engr.iupui.edu.

General Requirements

Graduate Programs in Mechanical Engineering

The Department of Mechanical Engineering has an outstanding and up-to-date engineering faculty with expertise and research interests in the areas of advanced manufacturing, advanced materials, biomechanics, composites, computational fluid dynamics, computer-aided design, computer-aided manufacturing, combustion, controls, fluid mechanics, finite element analysis, fracture, heat transfer, propulsion robotics, solid and structural mechanics, stress analysis, and turbomachinery. The department offers graduate programs of study that lead to the degrees of Master Science (M.S.), Master of Science in Engineering (M.S.E.), Master of Science in Mechanical Engineering (M.S.M.E.), and Ph.D. The program leading to the Ph.D. in mechanical engineering is jointly administered with the School of Mechanical Engineering at Purdue University, West Lafayette.

The department also offers combined bachelor's and master's degree programs, in which students may receive both B.S. and M.S. degrees in five years at IUPUI. These degree programs are open to qualified undergraduates at IUPUI, leading to either: 1) B.S. and M.S.M.E. degrees (B.S./M.S.M.E.) for mechanical engineering undergraduates, or 2) a B.S. degree in physics and an M.S. degree in mechanical engineering (B.P.M.M.E.) for physics undergraduates. The combined degrees prepare students for advanced engineering careers with two degrees (bachelor's and master's) in as little as five years.

Degree Programs

Contact: Andrew Hsu, Associate Dean for Research and Graduate Programs

- Master of Science (M.S.)
- Master of Science in Biomedical Engineering (M.S.Bm.E.)
- Master of Science in Engineering (M.S.E.)
- Master of Science in Electrical and Computer Engineering (M.S.E.C.E.)
- Master of Science in Mechanical Engineering (M.S.M.E.)
- Master of Science in Technology (M.S.Tech)
- Master of Science in Music Techology (M.S.)
- Master of Science in Music Therapy (M.S.)
- Doctor of Philosophy in Biomedical Engineering (Ph.D.)*
- Doctor of Philosophy in Electrical and Computer Engineering (Ph.D.)*
- Doctor of Philosophy in Mechanical Engineering (Ph.D.)*

* Jointly offered with Purdue University, West Lafayette.

Master of Science in Technology

The School of Engineering and Technology offers graduate education in technology with the primary goal of developing advanced levels of practitioners in industry. The Master of Science in Technology degree program is designed so that graduates holding a B.S. degree in a technology discipline or a related area can complete their degrees as a full-time student or while working full-time. The graduate degree program offers concentration or area of specialization in Applied Information Technology, Construction Engineering Management Technology, Facilities Mangaement (an online program), in addition to more interdisciplinary plans of study that draw courses from the various technology programs in the School. The curriculum consists of a total of 33 credit hours, including a directed project, and could be completed in four semesters(two academic years) and must be completed within five years.

For more information, send e-mail to gradengr@iupui.edu or gradtech@iupui.edu.

Graduate Programs in Biomedical Engineering

Biomedical engineering is an interdisciplinary program and a joint effort of the Purdue School of Engineering and Technology, the Purdue School of Science, and the Indiana University Schools of Medicine and Dentistry at Indiana University–Purdue University at Indianapolis (IUPUI). In addition to these participating academic units, the program operates in close collaboration with several centers and facilities on campus, and with the Department of Biomedical Engineering at Purdue University, West Lafayette.

Students interested in the M.S.Bm.E. degree should apply directly to the Graduate Programs Office of the Purdue School of Engineering and Technology in Indianapolis. Students with a master's degree, or who are solely interested in the Ph.D. degree, should apply to the

Department of Biomedical Engineering at West Lafayette, even though they may be resident and study on the Indianapolis campus.

Graduate Programs in Electrical and Computer Engineering

Students can earn the Master of Science in Electrical and Computer Engineering (M.S.E.C.E.), and the Master of Science in Engineering (M.S.E.), through the Department of Electrical and Computer Engineering at the Purdue School of Engineering and Technology at IUPUI. The M.S.E.C.E. degree is organized into several areas of study, including computer engineering, controls and automation, communication, signal processing, VLSI/ASIC design, and power systems, while the M.S.E. degree is interdisciplinary in nature and is primarily for non–electrical engineering undergraduates.

Qualified students may be authorized to pursue the Ph.D. degree in electrical and computer engineering at IUPUI. Programs leading to the Ph.D. in electrical and computer engineering are jointly administered with the School of Electrical and Computer Engineering at Purdue University, West Lafayette.

Departments

Engineering

- Department of Biomedical Engineering BS,MS(BME)
- Department of Electrical and Computer Engineering (ECE)
  - Computer Engineering BS (CmpE)
  - Electrical Engineering BS (EE)
  - Electrical & Computer Engineering MS (ECE)
- Department of Mechanical Engineering BS,MS (ME)

Technology

- Department of Computer, Information, & Leadership Technology (CILT)
  - Computer & Information Technology BS (CIT)
  - Organizational Leadersip & Supervision BS (OLS)
- Department of Design & Communication Technology (DCT)
  - Architectural Technology AS (ART)
  - Computer Graphics Technology BS (CGT)
  - Interior Design Technology AS, BS (INTR)
  - Technical Communications (TCM)
- Department of Engineering Technology (ENT)
  - Biomedical Engineering Technology AS, BS (BMET)
  - Construction Engineering Management Technology BS (CEMT)
  - Computer Engineering Technology BS (CpET)
  - Electrical Engineering Technology BS (EET)
  - Mechanical Engineering Technology BS (MET)
  - Motorsports Engineering BS (this is an engineering degree owned and operated by ENT) (MSTE)
- Department of Music & Arts Technology (MAT)*
  - Music Therapy MS (MSMTh)
  - Music Technology MS (MSMT)
  - Music Technology BS (BSMT)

New Student Academic Advising Center (NSAAC)

Biomedical Engineering (BME)

Professors: E. Berbari *(Chair)*, C. Turner (*Associate Chair*), G. Kassab, H. Yokota
Associate Professors: J**.** Schild, D. Xie, K. Yoshida
Assistant Professors: J. Ji, S. Na
Clinical Associate Professor: W. Combs
Lecturer: K. Alfrey *(Director of the Undergraduate Program)*

Bachelor of Science in Biomedical Engineering

Biomedical engineering is a discipline that advances knowledge in engineering, biology, and medicine, and improves human health through cross-disciplinary activities that integrate the engineering sciences with the biomedical sciences and clinical practice. Biomedical engineering is a vibrant and rapidly expanding field both in content and opportunities. As our technological infrastructure expands and our fundamental knowledge in the life sciences is now at the basic molecular level, biomedical engineers are poised to continue to make major advances.

The bachelor's degree in Biomedical Engineering (B.S.B.M.E.) integrates the engineering analysis and design skills of the Purdue School of Engineering and Technology with the life sciences offered through the Purdue School of Science and with significant medical/ clinical elements available through collaboration with the Indiana University School of Medicine.

The B.S.B.M.E. degree program combines a strong set of mathematics, science, and biomedical engineering courses into a demanding and rewarding four-year degree program aimed at solving contemporary problems in the life and health sciences. Outstanding features include instructional objectives that integrate the study of the fundamental principles of life and health sciences with rigorous engineering disciplines through a core of interdisciplinary courses that include biomechanics, biomeasurements, biomaterials, computational biology, and biosignals and systems analysis, among others. Many of the courses involve laboratory and problem solving recitation sections that lead the student through a practical encounter with methods of engineering analysis aimed at understanding and solving problems related to human health care and delivery. The Senior Design Experience is a two-semester sequence where a team approach is used to solve problems originating from the laboratories of faculty across the Schools of Engineering, Science, Dentistry, and Medicine. This approach will develop strong team-working skills among the students and enhance their communication skills with professionals outside of their discipline.

The senior year electives enable the student to pursue course content that develops a depth of understanding in a number of biomedical engineering expertise areas such as tissue engineering, biomolecular engineering, imaging, bioelectric phenomena, biomechanics, and regenerative biology. Students interested pursuing careers in medicine or dentistry may also use their electives to fulfill these

respective preprofessional requirements. Highly motivated students with strong academic credentials will find biomedical engineering an excellent premedical or predental degree program.

This exciting and innovative curriculum forms the basis of our program vision, whereby our students will be well educated in modern biomedical engineering, and with this knowledge they will be prepared to develop new devices, technologies, and methodologies that lead to significant improvements in human health care and delivery. The Biomedical Engineering Web site (www.engr.iupui.edu/bme/) has the most up-to-date information concerning the plan of study for the B.S.B.M.E. degree program.

Transfer Students

Transfer students are initially admitted to the Freshman Engineering Program. Subsequent transfer into the Department of Biomedical Engineering is permitted only after consultation with a Biomedical Engineering Advisor to ensure course equivalencies and to evaluate the student's overall academic achievement. Students requesting transfer into Biomedical Engineering must submit a brief application.

Admission into Biomedical Engineering

Freshman engineering students who declare a biomedical engineering major must apply to the Department of Biomedical Engineering for formal admission by April 1 of their first year. Acceptance into the department is competitive and is based on academic qualifications, advisor's recommendation, and available space.

Graduate Programs in Biomedical Engineering

Biomedical engineering is an interdisciplinary program and a joint effort of the Purdue School of Engineering and Technology, the Purdue School of Science, and the Indiana University Schools of Medicine and Dentistry at Indiana University-Purdue University at Indianapolis (IUPUI). In addition to these participating academic units, the program operates in close collaboration with several centers and facilities on campus, and with the Department of Biomedical Engineering at Purdue University, West Lafayette.

Students interested in the M.S.Bm.E. degree should apply directly to the Graduate Programs Office of the Purdue School of Engineering and Technology in Indianapolis. Students with a master's degree, or who are solely interested in the Ph.D. degree, should apply to the Department of Biomedical Engineering at West Lafayette, even though they may be resident and study on the Indianapolis campus.

Plan of Study - BS

Guidelines for selecting General Education Electives, as well as a list of approved courses, can be found on the BME website (http://www.engr.iupui.edu/bme/). BME, science, and technical electives must be selected in consultation with an academic advisor. These courses may include upper-level science, BME, or other engineering courses not already included on the BME plan of study. The goal of these electives is to provide depth of education in a specific sub-discipline of Biomedical Engineering.

Freshman Year	**Credit Hours**
First Semester	
ENGR 19600 Engineering Problem Solving	3
CHEM-C10500 Principles of Chemistry I	3
CHEM 12500 Experimental Chem. I	2
MATH 16300 Integrated Calculus and Analytic Geometry	5
ENG W 131 Elementary Composition I	3
ENGR 19500 Engineering Seminar	1
TOTAL	17
Second Semester	
ENGR 19700 Intro. To Computing (C)	2
BIOL-K 10100 Concepts of Biology	5
MATH 16400 Integrated Calculus and Analytic Geometry II	5
Phys 15200 Mechanics	4
TOTAL	16
Sophomore Year	
First Semester	
MATH 26100 Multivariate Calculus	4
PHYS 25100 Electricity, Heat, Optics	5
BME 22200 Biomeasurements	4
Chem C10600 Principles of Chemistry II	3
ENGR 29700 Intro. to Computing II (MATLAB)	1
TOTAL	16
Second Semester	
MATH 26200 Linear Algebra Differential Eqns.	4
BIOL K32400 Cell Biology	3
BIOL K32500 Cell Biology Lab	2

BME 24100 Intro. Biomechanics	4
Comm. R110 Fund of Speech Communication	3
General Education Elective	3
TOTAL	18

Junior Year

First Semester

BME 33400 Biomedical Computing	3
BME 38100 Implantable Materials & Biological Response	3
BME 38300 Problems in Implantable Materials & Biological Response	1
BME 33100 Biosignals and Systems	3
CHEM C34100 Organic Chemistry I	3
CHEM C34300 Organic Chemistry Lab I	2
General Education Elective	3
TOTAL	18

Second Semester

BME 32200 Probability & Statistics for BME	3
BME 35200 Tissue Behavior and Properties	3
BME 35400 Problems in Tissue Behavior and Properties	1
BME/Sci/Tech Elective	3
General Education Elective	3
General Education Elective	3
TCM 36000 Communications in Engineering Practice	2
TOTAL	18

Senior Year

First Semester

BME 49100 Biomedical Engineering Design I	3
BME 41100 Quantitative Physiology	3
BME 46100 Biofluid and Biosolid Mechanics	3
BME Elective	3
BME/Sci/Tech Elective	3
TOTAL	15

Second Semester

BME 49200 Biomedical Engineering Design II	3
BME 49500 Advanced Biomechanics	3
BME/Tech Elective	3
BME 40200 Senior Seminar	1
BME 40400 Ethics for Biomedical Engineers	1
General Education Elective	3
TOTAL	14

Electrical and Computer Engineering (ECE)

Professors Y. Chen (*Chair*), S. Chien, R. Eberhart, M. El-Sharkawy, M. Rizkalla, O. Yurtseven, K. Varahramyan
Associate Professors D. Kim, P. Salama, B. King, S. Koskie, S. Rovnyak
Assistant Professors Lauren Christophor, E. Du, J. Lee, L. Li
Research Professors M. Agarwal, X. Hu, R. Lind, J. Saleem

The Department of Electrical and Computer Engineering offers programs at the bachelor's, master's, and doctoral levels. At the bachelor's degree level, the department offers programs leading to the Bachelor of Science in Engineering (B.S.E.), Bachelor of Science in Computer Engineering (B.S.Cmp.E.), and Bachelor of Science in Electrical Engineering (B.S.E.E.) degrees. The B.S.E. degree program is designed for students who desire broad flexibility and the opportunity for interdisciplinary study; it does not have a designated professional curriculum. Additional information about the B.S.E. program can be obtained from the faculty in the Department of Electrical and Computer Engineering. The programs leading to the B.S.E.E. and B.S.Cmp.E. are described in this section. Graduate programs in electrical and computer engineering are described in the section entitled "Graduate Engineering Programs" in this bulletin.

Electrical and computer engineering programs are designed to prepare students for careers in the commercial, government, and academic sectors, where electrical and computer engineering expertise is needed in hardware and software design, information processing, circuit and electronics, control and robotics, communications and signal processing, energy systems, and manufacturing. Programs in the department are enhanced by interaction with local industry. Students have direct and routine access to full-time faculty, which further strengthens and accelerates the learning process.

These advantages and the metropolitan environment of the university lead to an application-oriented, practical education that prepares students for success.

The Department of Electrical and Computer Engineering regards research as an important catalyst for excellence in engineering education. Graduate research and undergraduate design projects in the areas of signal processing, communications, image processing, computational intelligence, networking, software engineering, embedded systems, high performance computing, control, robotics, manufacturing, biometrics, nanotechnology, and ASIC and FPGA based electronics offer opportunities for applying and deepening students' expertise.

An undergraduate education in electrical and computer engineering provides a strong foundation in mathematical, physical, and engineering sciences. In acquiring this knowledge, students must also develop problem-solving skills. In addition, the general-education courses in the program provide the communication skills and appreciation of human and social issues necessary to translate engineering achievements into advances for society.

For more information, contact the Department of Electrical and Computer Engineering at (317) 274-9726.

Bachelor of Science in Electrical Engineering

This program is accredited by the Engineering Accreditation Commission, ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700.

The B.S.E.E. degree program prepares students for career opportunities in the hardware and software aspects of design, development, and operation of electronic systems and components, embedded systems, control and robotics, communications, digital signal processing, and energy systems. Challenging positions are available in the government, commercial, and education sectors, in the areas of electronics, communication systems, signal and information processing, power, automation, robotics and manufacturing, control, networking, information processing, and computing. Within these areas, career opportunities include design, development, research, manufacturing, marketing, operation, field testing, maintenance, and engineering management.

The Electrical Engineering Program Educational Objectives are: We expect that after the first few years of employment as practicing engineers Graduates of our Electrical Engineering undergraduate program will succeed in industry and/or post-graduate education by:

- Providing practical solutions to problems by applying the knowledge of electrical engineering fundamentals, mathematics, and science, and by utilizing industry standard tools and equipment (a, b, c, e, k).
- Designing and analyzing electrical and electronic systems (a, b, c).
- Exhibiting strong professional attributes, which include ethical behavior in the workplace, understanding of societal responsibility, and engagement in continuing professional development (f, h, i, j).
- Collaborating with technical and non-technical personnel in an interdisciplinary team environment through effective communication (g, d).

The minimum number of credit hours for graduation is 126, distributed as follows for each discipline:

1. Mathematics and Physical Sciences
   - Calculus: MATH -16500, 16600, 17100, 26100, 26600 - 18 credit hours
   - Chemistry: CHEM C10500 - 3 credit hours
   - Physics: PHYS 15200 and 25100 - 9 credit hours
   - Math/Science elective - 3 credit hours
2. Communications and Ethics
   - Speech: COMM R110 - 3 credit hours
   - Writing: ENG W131 - 3 credit hours
   - Communication in Engineering Practice: TCM 36000 - 2 credit hours
   - Engineering Ethics and Professionalism: ECE 21000, ECE 40100 - 2 credit hours
3. General Education Electives
   - ECON201 or ECE 32700 - 3 credit hours
   - Electives - 12 credit hours
4. Freshman Engineering Courses
   - Introduction to the Engineering Profession: ENGR 19500 - 1 credit hours
   - Introduction to Engineering: ENGR 19600 - 3 credit hours
   - Comp Tools for Engr: ENGR 29700 - 1 credit hours
5. Engineering Science
   - Circuits: ECE 20100, 20200, and 20700 - 7 credit hours
   - Systems and Fields: ECE 30100, 30200, and 31100 - 9 credit hours
   - C Programming: ECE 26200
   - ECE 26300 - 4 credit hours
   - ME 29500
6. Engineering Design
   - Electronics: ECE 20800 and 25500 - 4 credit hours
   - Digital Systems: ECE 27000 and 36200 - 8 credit hours
   - Communication Systems: ECE 44000 - 4 credit hours
   - Control Systems: ECE 38200 - 3 credit hours
   - Capstone Design: ECE 48700 and 48800 - 3 credit hours
   - EE and Tech Electives - 15 credit hours
7. Restricted Electives - 3 credit hours

Semester by semester, the 126 total credit hours should be distributed as follows:

Freshman Year

First Semester (17 credit hours)

- ENGR 19500 Introduction to the Engineering Profession - 1 credit hours

- ENGR 19600 Introduction to Engineering - 3 credit hours
- CHEM C10500 Chemical Science I - 3 credit hours
- MATH 16500 Analyt. Geometry and Calc. I - 4 credit hours
- COMM R110 Fundamentals of Speech Communication - 3 credit hours
- Genrnal Education - 3 credit hours

Second Semester (17 credit hours)

- PHYS 15200 Mechanics - 4 credit hours
- MATH 16600 Analyt. Geometry and Calc. II - 4 credit hours
- Math 17100 Multidimentional Math - 3 credit hours
- ENG W131 Elementary Composition I - 3 credit hours
- General Education Elective1 - 3 credit hours

Sophomore Year

Third Semester (17 credit hours)

- MATH 26100 Multivariate Calculus - 4 credit hours
- PHYS 25100 Electricity and Optics - 5 credit hours
- ECE 20100 Linear Circuit Analysis I - 3 credit hours
- ECE 20700 Electronic Measurement Techniques - 1 credit hours
- ECE 26300 C Programming - 3 credit hours
- ECE 26200 C Programming Lab - 1 credit hours

Fourth Semester (16 credit hours)

- MATH 26600 Ordinary Diff. Eqn - 3 credit hours
- ECE 20200 Circuit Analysis II - 3 credit hours
- ECE 25500 Introduction to Electronics Analysis and Design - 3 credit hours
- ECE 20800 Electronic Design and Devices Lab - 1 credit hours
- ECE 27000 Digital Logic Design and Lab - 4 credit hours
- ENGR 29700 Computer Tools for Engineers - 1 credit hours
- ECE 21000 Sophomore Seminar 1 - 3 credit hours

Junior Year

Fifth Semester (16 credit hours)

- ECE 30100 Signals and Systems - 3 credit hours
- ECE 31100 Electric and Magnetic Fields - 3 credit hours
- ECE 36200 Microprocessor Systems and Interfacing - 4 credit hours
- TCM 36000 Comm. In Engineering Practice - 3 credit hours
- Math/Science Elective2 - 3 credit hours

Sixth Semester (15 credit hours)

- ECE 30200 Probabilistic Methods in Electrical Engineering - 3 credit hours
- ECE 38200 Feedback System Analysis - 3 credit hours
- ECE 32700 Engineering Economics - 3 credit hours
- ME 29500 Mechanicss and Heat - 3 credit hours
- EE Elective4 - 3 credit hours

Senior Year

Seventh Semester (15 credit hours)

- ECE 44000 Introduction to Communication Systems Analysis - 4 credit hours
- ECE 48700 Senior Design I - 1 credit hours
- ECE 40100 Ethics - 1 credit hours
- EE Electives4 - 6 credit hours
- Humanities or Social Science Elective1 - 3 credit hours

Eighth Semester (14 credit hours)

- ECE 48800 Senior Design II - 2 credit hours
- EE Electives4 - 6 credit hours
- Restricted Elective5 - 3 credit hours
- General Education Elective1 - 3 credit hours

After completing a rigorous, broad education in electrical and computer engineering during the first five semesters, juniors and seniors may select advanced electrical and computer engineering courses and technical elective courses from an approved list. Careful selection of these elective courses allows a student to concentrate in a specialized area of electrical engineering. A listing of acceptable electrical engineering and technical elective courses is given below. The actual course selection will depend on the schedule, as not every course is available every semester. Existing upper-level electrical engineering courses are offered in the areas of signal processing, imaging, robotics, control systems, VLSI, electronic circuits and manufacturing, nano technology, energy systems, network and data communication, software engineering, and embedded systems design. The Department of Electrical and Computer Engineering groups these and other allowable courses into several areas of specialization. An electrical and computer engineering student should file a plan of study with an academic advisor in either the sophomore year to decide how to select these electives.

1 From approved general education elective list.
2 From approved math/science elective list.
3 From approved technical elective list.
4 From approved electrical engineering elective list.
5 From lists 1-4.

EE Elective Courses choose 15 credit hours

Any non-required ECE 30000-level or above, except ECE 32600 or ECE 32700.

Students wishing to take a 50000-level course must meet with an academic advisor for permission to register for the course.

Math/Science Elective Courses

Math/Science/Technical Elective: Choose 3 credit hours from the list of Math/Science Electives or the list of Technical Electives.

- MATH 33300: Chaotic Dynamical Systems
- MATH 35100: Elementary Linear Algebra
- MATH 51000: Vector Calculus
- MATH 52000: Boundary Value Prob. of Diff. Eqn.
- MATH 51100: Linear Algebra with Applications
- MATH 52300: Introduction to Partial Diff. Eqn.
- MATH 52500: Introduction to Complex Analysis
- MATH 52600: Principles of Math. Modeling
- MATH 52700: Advanced Math. Eng. & Physics I
- MATH 52800: Advanced Math. Eng. & Physics II
- MATH 53000: Functions of a Complex Variable I
- MATH 53100: Functions of a Complex Variable II
- MATH 54400: Real Analysis and Measure Theory
- BIOL K10100: Concepts of Biology I
- BIOL K10300: Concepts of Biology II
- BIOL K32400: Cell Biology
- CHEM C10600: Principles of Chemistry II
- CHEM C31000: Analytical Chemistry
- CHEM C34100: Organic Chemistry
- CHEM C36000: Elementary Physical Chemistry
- CHEM C36100: Phys. Chemistry of Bulk Matter
- CHEM C36200: Phys. Chemistry of Molecules
- PHYS 31000: Intermediate Mechanics
- PHYS 34200: Modern Physics
- PHYS 40000: Physical Optics
- PHYS 40000: Quantum Mechanics
- PHYS 52000: Mathematical Physics
- PHYS 53000: Electricity & Magnetism
- PHYS 54500: Solid State Physics
- PHYS 55000: Introduction to Quantum Mechanics

Any 30000-level or above math/science course with prior written approval of students' advisory committee

Technical Elective Courses

Any non-required course from lists of Electrical Engineering Elective or Computer Engineering Elective, or from the following courses.

- ECE 32600: Engineering Project Management
- CSCI 43700: Introduction to Computer Graphics
- ME 20000: Thermodynamics I
- ME 27000: Basic Mechanics I
- ME 27200: Mechanics of Materials
- ME 27400: Basic Mechanics II
- ME 30100: Thermodynamics II
- ME 34400: Introduction to Engineering Material or students complete three or more 1-credit sessions of either
  - ECE C19900, ECE C29900, ECE C39900, ECE C49400, or ECE C49900, or
  - ECE I19900, ECE I29900, ECE I39900, ECE I49400, or ECE I49900,

*ECE 49500 Selected Topics in Electrical Engineering is generally used to offer new courses.

Restricted Elective: Choose 3 credit hours from any of the aforementioned elective lists.

Bachelor of Science in Computer Engineering

This program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700.

The Bachelor of Science in Computer Engineering (B.S.Cmp.E.) degree curriculum provides an in-depth education in the analytical skills, hardware, and software aspects of modern computer systems. The program builds on a strong foundation in engineering design, including traditional analog and digital circuit design. The three main areas of emphasis within the computer-engineering program are embedded systems, telecommunications and networking, and software engineering and distributed computing. Extensive laboratory experiences support the theoretical aspects of the course work. Students gain valuable digital hardware design and software design experiences throughout the curriculum. The junior and senior years strengthen the student's expertise with courses in data structures, embedded systems, computer architecture, parallel and high performance computing systems, advanced digital systems, and computer communications networks and network security.

The Computer Engineering Program Educational Objectives are:We expect that after the first few years of employment as practicing engineers, graduates of our Computer Engineering undergraduate program will succeed in industry and/or post-graduate education by:

- Providing practical solutions to problems by applying the knowledge of computer engineering fundamentals, mathematics, and science, and by utilizing industry standard tools and platforms (a, b, c, e, k).
- Developing well-designed computer software and hardware (a, b, c).
- Exhibiting strong professional attributes, which include ethical behavior in the workplace, understanding of societal responsibility, and engagement in continuing professional development (f, h, i, j).
- Collaborating with technical and non-technical personnel in an interdisciplinary team environment through effective communication (g, d).

The minimum number of credit hours for graduation is 126, distributed as follows for each discipline:

1. Mathematics and Physical Sciences
   - MATH 16500, 16600, 17100, and 26100, 26600 - 18 credit hours
   - Chemistry: CHEM C10500 - 3 credit hours
   - Physics: PHYS 15200 and 25100 - 9 credit hours
2. Communications and Ethics
   - Speech: COMM R110 - 3 credit hours
   - Writing: ENG W131 - 3 credit hours
   - Communication in Engineering Practice: TCM 36000 - 2 credit hours
   - Engineering Ethics and Professionalism: ECE 21000 and 40100 - 2 credit hours
3. General Education Electives

- a. Electives - 15 credit hours

4. Freshman Engineering Courses
   - Introduction to the Engineering Profession: ENGR 19500 - 1 credit hours
   - Introduction to Engineering: ENGR 19600 - 3 credit hours
   - Comp Tools for Engineers: ENGR 29700 - 1 credit hours
5. Engineering Science
   - Circuits: ECE 20100, 20200, and 20700 - 7 credit hours
   - Systems and Fields: ECE 30100, 30200 - 6 credit hours
6. Engineering Design
   - Digital Systems: ECE27000, 36200, and 36500 - 11 credit hours
   - Capstone Design: ECE48700, 48800 - 3 credit hours
7. Computer Science
   - Computing II: ECE 26200, 25300, and CSCI 24000 - 6 credit hours
   - UNIX Programming:ECE 28200 - 1 credit hours
   - DiscreetMath: CSCI 34000 - 3 credit hours
   - Data Structures: CSCI 36200 - 3 credit hours
   - Operating Systems: ECE 40800 - 3 credit hours
8. CmpE Electives4 - 9 credit hours
9. Advanced CmpE Electives5 - 6 credit hours
10. Math/Science/Technical Electives2or3 - 3 credit hours
11. Restricted Electives6 - 3 credit hours

1 From approved general education elective list.

2 From approved math/science elective list.

3 From approved technical elective list.

4 From approved computer engineering elective list.

5 From lists 1-4.

Semester by semester, the 126 total credit hours should be distributed as follows:

Freshman Year

First Semester (17 credit hours)

- ENGR 19500 Introduction to the Engineering Profession - 1 credit hours
- ENGR 196 Introduction to Engineering - 3 credit hours
- MATH 16500 Analytic Geometry and Integrated Calculus I - 4 credit hours
- CHEM C10500 Chemical Science I - 3 credit hours
- COMM R110 Fundamentals of SpeechCommunication - 3 credit hours
- General Elective - 3 credit hours

Second Semester (17 credit hours)

- PHYS 15200 Mechanics - 4 credit hours
- MATH 16600 Analytic Geometry and Integrated Calculus II - 4 credit hours
- ENG W131 Elementary Composition I - 3 credit hours
- General Education Elective1 - 3 credit hours

Sophomore Year

Third Semester (17 credit hours)

- ENGR 29700 Computer Tools for Engineers - 1 credit hours
- MATH 26100 Multivariate Calculus - 4 credit hours
- PHYS 25100 Electricity and Optics - 5 credit hours
- ECE 20100 Linear Circuit Analysis I - 3 credit hours
- ECE 20700 Electronic Measurement Techniques - 1 credit hours
- ECE 26200 C programming Lab - 1 credit hours
- ECE 26300 C Programming - 2 credit hours

Fourth Semester (15 credit hours)

- MATH 26600 Ordinary Differential Equations - 3 credit hours
- CSCI 24000 Advanced Programming - 3 credit hours
- ECE 20200 Circuit Analysis II - 3 credit hours
- ECE 27000 Digital Logic Design and Lab - 4 credit hours
- ENGR 29700 Computer Tools for Engineers - 1 credit hours
- ECE 21000 Sophomore Seminar - 1 credit hours

Junior Year

Fifth Semester (16 credit hours)

- ECE 30100 Signals and Systems - 3 credit hours
- ECE 36200 Microprocessor Systems and Interfacing - 4 credit hours
- CSCI 340 Discrete Math - 3 credit hours
- Math/Science/Tech Elective2 or 3 - 3 credit hours
- General Education Elective1 - 3 credit hours

Sixth Semester

- ECE 302 Probabilistic Methods in Electrical Engineering - 3 credit hours
- ECE 282 UNIX Programming for Engineers - 1 credit hours
- CSCI 362 Data Structures - 3 credit hours
- CmpE Elective4 - 3 credit hours
- TCM 36000 Comm. In Engineering Practice - 2 credit hours
- ECE 32700 Engineering Econiomics - 3 credit hours

Senior Year

Seventh Semester (15 credit hours)

- ECE 365 Introduction to the Design of Digital Computers - 3 credit hours
- ECE 48700 Senior Design I - 1 credit hours
- ECE 40100 Engineering Ethics - 1 credit hours
- Advanced Computer Engineering Elect.5 - 3 credit hours
- CmpE Elective4 - 6 credit hours

Eighth Semester (14 credit hours)

- ECE 40800 Operating Systems - 3 credit hours
- ECE 48800 Senior Design - 2 credit hours
- Advanced CmpE Elective4 - 3 credit hours
- CmpE Elective - 3 credit hours
- Restricted Elective5 - 3 credit hours

1 From approved general education elective list.

2 From approved math/science elective list.

3 From approved technical elective list.

4 From approved computer engineering elective list.

5From approved advanced computer engineering elective list

6 From lists 1-4.

Advanced Computer Engineering Elective Courses

- ECE 42100 Advanced Digital Systems Design
- ECE 46100 Software Engineering
- ECE 46300 Intro to Computer Communication Networks
- ECE 46800 Introduction to Compilers and Translation Engineering
- ECE 47100 Embedded Systems

Students may also use the 50000-level version of any of these classes

CmpE Elective Courses

Computer Engineering Elective: Choose 9 credit hours from the following list. At least 3 credit hours must be at or above 400-level.

Any ECE 30000 or above courses, except ECE 32600 or ECE 32700

- ECE 25500: Intro. to Electronic Analysis & Design
- CSCI 35500: Intro. to Programming Languages
- MATH 41400: Numerical Analysis
- CSCI 43700: Intro. to Computer Graphics
- CSCI 43500: Multimedia Information Systems
- CSCI 43800: Computer Graphics II
- CSCI 48100: Data mining
- CSCI 44300: Database Systems

* Course ECE 49500 Selected Topics in Electrical Engineering is generally used to offer new courses.

Math/Science/Technical Elective Courses

- MATH 33300: Chaotic Dynamical Systems
- MATH 35100: Elementary Linear Algebra
- MATH 51000: Vector Calculus
- MATH 52000: Boundary Value Prob. of Diff. Eqn.
- MATH 51100: Linear Algebra with Applications
- MATH 52300: Introduction to Partial Diff. Eqn.
- MATH 52500: Introduction to Complex Analysis
- MATH 52600: Principles of Math. Modeling
- MATH 52700: Advanced Math. Eng. & Physics I
- MATH 52800: Advanced Math. Eng. & Physics II
- MATH 53000: Functions of a Complex Variable I
- MATH 53100: Functions of a Complex Variable II
- MATH 54400: Real Analysis and Measure Theory
- BIOL K10100: Concepts of Biology I
- BIOL K10300: Concepts of Biology II
- BIOL K32400: Cell Biology
- CHEM C10600: Principles of Chemistry II
- CHEM C31000: Analytical Chemistry
- CHEM C34100: Organic Chemistry
- CHEM C36000: Elementary Physical Chemistry
- CHEM C36100: Phys. Chemistry of Bulk Matter
- CHEM C36200: Phys. Chemistry of Molecules
- PHYS 31000: Intermediate Mechanics
- PHYS 34200: Modern Physics
- PHYS 40000: Physical Optics
- PHYS 40000: Quantum Mechanics
- PHYS 52000: Mathematical Physics
- PHYS 53000: Electricity & Magnetism
- PHYS 54500: Solid State Physics
- PHYS 55000: Introduction to Quantum Mechanics

Any 300-level or above math/science course with prior written approval of student's advisory committee

: Any non-required course from lists of Electrical Engineering Elective or Computer Engineering Elective or Advanced Computer Engineering Elective, or following courses.

- ECE 32600: Engineering Project Management
- CSCI 30000: Systems Programming
- CSCI 44100: Client-Server Database Systems
- CSCI 48700: Artificial Intelligence
- ME 2xx00: Engineering Mechanics & Heat

or student complete three or more 1-credit sessions of either

- a. ECE C19900, ECE C29900, ECE C39900, ECE C49400, or ECE C49900, or
- b. ECE I19900, ECE I29900, ECE I39900, ECE I49400, or ECE I49900,

Restricted elective course: any course in the list of Technical electives, math/science electives, or Humanities or Social Science electives

Bachelor of Science in Engineering-Interdisciplinary Engineering

This program is not accredited by the Engineering Accreditation Commission of the ABET.

The Electrical and Computer Engineering Department offers a Bachelor of Science in Engineering (B.S.E.) degree program for students wishing to supplement a strong core curriculum in electrical and computer engineering science and design with courses from mathematics, science, business, biomedicine, or another engineering discipline. While not ABET-accredited, the B.S.E. degree program offers the student greater flexibility to create a plan of study to accommodate broad interdisciplinary interests and objectives. The plan coincides with the traditional B.S.E.E. curriculum through the sophomore year and then diverges to include ECE electives and courses from interdisciplinary areas in the remainder of the curriculum.

The minimum number of credit hours for graduation is 126, distributed as follows for each discipline:

1. Mathematics and Physical Sciences
   - Calculus: MATH 16500, 16600, 26100, and 26600 - 18 credit hours
   - Chemistry: CHEM C10500 - 3 credit hours
   - Physics: PHYS 15200 and 25100 - 9 credit hours
2. Communications and Ethics
   - Speech: COMM R110 - 3 credit hours
   - Writing: ENG W131 - 3 credit hours
   - Communication in Engineering Practice: TCM 36000 - 2 credit hours
   - Engineering Ethics and Professionalism: ECE 21000 and 40100 - 2 credit hours
3. Humanities and Social Sciences
   - Electives - 15 credit hours
4. Freshman Engineering Courses
   - Introduction to the Engineering Profession: ENGR 19500 - 1 credit hours
   - Introduction to Engineering: ENGR 19600 - 3 credit hours
   - Programming Concepts: ENGR 19700 - 3 credit hours
   - ENGR 29700 - 1 credit hours
5. Electrical Engineering Courses
   - ECE Core: ECE 20100, 20200, 20700, 20800, 25500, 27000, 30100, and 36200 - 22 credit hours
   - ECE Electives (any ECE 30000-, 40000-, or 50000-level course) - 9 credit hours
6. Technical Elective Course - 3 credit hours
7. Interdisciplinary Area
   - Core Requirements - 12 credit hours
   - Core Electives - 12 credit hours

Freshman Year

First Semester (15 credit hours)

- ENGR 19500 Introduction to the Engineering Profession - 1 credit hours
- ENGR 19600 Introduction to Engineering - 3 credit hours
- CHEM C10500 Principles of Chemistry I - 3 credit hours
- COMM R110 Fundamentals of Speech Communication - 3 credit hours
- MATH 16500 Analytic Geometry and Integrated Calculus I - 4 credit hours

Second Semester (18 credit hours)

- ENGR 19700 Programming Concepts - 3 credit hours
- CHEM C10600 Principles of Chemistry II - 3 credit hours
- ENG W13100 Elementary Composition I - 3 credit hours
- MATH 16400 Integrated Calculus and Analytic Geometry II - 5 credit hours
- PHYS 15200 Mechanics - 4 credit hours

The remainder of the interdisciplinary plan of study is individualized. Students should speak to their academic advisors regarding course selection.

Graduate Programs in Electrical and Computer Engineering

Students can earn the Master of Science in Electrical and Computer Engineering (M.S.E.C.E.), and the Master of Science in Engineering (M.S.E.), through the Department of Electrical and Computer Engineering at the Purdue School of Engineering and Technology at IUPUI. The M.S.E.C.E. degree is organized into several areas of study, including computer engineering, controls and automation, communication, signal processing, VLSI/ASIC design, and power sytems, while the M.S.E. degree is interdisciplinary in nature and is primarily for non-electrical engineering undergraduates. Qualified students may be authorized to pursue the Ph.D. degree in electrical and computer engineering at IUPUI. Programs leading to the Ph.D. in electrical and computer engineering is jointly administered with the School of Electrical and Computer Engineering at Purdue University, West Lafayette.

Mechanical Engineering (ME)

Professors J. Chen *(Chair),* R. Nalim, A. Hsu
Associate Professors H. El-Mounayri, S. Anwar, T. Wasfy, T. Katona
Assistant Professors A. Jones, S. S. Krishnan, G. Wang, J. Xie, L. Zhu

The Department of Mechanical Engineering offers programs at the bachelor's, master's, and doctoral levels. At the bachelor's level, programs described here lead to the Bachelor of Science in Mechanical Engineering (B.S.M.E.) and to the Bachelor of Science in Engineering (B.S.E.), an interdisciplinary degree. Students enrolled in the department study under faculty actively engaged in research in a variety of areas: advanced materials, biomechanics, combustion, composites, computational fluid dynamics, computer-aided design, control, elasticity, experimental mechanics, fluid mechanics, finite element methods, fracture, heat transfer, manufacturing, robotics, solid and structural mechanics, stress analysis, turbomachinery, and vibration. For more information, contact the Department of Mechanical Engineering at (317) 274-9717 or visit the Department's website at www.engr.iupui.edu/me.

Bachelor of Science in Mechanical Engineering

The B.S.M.E. Program is accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700.

Mechanical engineering has its foundation in the basic sciences, including mathematics, physics, and chemistry, and requires an understanding of such areas as solid and fluid mechanics, materials, thermodynamics, heat and mass transfer, manufacturing processes, instrumentation, and control. Mechanical engineers are engaged in a variety of activities including design, manufacturing, research, development, testing, construction, operations, sales, management, consulting, and teaching.

The mechanical engineering curriculum provides a broad base on which to build an engineering career. Traditional

subjects in mechanical engineering are complemented by extensive computer experience in such areas as computer-aided design and numerical problem solving. The program's flexibility allows students to specialize in their area of interest through choosing electives. Part-time employment is available to students in the research laboratories of the department. Such experience enhances course work and is particularly valuable to those who later undertake graduate study.

The Mechanical Engineering Program Educational Objectives are:

1. Demonstrate excellent technical capabilities in mechanical engineering.
2. Exhibit responsible citizenship and professionalism in the workplace.
3. Continue their professional advancement through life-long learning.
4. Apply sound design methodology in the multidisciplinary fields of mechanical engineering.
5. Competently use mathematical methods, engineering analysis and computations, and measurement and instrumentation techniques.
6. Practice effective oral and written communication skills.
7. Understand the environmental, ethical, diversity, cultural, and contemporary aspects of their work.
8. Work collaboratively and effectively in engineering and manufacturing industries.

The number of credit hours required for graduation is 130, distributed as follows for each discipline:

1. Mathematics and Physical Sciences
   - Calculus: **MATH 16500**, **16600**, **26100:** 12 credit hours
   - Multidimensional Mathematics: **MATH 17100:** 3 credit hours
   - Differential Equations: **MATH 26600:** 3 credit hours
   - Chemistry: **CHEM**-**C 105:** 3 credit hours
   - Physics: **PHYS 15200** and **25100:** 9 credit hours
   - Science/TECH Elective (also listed under Technical Electives): 3 credit hours
2. Communications, Ethics and Contemporary Issues
   - Speech: **COMM**-**R 110:** 3 credit hours
   - Writing: **ENG**-**W 131:** 3 credit hours
   - Communication in Engineering Practice: **TCM 36000:** 2 credit hours
   - Engineering Ethics and Professionalism: **ME 40100:** 1 credit hour
   - Seminar & Fundamentals of Engineering Review: **ME 40500:** 1 credit hour
3. General Education
   - Engineering Economics: **ME 32700:** 3 credit hours
   - Electives: 12 credit hours
   - Free Elective 3 credit hours
4. Freshman Engineering Courses
   - Introduction to the Engineering Profession: **ENGR 19500:** 1 credit hour
   - Introduction to Engineering: **ENGR 19600: 3 credit hours**
   - Introduction to Programming Concepts: **ENGR 19700: 2 credit hours**
   - Computer Tools for Engineering: **ENGR 29700: 3 credit hours**
5. Mechanics and Materials
   - Mechanics: **ME 27000** and **ME 27400: 6 credit hours**
   - Materials: **ME 27200** and **ME 34400: 7 credit hours**
6. Design
   - Mechanical Design: **ME 26200** and **37200: 7 credit hours**
   - Capstone Design: **ME 46200: 3 credit hours**
   - Thermal-Fluid Systems Design: **ME 41400: 3 credit hours**
7. Thermal-Fluid Sciences
   - Thermodynamics: **ME 20000: 3 credit hours**
   - Fluid Mechanics: **ME 31000: 4 credit hours**
   - Heat and Mass Transfer: **ME 31400: 4 credit hours**
8. Electrical Engineering, Instrumentation and Control
   - Electrical Engineering: **ECE 20400: 4 credit hours**
   - Systems, Measurements and Controls: **ME 33000**, **34000**, and **48200: 9 credit hours**
9. Technical Electives
   - TECH Electives: 9 credit hours
   - Statistics Elective: 3 credit hours
   - Science/TECH Elective (also listed under Mathematics and Physical Sciences): 3 credit hours

Semester by semester, the **130 total credit hours** are distributed as follows:

First Semester (14 credit hours)

- **ENGR 19500** Introduction to the Engineering Profession: 1 credit hours
- **ENGR 19600** Introduction to Engineering: 3 credit hours
- **CHEM-C 10500** Chemical Science I: 3 credit hours
- **COMM-R 110** Fundamentals of Speech Communication: 3 credit hours
- **MATH 16500** Analytic Geometry and Calculus I: 4 credit hours

Second Semester (16 credit hours)

- **ENGR 19700** Introduction to Programming Concepts: 2 credit hours
- **ENG-W 131** Elementary Composition I: 3 credit hours
- **MATH 16600** Analytic Geometry and Calculus II: 4 credit hours
- **PHYS 15200** Mechanics: 4 credit hours
- **MATH 17100** Multidimensional Mathematics: 3 credit hours

Sophomore Year

Third Semester (16 credit hours)

- **ENGR 29700** Computer Tools for Engineering: 1 credit hours
- **ME 20000** Thermodynamics I: 3 credit hours
- **ME 27000** Basic Mechanics I: 3 credit hours
- **MATH 26100** Multivariate Calculus: 4 credit hours
- **PHYS 25100** Heat, Electricity, and Optics: 5 credit hours

Fourth Semester (16 credit hours)

- **ME 32700** Engineering Economics: 3 credit hours
- **ME 26200** Mechanical Design I: 3 credit hours
- **ME 27400** Basic Mechanics II: 3 credit hours
- **ECE 20400** Introduction to Electrical and Electronic Circuits: 4 credit hours
- **MATH 26600** Ordinary Differential Equations: 3 credit hours

Junior Year

Fifth Semester (17 credt hours)

- **ME 27200** Mechanics of Materials: 4 credit hours
- **ME 33000** Modeling and Analysis of Dynamic Systems: 3 credit hours
- **ME 31000** Fluid Mechanics: 4 credit hours
- Statistics Elective: 3 credit hours
- General Education Elective: 3 credit hours

Sixth Semester (17 credit hours)

- **ME 34400** Introduction to Engineering Materials: 3 credit hours
- **ME 31400** Heat and Mass Transfer: 4 credit hours
- **ME 37200** Mechanical Design II: 4 credit hours
- **ME 34000** Dynamic Systems and Measurements: 3 credit hours
- General Education Elective: 3 credit hours

Senior Year

Seventh Semester (17 credit hours)

- **ME 41400** Thermal-Fluid Systems Design: 3 credit hours
- **ME 48200** Control Systems Analysis and Design: 3 credit hours
- **TCM 36000** Communication in Engineering Practice: 2 credit hours
- TECH **Elective:** 3 credit hours
- **General Education Elective:** 3 credit hours
- **General Education Elective: :** 3 credit hours

Eighth Semester (17 credit hours)

- **ME 40100** Engineering Ethics and Professionalism: 1 credit hour
- **ME 40500** FE Exam Preparation and Seminar: 1 credit hour
- **ME 46200** Capstone Design: 3 credit hours
- TECH Elective: 3 credit hours
- TECH Elective: 3 credit hours
- Free Elective: 3 credit hours

The complete list of Approved Electives for the B.S.M.E. curriculum may be found by clicking here.

Bachelor of Science in Engineering-Interdisciplinary Engineering

Interdisciplinary engineering provides an opportunity for students whose interests and talents, while oriented toward engineering and science, do not coincide with the plan of study outlined for the B.S.M.E. student. Interdisciplinary engineering does not have a designated professional curriculum, but it is constituted to accommodate a degree objective with broad flexibility and opportunity for interdisciplinary studies.

Students cooperate with their faculty advisors to develop a personalized plan of study leading to the Bachelor of Science in Engineering (B.S.E.) degree with interdisciplinary engineering identified as the major field of study. The Department of Mechanical Engineering has prepared plans of study with such major program areas as Bioengineering, Structural Design, Construction Engineering Management and Engineering Management. The "Major Area" on a B.S.E. Plan of Study includes a minimum of 25 credit hours to complement at least 30 credit hours of Engineering Science/Design. At least 15 of the engineering credits must be at the 300 level or higher.

A description of the Engineering Management program follows as an example. For information about other available options, please consult faculty in the Department of Mechanical Engineering or visit the Department's Undergraduate Programs website.

Bachelor of Science in Engineering-Engineering Management

The School of Engineering and Technology and the Indiana University School of Business offer a joint program in engineering management. This program prepares students to begin careers that may lead to administrative or management positions in technological, engineering, or manufacturing operations. The program also prepares students for careers in large nontechnological organizations such as financial institutions, which may require skills generally associated with both engineering and business. The engineering management program provides a solid background in both engineering and management. To complete the graduation requirements, students take courses in electrical, industrial, and mechanical engineering, as well as accounting, business law, economics, finance, marketing, and management.

Students who finish this four-year degree have several options for continuing their education. With approximately three additional semesters of study, they can also complete an undergraduate program in industrial, electrical, or mechanical engineering. With approximately six additional undergraduate courses they can enroll in a master's degree program in industrial, electrical, or mechanical engineering. They may also apply for direct admission to law school. Students interested in any of these options for continued education should consult their advisors when determining their plans of study.

The number of credit hours required for graduation is 127, distributed as follows for each discipline:

1. Mathematics and Physical Sciences

- Calculus: MATH 16500, 16600, 26100: 12 credit hours
- Multidimensional Mathematics: MATH 17100: 3 credit hours
- Differential Equations: MATH 26600: 3 credit hours
- Chemistry: CHEM-C 10500: 3 credit hours
- Physics: PHYS 15200 and 25100: 9 credit hours

2. Communications, Ethics and Contemporary Issues
   - Speech: COMM-R 110: 3 credit hours
   - Writing: ENG-W 131: 3 credit hours
   - Communication in Engineering Practice: TCM 36000: 2 credit hours
   - Engineering Ethics and Professionalism: ME 40100: 1 credit hour
   - Seminar & Fundamentals of Engineering Review: ME 40500: 1 credit hours
3. General Education
   - Electives: 12 credit hours
4. Freshman Engineering Courses
   - Introduction to the Engineering Profession: ENGR 19500: 1 credit hour
   - Introduction to Engineering: ENGR 19600: 1 credit hour
   - Introduction to Programming Concepts: ENGR 19700: 2 credit hours
   - Computer Tools for Engineering: ENGR 29700: 1 credit hour1
5. Engineering Courses
   - Electrical Engineering: ECE 20400 and 26600: 2 credit hours
   - General Engineering: 9 credit hours
   - Mechanical Engineering: ME 20000, 27000, 27200, 27400, and 33000: 16 credit hours
   - Materials: ME 34400: 3 credit hours
   - Design: ME 46200: 3 credit hours
6. Economics: ECON E201, E202: 6 credit hours
7. Business
   - Accounting: A200: 3 credit hours
   - Business Law: BUS L203: 3 credit hours
   - Finance: BUS F300: 3 credit hours
   - Management: BUS Z302: 3 credit hours
   - Marketing: BUS M300: 3 credit hours
   - Operations and System Management: BUS P300: 3 credit hours
   - Computer: BUS K201: 3 credit hours
   - Statistics: STAT 35000: 3 credit hours

Semester by semester, the **127 total credit hours** are distributed the same as the B.S.M.E. curriculum during the first two semesters, as shown below, and the student works with his or her advisor to make an individualized plan of study for the remaining semesters.

Freshman Year

First Semester

- **ENGR 19500** Introduction to the Engineering Profession: 1 credit hours
- **ENGR 19600** Introduction to Engineering: 3 credit hours
- **CHEM-C 10500** Chemical Science I: 3 credit hours
- **COMM-R 110** Fundamentals of Speech Communication: 3 credit hours
- **MATH 16500** Analytic Geometry and Calculus I: 4 credit hours

Second Semester

- **ENGR 19700** Introduction to Programming Concepts: 2 credit hours
- **ENG-W 131** Elementary Composition I: 3 credit hours
- **MATH 16600** Analytic Geometry and Calculus II: 4 credit hours
- **PHYS 15200** Mechanics: 4 credit hours
- **MATH 17100** Multidimensional Mathematics: 3 credit hours

The Third through Eighth semesters are scheduled on an individual basis.

Graduate Programs in Mechanical Engineering

The Department of Mechanical Engineering has an outstanding and up-to-date engineering faculty with expertise and research interests in the areas of advanced manufacturing, biomechanics, composites, computational fluid dynamics, computer-aided design, computer-aided manufacturing, combustion, controls, elasticity, fluid mechanics, finite element analysis, fracture, heat transfer, robotics, solid and structural mechanics, stress analysis, and turbomachinery. The department offers graduate programs of study that lead to the degrees of Master Science (M.S.), Master of Science in Engineering (M.S.E.), Master of Science in Mechanical Engineering (M.S.M.E.), and Ph.D. The program leading to the Ph.D. in mechanical engineering is jointly administered with the School of Mechanical Engineering at Purdue University, West Lafayette.

The department also offers combined bachelor's and master's degree programs, in which students can receive both B.S. and M.S. degrees in five years at IUPUI. These degree programs are open to qualified undergraduates at IUPUI, leading to either: 1) B.S. and M.S.M.E. degrees (B.S./M.S.M.E.) for mechanical engineering undergraduates, or 2) a B.S. degree in physics and an M.S. degree in mechanical engineering (B.P.M.M.E.) for physics undergraduates. The combined degrees prepare students for advanced engineering careers with two degrees (bachelor's and master's) in as little as five years.

Computer, Information, & Leadership Technology (CILT)

Chair: Eugenia Fernandez, Associate Professor of Computer & Information Technology
Associate Chair: Clifford Goodwin, Associate Professor of Organizational Leadership & Supervision

The Department of Computer, Information, and Leadership Technology houses degree and certificate programs in Computer and Information Technology (CIT), Organizational Leadership and Supervision (OLS),

and three graduate tracks offered through the School of Engineering and Technology's Master of Science in Technology degree.

Our department partners two dynamic programs, bringing together talented faculty and staff who continue to develop innovative and creative opportunities for teaching and learning both on and off campus. CIT's Living Lab, STEM Mentors, Go Green study abroad trips and the Mexico Immersion Program all serve as powerful tools for experiential learning for our students, and are exemplars of IUPUI's RISE to the Challenge Initiative.

CIT's degree program is in the process of seeking ABET (Accreditation Board for Engineering and Technology) accreditation, a process involving voluntary review to ensure the CIT program meets established quality standards. By participating in ABET accreditation, we focus on continuous quality improvement, a hallmark of all successful organizations.

As a CILT student, graduate, or industrial partner; you are an integral part of tomorrow's computer information technology industry or leadership community. Technical skills and professional leadership competencies continue to make our graduates distinctive, unique, and highly marketable in meeting the needs of employers today. All industries seek strong, effective, and mature leaders with the technological knowledge to compete in a global workforce. CILT programs will be the resource of choice to meet that need and each of you will benefit from the synergy created in our department.

Computer & Information Technology Program (CIT)

Professors: T. **Ho, A. Jafari** Associate **Professors:** E. Fernandez (*Chair*), J. Starks
Assistant Professor: H. Wu, F. Lee
Clinical Assistant Professor: C. **Justice** Lecturers: S. Catlin, J. Clark, N. Evans, R. Elliott

The Computer and Information Technology (CIT) program offers a Purdue Bachelor of Science Degree. This degree is available with four concentrations: Web Development, Data Management, Networking Systems, and Information Security These concentrations are designed to provide an applications-oriented, practical education that prepares students for careers as application developers (people who design, write, install and maintain a variety of IT systems, with an emphasis on Web applications); data managers (people who, design, implement, program and maintain databases); network systems specialists (people who to design, configure, secure and maintain IT networks); and information security specialists (people who protect information assets of an organization).

Students who must interrupt their course of study for two calendar years or more will be required to meet all requirements for the program as it stands at the time of their return. Computer and Information Technology (CIT) courses over 10 years old may have to be repeated. Students should check with a CIT advisor.

CIT has been a leader in offering degree courses that can be completed via distance education. Selected courses may be taken either partially or completely via the Web.

CIT offers a minor in computer technology to students majoring in other areas of study at IUPUI. The computer information technology minor provides a basic set of computer concepts and programming courses along with a sequence of computing specialty courses.

CIT also offers Web-based certificate programs, which can be completed via distance education. The Information Technology Certificate focuses on the principles and techniques used to develop Web-based business applications. The six courses that comprise the program cover the application development process including analysis, design, Web programming, database integration and implementation.

CIT offers a Network Security Certificate (NSC) program accredited by The Committee on National Security Systems (CNSS) that addresses the ever-growing need in security. The NSC provides information assurance and security education and training to students and professionals. This program is hands-on and requires students to have some networking and systems experience. Completion of the NSC provides students with a solid foundation in security techniques and prepares participants to work in information assurance and network security. The certificate consists of six courses and is designed so that it can be completed within three semesters (cit.iupui.edu/citnet).

CIT offers a Computer Technology Applications Certificate (CTAC). CTAC is a six-course, 18-credit-hour sequence of classes designed to give you a strong background in computer applications. It will equip you with technology expertise to support your professional academic endeavors and help you transition to the technology of the future. In the required courses, you will use software applications rather than programming to build web sites, develop software training modules, create other interactive IT products, and complete a service learning project. Electives allow you to explore personal-use topics such as IT for the consumer, home networking, and protecting yourself in cyberspace or professional topics such as ethics, IT fundamentals, HTML, and desktop publishing.

Courses in any of the certificate programs may be applied directly to the Bachelor's degree in Computer and Information Technology.

The Program Objectives for Computer and Information Technology are:

1. Apply appropriate information technologies and methodologies to enable an organization to meet its goals.
2. Create, maintain and secure the information technology infrastructure of an organization.
3. Communicate effectively in oral, written, and visual modes in interpersonal and group environments.
4. Act professionally and ethically both as individuals and as members of diverse workplace teams.
5. Engage in ongoing professional development and learning activities.

For more information, visit our Web site at cit.iupui.edu or contact Computer and Information Technology at (317) 274-9705 or via email: cit@iupui.edu.

Bachelor of Science in Computer & Information Technology

This program is not officially accredited by the Technology Accreditation Commission of the ABET; however, it is undergoing accreditation at the time this was published.

General Requirements

1. Completion of the core requirements of a selected concentration and a minimum of 121 credit hours See the following summary table of the core requirements of selected concentrations for more specifics concerning requirements and courses.
2. A minimum of 39 credit hours must be earned in courses at the 300 level or higher. Students must verify upper-level credit with a CIT advisor.
3. Students are required to complete at least two of the four RISE experiences - research, international, service learning, and experiential learning. See advisor for details.

Core Requirements

The bachelor's degree core requirements are fulfilled by meeting all of the requirements of a selected concentration. Four concentrations are available for a student to select: data management, information security, networking systems, and Web development.

Requirements for Bachelor of Science in Computer and Information Technology CIT BS

Requirements - 121 credit hours

(minimum of 39 credit hours at upper level)

Core Requirements

- Concentration - 27 credit hours
- Core - 36 credit hours
- Electives - 18 credit hours

Free Electives

Electives must include 9 units in same (non-CIT) subject area with at least 3 units at 30000/40000 level, but not CIT 10600,

Econ-E270, PSY-B 30500 or SOC-R 359. Minor or Certificates are recommended. See advisor for details.

General Education

- Communications [composition, speech, and report writing] - 12 credit hours
- Mathematics/Science - 18 credit hours
  - Science electives may come from chemistry, geology, physics, and life sciences; however, a laboratory must be associated with the course.
- Leadership - 10 credit hours
  - Human behavior, ethics, project management, and career planning

Specific Concentration Areas

Data Management - Concentration Requirements (27 credits)

- 30000-level Programming - 3 credit hours
- **CIT 37200** Database Programming - 3 credit hours
- **CIT 34400** Database Security - 3 credit hours
- **CIT 44400** Advanced Database Design - 3 credit hours
- **CIT 41200** XML-Based Web Applications - 3 credit hours
- **CIT 47900** Database Administration - 3 credit hours
- **CIT 48800** Data Warehouse and mining - 3 credit hours
- CIT Selectives (any level) - 6 credit hours

Information Security - Concentration Requirements (27 Credits)

- **CIT 35600** Network O/S Administration - 3 credit hours
- **CIT 40600** Advanced Network Security - 3 credit hours
- **CIT 41500** Advanced Network Administration - 3 credit hours
- **CIT 42000** Digital Forensics - 3 credit hours
- **CIT 43100** Applied Security Protocols - 3 credit hours
- **CIT 45100** IT Risk Assessment - 3 credit hours
- **CIT 46000** Wireless Security - 3 credit hours

Networking Systems - Concentration Requirements (27 Credits)

- **CIT 32700** Wireless Networking - 3 credit hours
- **CIT 40200** Design & Implementation of LANs - 3 credit hours
- **CIT 35600** Network O/S Administration - 3 credit hours
- **CIT 44000** Communications Network Design - 3 credit hours
- **CIT 41500** Advanced Network Administration - 3 credit hours
- **CIT 40600** Advanced Network Security - 3 credit hours
- **CIT 38100** Unix Programming & Admin - 3 credit hours
- **CIT Selectives** (any level) - 6 credit hours

Web Development - Concentration Requirements (27 Credits)

- **CIT 27000 or CIT 21500 or CIT 24200** Programming - 3 credit hours
- **CIT 31200** Advanced Web Site Design - 3 credit hours
- **CIT 3xx00 level** Programming - 3 credit hours
- **CGT Selective** - 3 credit hours
- **CIT 37400** Systems and Database Analysis - 3 credit hours

- **CIT 41200** XML-Based Web Applications - 3 credit hours
- **CIT 43600** Advanced E-Commerce or CIT 34400 Database Programming - 3 credit hours
- **CIT Selectives** (any level) - 6 credit hours

Minor in Computer Technology

A minor in computer technology requires the completion of either 18 or 19 credit hours of computer technology courses, plus certain requirements in mathematics, statistics, and computer applications. Required courses in computer technology are provided in two groupings: (a) core requirements, and (b) a specialty sequence. At least 12 credit hours of the minor must be taken at IUPUI.

Students who wish to complete a minor in computer technology must already be accepted as a major by some other department on the IUPUI campus. Students should ask their department's academic advisor whether a minor in computer technology is acceptable with their major field.

A student who applies for a computer technology minor must have a mathematics competency as evidenced by completing MATH 118 and 119 or MATH 153 and 154, or MATH 159, and a college-level computer literacy course (equivalent to CIT 106).

The computer technology minor's core requirements (12 credit hours):

- **CIT 11200** Information Technology Fundamentals **or BUS S302** Management Information Systems - 3 credit hours
- **CIT 21200** Web site Design - 3 credit hours
- **CIT 14000** Programming Constructs Laboratory - 3 credit hours
- **CIT 26200** Problem Solving and Programming **or CIT 27000** Java Programming I **or CIT 24200** Intro to ASP.Net Programming - 3 credit hours

Prior to continuing into the specialty sequences, a student must have:

1. attained the mathematics and computer literacy ability evidenced by college-level courses,
2. completed the above computer technology minor's core requirements,
3. completed 30 credit hours toward his or her major,
4. earned a cumulative grade point average (GPA) of 2.0 or higher.

The student who has met these conditions then selects one of the specialty sequences below and proceeds to complete the three courses of that selected specialty.

The computer technology specialty sequences are:

Applications Development (9 cr.)

- **CIT 21400** Intro to Data Management
- **CIT 21300** Systems Analysis and Design **or BUS A337** Computer Based Accounting Systems Analysis
- **CIT 32500** Human-Computer Interaction **or CIT 41200** XML-Based Web Application

Network Systems (10 cr.)

- **CIT 30700** Data Communications (4 cr.)
- **CIT 30300** Communications Security and Network Controls
- **CIT 40200** Design and Implementation of Local Area Networks **or CIT 44000** Communications Network Design

Web Technologies (9 cr.)

- **CIT 21400** Intro to Data Management
- **CIT 21500** Web Programming
- **CIT 31200** Advanced Web Site Design **or**
- **CIT 41200** XML-Based Web Applications

Information Technology Certificate

The Information Technology Certificate program requires the completion of **18 credit hours**, all delivered over the Web. The courses cover the principles and techniques of the application development process as they apply to a Web environment.

The Information Technology Certificate requirements are:

- **CIT 11200** Information Technology Fundamentals - 3 credit hours
- **CIT 21200** Web site Design - 3 credit hours
- **CIT 21300** Systems Analysis and Design - 3 credit hours
- **CIT 21400** Intro to Data Management - 3 credit hours
- **CIT 21500** Web Programming - 3 credit hours
- **CIT 31300** Commercial Web site Development - 3 credit hours

Computer Technology Applications Certificate

The Computer Technology Applications Certificate requires the completion of **18 credit hours.** The courses cover intro and advanced use of computer applications.

The Computer Technology Applications Certificate requirements are:

- **CIT 10600** Using a Personal Computer - 3 credit hours
- **CIT 20600** Advanced Applications and Desktop Publishing - 3 credit hours
- **CIT-E 306**00 Computer Technology Applications Capstone - 3 credit hours

Electives (Choose 3):

- **CIT 11200** Information Technology Fundamentals - 3 credit hours
- **CIT-E 13300** Computer Troubleshooting - 3 credit hours
- **CIT**-E **20300** Desktop Publishing - 3 credit hours

- **CIT 21200** Web Site Design - 3 credit hours
- **CIT-E 30100** Protecting Yourself in Cyberspace - 3 credit hours
- **CIT-E 30200** Home Networking - 3 credit hours
- **CIT 41000** IT Ethics and Leadership - 3 credit hours

Network Security Certificate

The Network Security Certificate requires the completion of 18 credit hours. The program covers information assurance and security. It requires students to have some networking and systems experience.

The Network Security Certificate requirements are:

- **CIT 30300** Communication Security and Network Controls - 3 credit hours
- **CIT 40600** Advanced Network Security - 3 credit hours
- **CIT 41500** Advanced Network Administration - 3 credit hours
- **CIT 42000** Digital Forensics - 3 credit hours
- **CIT 43100** Applied Secure Protocols - 3 credit hours
- CIT Selective - 3 credit hours

Organizational Leadership & Supervision Program (OLS)

Associate Professors C. Goodwin (*Associate Chair*), S. Hundley, C. Feldhaus
Clinical Professor P. **Fox** Academic Specialist T. Diemer
Senior Lecturer R. Wolter

This program offers a broad based education for those students who desire leadership roles in business, government, technology and industry. A guiding vision of the department is to close the gap between theory and practice. In addition to a Bachelor of Science (B.S.) degree, OLS offers a Certificate in Human Resource Management, International Leadership, and Leadership Studies. The Certificate in Leadership Studies is only available to non-majors.

The degree programs are flexible to meet the needs of both traditional and nontraditional students. As part of a relevant and practical discipline, our programs integrate a series of core courses with a choice of concentration tracks. The core courses offer a strong foundation in leadership, communication and general education, mathematics, and science. Concentration tracks allow students to develop their interests and talents within a particular technical field. Students will select courses from the following related areas of study:

- Architectural Technology (ART)
- Computer & Information Technology (CIT)
- Construction Engineering Management Technology (CEMT)
- Electrical and Computer Engineering Technology (ECET)
- Interior Design (INTR)
- Mechanical Engineering Technology (MET)
- Music Technology (MUS)
- Allied Health
- Biology
- Business
- Chemistry
- Engineering
- Informatics
- Interdisciplinary
- Nursing
- School of Public and Environmental Affairs (SPEA)
- Tourism, Convention, & Events Management (TCEM)
- World Languages (WLAC)
- Ivy Tech & Vincennes University Associates Degrees (except General Studies)
- Ivy Tech & Vincennes University AAS Degrees

Students are encouraged to complete a minor, certificate, or dual baccalaureate degree through the completion of their related area of study.

The B.S. degree increases the range and depth of the student's education in technical and leadership areas. Graduates are prepared to assume leadership positions in a variety of organizational functions as well as to pursue graduate degrees. The degree requirements are arranged in three areas of study: leadership and supervision, math/science/technology (or related area of study), and general education requirements (communication, behavioral/social science, humanities, and electives.

Students working toward their B.S. degrees may earn two or more certificates in specialty areas in technology and in OLS. For example, by taking a combination of OLS courses, students may earn a certificate in Human Resource Management. Academic advisors will assist the student in selecting courses needed to meet the requirements in the concentration area.

The program educational objectives for Organizational Leadership and Supervision are:

1. Prepare leaders who have demonstrated competence within specific technical fields.
2. Give students an understanding of the principles, practices, and forces (economic, social, political, technological, and cultural) shaping the closely related disciplines of leadership, supervision, and management.
3. Close the gap between theory and practice in the disciplines of leadership, supervision, and management.
4. Equip OLS students with knowledge, skills, resources, and perspectives necessary to be contributing members of their respective professions.
5. Enable students to work well with others in a team setting, and be able to be self-managed and self-directed in planning, implementing, presenting, and evaluating their work.
6. Provide students with authentic experiences, activities, and situations that mirror the dynamics of what the OLS student will encounter in the workplace.
7. Place emphasis on involving the students in their learning experience by employing experiential

learning, case studies, classroom discussions, and simulations as the primary methods of instruction.
8. Utilize learning methodologies to develop students within collaborative and interdisciplinary educational experiences.

Where applicable, The OLS Department agrees to accept credit hours earned at Ivy Tech and Vincennes University to satisfy the requirements for the Bachelor of Science degree program in OLS. OLS will accept a maximum of 64.0 credit hours of approved coursework taken towards an AS degree (Associates Degree) or AAS degree (Apprenticeship Program) from an accredited 2-year college.

For more information, call (317) 278-0277 or e-mail et_ols@iupui.edu.

Bachelor of Science in Organizational Leadership & Supervision

The B.S. degree in Organizational Leadership and Supervision requires a total of 122 credit hours. Of the 46 credit hours required in OLS, 25 must result from taking OLS 10000, 25200, 26300, 27400, 32700, 37100, 39000, 41000, and 49000. The balanceof the requirements for graduation are as follows:

1. 21 additional credit hours of OLS elective course work beyond the required courses above, for a total of 46 credit hours of OLS (one OLS elective must fulfill the IUPUI RISE requirement for learning drawn from research, international experience, service, or experiential learning such as internships or coops) completes the OLS Core.
2. 24 credit hours in an applied technology or related competency that complements OLS and directly relates to specific career interests such as CEMT, CIT, ECET, MET, business, nursing, allied health, SPEA, informatics, etc. These courses must be related to a second degree, a minor, a certificate, or reflect some logical combination of courses. Students will be directed to the appropriate advisor for a certificate, or minor; and the faculty in that department will counsel the student for those required courses. Note: Students must have the set of courses they plan to apply to the related technology area preapproved by an OLS academic advisor.
3. CIT 10600 or similar computer applications coursework, TECH 10200, 3 credit hours of any physical science, IET 35000, 3 credit of statistics, and 6 credit hours in mathematical skills (above Math 11100) must be completed by all students to round out the mathematics, science, and Technology Core.
4. 3 credit hours in behavioral or social sciences, selected from courses in anthropology, psychology, sociology, economics and/or geography; 3 credit hours in humanities, selected from courses in art, history, literature, music, religion, and/or theater; 15 credit hours in communication, including COMM R110, ENG W131, TCM 22000, , and TCM 32000*, and 3 credits of communication elective (foreign language, ENG-W, -G, COMM-R, -C, linguistics, or TCM). Students should take TCM 32000 with OLS 41000 (both are prerequisites for OLS 49000 Senior Research Project.
5. 12 credit hours of electives from any department. Students should choose courses that "round out" their degree and expose them to different disciplines and ways of thinking or to improve their marketability in the workplace by fulfilling requirements for certificates/minors or master's degree prerequisites. Prior approval by an OLS advisor is strongly recommended.

Certificate Programs

To enroll in certificate programs, students must be formally admitted by the Office of Admissions on the IUPUI campus. Credit may be given for applicable courses taken at other colleges or universities. Students may apply these courses toward degree programs in the Organizational Leadership and Supervision Program.

Human Resource Management Certificate Program

Although all resources are essential for success, people are an organization's principal resource. How skillfully an organization develops, allocates, and supervises its human resource governs its success or failure. This certificate provides a thorough explanation of the human resource manager's role in helping individuals, work groups, and organizations succeed. The focus of the courses is practical, and each course emphasizes the application of vital concepts so that students will acquire a comprehensive understanding of the subject matter. This Certificate is useful to students who seek careers in human resource management or in other disciplines.

A certificate will be presented to those who successfully complete all course work.

Admission

Candidates for this certificate are required to be formally admitted by the IUPUI Office of Admissions, but are not required to be students in the Purdue School of Engineering and Technology. Each student must meet with an OLS Advisor to declare their intent to pursue the certificate and complete the necessary forms.

Curriculum

Students are required to successfully complete a total of seven courses (21 credit hours) to earn the certificate.

Required Core Courses - Total Hours: 21

All students must successfully complete all of the following courses:

- **OLS 38300** Human Resources Management1 - 3 credit hours
- **OLS 33100** Occupational Safety and Health - 3 credit hours
- **OLS 36800** Personnel Law - 3 credit hours
- **OLS 37500** Training Methods - 3 credit hours
- **OLS 37800** Labor Relations - 3 credit hours
- **OLS 47600** Compensation Planning and Management - 3 credit hours

- **OLS 47900** Staffing Organizations - 3 credit hours

Certificate in Leadership Studies

The Certificate in Leadership Studies equips students with the knowledge, skills, experiences, attitudes, perspectives, and tools necessary to understand the broad-based concepts associated with leadership in a variety of individual, organizational, and community settings in an ever changing, pluralistic, global society. A unique feature of this certificate is its ability to attract a diverse group of students from across the myriad of disciplines taught at IUPUI. Such a strong mixture of interdisciplinary perspectives augments the richness of learning that occurs in certificate courses.

Admission

Candidates for this certificate are required to be formally admitted by the IUPUI Office of Admissions, but are not required to be students in the Purdue School of Engineering and Technology. Credit will be given for applicable courses taken at other colleges and universities. Credits earned while completing this certificate may be subsequently applied toward the B.S. degree in Organizational Leadership and Supervision (OLS). Each student must meet with an OLS Advisor to declare their intent to pursue the certificate and complete the necessary forms; however, students with a declared major in OLS are not eligible to earn the leadership studies certificate, due to curricular redundancy.

Prerequisites

English W131 and Communication R110 are *encouraged prerequisites* for enrollment in OLS 252, 263, and 274, and are *required prerequisites* for enrolling in any 300- or 400-level OLS course.

Curriculum

Students are required to successfully complete the following courses in order to earn the certificate in Leadership Studies:

- **OLS 25200** Human Behavior in Organizations1 - 3 credit hours
- **OLS 26300** Ethical Decisions in Leadership1 - 3 credit hours
- **OLS 27400** Applied Leadership1 - 3 credit hours
- **OLS 32700** Leadership for a Global Workforce - 3 credit hours
- **OLS 39000** Leadership Theories and Processes - 3 credit hours
- **OLS 3xx** Any OLS 30000- or 40000-level Selective Course - 3 credit hours

Total Hours: 18 OLS 25200, 26300, and 27400 must be taken prior to OLS 32700 and 39000.

International Leadership Certificate

The interdisciplinary International Leadership Certificate is designed to provide the knowledge, skills, abilities, perceptions, and experiential learning opportunities appropriate for any student interested in supervising or leading individuals from different countries or preparing for international work assignments. Students who complete the International Leadership Certificate will develop the tools necessary to understand the broad-based concepts associated with leadership in a variety of individual, organizational, and community settings in an ever changing, pluralistic, global society.

Admission

Candidates for this certificate are required to be formally admitted by the IUPUI Office of Admissions, but are not required to be students in the Purdue School of Engineering and Technology. Credit will be given for applicable courses taken at other colleges and universities. Credits earned while completing this certificate may be subsequently applied toward the B.S. degree in Organizational Leadership and Supervision. (OLS). Each student must meet with an OLS Advisor to declare their intent to pursue the certificate and complete the necessary forms.

Prerequisites

English W131 and Communication R110 are *encouraged prerequisites* for enrollment in any OLS 200-400 level courses.

Curriculum

Students are required to successfully complete the following courses in order to earn the certificate in Leadership Studies:

12 credit hours of specific OLS Courses

- **OLS 25200** Human Behavior in Organizations1 - 3 credit hours
- **OLS 32700** Leadership for a Global Workforce - 3 credit hours
- **OLS 32800** Principles of International Business - 3 credit hours
- **OLS 45400** Gender and Diversity in Management - 3 credit hours

9 credit hours of International Experience/Foreign Language

3 - 6 credit hours of a single foreign language

3 - 6 credit hours of approved international experience* (OLS 42300, Mexico Immersion, or OVST)

Total Hours: 21

**International Experience includes all IU/IUPUI Study Abroad, Service Learning work in a bi-lingual setting, or other approved international experience.*

Engineering Technology (ENT)

Chair: E. Cooney, Professor of Electrical and Computer Engineering Technology **Program Directors: BMET** - B. Christe
CEMT - T. Iseley
CpET - B. Lin
EET - E. Cooney
MET - J. Zecher
MSTE - P. Hylton

The Department of Engineering Technology offers one degree program at the associate level and six degree programs at the bachelor's level. ENT offers an Associate of Science degree with a major in Biomedical Electronics Technology (BMET). Graduates from the BMET associate degree program can continue their education for an additional two years and complete the course work leading to a Bachelor of Science degree.

The department offers Bachelor of Science degrees in Biomedical Engineering Technology, Computer Engineering Technology, Construction Engineering Management Technology, Electrical Engineering Technology, Mechanical Engineering Technology, and Motorsports Engineering. The ENT programs are well-suited for individuals who are curious about how things work and want a practice-oriented education. The department faculty members all have practical engineering work experience in their fields of expertise and are able to offer an educational experience that provides graudates with the skills necessary to quickly become productive employees. The faculty is dedicated to teaching and is very focused on meeting the educational needs of students. Daytime, evening and selected web-based courses are offered.

For more information, contact the Department of Engineering Technology at (317) 274-2363, e-mail aland@iupui.edu, or visit our Web site at http://www.engr.iupui.edu/ent.

Biomedical Engineering Technology Program (BMET)

Associate Professor B. Christe (*Program Director)*

Associate of Science in Biomedical Engineering Technology

This two-year program consists of a combination of courses in basic electrical circuits, analog and digital electronics, microprocessor fundamentals, mathematics, physics, medical instrumentation, human anatomy, and human physiology. The program is enhanced by the department's interaction with the Indiana University Hospital on the IUPUI campus and with other area hospitals.

The biomedical engineering technology (BMET) curriculum enables graduates to find employment as biomedical equipment technicians, medical equipment sales personnel, medical equipment servicing/ maintenance technicians, and research technicians.

The curriculum satisfies the educational requirements of the Association for the Advancement of Medical Instrumentation (AAMI) and the Certified Biomedical Equipment Technician Examination. Courses are offered in the day, evening, and online.

Graduates of this program may chose to work toward the Bachelor of Science degree program in biomedical engineering technology. Approximately two additional years of study are necessary to complete the requirements for the B.S. in Biomedical Engineering Technology.

Freshman Year

First Semester (17 credit hours)

- **BMET 10500** Introduction to Biomedical Electronics Technology: 1 credit
- **ECET 10700** Introduction to Circuit Analysis: 4 credits
- **ECET 10900** Digital Fundamentals: 3 credits
- **MATH 15300** Algebra and Trigonometry I: 3 credits
- **ENG W131** Elementary Composition I: 3 credits
- **BMET 22000** Applied Human Biology: 3 credits

Second Semester (17 credit hours)

- **ECET 15700** Electronics and circuit Analysis: 4 credits
- **COMM R110** Fundamentals of Speech Communication: 3 credits
- **ECET 16400** Applied Object-Oriented Programming: 3 credits
- **MATH 15400** Algebra and Trigonometry II: 3 credits
- **BMET 20700** AC Electronics Circuit Anlalysis: 4 credits

Sophomore Year

Third Semester (16 credit hours)

- **ECET 15500** Digital fundamentals II: 3 credits
- **BMET 20900** Intoduction to Microcontrollers: 4 credits
- **ECET 23400** PC Systems I: 3 credits
- **BMET 24000** Introduction to Medical Electronics: 3 credits
- **PSY B104** Psychology as a Social Science: 3 credits

Fourth Semester (15 credit hours)

- **BMET 32000** Biomedical Electronics Systems: 4 credits
- **BMET 29000** BMET Practicum: 4 credits
- **PHYS 21800** General Physics: 4 credits
- **MATH 22100** Calculus for Technology I: 3 credits

Bachelor of Science in Biomedical Engineering Technology

Building on the foundational coursework completed in the first two years of study in Biomedical Engineering Technology, students focus on developing skills to support technology used in patient care. Students integrate the technical/electrical/computer aspects of medical equipment with the needs of the medical staff and patients. Graduates will be integral members of the health care team, demonstrating excellent problem solving skills blended with an emphasis on customer service toward the medical staff to result in safe and effective patient care.

Some graduates may elect to work directly for medical equipment manufacturers, investigating device design, integration, sales or support.

Junior Year

Fifth Semester (16 credit hours)

- **ECET 28400** Computer Communications: 4 credits
- **BMET 31000** Intro to Radiography Systems: 3 credits

- **MATH 22200** Calculus for Technology II: 3 credits
- **BUS A200** Foundations of Accounting: 3 credits
- **TCM 22000** Technical Report Writing: 3 credits

Sixth Semester (16 credit hours)

- **BMET 42000** Techn & Patient Populations: 3 credits
- **ECET 48300**: 4 credits
- **IET 15000** Quaniative Methods for Tech: 3 credits
- **TCM 32000** Written Comm for Sci & Industry: 3 credits
- **Communication, Humanities, and Social Science** Elective: 3 credits

Senior Year

Seventh Semester (16 credit hours)

- **BMET 44000** Codes Reg & Patient Safety: 3 credits
- **BMET 49000** Project Planning & Design: 1 credits
- **ECET 49300** Ethics and Professionalism in Technology: 1 credits
- **CHEM C110 and C115** The Chemistry of Life: 3 & 2 credits
- **Communication, Humanities, and Social Science** Elective: 3 credits
- **NURS B231** Comm for the Health Care Prof: 3 credits

Eighth Semester (14 credit hours)

- **BMET 47000** Special Topics in BMET: 3 credits
- **OLS** Elective: 3 credits
- **OLS** Elective: 3 credits
- **Communication, Humanities, and Social Science** Elective: 3 credits

Computer Engineering Technology Program (CpET)

Professors W. Conrad, E. Cooney *(Chair)*, R. Pfile
Associate Professors B. Christe, W. Lin, K. Reid, K. Rennels
Clinical Associate Professor B. Lin

Bachelor of Science in Computer Engineering Technology

Accredited by the Technology Accreditation Commission, ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700.

The purpose of the Computer Engineering Technology Program is to train engineering technologists to design, develop, and implement computer-based applications. The CpET program is offered by a partnership between the Department of Engineering Technology and the Computer and Information Technology program. A major emphasis of the CpET program is practice-oriented, "hands-on" training in laboratories to provide students and graduates with a rich experience in computer applications.

B.S. degree graduates will be able to provide technical support for computer systems in advanced manufacturing systems, control systems, networks, telecommunication systems, embedded systems, product development, and instrumentation. Graduates of the B.S. CpET program will have titles such as software technologist, automation engineer, applications software engineer, systems analyst, telecommunications engineer, network administrator and system test engineer.

The educational objectives for the Computer Engineering Technology program are:

1. Demonstrate knowledge, techniques (including the use of modern tools), and skills in the use of microprocessors, programs, networks, and systems encountered in the degree program's courses
2. Use current knowledge of mathematics, science, and emerging technology tools of their discipline to solve problems and demonstrate solutions
3. Identify, analyze and solve technical problems as required in the degree program's courses
4. Apply and design hardware, systems, and software programs in their specialty area as demonstrated in a senior project.
5. Conduct, analyze and interpret experiments, and assess results
6. Function as a member of a 2-4 person team to complete a task in a timely manner. Demonstrate ability to organize work done by team members
7. Write technical reports, present data and results coherently in oral and graphic formats
8. Demonstrate skills for life-long learning by locating, evaluating, and applying relevant information using external resources such as the internet, data books, trade publications and library resources.
9. Demonstrate ethical conduct as described in the university student code of conduct. Demonstrate knowledge of professional code of ethics.
10. Demonstrate a respect for diversity as described in the university civility statement. Recognize contemporary professional, societal and global issues in case studies and course projects.
11. Demonstrate quality, timeliness, and ability to complete increasingly complex homework and projects throughout the degree experience.

The Bachelor of Science in Computer Engineering Technology study plan for the industrial computing option is as follows.

Freshman Year

First Semester (14 credit hours)

- **TECH 10200** Discovering Technology: 1 credits
- **TECH 10700** Introduction to Circuit Analysis: 4 credits
- **ECET 10900** Digital Fundamentals: 3 credits
- **MATH 15300** Algebra and Trigonometry I: 3 credits
- **ENG W131** Elementary Composition I: 3 credits

Second Semester (16 credit hours)

- **ECET 15700** Electronics Circuit Analysis: 4 credits
- **COMM R110** Fundamentals of Speech Communications: 3 credits
- **CIT 14000** Programming Constructs Lab: 3 credits
- **MATH 15400** Algebra and Trigonometry II: 3 credits
- **ECET 16400** Applied Object-Oriented Programming: 3 credits

Sophomore Year

Third Semester (16 credit hours)

- **ECET 15500** Digital Fundamentals II: 3 credits
- **ECET 20900** Intro to Microcontrollers: 4 credits
- **ECET 23400** PC systems I: 3 credits
- **MATH 22100** Calculus for Tech I: 3 credits
- **CIT 27000** Java Programming: 3 credits

Fourth Semester (18 credit hours)

- **MATH 23100** Electrical Power and Controls: 4 credits
- **ECET 28400** Computer Communications: 4 credits
- **CIT 28600** Operating Systems and Administration: 3 credits
- **Communications, Humanities and Social Science** Elective: 3 credits
- **PHYS 21800** General Physics I: 4 credits

Junior Year

Fifth Semester (14 credit hours)

- **ECET 35700** Real-Time Digital Signal Processing: 4 credits
- **MATH 22200** Calculus for Technology II: 3 credits
- **ECET 23100** Electrical Power & Controls: 4 credits
- **ECET Elective**: 4 credits
- **TCM 22000** Technical Report Writing: 3 credits

Sixth Semester (17 credit hours)

- **ECET Elective**: 4 credits
- **ECET Elective**: 4 credits
- **CIT Selective***: 3 credits
- **TCM 37000** Oral Practicum: 3 credits
- **OLS 26300** Ethical Decisions in Leadership: 3 credits

Senior Year

Seventh Semester (15 credit hours)

- **ECET Elective**: 4 credits
- **ECET 49000** Senior Design Project Phase I: 1 credit
- **ECET 49300** Ethics and Professionalism in Technology: 1 credit
- **CIT Selective***: 3 credits
- **STAT 301/IET 150/ECON 270 or Statistical Methods or Chem C101 & Chem 121** Elementary Chemistry: 3 credits
- **Communication, Humanities and Social Science** Elective: 3 credits

Eighth Semester (16 credit hours)

- **ECET 49100** Senior Design Project Phase II: 2 credits
- **ECET Elective**: 4 credits
- **CIT Selective***: 3 credits
- **ECET Elective**: 4 credits
- **Communication, Humanities and Social Science** Elective: 3 credits

Construction Engineering Management Technology (CEMT)

Professor T. Isley, E. Sener
Assistant Professor B. Kinsey
Lecturer Bill White

The Construction Engineering Management Technology program offers students in the program a B.S. degree. Students may apply to enter the co-op or internship work programs following their freshman year.

For more information, contact the Department of Engineering Technology at (317) 274-2363 or email aland@iupui.edu. or visit our Web site at www.engr.iupui.edu/cnt.

Bachelor of Science in Construction Engineering Management Technology

Accredited by the Technology Accreditation Commission, ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700.

The Construction Engineering Management Technology curriculum is intended to further students' knowledge in areas of construction contract administration, specification writing, construction field operations, construction scheduling/project control, construction costs and bidding, construction law and ethics, construction safety and inspection, construction project cost and project control, soils and foundations, construction economics, and construction management through further course work. Additional course work in microeconomics, mathematics, lab sciences, and training in written and oral communications is also included. Many students complete all or part of their course work on a part-time basis by taking a reduced course load during the semesters they are engaged in construction-related employment.

Graduates of the program are prepared for employment with contractors, building product companies, consulting engineering firms, construction material and equipment vendors, testing labs, utilities, and state and other government organizations. Occupations such as inspecting, estimating, project management, merchandising, supervising, and testing may also be filled by graduates of this program.

The career educational objectives for Construction Technology are:

1. Demonstrate excellent technical capabilities in construction technology and related fields.
2. Be responsible citizens.
3. Continue professional advancement through life-long learning
4. Apply sound methodology in multidisciplinary fields of construction technology that is sensitive to the health, safety and welfare of the public.
5. Competently use mathematical, measurement, instrumentation testing techniques.
6. Practice effective oral, written and visual communication skills.
7. Understand the environmental, ethical, diversity, cultural and contemporary aspects of their work.
8. Work effectively and collaboratively in architectural, engineering and construction industries.

Graduates typically find employment with engineering firms, construction firms, consulting companies, surveying companies, contractors and subcontractors, builders, construction materials testing companies, building products, materials and equipment suppliers, land

developers, highway departments, utilities, and various state, city, and governmental agencies and work with titles such as project manager or project supervisor, contract administrator, specifications writer, safety supervisor, project estimator, project scheduler, contractor, sub-contractor, builder, surveyor, designer, remodeller, testing supervisor, merchandiser of construction materials and equipment.

The curriculum is not intended to prepare students for registration as professional engineers.

Freshman Year

First Semester (15 credit hours)

- **CEMT 10500** Introduction to Construction Technology: 3 credit hours
- **CEMT 12500** Construction Visualization: 3 credit hours
- **TECH 10200** Discovering Technology:1 credit hours
- **OLS 25200 or 27400**: 3 credit hours
- **ENG W131** Elementary Composition I: 3 credit hours
- **MATH 15300** Algebra and Trigonometry I: 3 credit hours

Second Semester (15 credit hours)

- **OLS Selective:** 3 credit hours
- **CEMT 27500** Civil Eng Drafting: 3 credit hours
- **COMM R110** Fundamentals of Speech Communication: 3 credit hours
- **MATH 15400** Algebra and Trigonometry II: 3 credit hours
- **TCM 22000** Technical Report Writing: 3 credit hours

Sophomore Year

Third Semester (17 credit hours)

- **CEMT 21500** Constr Mech & Elec: 4 credit hours
- **CEMT 11000** Construction Accounting: 3 credit hours
- **TCM 34000** Correspondence in Bus & Ind: 3 credit hours
- **ECON E201** Microeconomics: 3 credit hours
- **PHYS 218** General Physics I: 4 credit hours

Fourth Semester (15 credit hours)

- **Gen Ed Elective**: 3 credit hours
- **CEMT 28000** Quantity Survey: 3 credit hours
- **CEMT 10400** Surveying Fundamentals: 3 credit hours
- **CEMT 16000** Statics: 3 credit hours
- **MATH 22100** Calculus for Technology I: 3 credit hours

Junior Year

Fifth Semester (15 credit hours)

- **CEMT 30200** Construction Law & Ethics: 3 credit hours
- **CEMT 34200** Construction Cost & Bidding: 3 credit hours
- **CEMT 31200** Construction Surveying: 3 credit hours
- **CEMT 26000** Strength of Materials: 3 credit hours
- **CEMT 26700** Materials Testing: 2 credit hours

Sixth Semester (16 credit hours)

- **CEMT 34700** Constr. Contract Admin & Specs: 3 credit hours
- **CEMT 34100** Construction Scheduling: 3 credit hours
- **CEMT 48400** Wood, Timber and Formwork Design: 3 credit hours
- **Science Elective:** 4 credit hours
- **Math/Stat/Phys/.Elective:** 3 credit hours

Senior Year

Seventh Semester (16 credit hours)

- **CEMT 45200** Hydraulics and Drainage: 3 credit hours
- **CEMT 33000** Construction Field Operations: 3 credit hours
- **CEMT 45500** Constr. Safety & Inspection: 3 credit hours
- **CEMT 48600** Reinfor Concrete Des & Const: 3 credit hours
- Humanites, Social Science Elective: 3 credit hours
- **CEMT 39000** Construction Experience: 1 credit hours

Eighth Semester (16 credit hours)

- **CEMT 43000** Soils and Foundations: 3 credit hours
- **CEMT 49400** Engineering Economics for Construction: 3 credit hours
- **CEMT 44700** Project Management: 3 credit hours
- **CEMT 35000** Constr. Proj. Cost & Proj. Cntrl: 3 credit hours
- **Construction Elective:** 3 credit hours

Construction Management Certificate

This certificate is designed to provide educational opportunities for those who need or desire to learn contemporary construction management techniques and skills and employ the latest technology in doing so. This program emphasizes developing the skills required by the construction industry and relies on the use of computers, whenever possible, to provide a contemporary education in the use of the latest technology in the management process. Those who earn the certificate will qualify for entry-level positions as superintendents, project managers, estimators, or schedulers for construction-related firms and will be competent in using the latest technology.

Good candidates for the program are people who wish to acquire additional marketable skills in construction management, who wish to upgrade existing construction management skills, or who wish to earn tangible verification of acquired skills and bodies of knowledge related to construction management.

Curriculum (27 credit hours)

- **CEMT 11000** Construction Accounting: 3 credit hours
- **CEMT 28000** Quantity Survey: 3 credit hours
- **CEMT 33000** Construction Field Operations: 3 credit hours

- **CEMT 34100** Construction Scheduling and Project Control: 3 credit hours
- **CEMT 34200** Construction Cost and Bidding: 3 credit hours
- **CEMT 34700** Construction Contract Administration and Specifications: 3 credit hours
- **CEMT 44700** Construction Project Management: 3 credit hours
- **CEMT 45500** Construction Safety and Inspection: 3 credit hours
- **CEMT 49400** Engr Economics for Construction: 3 credit hours

Any student who has 8 credit hours in college-level technical mathematics, including algebra, trigonometry, and calculus; proven computer competency; the ability to read and interpret construction documents; and is formally admitted to the university, may be a candidate for this certificate. Courses taken at other universities may be recognized as equivalent to selected required courses. Course credit may be given for appropriate job experience.

Courses taken at other universities may be recognized as equivalent to selected required courses, as corequisites, or as prerequisites, and course credit may be given for appropriate job experience. Please see the department chair before starting this certificate to obtain the full certificate requirements and the flowchart for the certificate program of study, there may be other course requirements that circumstances may necessitate. Students pursuing a degree cannot be awarded a certificate.

Electrical Engineering Technology Program (EET)

Professors W. Conrad, E. Cooney*(Chair)*, R. Pfile
Associate Professor B. Christe
Clinical Associate Professor W.Lin
Assistant Professors Afshin Izadian, David Goodman

Bachelor of Science in Electrical Engineering Technology

Accredited by the Technology Accreditation Commission, ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700.

Graduates of this program are qualified for high-level positions as technologists with job titles such as product engineer, process automation specialist, quality engineer, audio engineer, manufacturing system integration engineer, product engineer, field service engineer, substation engineer, controls engineer, calibration specialist, and sales engineer. The courses are offered both in the day and evening.

The educational objectives for the Electrical Engineering Technology program are:

1. Demonstrate knowledge, techniques (including the use of modern tools), and skills in the use of microprocessors, programs, networks, and systems encountered in the degree program's courses
2. Use current knowledge of mathematics, science, and emerging technology tools of their discipline to solve problems and demonstrate solutions
3. Identify, analyze and solve technical problems as required in the degree program's courses
4. Apply and design hardware, systems, and software programs in their specialty area as demonstrated in a senior project.
5. Conduct, analyze and interpret experiments, and assess results
6. Function as a member of a 2-4 person team to complete a task in a timely manner. Demonstrate ability to organize work done by team members
7. Write technical reports, present data and results coherently in oral and graphic formats
8. Demonstrate skills for life-long learning by locating, evaluating, and applying relevant information using external resources such as the internet, data books, trade publications and library resources.
9. Demonstrate ethical conduct as described in the university student code of conduct. Demonstrate knowledge of professional code of ethics.
10. Demonstrate a respect for diversity as described in the university civility statement. Recognize contemporary professional, societal and global issues in case studies and course projects.
11. Demonstrate quality, timeliness, and ability to complete increasingly complex homework and projects throughout the degree experience.

Freshman Year

First Semester (14 credit hours)

- **TECH 10200** Discovering Technology: 1 credit hours
- **ECET 10700** Introduction to Circuit Analysis: 4 credit hours
- **ECET 10900** Digital Fundamentals: 3 credit hours
- **MATH 15300** Algebra and Trigonometry I: 3 credit hours
- **ENG W131** Elementary Composition I: 3 credit hours

Second Semester (17 credit hours)

- **ECET 15700** Electronics Circuit Analysis: 4 credit hours
- **COMM R110** Fundamentals of Speech
- **ECET 16400** Applied Object-Oriented Programming: 3 credit hours
- **TCM 22000** Technical Report Writing: 3 credit hours
- **MATH 15400** Algebra and Trigonometry II: 3 credit hours
- **ECET 20700** AC Electronics Circuit Analysis: 4 credit hours

Sophomore Year

Third Semester (16 credit hours)

- **ECET 15500** Digital Fundamentals II: 3 credit hours
- **ECET 20900** Introduction to Microcontrollers: 4 credit hours
- **ECET 23400** PC Systems I: 3 credit hours
- **MATH 22100** Calculus for Tech I: 3 credit hours
- **Tech** Elective **or Tech** Specialty : 3 credit hours

Fourth Semester (17 credit hours)

- **ECET 23100** Electrical Power and Controls: 4 credit hours

- **ECET 28400** Computer Communications: 4 credit hours
- **PHYS 21800** General Physics: 4 credit hours
- **CGT 12000** Electrical and Electronic Drafting: 2 credit hours
- Communication, Humanities, and Social Science Elective: 3 credit hours

Five specialty tracks are available in the B.S. program: communication systems, control systems, digital/ microprocessor systems, electronic devices and systems, and power systems. The B.S. requirements are listed below; the recommended curriculum for each specialty track follows.

Junior Year

Fifth Semester (17 credit hours)

- **ECET 30700** Analog Network Signal Processing: 4 credit hours
- **ECET** Elective: 4 credit hours
- **MATH 22200** Calculus for Technology II: 3 credit hours
- **STAT 30100** Elementary Statistics: 3 credit hours
- **TCM 22000** Technical Report Writing: 3 credit hours

Sixth Semester (17 credit hours)

- **ECET** Elective: 4 credit hours
- **ECET** Elective: 4 credit hours
- **MET/IET/CIT** Technical Elective: 3 credit hours
- **TCM 37000** Oral Practicum for Technology: 3 credit hours
- **OLS 26300** Ethical Decisions in Leadership: 3 credit hours

Senior Year

Seventh Semester (14 credit hours)

- **ECET** Elective: 4 credit hours
- **ECET 49000** Senior Design Project Phase I: 1 credit hours
- **ECET 49300** Ethics and Professionalism in Technology: 1 credit hours
- **CHEM C101 and C121** Elementary Chemistry I: 3&2 credit hours
- Communication, Humanities, and Social Science Elective: 3 credit hours

Eighth Semester (15 credit hours)

- **ECET** Elective: 4 credit hours
- **ECET 49100** Senior Design Project Phase II: 2 credit hours
- **MET/IET/CIT** Technical Elective: 3 credit hours
- **MET/IET/CIT** Technical Elective: 3 credit hours
- Communication, Humanities, and Social Science Elective: 3 credit hours

Communication Systems

The communication systems track prepares graduates for career opportunities in communication systems, signal processing, applications and specifications of systems, computer networking, and broadcasting. Students in this track study analog and digital communication systems, radio transmissions and reception, audio signal processing, and local area networks.

- **ECET** Technical Specialty Electives
- **ECET 30400** Introduction to Communications Systems
- **ECET 35700** Real-Time Digital Signal Processing
- **ECET 40300** Data-communications and Telecommunications
- **ECET 48300** Network Fundamentals with Microcontrollers
- **ECET 45300** Topics in Telecommunications

Interdisciplinary Technical Electives

Minimum of 9 credit hours with approval of advisor. See the effective plan of study for course suggestions.

Control Systems

The control systems track prepares graduates for career opportunities in the design and analysis of automatic control systems, including control hardware and software used in automation, robotics, industrial controllers, and military electronics systems. Prospective fields of employment are manufacturing industries, automation integrators, pharmaceutical manufacturing, processing industries, and other areas of commerce that use control systems.

- **ECET** Technical Specialty Electives
- **ECET 30900** Advanced Embedded Microcontrollers
- **ECET 35700** Real-Time Digital Signal Processing
- **ECET 37100** Automation, Instrumentation, and Process Control
- **ECET 48300** Network Fundamentals with Microcontrollers
- **ECET** Elective

Interdisciplinary Technical Electives

Minimum of 9 credit hours with approval of advisor. See the effective plan of study for course suggestions.

Digital/Microprocessor

The digital/microprocessor track prepares graduates for career opportunities in design, testing, and troubleshooting of computer-based systems. Instruction is provided in computer hardware and software design, computer networking systems, and advanced digital design techniques utilizing simulation and computer-based design tools. Applications are found in consumer products, automation systems, computer systems, medicine, military electronics, communications, and instrumentation.

- **ECET** Technical Specialty Electives
- **ECET 30900** Advanced Embedded Microcontrollers
- **ECET 35700** Real-Time Digital Signal Processing
- **ECET 41700** Advanced Digital Systems Design with VHDL
- **ECET 45300** Topics in Telecommunications
- **ECET 48300** Network Fundamentals with Microcontrollers

Interdisciplinary Technical Electives

Minimum of 9 credit hours with approval of advisor. See the effective plan of study for course suggestions.

Electronic Devices and Systems

The electronic devices and systems track prepares graduates for career opportunities in analog and digital systems, signal processing, audio systems, and integrated circuit technologies. Students in this track study analog and digital devices and systems, communications, D/A-A/D technologies, computer simulation, and applied analysis of circuits.

- ECET Technical Specialty Electives
- ECET 30400 Introduction to Communications Systems
- ECET 41700 Advanced Digital Systems Design with VHDL
- ECET 30200 Introduction to Control Systems
- ECET 35700 Real-time Digital Signal Processing
- ECET 37100 Automation, Instrumentation, and Process Control

Interdisciplinary Technical Electives

Minimum of 9 credit hours with approval of advisor. See the effective plan of study for course suggestions.

Power Systems

The power track prepares graduates for career opportunities in the areas of power transmission and distribution in both the utility and the industrial setting. Applications include industrial power distribution, fault studies, fuse coordination, system economic analysis, lighting design, transmission losses, and power system protection.

- ECET Technical Specialty Electives
- ECET 30200 Introduction to Control Systems
- ECET 37100 Automation, Instrumentation, and Process Control
- ECET 38100 Electrical Distribution Systems
- ECET Elective
- ECET 33100 Generation and Transmission of Electrical Power or ECET Elective
- ECET 48300 Network Fundamentals with Microcontrollers

Interdisciplinary Technical Electives

Minimum of 9 credit hours with approval of advisor. See the effective plan of study for course suggestions.

Advanced Curriculum Program

Electrical engineering technology students interested in pursuing advanced degrees in science, engineering, or professional registration are encouraged to take the ECET department's Advanced Curriculum Program (ACP).1 This program maximizes a student's undergraduate preparation in the mathematics, science, and engineering science required for advanced studies within the framework of the B.S. degree program. The ACP requirements are listed below, with the four-year technology course substitution shown in parentheses.

Mathematics and Science

- MATH 16300 Integrated Calculus and Analytic Geometry I (in place of MATH 22100)
- MATH 16400 Integrated Calculus and Analytic Geometry II (in place of MATH 22200)
- MATH 26100 and 26200
- STAT 511 Statistical Methods I (in place of STAT 30100)
- PHYS 15200 Mechanics (in place of PHYS 21800)
- PHYS 25100 Heat, Electricity, and Optics (PHYS 21900)
- CHEM C105 and CHEM C125 Principles of Chemistry I (in place of CHEM C101 and CHEM C121)
- Two engineering design courses

Interdisciplinary Technical Electives

Minimum of 12 credit hours with approval of advisor.

Minor in Electrical Engineering Technology

The minor in electrical engineering technology (EET) requires completion of a minimum of 22 credit hours of ECET courses. Required courses are ECET 107, 109, 157, 155, and 207. In addition, one course from the following list must be completed: ECET 209, 231 or 284 . At least 12 credit hours of minor must be completed in residence at IUPUI. Students with credit for ECET 116 should consult the ECET department.

Students who wish to complete a minor in electrical engineering technology should consult a department advisor about prerequisite courses or credit for courses taken at other universities.

1 For details on a specific program, consult a department advisor.

Mechanical Engineering Technology Program (MET)

Professors J. Zecher *(Program Director)* Associate Professors D. Acheson, K. Rennels, P. Hylton Assistant Professors R. Chen

The Department of Engineering Technology offers a Bachelor of Science degree in mechanical engineering technology. The short-duration certificate programs are offered in quality assurance and motorsports technology.

For more information, contact the Department of Engineering Technology at (317) 274-3428, or email aland@iupui.edu , or visit our Web site at: www.engr.iupui.edu/met.

Bachelor of Science in Mechanical Engineering Technology

Accredited by the Technology Accreditation Commission, ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700.

This program is designed to satisfy a specific need of industry. Building on the A.S. background, selected practical and applied courses give students additional communicative and supervisory skills, interdisciplinary technical understanding, and greater expertise in their major area.

The program educational objectives for Mechanical Engineering Technology are:

1. Show their ability to solve problems related to the workplace through their application of excellent technical capabilities in mechanical engineering technology and related supporting fields.

2. Be responsible citizens in the workplace through their demonstrated ethical and professional conduct, and appreciation for diversity in its various forms.
3. Continue their professional advancement through life-long learning opportunities, in-service training, and engagement with professional organizations.
4. Practice effective oral and written communication skills.
5. Show their ability to address diverse environmental, ethical, diversity, cultural, and contemporary aspects of their work.
6. Work collaboratively and effectively in engineering and manufacturing industries as a liaison between professional engineers and manufacturing personnel.

Freshman Year

First Semester (15 credit hours)

- MET 10500 Introduction to Engineering Technology: 3 credit hours
- MET 14100 Materials I: 3 credit hours
- CGT 11000 Technical Graphics Communication: 3 credit hours
- MATH 15300 Algebra and Trigonometry I: 3 credit hours
- ENG W131 Elementary Composition I: 3 credit hours

Second Semester (18 credit hours)

- MET 10200 Production Design and Specifications: 3 credit hours
- MET 11100 Applied Statics: 3 credit hours
- MET 14200 Manufacturing Processes I: 3 credit hours
- TCM 22000 Technical Report Writing: 3 credit hours
- OLS 25200 Human Behavior in Organizations: 3 credit hours
- MATH 15400 Algebra and Trigonometry II: 3 credit hours

Sophomore Year

Third Semester (17 credit hours)

- MET 21100 Applied Strength of Materials: 4 credit hours
- MET 24200 Manufacturing Processes II: 3 credit hours
- COMM R110 Fundamentals of Speech Communication: 3 credit hours
- PHYS 21800 General Physics I: 4 credit hours
- MATH 22100 Calculus for Technology I: 3 credit hours

Fourth Semester (16 credit hours)

- MET 21400 Machine Elements: 3 credit hours
- MET 22000 Heat/Power: 3 credit hours
- MET 23000 Fluid Power: 3 credit hours
- PHYS 21900 General Physics II: 4 credit hours
- Technical Elective: 3 credit hours

Junior Year

Fifth Semester (15 credit hours)

- MET 21300 Dynamics: 3 credit hours
- MET 32000 Applied Thermodynamics: 3 credit hours
- TCM 34000 Correspondence in Business and Industry: 3 credit hours
- IET 15000 Quantitative Methods for Technology: 3 credit hours
- MATH 22200 Calculus for Technology II: 3 credit hours

Sixth Semester (16 credit hours)

- MET 31000 Computer-Aided Machine Design: 3 credit hours
- MET 34400 Materials II: 3 credit hours
- MET 35000 Applied Fluid Mechanics: 3 credit hours
- ECET 11600 Electrical Circuits: 3 credit hours
- CIT 14000 Programming Constructs Lab: 3 credit hours

Senior Year

Seventh Semester (15 credit hours)

- MET 32800 CAD/CAM for Mechanical Design: 3 credit hours
- MET 38400 Instrumentation: 3 credit hours
- IET 10400 Industrial Organization: 3 credit hours
- IET 35000 Engineering Economy: 3 credit hours
- TCM 37000 Oral Practicum for Technical Managers: 3 credit hours

Eighth Semester (17 credit hours)

- MET 41400 Design of Mechanical Projects: 3 credit hours
- CHEM C101 & C121 ElementaryChemistry I: 5 credit hours
- Social Science Electives: 6 credit hours
- Technical Elective: 3 credit hours

Bachelor of Science in Mechanical Engineering Technology

Advanced Curriculum Track

The advanced-degree Mechanical Engineering Technology Program includes classes in advanced mathematics, and science.

Junior Year

Fifth Semester (16 credit hours)

- MET 21300 Dynamics: 3 credit hours
- MET 32000 Applied Thermodynamics: 3 credit hours
- TCM 34000 Correspondence in Business and Industry: 3 credit hours
- IET 15000 Quantitative Methods for Technology: 3 credit hours
- MATH 26100 Multivariate Calculus: 4 credit hours

Sixth Semester (16 credit hours)

- MET 31000 Computer-Aided Machine Design: 3 credit hours
- MET 34400 Materials II: 3 credit hours
- MET 35000 Applied Fluid Mechanics: 3 credit hours
- ECET 11600 Electrical Circuits: 4 credit hours
- CIT 14000 Programming Constructs Lab: 3 credit hours

Senior Year

Seventh Semester (15 credit hours)

- MET 32800 CAD/CAM for Mechanical Design: 3 credit hours
- MET 38400 Instrumentation: 3 credit hours
- IET 10400 Industrial Organization: 3 credit hours
- IET 35000 Engineering Economics: 3 credit hours
- TCM 37000 Oral Practicum for Technical Managers: 3 credit hours

Eighth Semester (17 credit hours)

- MET 41400 Design of Mechanical Projects: 3 credit hours
- CHEM C10100 and C12100 Elementary Chemistry I: 5 credit hours
- Technical Elective: 3 credit hours
- Social Science Electives: 6 credit hours

Quality Assurance Certificate Program

Developed in conjunction with the Northeast Indiana Section of the American Society for Quality Control, this certificate program provides training and instruction in the use of measuring instruments and techniques of statistical quality control. The course work provides a basis for putting these techniques to work in the quality control system of an industrial organization. The program includes an investigation of the concept of quality control and the impact of quality costs, determination of customer needs, and follow-up on field performance and feedback. A certificate will be presented to those who successfully complete all course work and the transcript noted.

A total of 20 credit hours and cumulative grade point average of 2.0 on a 4.0 scale is required to receive the certificate.

All students must complete the following courses:

The courses are listed in the order in which they should be taken.

Curriculum (23 credit hours)

- MATH 15100 or MATH 15300/15400 Algebra and Trigonometry: 5 credit hours
- MET 10500 Intro to Engineering Technology: 3 credit hours
- IET 30000 Metrology for Quality Assurance: 3 credit hours
- IET 15000 Quantitative Methods for Technology: 3 credit hours
- IET 36400 Total Quality Control: 3 credit hours
- IET 37400 Nondestructive Testing or
- IET 47400 Quality Improvement of Products and Processes: 3 credit hours
- IET 45400 Statistical Quality Control: 3 credit hours

Motorsports Engineering Program (MSTE)

Associate Professor P. Hylton *(Program Director)*

Lecturer A. Borme

IUPUI is the first University in the United States to offer a bachelor's degree in motorsports engineering

The motorsports industry is growing and expected to continue to grow at a rapid pace. By most accounts, Indiana, North Carolina, and England are recognized as the three leading local motorsports economies. Indianapolis, while generally known as the home of open-wheel racing has a broad appeal. It is also known for sprint cars, midgets, karting, NHRA, and many other forms of racing. It is estimated that there are over 400 motorsports-related firms in the Indianapolis region including companies that produce engines, brakes, shocks, springs, and other racing products.

Bachelor of Science in Motorsports Engineering

This 4-year Bachelor of Science of Degree in Motorsports Engineering degree program was just approved in May, 2008. This program, which aims to prepare graduates for careers in the motorsports industry, as well as automotive-related companies, will focus on teaching fundamentals of engineering and will include hands-on projects that involve designing, analyzing, and building of actual systems.

Freshman Year

First Semester (14 credit hours)

- ENG-W 131 Elementary Composition: 3 credit hours
- Math 16500 Calculus I: 4 credit hours
- ENGR 19500 Learning Community: 1 credit hour
- CHEM C 10500 Chemistry II: 3 credit hours
- MSTE 27200 Intro to Motorsports: 3 credit hours

Second Semester (16 credit hours)

- COMM_R110 Fund. Of Speech Comm: 3 credit hours
- MATH 16600 Calculus II: 4 credit hours
- PHYS 15200 General Physics I: 4 credit hours
- ENGR 19700 Intro to Programming Concep: 2 credit hours
- MATH 17100 Multidimensional Math: 3 credit hours

Sophomore Year

Third Semester (17 credit hours)

- MSTE 29700 Computer Modeling for Motorsports: 1 credit hour
- MATH 26100 Multivariate Calculus: 4 credit hours
- PHYS 25100 General Physics II: 5 credit hours
- ME 20000 Thermodynamics: 3 credit hours
- MSTE 21000 Statics and Dynamics: 4 credit hours

Fourth Semester (17 credit hours)

- MATH 26600 Ordinary Differential Equations: 4 credit hours
- ECE 20400 Electrical & Electronics Circuits: 4 credit hours
- ME 27200 Strength of Materials: 4 credit hours
- Technical Elective: 3 credit hours
- MSTE 35000 Computer Aided Design & Mfg: 3 credit hours

Junior Year

Fifth Semester (16 credit hours)

- MSTE 32000 Motorsports Design I: 3 credit hours
- MSTE 33000 Data Acquisition in Motorsports I: 3 credit hours
- MSTE 34000 Dynamic Systems & Signals: 3 credit hours
- MSTE 31000 Business of Motorsports I: 3 credit hours
- ME 31000 Fluid Mechanics: 4 credit hours

Sixth Semester (15 credit hours)

- MSTE I 4100 Internship: 1 credit hour
- MSTE 33100 Data acquisition in Motorsports II: 3 credit hours
- MSTE 31100 Business of Motorsports II: 3 credit hours
- STAT Elective: 3 credit hours
- ME 34400 Materials: 3 credit hours
- TCM 36000 Communications/Writing: 2 credit hours

Senior Year

Seventh Semester (16 credit hours)

- MSTE I 41000 Internship: 1 credit hour
- MSTE 47200 Vehicle Dynamics: 3 credit hours
- Gen Ed Elective: 3 credit hours
- Technical Selective: 3 credit hours
- MSTE 36000 Control Systems Analysis & Des: 3 credit hours
- ECON: 3 credit hours

Eighth Semester (17 credit hours)

- MSTE I 41000 Internship: 1 credit hour
- Ethics: 3 credit hours
- MSTE 42000 Automotive Control: 3 credit hours
- MSTE 41400 Motorsports Design II: 3 credit hours
- MSTE 42600 Internal Combustion Engines: 3 credit hours
- Tech Elective: 3 credit hours
- Gen Ed Elective: 3 credit hours

Motorsports Engineering Certificate

This certificate provides an educational opportunity in the basics of the motorsports industry. Motorsports is a rapidly expanding segment of the Indiana employment market. This certificate will assist in developing technical skills in this area. A certificate and transcript notation will be awarded upon completion of the course work.

A total of 26 credit hours and a cumulative grade point average of 2.0 on a 4.0 scale is required to receive the certificate

All students must complete the following courses or their equivalents:

- Math 15900 Algebra & Trigonometry or Math 153/154 Algebra & Trigonometry I&II: 5 credit hours
- MET 11100 Statics: 3 credit hours
- MET 21100 Strength of Materials or MET 213 Dynamics: 3 credit hours
  - (must take one but both are recommended)
- MET 22000 Heat and Power: 3 credit hours
- MET 29900 Intro to Motorsports: 3 credit hours
- MET 42600 IC Engines: 3 credit hours
- MET 49900 Vehicle Dynamics: 3 credit hours
- An MET Project Course with a Motorsports related project: 3 credit hours
  - (may be MET 41400, MET 49700 or MET 29900 project course)

Design & Communication Technology (DCT)

Chair: M. Bannatyne

Associate Chair: W. Worley, Assistant Professor of English and Technical Communications

It would be an understatement to say that the world about us is changing at a pace unprecedented in any other era of history. If I were to try and identify the most significant influence that has pushed these changes along, I would have to name the computer.

The amazing changes in our world have not resulted simply due to the invention of the computer itself, but rather from the multitude of applications that computer has opened up to us for our own use and pleasure. Once only viewed as a means to calculate answers to complex equations, we now look in awe at the way visual information on a computer screen is hurdled across the arch of heaven from one nation to another in an endless stream of digital bits and bytes. Indeed, the computer and its associated networks have made information available to us in such quantities that a hundred lifetimes would never be long enough to capture even the smallest fraction of it all. At times, I am sure that many of us may feel this flood of information may seem more of "a solution in search of a problem" rather than the means of bringing any inquiry to a successful conclusion.

"What are we to do with this plethora of data and images?" The answer is simple, "Use what we need, and pass the rest along to other areas of discovery and learning!" With the vast wealth of visual information available to us via the computer, we can now reach out to colleagues and students in ways that were only a mere generation ago still a dream of things yet in the distant future. While an argument might certainly be made that the computer's greatest value is shown through the visual graphics it can provide to support education, we must be careful that we do not attribute to the computer any prowess that does not exist.

Perhaps the most significant change the computer has made in our lives is the way we think about it. Where once we were told, "The computer cannot make a mistake", we now view the computer as a valuable resource that assists us to get a job done in a manner that suits our needs. We now accept the technological change that the computer caused, not so much as a miracle that is only understood by a few, but as a tool that has become a part of our natural domain...a tool that is expected to solve many of our problems. In the final analysis, perhaps

ultimately this change in our perception will be seen as the greatest change of all in our world.

We live in a remarkable technological age, but stay tuned for the best is yet to come. Join us in DCT where we will help prepare you to meet the design and communication challenges of living in the future with confidence.

Architectural Technology Program (ART)

Associate Professor: J. Cowan
Assistant Professor: B. Kelceoglu

The Architectural Technology (ART) curriculum is a two-year associate degree program designed to provide students with the skills to work in the areas of architectural drafting and detailing, simple structural design, planning, estimating, inspection, and sales. The curriculum is not intended to prepare students for registration as professional architects.

Emphasis is on basic engineering principles of mechanics, surveying, residential and commercial construction drawings, mechanical and electrical systems in buildings, and materials testing. Also included are courses in mathematics, physical sciences, social sciences, communications, computer programming fundamentals, and the humanities.

Graduates typically find employment with architectural firms, construction firms, building material suppliers, and various governmental agencies. Graduates are also eligible to pursue a Bachelor of Science in Construction Engineering Management Technology (construction option).

This program is not intended to prepare students for registration as licensed architects.

The career educational objectives for Architectural Technology are:

- Demonstrate excellent technical capabilities in architectural technology and related fields.
- Be responsible citizens.
- Continue professional advancement through life-long learning
- Apply sound design methodology in multidisciplinary fields of architectural technology that is sensitive to the health, safety and welfare of the public.
- Competently use mathematical, measurement, instrumentation, and testing techniques.
- Practice effective oral, written and visual communication skills.
- Understand the environmental, ethical, diversity, cultural and contemporary aspects of their work.
- Work effectively and collaboratively in architectural, engineering and construction industries.

Associate of Science in Architecture Technology

Freshman Year

1st Semester

- ART 11700 Construction Graphics and CAD, 3 credits.
- ART 16500 Building Systems and Materials, 3 credits.
- ART 10500 Intro to Design Technology, 2 credits.
- *Math 15900 Pre-Calculus, 5 credits.
- Eng W131 Eementary Composition I, 3 credits.
- MATH 15300 Algebra and Truigonometry, 3 credits.

2nd Semester (17 hrs required)

- ART 11700 Construction Graphics and CAD, 3 credits.
- ART 15500 Residential Construction , 3 credits.
- ART 21000 History of Architecture I , 3 credits.
- ART 28500 Electrical Sustems for Buildings , 2 credits.
- COMM R110 Fundamentals of Speech Communication, 3 credits.
- MATH 15400 Algebra and Trigonometry II , 3 credits.

Sophomore Year

Third Semester

- ART 22200 Commercial Construction , 3 credits.
- ART 28400 Mechanical Systems for Buildings, 3 credits.
- CEMT 10400 Fundamentals for Surveying, 3 credits.
- CEMT 16000 Statics, 3 credits.
- PHYS 21800 General Physics I, 4 credits.

Fourth Semester (18 Credits)

- CEMT 26000 Strength of Materials, 3 credits.
- CEMT 26700 Material Testing , 2 credits.
- CEMT 28000 Quantity Survey 3 credits.
- TCM 22000 Technical Report Writing, 3 credits.
- MATH 22100 Calculus for Technology I, 3 credits.
- PHYS 21900 General Physics II, 4 credits.

**Math 153 and 154 are acceptable substitute for Math 159*

Computer Graphics Technology Program (CGT)

Associate Professor: M. Bannatyne
Assistant Professor: D. Baldwin
Assistant Professor: P. Mehta

Consistent with the criteria set by the Accreditation Board for Engineering and Technology (ABET), the Program Educational Objectives of the CGT program within the Department of Design and Communication Technology (DCT) are "*To produce graduates who, during the first few years of professional practice, will...*":

- Show their ability to solve problems related to the workplace through their application of excellent technical capabilities in visual communication, computer systems, and related supporting field
- Be responsible citizens in the workplace through their demonstrated ethical and professional conduct and appreciation for diversity in its various forms
- Continue their professional advancement through life-long learning opportunities, in-service training, and engagement with professional organizations
- Practice effective oral and written communication skills

- Show their ability to address diverse environmental, ethical, legal, cultural diversity, and contemporary social aspects of their work
- Work collaboratively and effectively in diverse enterprises where they may be asked to act as a liaison between their company and the client
- Have the ability to function both as an individual, and within the dynamics of a group environment, in the workplace

Bachelor of Science in Computer Graphics Technology

Interactive Multimedia Developer Track

Freshman Year

1st Semester
(13 hours required)

Course	*Hrs*
*CGT 10100 - Introduction to CGT	3
*CGT 11100 - Design for Visualization & Comm.	3
*CGT 11200 - Sketching for Visualization & Comm.	3
ENG-W 131 - Elementary Composition I	3
TECH 10200 - Discovering Technology	1

2nd Semester
(17 hours required)

Course	*Hrs*
*CGT 11600 - Geometric Mod. for Visual. & Comm.	3
*CGT 11700 - Illustrating for Visual. & Comm.	3
COMM-R 110 - Fund. of Speech Communication	3
Human./Social Science Elective	3
**MATH 15900 - Pre-calculus	5

1st Semester (16 hours required)

Course	*Hrs*
*CGT/CIT 14100*** - Internet Fund. Develop. & Techn.	3
*CGT 21100 - Raster imaging for Computer Graphics	3
*CGT 21600 - Vector Imaging for Computer Graphics	3
*CGT 29900 - Seminar: Current Issues in CG	1
Science Elective	3
TCM 34000 - Correspondence in Business & Industry	3

2nd Semester
(14 hours required)

Course	*Hr*
*CGT 24100 - Introduction to Animation	3
*CGT 25100 - Principles of Creative Design	3
*CGT 29900 - Seminar: Portfolio Review	2
Free Elective	3
PSY-B 104 - Psychology as a Social Science	3

Junior Year

1st Semester
(15 hours required)

Course	*Hr*
*CGT 35100 - Multimedia Authoring I (or CGT 353)	3
*CGT 35600 - Dynamic Content Development I	3
CIT 21400 - Using a Database Management System	3
Human./Social Science or Liberal Arts Elective	3
TCM 37000 - Oral Practicum for Technical Managers	3

2nd Semester
(15 hours required)

Course	*Hr*
*CGT 34600 - Digital Video & Audio	3
*CGT-I 39800 - Career Enrichment Internship III	3
* CGT 45100 - Multimedia Application Development	3
* CGT 45600 - Dynamic Content Development II	3
CIT 21500 - WEB Programming	3

Senior Year

1st Semester
(16 hours required)

Course	*Hr*
Business/Economics/ Marketing Selective	3
*CGT 41100 - Contemporary Problems in A.C.G.	3
*CGT-I 49800 - Career Enrichment Internship V	3
*CGT 49900 - Senior Seminar	1
Technical Elective	3
Technical Elective	3

2nd Semester (16 hours required)

Course	*Hr*
*CGT 41500 - Seminar for Senior Design Project	1
*CGT 41600 - Senior Design Project	3
Free Elective	3
Human./Social Science or Liberal Arts Elective	3
OLS 27400 - Applied Leadership	3
Technical Elective	3
Total Hours for Baccalaureate Degree	122

Technical Animation and Spatial Graphics Track

Freshman Year

1st Semester
(13 hours required)

Course	*Hrs*
*CGT 10100 - Introduction to CGT	3
*CGT 11100 - Design for Visualization & Comm.	3
*CGT 11200 - Sketching for Visualization & Comm.	3
ENG-W 131 - Elementary Composition I	3
TECH 10200 - Discovering Technology	1

2nd Semester
(17 hours required)

Course	*Hrs*
*CGT 11600 - Geometric Mod. for Visual. & Comm.	3
*CGT 11700 - Illustrating for Visual. & Comm.	3
COMM-R 110 - Fund. of Speech Communication	3
Human./Social Science Elective	3
**MATH 15900 - Pre-calculus	5

Sophomore Year

1st Semester (16 hours required)

Course	*Hrs*
*CGT/CIT 14100*** - Internet Fund. Develop. & Techn.	3
*CGT 21100 - Raster imaging for Computer Graphics	3

*CGT 21600 - Vector Imaging for Computer Graphics	3
*CGT 29900 - Seminar: Current Issues in CG	1
Science Elective	3
TCM 34000 - Correspondence in Business & Industry	3

2nd Semester (14 hours required)

Course	*Hrs*
*CGT 24100 - Introduction to Animation	3
*CGT 25100 - Principles of Creative Design	3
*CGT 29900 - Seminar: Portfolio Review	2
Free Elective	3
PSY-B 10400 - Psychology as a Social Science	3

Junior Year

1st Semester (15 hours required)

Course	*Hr*
*CGT 34100 - Motion for Computer Animation	3
*CGT 35100 (MM Auth. I) or CGT 356 (Hyper. Auth. I)	3
*CGT 39000 - Seminar: Storyboarding & Preproduction	3
Human./Social Science Elective	3
TCM 37000 - Oral Practicum for Technical Managers	3

2nd Semester (15 hours required)

Course	*Hr*
*CGT 34000 - Digital Light. & Render. For Com. Anim.	3
*CGT 34600 - Digital Video & Audio	3
*CGT-I 39800 - Career Enrichment Internship III	3
*CGT 44200 - Production for Computer Animation	3
Free Elective	3

1st Semester (16 hours required)

Course	*Hr*
Business/Economics/ Marketing Selective	3
*CGT 41100 - Contemporary Problems in A.C.G.	3
*CGT 44400 - Visual Effects in Film and Animation	3
*CGT-I 49800 - Internship V	3
*CGT 49900 - Senior Seminar	1
Technical Elective	3

2nd Semester (16 hours required)

Course	*Hr*
*CGT 41500 - Seminar for Senior Design Project	1
*CGT 41600 - Senior Design Project	3
*CGT 44600 - Digital Postproduction	3
Human./Social Science or Liberal Arts Elective	3
OLS 27400 - Applied Leadership	3
Technical Elective	3
Total Hours for Baccalaureate Degree	122

**CGT CORE courses require a grade of C- or higher to pass*

***Math 118 & 119 or Math 153 & 154 may be used in place of Math 159*

****CIT 212 or CSCI-N 241 may be substituted for this course*

Interior Design Technology Program (INTR)

Assistant Clinical Professor E. McLaughlin (*Program Director)* Assistant Clinical Professor D. Nickolson
Assistant Professor B. Kelceoglu
Lecturer MA Frank

Associate of Science in Interior Design Technology

The Interior Design curriculum is a two year Associate of Science (A.S.) degree program that uses the latest technology while employing faculty from the areas of interior design, architecture, fine arts, and computer graphics to provide students with the skills necessary to work as interior design assistants and be able to sit for the National Council for Interior Design Qualification (NCIDQ) exam after approximately four years of work experience.

The emphasis is on technical knowledge, methodology, and aesthetic appreciation of interior design for the health, safety, and welfare of the public; equipping students with visual presentation and communication skills; imparting awareness for environmental, business, ethical, and other contemporary issues; and linking classroom knowledge to applications in the field. These graduates can address complex design problems and manage projects.

The educational objectives for the A.S. Interior Design are:

1. Demonstrate technical knowledge and application of the design process.
2. Solve problems that are quantitative in nature.
3. Analyze complex issues and apply sound design methodology in multidisciplinary fields of interior design technology.
4. Practice effective communication skills in, oral, written and visual presentations.
5. Increase knowledge and demonstrate solutions sensitive to health, safety and welfare of the public.
6. Work collaboratively and effectively in technology and design related industries.
7. Continue professional advancement through life-long learning.
8. Understand the environmental, ethical, diversity, cultural and contemporary aspects of their work.
9. Be responsible citizens.

Graduates typically find employment in residential design fields as designers, in retail or manufacturing settings as sales associates, in design and construction industries as manufacturer's reps for products, as CAD technicians for the interior design or architecture fields, or as self-employed designers.

Freshman Year

First Semester (15 credits)

- ART 12000 Architectural Presentation, 3 credits.
- COMM R110 Fundamentals of Speech Communication, 3 credits.
- ENG W131 Elementary Composition I, 3 credits.
- HER E109 Color and Design, 3 credits.
- INTR 10300 Introduction to Interior Design, 3 credits.
-

Second Semester (18 credits)

- ART 11700 Introduction to Construction Drafting with CAD, 3 credits.
- ART 16500 Building Systems and Materials, 3 credits.
- CGT 21100 Raster Imaging for Computer Graphics, 3 credits.
- HER E209 Drawing for Interior Design, 3 credits.
- INTR 15100 Textiles for Interiors, 3 credits.
- MATH 15300 Algebra & Trig I, 3 credits.

Sophomore Year

Third Semester (18 credits)

- ART 15500 Residential Construction, 3 credits.
- CGT 22100 Graphical Representation in Architectural Documents, 3 credits.
- INTR 12400 Space Planning for Interiors, 3 credits.
- INTR 12500 Color and Lighting, 3 credits.
- INTR 20200 Interior Materials and Applications, 3 credits.
- INTR 20400 History of Interiors and Furniture, 3 credits.

Fourth Semester (15 credits)

- ART 21000 History of Architecture, 3 credits.
- ART 22200 Commercial Construction, 3 credits.
- INTR 22400 Residential I, Kitchen and Bath, 3 credits.
- INTR 22500 3D Interior Design Studio, 3 credits.
- INTR 22600 Commercial Systems I, 3 credits.

Bachelor of Science in Interior Design Technology

This program is accredited by the Council of Interior Design Accreditation (CIDA) as well as the National Association of Schools of Art and Design (NASAD).

The Interior Design curriculum is a four-year Bachelor of Science (B.S.) degree program that employs faculty from the areas of interior design, architecture, fine arts, computer graphics, construction and organizational leadership to provide students with the skills necessary to work as professional interior designers and be able to sit for the National Council for Interior Design Qualification (NCIDQ) exam after approximately two years of work experience.

The emphasis is on technical knowledge, methodology, and aesthetic appreciation of interior design for the health, safety, and welfare of the public; equipping students with visual presentation and communication skills; imparting an awareness for environmental, business, ethical, and other contemporary issues; and linking classroom knowledge to application in the field. These graduates can address complex design problems and manage projects.

The educational objectives for the B.S. Interior Design are:

1. Demonstrate technical knowledge and application of the design process.
2. Solve problems that are quantitative in nature.

3. Analyze complex issues and apply sound design methodology in multidisciplinary fields of interior design technology.
4. Practice effective communication skills in, oral, written and visual presentations.
5. Increase knowledge and demonstrate solutions sensitive to health, safety and welfare of the public.
6. Work collaboratively and effectively in technology and design related industries.
7. Continue professional advancement through life-long learning.
8. Understand the environmental, ethical, diversity, cultural and contemporary aspects of their work.
9. Be responsible citizens.

Graduates typically find employment in residential or commercial design fields as designers, in retail or manufacturing settings as sales associates, in design and construction industries as manufacturer's reps for products, as CAD technicians for the interior design or architecture fields, or as self-employed designers.

Freshman Year

First Semester (15 credits)

- ART 12000 Architectural Presentation, 3 credits.
- COMM R110 Fundamentals of Speech Communication, 3 credits.
- ENG W131 Elementary Composition I, 3 credits.
- HER E109 Color and Design, 3 credits.
- INTR 10300 Introduction to Interior Design, 3 credits.

Second Semester (18 credits)

- ART 11700 Introduction to Construction Drafting with CAD, 3 credits.
- ART 16500 Building Systems and Materials, 3 credits.
- CGT 21100 Raster Imaging for Computer Graphics, 3 credits.
- HER E209 Drawing for Interior Design, 3 credits.
- INTR 15100 Textiles for Interiors, 3 credits.
- MATH 15300 Algebra & Trig I, 3 credits.

Sophomore Year

Third Semester (18 credits)

- ART 15500 Residential Construction, 3 credits.
- CGT 22100 Graphical Representation in Architectural Documents, 3 credits.
- INTR 12400 Space Planning for Interiors, 3 credits.
- INTR 12500 Color and Lighting, 3 credits.
- INTR 20200 Interior Materials and Applications, 3 credits.
- INTR 20400 History of Interiors and Furniture, 3 credits.

Fourth Semester (15 credits)

- ART 21000 History of Architecture, 3 credits.
- ART 22200 Commercial Construction, 3 credits.
- INTR 22400 Residential I, Kitchen and Bath, 3 credits.
- INTR 22500 3D Interior Design Studio, 3 credits.
- INTR 22600 Commercial Systems I, 3 credits.

Junior Year

Fifth Semester (18 credits)

- Art History Selective, 3 credits.
- Humanities or Social Science Elective, 3 credits.
- INTR 30400 History of American Interiors and Furniture, 3 credits.
- INTR 32400 Residential Interior Design Studio II, 3 credits.
- INTR 32500 Environmental Lighting Design, 3 credits.
- OLS 25200 Human Behavior in Organizations, 3 credits.

Sixth Semester (15 credits)

- CEMT 28000 Quantity Survey, 3 credits.
- CGT 32100 Advanced Digital Pictorial Illustration, 3 credits.
- INTR 32600 Commercial Interior Design Studio II, 3 credits.
- INTR 39000 Internship, 3 credits.
- TECH Selective, 3 credits.

Senior Year

Seventh Semester (15 credits)

- CEMT 34700 Construction Contract Admin. and Specifications, 3 credits.
- Humanities or Social Science Elective, 3 credits.
- INTR 42600 Healthcare Design Studio, 3 credits.
- INTR 45200 Building Systems, 3 credits.
- INTR 45300 Business Practices, 3 credits.

Eighth Semester (12 credits)

- INTR 42800 Capstone, 3 credits.
- INTR 48000 Senior Thesis, 3 credits.
- INTR 49500 Sustainable Design, 3 credits.
- OLS 37100 Project Management, 3 credits.

Technical Communication Program (TCM)

Associate Professor M. Hovde
Associate Professor W. Worley *(Director)* Lecturer *G. Harley*

The Technical Communication Program offers specialized courses for students in engineering and technology programs that help them prepare for the writing and speaking tasks they will perform as part of their professional work. These courses build on students' previous experiences in written and oral communication and help them learn to present technical information effectively to audiences in organizational settings. In addition, the program works with other schools and local industry to prepare students for careers as technical communicators.

Certificate in Technical Communication

The Technical Communication Certificate is offered by the Purdue School of Engineering and Technology in cooperation with the Department of English, the Department of Communication Studies, and the Hoosier Chapter of the Society for Technical Communication. Any student formally admitted to the university may be a candidate for the certificate. Students who earn the certificate will have demonstrated they have the core competencies necessary for entry-level positions as technical communicators: the ability to gather and transform technical information for a variety of audiences and the ability to design, develop, and edit effective documents using rhetorical principles and current technology.

Technical Specialty

A technical or scientific major or minor or technical interest demonstrated by 10 credit hours of courses, including CIT 106 or 112 or an equivalent introductory computer course.

Required Courses: 10 credits

- TCM 22000 Technical Report Writing or 32000 Written Communication in Science and Industry , 3 credits.
- TCM 35000 Visual Elements of Technical Documents, 3 credits.
- ENG W365 Theories and Practices of Editing, 3 credits.
- TCM 43500 Portfolio Presentation, 1 credits.

Selected Courses: 9 credits

- TCM 34000 Correspondence in Business and Industry, 3 credits.
- TCM 37000, COMM C401, or COMM C402, a course in oral presentation of technical material, 3 credits.
- TCM 38000 Technical Communication in the Healthcare Professions, 3 credits.
- TCM 39500 Independent Study in Technical Communication-selected topics, 1-3 arranged credits.
- TCM 42000 Field Experience in Technical Communication, 1-3 arranged credits.
- TCM 42500 Managing Document Quality3 credits.
- TCM 45000 Research Approaches for Technical and Professional Communication, 3 credits.
- TCM 49900 Selected Topics in Technical Communication, 1-3 arranged credits.
- ENG G205 Introduction to the English Language, 3 credits.
- ENG W315 Composing Computer-Delivered Text, 3 credits.
- COMM R320 Advanced Public Communication or COMM R321 Persuasion, 3 credits.
- COMM C228 Discussion and Group Methods or COMM C380 Organizational Communication, 3 credits.
- OLS 27400 Applied Leadership, OLS 375 Training Methods, or OLS 47400 Conference Leadership Training, 3 credits.
- JOUR J463/J563 Desktop Publishing or JOUR J390 Corporate Publications, 3 credits.
- IET 364 Total Quality Control, 3 credits.

Other courses may be approved by the TCM director based on a student's particular interests and career objectives.

Portfolio

To earn a Certificate in Technical Communication, a student must submit a portfolio containing several samples of written work, each accompanied by a description of the document's purpose and intended audience, for review by representatives from local industry. The portfolio must be completed within one year of completion of the final certificate course.

Music and Arts Technology (MAT)

Chair: Fred J. Rees, Professor of Music & Arts Technology

The Department of Music and Arts Technology reflects urban culture, contemporary and digital arts. Special courses on American popular music, contemporary music performance styles, music technology and music therapy are delivered by innovative instructional technology. department's technology facilities have captured national attention.

The Department of Music and Arts Technology is committed to delivering quality music instruction to the undergraduate and graduate students at the nation's premiere urban institution. Most undergraduate courses carry no prerequisites and are open to all students. Performance ensembles are open to students, staff, faculty, and community members.

Ensemble groups include the IUPUI Jazz Ensemble, IUPUI Jazz Combos, Pep Band, University Choir, IUPUI Percussion Ensemble, Guitar Ensemble, Steel DrumEnsemble, Afro-Cuban Percussion Ensemble, Chamber Ensemble, Telematic Performing Ensemble, and Laptop Orchestra.

This department awards degrees from Indiana University.

For more information, call or write: Department of Music and Arts Technology, IUPUI, 535 W. Michigan Street, Indianapolis, IN 46202, (317) 274-4000.

Web: music.iupui.edu

Undergraduate Programs

Music Minor

The Department of Music and Arts Technology welcomes students whose majors are outside the department, but who wish to minor in music. There is no audition required to minor in music, but students must declare music as their minor at the appropriate time in their undergraduate studies.

Music minors should participate in music ensembles within the Department of Music and Arts Technology and should register (or audition when required) for these ensembles during undergraduate orientation or the first week of class. The IUPUI Flute Choir, Jazz Ensemble, Pep Band, University Choir, Guitar Ensemble, and Urban Drum Experience are open to all students.

Music Minor in Musical Theatre

The Music Minor in Musical Theatre program (M.M.M.T.) is designed for students seeking to immerse themselves in the art of musical theatre.

This program provides opportunity in the creative process as well as becoming more in tune with the human experience.

Emphasis will be placed on performance which includes singing, acting (character development) and staging.

This course of study includes an annual performance open to family and friends.

Bachelor of Science in Music Technology

The Bachelor of Science in Music Technology degree is designed to provide professional training for students seeking careers that employ music technology. The program builds skills and knowledge common to the music industry and professional fields. The program is broad in scope and enables students to function effectively in the changing, contemporary musical world. It fosters leadership skills in the areas of creativity, entrepreneurship, self-reliance, and resourcefulness. The BSMT graduate will be able to adapt knowledge gained from this program to related disciplines beyond traditional music specializations. It will serve as a platform for students seeking the IUPUI Master of Science in Music Technology degree and will prepare graduates for advanced musical and technical study.

Overview

One hundred and thirty (130) hours of course work are required for this IU Degree. Students are engaged in making music with technology, performing, composing and producing digital music formatted materials. Students study musicianship during the first two years of the degree program, which combines music theory, history, keyboard and aural training. They participate in music ensembles and applied music lessons each semester of this four-year course of study.

Students also develop an outside concentration related to the degree. Examples might be in Business, Computer Technology, Informatics, Communication Studies, Mathematics, or Languages.

Admission Requirements

- High School Diploma
- SAT Scores
- Admittance into IUPUI: Bachelor's degree admission requirements
- TOEFL: a provisional minimum of 61+ (internet-based version/iBT), 173+ (computer-based version/ CBT), or 500+ (paper-based version/PBT) http://www.toefl.org. You must request that official score reports be sent to IUPUI. Use school code 1325.
- Completed BSMT Application send to Department of Music and Arts Technology
- Audition
- Interview
- Basic Musical Skills Test
- Additional information may be requested to document musical skills or experience with technology.

Music Therapy Equivalency Program

The music therapy equivalency program is designed to assist students who already have an undergraduate degree in music in obtaining the needed competencies to become board-certified music therapists.

Admission Requirements

- Bachelor's degree in music from NASM-approved school
- Minimum grade point average of 3.0 (4.0 scale)
- Submission of a university and a department application
- Official transcripts of all college course work
- Evidence of musicianship through performance videotape, audio cassette, CD/DVD, or live audition
- Three letters of recommendation required tosupport the admission application
- In-person or telephone admission interview withthe music therapy faculty
- Non-native speakers must demonstrate English language proficiency with a minimum TOEFL score of 600/97. International students will also need to meet the application requirements of the IUPUI Office of International Affairs.

Admission Categories

Upon receipt of the completed application, letters of recommendation, transcript, evidence of musicianship, and the interview, the Graduate Admissions Committee of the IU Department of Music and Arts Technology at IUPUI may grant regular admission, grant admission on probation, or reject the application.

Admission on Probation

Students who do not have an undergraduate average of 3.0 or higher may be admitted on probation in exceptional cases. The probationary status continues until 9 credit hours of course work have been successfully completed. Students who are admitted on probation and incur academic probation during their first semester of study are subject to dismissal.

Program Requirements

Program requirements vary depending on the student's background and educational needs. The American Music Therapy Association and the Certification Board for Music Therapists have identified minimum competencies needed to become board certified as a music therapist. The faculty and student will determine which competencies have not been addressed during previous course work, this needs and strength analysis will determine the courses needed to meet the standards.

Minimum Grade Point Average

- 3.0 average to continue
- No grades lower than C in music therapy core courses are counted toward equivalency

Music Therapy Equivalency Curriculum

There are 22 credit hours of music therapy core courses and 7 credit hours of practicum courses (including internship) required for the equivalency program. In addition, courses in clinical (psychology and anatomy) and musical foundations may be required, depending on the student's previous educational background.

Graduate Programs

On-Campus Program: Master of Science in Music Technology

The Master of Science in Music Technology provides graduate students an academic background in digital music production, instructional design, and multimedia development. Current graduates of this master's program have found employment in a wide range of business and educational settings. Participants develop skills in designing software, using authoring tools and languages, applying multimedia concepts, and managing technology facilities and projects. This degree is offered as an on-campus or online program.

Admission Requirements

- Bachelor's degree (with demonstrated musicalskills)
- Minimum grade point average of 3.0 (4.0 scale)
- Submission of a university and a department application
- Official transcripts of all undergraduate and graduate study
- Evidence of musicianship through performance videotape, audio cassette, CD/DVD, or live audition
- Three letters of recommendation required tosupport the admission application
- In-person or telephone admission interview withthe Head of Graduate Studies
- Non-native speakers must demonstrate English language proficiency with a minimum TOEFL score of 550/79 International students will also need to meet the application requirements of theIUPUI Office of International Affairs

Admission Categories

Upon receipt of the completed application, letters of recommendation, transcript, evidence of musicianship, and the interview, the Graduate Admissions Committee of the IU Department of Music and Arts Technology at IUPUI may grant regular admission, grant admission on probation, or reject the application.

Admission on Probation

Students who do not have an undergraduate and graduate grade point average of 3.0 or higher may be admitted on probation in exceptional cases. The probationary status continues until 9 credit hours of course work have been successfully completed. At this time student admission requests are re-evaluated. Students who are admitted on probation and incur academic probation during their first semester of study are subject to dismissal.

Degree Requirements

- 30 credit hours (18 credit hours at the 500 level or above)
- 6 credit hours in cognate courses (at the 400 level or above) to be selected from music, business, communications, computer science, education, fine arts, or law
- 6 credit hours of approved courses (at the 400 level or above) from the cognate field or other fields with the approval of the Head of Graduate Studies

Minimum Grade Point Average

- 3.0 average to continue
- No grades lower than B in core courses arecounted toward the degree
- No grades lower than C are counted toward thedegree

Residency Requirement (for on-campus students only)

- Three consecutive summers, two contiguous academic terms

Core Courses

The following courses, totaling 18 credit hours, are required of all students enrolled in the Master of Science in Music Technology program:

Class/Credit Hours

- N512 Foundations of Music Production - 3 cr.
- N513 Principles of Multimedia Technology - 3 cr.
- N514 Music Technology Methods - 3 cr.
- N515 Multimedia Design Applications in the Arts - 3 cr.
- N516 Advanced Interactive Design Applications in the Arts - 3 cr.
- N517 Internship in Arts Technology - 3 cr.
- N518 Arts Technology Major Project - 3 cr.

Total Credit Hours - 18

Cognate Field Courses

Six (6) credit hours are required in an approved cognate field within or outside the Department of Music and Arts Technology. Students may choose to complete the remaining 6 credit hours with emphasis in one of the following areas: music, business, communications, computer science, education, fine arts, law, or others with the approval of the department. The cognate field may become a minor if at least 12 credit hours are taken in one field.

Internship or Technology Project

Students may elect to enroll in an internship (N517) or develop a multimedia project (N518) as the summative experience in the program. Either option is supervised by the student's academic advisor and requires a full report. (These courses are part of the core courses listed previously.) Students participating in the internship are placed in an academic technology setting or an industry setting for one semester of experience working with technology and multimedia experts. No thesis is required for the degree.

Online Program: Master of Science in Music Technology

The IUPUI Department of Music and Arts Technology offers the entire M.S.M.T. Program "live," using streaming video, videoconferencing and audio through the Internet. All course and degree requirements are the same as the on-campus program.

*Admission Requirements**

- Bachelor's degree (with demonstrated musicalskills)
- Minimum grade point average of 3.0 (4.0 scale)
- Submission of a university and a department application
- Official transcripts of all undergraduate and graduate study
- Evidence of musicianship through performance videotape, audio cassette, or CD/DVD
- Three letters of recommendation are required tosupport the admission application
- In-person or telephone admission interview withthe Head of Graduate Studies
- Non-native speakers must demonstrate English language proficiency with a minimum TOEFL score of 550/79 International students will also need to meet the application requirements of theIUPUI Office of International Affairs

Admission Categories

Upon receipt of the completed application, letters of recommendation, transcript, evidence of musicianship, and the interview, the Graduate Admissions Committee of the IU Department of Music and Arts Technology at IUPUI may grant regular admission, grant admission on probation, or reject the application.

Admission on Probation

Students who do not have an undergraduate and graduate grade point average of 3.0 or higher may be admitted on probation in exceptional cases. The probationary status continues until 9 credit hours of course work have been successfully completed. At this time student admission requests are re-evaluated. Students who are admitted on probation and incur academic problems during their semesters of study are subject to dismissal.

Degree Requirements

- 30 credit hours (18 hours at the 500 level orabove)
- 6 credit hours in cognate courses (at the 400 level or above) to be selected from music, business, communications, computer science, education, fine arts, or law
- 6 credit hours of approved courses (at the 400 level or above) from the cognate field or other fields with the approval of the Head of Graduate Studies

Minimum Grade Point Average

- 3.0 average to continue
- No grades lower than B in core courses arecounted toward the degree
- No grades lower than C are counted toward thedegree

Virtual Residency Requirement

Course enrollment during three consecutive summers, or one summer and a contiguous academic term**.**

Core Courses

The following courses, 18 credit hours, are required of all students enrolled in the M.S.M.T. program:

Class/Credit Hours

- N512 Foundations of Music Production - 3 cr.
- N513 Principles of Multimedia Technology - 3 cr.
- N514 Music Technology Methods - 3 cr.
- N515 Multimedia Design Applications in the Arts - 3 cr.
- N516 Advanced Interactive Design Applications in the Arts - 3 cr.
- N518 Arts Technology Major Project - 3 cr.

Total Credit Hours - 18

Cognate Field Courses

Six (6) credit hours are required in an approved cognate field within or outside the Department of Music and Arts Technology. Students may choose to complete the remaining 6 credit hours with emphasis in one of the following areas: music, business, communications, computer science, education, fine arts, law, or others with the approval of the department. The cognate field may become a minor if at least 12 credit hours are taken in one field.

Technology Project

Students develop a multimedia project (N518) as the summative experience in the program. This project is supervised by the student's academic advisor and requires a full report. (This course is part of the core courses listed previously.) No thesis is required for the degree.

Master of Science in Music Therapy

The Master of Science in Music Therapy program is designed to provide professional music therapists with advanced research skills and clinical practice in music therapy, and to teach music therapists how to utilize the array of tools available in music technology for such purposes. This degree is offered on campus and online.

Admission Requirements

- Bachelor's degree in music therapy or its equivalent
- Board certified by the Certification Board for Music Therapists
- Minimum grade point average of 3.0 (4.0 scale)
- Submission of a university and adepartment application
- Official transcripts of all undergraduate and graduate study
- Three letters of recommendation
- In-person or telephone admission interview withmusic therapy faculty
- Videotaped music therapy session (with accompanying documentation, the function oftherecording is equivalent to a music audition;it will not be an actual session)
- Non-native speakers must demonstrate English language proficiency with a minimum TOEFL score of 600/97. International students will also need to

meet the application requirements of theIUPUI Office of International Affairs.

Admission Categories

Upon receipt of the completed application, letters of recommendation, transcript, evidence of musicianship, and the interview, the Graduate Admissions Committee of the IU Department of Music and Arts Technology at IUPUI may grant regular admission, grant admission on probation, or reject the application.

Admission on Probation

Students who do not have an undergraduate and graduate grade point average of 3.0 or higher may be admitted on probation in exceptional cases. The probationary status continues until 9 credit hours of course work have been successfully completed. At this time student admission requests are re-evaluated. Students who are admitted on probation and incur academic probation during their first semester of study are subject to dismissal.

Degree Requirements

- A total of thirty (30) credit hours are required for completion of the degree, including:
- 12 credit hours in music therapy (at the 500 level or above);
- 9 credit hours in core music technology courses (at the 500 level or above);
- 6 credit hours of cognates (at the 500 level or above);
- 3 credit hours of thesis

Minimum Grade Point Average

- Minimum 3.0 average to continue
- No grades lower than B in core courses arecounted toward the degree
- No grades lower than C are counted toward thedegree

Core Courses

The following courses are required of all students enrolled in the Master of Science in Music Therapy program:

Class/Credit Hours

- N512 Foundations of Music Production - 3 cr.
- N513 Principles of Multimedia Technology - 3 cr.
- N514 Music Technology Methods - 3 cr.
- N521 Research Methods in Arts and Music Technology - 3 cr.
- N530 Philosophy and Theory in Music Therapy - 3 cr.
- N531 Music Therapy Quantitative and Qualitative Research - 3 cr.
- N532 Music in Medicine - 3 cr.
- N533 Advanced Clinical Techniques in Music Therapy - 3 cr.
- N600 Music Therapy Thesis

Music Therapy Thesis

The thesis is the final academic requirement for the degree. The thesis proposal must be approved by a faculty committee before enrollment in the thesis will be permitted.

IUPUI Music Academy

The IUPUI Music Academy is a non-profit community music school committed to providing high quality, professional music instruction to area residents of all ages and levels of ability. The academy serves over 500 people each year, ages 18 months through adulthood, by offering music classes for children and adults, ensembles, and private lessons. The academy is a member of the National Guild of Community Schools of the Arts.

Music at the Center for Young Children

Children attending the IUPUI Center for Young Children (CYC) can participate in preschool music classes during the weekday. Classes are held at the CYC after lunch, so students do not miss any instruction time from the CYC program

For more information, contact:

E.J. Choe, Director
IUPUI Music Academy
535 W. Michigan Street, Room 378
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International Music Technology Conference and Workshop

The Annual International Music Technology Conference and Workshop is hosted in Indianapolis during the latter part of June. Participants may register for graduate credit. During the International Computer Music Technology Conference, they will be able to see and experiment with the latest technology. There is a technology facility and three labs to which they may have access.

- The IUPUI Computer Music Technology Facility includes two fully-networked computer music technology laboratories with video-streaming equipment for Internet-based participants. Eachworkstation is equipped with a multimedia computer and an Axiom 61keyboard. The Digital Keyboard Lab is equipped with 16Roland keyboards, a Roland controller audio system, Dell XPS-one computers, and a Teacher Station.
- The Graduate Multimedia Lab has full production capabilities, including a digital flatbedscanner, video and photographic digital cameras, sound- and video-editing software, multimedia authoring tools and CD/DVD-ROM burner hardware and software. Both PC and Macintosh computers are available.
- The Digital Sound Design Lab provides capabilities for all aspects of digital audio and MIDI-based production for sound tracks, multimedia design, sound sampling, sound design, and collaborative composition over the Internet.

Participants have the opportunity to work with both Macintosh and Windows applications. Topics include the following:

- Multimedia applications
- CD/DVD technology

- Music notation, sequencing and sampling
- Internet resources and Web design
- Computer-based music instruction
- Music workstation design and construction
- Grant writing and fundraising for technology support
- Computer-based music curriculum design
- Special topics (e.g., podcasting, wikis, distance learning, new music software products)

New Student Academic Advising Center (NSAAC)

Director N. Lamm
Assistant Director D. King

The New Student Academic Advising Center for the School of Engineering and Technology was formed in 2007. The center is the advising unit for all students new to the School of Engineering and Technology, including beginners, transfers, second degree, and returning students. The center provides services that include orientation programs, transfer credit analysis, and academic advising through the first year of the student's enrollment. In addition to providing academic advising, the center coordinates the curriculum and teaching for the freshman engineering courses and also the learning community courses required for all beginning students.

Freshman Engineering Program

Director of Freshman Engineering N. Lamm
Senior Lecturer P. Orono
Lecturer P. Gee
Freshman Engineering Academic Specialist J. Meyer

All qualified students interested in pursuing an engineering degree at IUPUI are admitted to the Freshman Engineering Program. This includes second-degree and transfer students as well as beginning students. While in this program, beginning students complete the basic sequence of courses common to all engineering majors. These courses include calculus I and II, chemistry and physics for science and engineering majors, English composition, and public speaking. Freshman engineering courses include: ENGR 19500 Introduction to the Engineering Profession, ENGR 19600 Introduction to Engineering, ENGR 19700 Introduction to Programming Concepts, and ENGR 29700 Computer Tools for Engineering. The Freshman Engineering Program provides students with an opportunity to explore the various engineering disciplines before making a commitment to a specific curriculum.

Student Organizations & Services

Engineering and technology students have the opportunity to participate in the activities of the following student societies or chapters:

- American Institute of Aeronautics and Astronautics
- American Society of Mechanical Engineers
- Association of Computer Machinery (ACM)
- Engineering and Technology Student Council
- Engineers Without Borders
- Eta Kappa Nu
- Graduate Student Organization
- Institute of Electrical and Electronics Engineers
- National Society of Black Engineers
- National Society of Professional Engineers
- Pi Tau Sigma Honor Society
- Society of Hispanic Professional Engineers
- Society of Women Engineers
- Tau Alpha Pi Honor Society

Minority Engineering Advancement Program (MEAP)

The Minority Engineering Advancement Program (MEAP) was established in 1974 to encourage minority students to pursue studies in engineering and engineering technology. Through the annual MEAP summer workshops, the school identifies and recruits talented secondary school students and provides them with information about engineering careers and college requirements. Since 1976, more than 100 students have participated each summer in the program.

MEAP also provides counseling and tutor referral service to minority undergraduates enrolled in the School of Engineering and Technology. In addition, scholarships and grants are available to American Indian, African American, and Hispanic students, people from groups that have been historically underrepresented in engineering. For more information, students should contact the Office for Academic Programs, School of Engineering and Technology, 799 W. Michigan Street, IUPUI, Indianapolis, IN 46202-5160; www.engr.iupui.edu/meap; phone (317) 274-2943.

Opportunities to Study Abroad

The School of Engineering and Technology offers credit and noncredit internship opportunities abroad. Internships are full-time positions, and work assignments last from the middle of May until the middle of July. These internships allow students to gain technical experience in international companies, knowledge of a foreign culture, improved foreign language skills, and other benefits of an intercultural experience. Juniors or seniors with grade point averages of 3.0 or higher and specific language skills are eligible to apply. Participants receive a stipend to cover a major part of their expenses. Living accommodations are arranged, usually with a host family. Free time for travel, study, and recreation is available at the end of the program. For more information, contact the Office for Academic Programs, School of Engineering and Technology, 799 W. Michigan Street, Indianapolis, IN 46202-5160; phone (317) 274-2533.

Policies & Procedures

Undergraduate Policies

Academic Probation and Academic Dismissal

Students will be notified by IUPUI email from the Associate Dean for Academic Affairs & Undergraduate Programs, School of Engineering and Technology, when they are placed on academic probation. The email will inform the student of the conditions that must be met for removal from academic probation. Students who are dismissed for academic reasons will be notified by letter from the Office of Academic Programs.

The following standards are currently applicable for students enrolled in the School of Engineering and Technology.

Academic Probation

Graduate degree-seeking students are placed on academic warning and probation when either the cumulative index or the semester index is below 3.00 (B). Graduate students must maintain a semester and cumulative grade point average of at least 3.00 each semester to be in good standing. Academic probation will be removed when students achieve a semester and cumulative grade point average of 3.00. The minimum grade acceptable for a graduate-level course is C (2.00).

Full-time and part-time undergraduate students are automatically on academic probation when either the cumulative semester index or the semester index is below 2.0 (C). All students on probation are automatically placed on academic checklist. Students on an academic hold must meet with their academic advisor before registering for classes.

Students who, in subsequent enrollments, do not improve significantly may receive a letter stating that they will be subject to dismissal if an index of 2.0 (C) or higher is not earned in the current enrollment period. Such students may register only after their grades have been posted.

Removal from Probation

Students are removed from academic probation when they complete 12 credit hours of consecutive enrollment with a minimum grade point average of 2.0, provided their overall grade point average is also at or above 2.0.

Academic Dismissal

Students may be dismissed when they fail to attain a 2.0 semester grade point average in any two consecutive semesters or when their cumulative semester index has remained below 2.0 (C) for any two consecutive semesters.

Readmission

A student who has been dismissed due to scholastic deficiency may petition the Faculty Committee on Readmission for readmission. If readmitted, the student will be placed on probation. Students may contact the Recorder in the Office of Academic Programs at (317) 278-7091 or kssloan@iupui.edu for a Petition for Readmission.

Acceptance of Grade Replacement & Repeating Courses

Repeated Courses (Grade Replacement Policy)

Students enrolled in the School of Engineering and Technology are permitted to apply only the provisions of the IUPUI Grade Replacement Policy that pertain to repeating a course in order to achieve a higher grade. This replacement will affect a student's academic record only at the Purdue School of Engineering and Technology at IUPUI. If the student subsequently transfers to another academic unit at IUPUI or another campus, different interpretations of the grade replacement policy may be in place.

An undergraduate student who retakes any course may elect to have only the final grade counted in computation of the cumulative semester index, in accordance with the limitations listed below. After retaking the course, the enrollment and original grade will be removed from calculations used to determine the student's cumulative GPA. The student's transcript, however, will continue to show the original enrollment in the course and all grades earned for each subsequent enrollment.

This policy is subject to the following limitations:

- Students may exercise the grade replacement option for no more than 15 credit hours, including any courses in which the former FX option was used for their 1st undergraduate degree.
- A grade may be replaced only by another grade for the same class.
- A student may exercise the Grade Replacement Policy a maximum of two times for a single course.
- The request to remove a grade from the cumulative GPA calculation by this method is irreversible.
- The second enrollment for any course covered by this policy must have occurred during fall semester 1996 or later.

Students who plan to use the grade replacement option must complete and submit the grade replacement form to the Recorder in the Office of Academic Programs for processing after retaking the course.

Academic Regulations

Grades and Grade Reports

Students are responsible for completing all required work in each of their courses by the last scheduled class meeting, unless course assignments have been properly cancelled. Students receive a grade in each course in which they are enrolled at the close of the session. Grades indicate what a student has achieved with respect to the objectives of the course, and instructors are required, by action of the Faculty Senate, to record the grade a student has earned in a course. Grades that have been officially recorded will be changed only in cases of instructor error or subsequent finding of student academic dishonesty.

Basis of Grades

The School of Engineering and Technology uses a grading system that may include plus and minus grades as well as straight letter grades for all undergraduate and graduate courses. These grades and their grade point values are indicated below.

For credit courses:

A or A+	4.0
A–	3.7
B+	3.3
B	3.0
B–	2.7
C+	2.3
C	2.0
C–	1.7
D+	1.3
D	1.0
D–	0.7
F	0.0 (no credit)

For credit courses taken under the Pass/Fail option:

P: Pass; equivalent to grade A through D– (no grade point value assigned).
F: Failure; failure to achieve minimal objectives of the course. The student must repeat the course satisfactorily in order to obtain credit for it. The F is factored into the student's grade point average.

For noncredit courses, including thesis research:

S: Satisfactory; meets course objectives (no grade point value assigned).
F: Unsatisfactory; does not meet course objectives (is factored into grade point average).

Note that no separate grades are given for course laboratory sections that have been given separate course designations for scheduling purposes.

Incomplete, Deferred, or Withdrawal grades for credit or noncredit courses (no grade point value assigned):

I: Incomplete, no grade; a temporary record indicating that the work is satisfactory as of the end of the semester but has not been completed. The grade of Incomplete may be assigned only when a student has successfully completed at least three-fourths of the work in a course and unusual circumstances prevent the student from completing the work within the time limits previously set. An instructor may require the student to secure the recommendation of the dean that the circumstances warrant a grade of Incomplete. When an Incomplete is given, the instructor will specify the academic work to be completed and may establish a deadline of up to one year. If the student has not completed the required work by the end of the following year, the registrar will automatically change the I to an F.
R: Deferred; a grade given for those courses that normally require more than one academic session to complete, such as project, thesis, and research courses. The grade indicates that work is in progress and that the final report has not been submitted for evaluation.
W: Withdrawal; a grade of W is recorded on the final grade report.

Withdrawing from Classes

During the first half of a semester or session, students may officially withdraw from classes without penalty if they obtain the approval of their advisor. During the third quarter of a semester or session, students may withdraw from classes if they obtain the approval of their advisor and the appropriate instructors; during the last quarter of the semester, students will be allowed to withdraw from classes only under extenuating circumstances. At that time they must obtain the approval of the appropriate instructors, their advisor, and the dean, and must also present a written justification from a doctor, member of the clergy, advisor, or similar person of authority. The fact that a student merely stops attending a class will not entitle the student to a grade of W.

Uses of the Pass/Fail Option

To provide students with the opportunity to broaden their education with less worry about the grades they may earn, an alternate grading system, the Pass/Fail option, is permitted for a limited portion of the required credit hours. The following general rules are currently applicable; individual departments may impose further restrictions.

- Subject to the regulations of divisions or departments, students may choose this option in any course that does not already appear on their academic record and that they are otherwise eligible to take for credit with a letter grade. Students may use this option for not more than 20 percent of the total credit hours required for graduation.
- Students taking a course under this option have the same obligations as those taking the course for credit with a letter grade. When instructors report final grades in the course, any student who would have earned a grade of A through D– will receive a P, and any student who has not passed will receive an F. The registrar will note either result on the student's academic records, but will not use the course in computing the grade point average unless the student receives an F.
- This option is not available to students on probation.
- This option is available for a maximum of two courses in any one semester and one course during a summer session.
- Students receiving the grade of Pass in a course taken under the Pass/Fail option may not retake the same course for a letter grade.
- Courses taken under Pass/Fail option and courses taken by correspondence may not be used to fulfill graduation requirements for engineering students. Whether the courses are accepted for technology students is up to each major department.

These rules are general or minimum guidelines for those electing this option. There are certain specific limitations on registration for the Pass/Fail option. This option may be elected only during continuing student registration, late registration, and the drop/ add period at the beginning of a semester or session. Changes from letter grade to Pass/ Fail and vice versa may not be made after the second week of classes during the regular semester or after the first week of classes during the summer sessions.

Absence from Campus

Students who interrupt their course of study for more than one calendar year may be required to meet all departmental curriculum requirements for the program offered at the time of their return.

Scholastic Indexes

The scholarship standing of all undergraduate degree regular students is determined by two scholastic indexes: the semester index and the graduation index.

Semester Index

The semester index (semester grade point average) is an average determined by weighting each grade received (4.0 for an A, 3.7 for an A–, etc.) during a given semester and multiplying it by the number of credit hours in the course, adding up all the figures, and then dividing the sum by the total number of course credit hours obtained during that semester. Grades of P and S are not included in the computation; grades of F are included. The cumulative semester index is the weighted average of all courses taken by a student, except those to which the FX policy is applied. See "Repeated Courses (FX Policy)" above in this section of the bulletin.

Graduation Index

The graduation index (degree grade point average) is the weighted average of grades in only those courses that are used to meet the graduation requirements for the program

in which the student is enrolled. When a student retakes a course with the advisor's approval or later substitutes an equivalent course for one previously taken, only the most recent course grade is used by the school in calculating the graduation index. Since certain courses previously completed by the student may on occasion be omitted from a program of study, the graduation index and the cumulative semester index may differ.

Graduation Index Requirements

For all bachelor's degrees in the School of Engineering and Technology, a minimum graduation index of 2.0 is required for graduation. Candidates for graduation from engineering programs must also have an index of 2.0 for all required engineering courses.
For the Associate of Science degree, a minimum graduation index of 2.0 is required for graduation.

Good Standing

For purposes of reports and communications to other institutions and agencies and in the absence of any further qualification of the term, students are considered in good standing unless they have been dismissed, suspended, or dropped from the university and have not been readmitted.

Graduate and Professional Policies

Academic Probation and Academic Dismissal

Academic standards for probation (warning status) and dismissal are established by the faculty for each specific academic program. Therefore, a student is subject to the regulations applicable to all students enrolled in a particular program at the time of registration. If students are experiencing academic difficulty, they are urged to consult their academic advisor as soon as possible.

Students will be notified by IUPUI e-mail from the Office of the Associate Dean for Academic Programs, School of Engineering and Technology, when they are placed on academic probation. The e-mail will also inform the student of the conditions that must be met for removal from academic probation. Students who are dismissed for academic reasons will also be notified by letter from the Office of the Associate Dean for Academic Programs.

The following standards are currently applicable for students enrolled in the School of Engineering and Technology.

Academic Probation

Graduate degree-seeking students are placed on academic warning and probation when either the cumulative index or the semester index is below 3.00 (B). Graduate students must maintain a semester and cumulative grade point average of at least 3.00 each semester to be in good standing. Academic probation will be removed when students achieve a semester and cumulative grade point average of 3.00. The minimum grade acceptable for a graduate-level course is C (2.00).

Full-time undergraduate students are automatically on academic probation when either the cumulative semester index or the semester index is below 2.0 (C). Part-time students are automatically on academic probation when either the cumulative semester index or the grade point average for the last 12 credit hours of consecutive enrollment is below 2.0 (C). All students on probation are automatically placed on academic checklist. Students on checklist must obtain the signature of a departmental advisor in order to register.
Students who, in subsequent enrollments, do not improve significantly may receive a letter stating that they will be subject to dismissal if an index of 2.0 (C) or higher is not earned in the current enrollment period. Such students may register only after their grades have been posted and their departmental checklist clearance form has been approved by the dean.

Removal from Probation

Students are removed from academic probation when they complete 12 credit hours of consecutive enrollment with a minimum grade point average of 2.0, provided their overall grade point average is also at or above 2.0.

Academic Dismissal

Full-time students may be dismissed when they fail to attain a 2.0 semester grade point average in any two consecutive semesters or when their cumulative semester index has remained below 2.0 (C) for any two consecutive semesters. Part-time students may be dismissed when their cumulative semester index or grade point average for the last 18 credit hours of consecutive enrollment is below 2.0 (C).

Readmission

A student who has been dropped due to scholastic deficiency may petition the Faculty Committee on Readmission for readmission. If readmitted, the student will be placed on probation. Students may contact the particular department for specific rules and regulations.

Acceptance of Grade Replacement & Repeating Courses

Students enrolled in the School of Engineering and Technology are permitted to apply only the provisions of the IUPUI Grade Replacement Policy that pertain to repeating a course in order to achieve a higher grade. This replacement will affect a student's academic record only at the Purdue School of Engineering and Technology at IUPUI. If the student subsequently transfers to another academic unit at IUPUI or another campus, different interpretations of the grade replacement policy may be in place.

An undergraduate student who retakes any course may elect to have only the final grade counted in computation of the cumulative semester index, in accordance with the limitations listed below. After retaking the course, the enrollment and original grade will be removed from calculations used to determine the student's cumulative GPA. The student's transcript, however, will continue to show the original enrollment in the course and all grades earned for each subsequent enrollment.

This policy is subject to the following limitations:

- Students may exercise the grade replacement option for no more than 15 credit hours, including any courses in which the former FX option was used.
- A grade may be replaced only by another grade for the same class.
- A student may exercise the Grade Replacement Policy a maximum of two times for a single course.

- The request to remove a grade from the cumulative GPA calculation by this method is irreversible.
- The second enrollment for any course covered by this policy must have occurred during fall semester 1996 or later.

Students who plan to use the grade replacement option must inform the engineering and technology recorder after they have retaken a course and wish to apply the policy.

Academic Regulations

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S: Satisfactory; meets course objectives (no grade point value assigned).
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Uses of the Pass/Fail Option

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- Students taking a course under this option have the same obligations as those taking the course for credit with a letter grade. When instructors report final grades in the course, any student who would have earned a grade of A through D– will receive a P, and any student who has not passed will receive an F. The registrar will note either result on the student's academic records, but will not use the course in computing the grade point average unless the student receives an F.

- This option is not available to students on probation.
- This option is available for a maximum of two courses in any one semester and one course during a summer session.
- Students receiving the grade of Pass in a course taken under the Pass/Fail option may not retake the same course for a letter grade.
- Courses taken under Pass/Fail option and courses taken by correspondence may not be used to fulfill graduation requirements for engineering students. Whether the courses are accepted for technology students is up to each major department.

These rules are general or minimum guidelines for those electing this option. There are certain specific limitations on registration for the Pass/Fail option. This option may be elected only during continuing student registration, late registration, and the drop/ add period at the beginning of a semester or session. Changes from letter grade to Pass/ Fail and vice versa may not be made after the second week of classes during the regular semester or after the first week of classes during the summer sessions.

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The scholarship standing of all undergraduate degree regular students is determined by two scholastic indexes: the semester index and the graduation index.

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Graduation Index

The graduation index (degree grade point average) is the weighted average of grades in only those courses that are used to meet the graduation requirements for the program in which the student is enrolled. When a student retakes a course with the advisor’s approval or later substitutes an equivalent course for one previously taken, only the most recent course grade is used by the school in calculating the graduation index. Since certain courses previously completed by the student may on occasion be omitted from a program of study, the graduation index and the cumulative semester index may differ.

Graduation Index Requirements

For all bachelor’s degrees in the School of Engineering and Technology, a minimum graduation index of 2.0 is required for graduation. Candidates for graduation from engineering programs must also have an index of 2.0 for all required engineering courses.

For the Associate of Science degree, a minimum graduation index of 2.0 is required for graduation.

Good Standing

For purposes of reports and communications to other institutions and agencies and in the absence of any further qualification of the term, students are considered in good standing unless they have been dismissed, suspended, or dropped from the university and have not been readmitted.

Faculty

Administrative Officers

- **H. Öner Yurtseven**, Dean
- **Stephen Hundley**, Associate Dean for Academic Affairs and Undergraduate Programs
- **Andrew Hsu**, Associate Dean for Graduate Programs and Research
- **Paula Jenkins**, Assistant Dean for Development and External Relations
- **Sherri Alexander**, Assistant Dean for Finance and Administration
- **Terri Talbert-Hatch**, Assistant Dean for Student Services
- **Eugenia Fernandez**, Chair of the Department of Computer, Information and Leadership Technology
- **Yaobin Chen**, Chair of the Department of Electrical and Computer Engineering
- **Elaine Cooney**, Chair of the Department of Engineering Technology
- **Jie Chen**, Chair of the Department of Mechanical Engineering
- **Mark Bannatyne,** Chair of the Department of Design and Communication Technology
- **Edward Berbari**, Chair of the Department of Biomedical Engineering
- **Wanda Worley**, Director of Technical Communications
- **Tim Diemer**, Director of International Services
- **Joe Abella**, Director of Industry Relations
- **Nancy Lamm**, Director of New Student Academic Advising Center
- **Marilyn Mangin**, Director of Student Recruitment
- **Josh Killey**, Director of Career Services and Professional Development

Faculty Emeriti

Akay, Hasan U., Chancellor's *Professor Emeritus of Mechanical Engineering (1981); B.S. Civil Engineering, 1967, Middle East Technical University, Turkey; M.S. Civil Engineering, 1969, Ph.D. Civil Engineering, 1974, University of Texas at Austin*

Ansty, William T., *Organizational Leadership and Supervision (1973); B.S. Foreign Service, 1955, Georgetown University; M.B.A. Business Administration, 1957, Harvard University*

Arffa, Gerald L., *Organizational Leadership and Supervision (1979); A.A.S. Chemical Technology, 1950, Broome County Technical College; B.S. Chemical Engineering, 1955, Clarkson College of Technology; M.B.A. Production Management, 1958, Syracuse*

University; Ph.D. Administrative and Engineering Systems, 1980, Union College; P.E., New York

Beck, Richard J., *Civil Engineering Technology (1962); B.S., Light Building, 1951, University of Wisconsin; M.S. Structures, 1959, University of Illinois; P.E., Indiana*

Bostwick, W. David, *Organizational Leadership and Supervision (1976); B.S. Mathematics, 1961, Northern Illinois University; M.A. Educational Administration, 1964, Roosevelt University; Ph.D. Educational Administration, 1970, University of Kentucky*

Bowman, Michael S., *Mechanical Engineering Technology (1964); B.S. Mechanical Engineering, 1959, Purdue University; M.B.A. 1961, Indiana University*

Close, Sam, *Mechanical Engineering Technology (1966); B.M.E. Mechanical Engineering, 1947, Cleveland State University; P.E., Indiana, Ohio*

Crozier, Robert G., *Computer Technology (1972); B.S. Forestry, 1961, University of Missouri; M.S. Forestry, 1962, Ph.D. Entomology, 1966, Purdue University*

Dault, Raymond A., *Restaurant, Hotel, Institutional, and Tourism Management (1950); B.A. Hotel Administration, 1950, Michigan State University; M.B.A. Management, 1969, Indiana University*

Dunipace, Kenneth R., *Electrical Engineering (1977); B.S. Secondary Education, 1951, The Ohio State University; B.S. Mechanical Engineering, 1956, Massachusetts Institute of Technology; M.E. Electrical Engineering, 1965, University of Florida; Ph.D. Electrical Engineering, 1968, Clemson University; P.E., Massachusetts, Missouri*

Ecer, Akin, *ProfessorEmeritus of Mechanical Engineering (1979); B.S. Civil Engineering, 1966, M.S. Civil Engineering, 1967, Middle East Technical University, Turkey; Ph.D. Engineering, 1970, University of Notre Dame*

Ebling, Daniel W., *Organizational Leadership and Supervision (1967); B.S. Economics, 1955, Albright College; M.B.A. General Business, 1956, Indiana University*

Fleenor, Edgar, *Construction Technology (1997); B.S. Industrial Education, 1955, M.A. Education, 1960, Indiana State University; Ph.D. Education, 1974, The Ohio State University*

Max, Abraham M., *Mechanical Engineering (1968); B.S., 1934, M.S., 1935, Ph.D., 1937, University of Wisconsin*

Maxwell, Michael P., *Emertius, Construction Technology (1977); B.A.E. Architectural Engineering, 1955, University of Detroit; Reg. Architect, Indiana, Illinois*

Moll, Richard E., *Mechanical Engineering Technology (1958); B.S. Industrial Education, 1955, M.S. Industrial Education, 1963, Purdue University*

Naghdi, Amir K., *Mechanical Engineering and Mathematical Sciences (1966); B.S. Mechanical Engineering, 1951, University of Tehran, Iran; M.S. Mechanical Engineering, 1958, University of Illinois; Ph.D. Engineering Sciences, 1964, Purdue University*

Needler, Marvin A., *Professor of Electrical and Computer Engineering Technology and of Electrical and Computer Engineering (1964); B.S. Electrical Engineering, 1963, M.S. Electrical Engineering, 1964, Purdue University; Ph.D. Systems Science, 1971, Michigan State University; Professional Engineer License, Indiana*

O'Loughlin, Carol L., *Electrical Engineering (1984); B.S. Physics/Mathematics, 1957, Marquette University; M.S. Physics, 1962, Purdue University; Ph.D. Solid-State Physics, 1968, Tulane University; P.E., Indiana*

O'Loughlin, John R., *Mechanical Engineering (1969); B.E. Mechanical Engineering, 1955, Youngstown State University; M.S. Mechanical Engineering, 1958, University of Pittsburgh; Ph.D. Mechanical Engineering, 1961, Purdue University; M.B.A. Business Administration, 1977, Indiana University; P.E., Indiana*

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