PURDUE
SCHOOL OF ENGINEERING AND TECHNOLOGY

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Contents

Introduction

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.

History of the Purdue School of Engineering and Technology

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. The school now 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.

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.

Academic Programs

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.

Engineering Degree Programs

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.)
Bachelor of Science in Engineering (B.S.E.)
Bachelor of Science in Mechanical Engineering (B.S.M.E.)
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.)
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.)

Technology Degree Programs

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

Architectural Technology
Biomedical Electronics Technology
Civil Engineering Technology
Computer Engineering Technology
Computer Graphics Technology
Computer Integrated Manufacturing Technology
Computer Technology
Electrical Engineering Technology
Interior Design
Mechanical Engineering Technology
Organizational Leadership and Supervision

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

Computer Engineering Technology
Computer Graphics Technology
Computer Integrated Manufacturing Technology
Computer Technology
Construction Technology
Electrical Engineering Technology
Mechanical Engineering Technology
Organizational Leadership and Supervision

In addition to IUPUI's accreditation by the North Central Association of Colleges and Secondary Schools, most individual programs have professional accreditation from either the Engineering Accreditation Commission or the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700. Where appropriate, program accreditation is identified on the page describing the individual plan of study.

Information Technology Programs

Information technology (IT) is a broad term covering all products and services that turn data into useful, meaningful, and accessible information. The Purdue School of Engineering and Technology at IUPUI has degree programs and courses that provide the knowledge and skills for our graduates to be successful in a variety of IT related careers. The information technology industry has three major facets: computer hardware, software, and services. IT professionals design, develop, support, and manage networks, such as the Internet. The applications of these technologies are all around us. In fact, IT is probably already a part of your life in ways you aren't even aware of. Computer software used to write a term paper, computer generated animation in a blockbuster movie, networks and programs that let you order books over the Internet, and satellites and systems that enable NASA to conduct remote space exploration are all developed by creative and dedicated IT professionals.

Undergraduate Admission

The Purdue School of Engineering and Technology offers admission opportunities to all students qualified to complete any of its programs, as long as space for effective instruction is available. The school reserves the right, however, to give admission preference to those students whose legal residence is within the state of Indiana. Inquiries about admission as well as requests for admission applications should be addressed to the Office of Admissions, Cavanaugh Hall 129, 425 University Boulevard, IUPUI, Indianapolis, IN 46202-5140. For more information check out the prospective student Web site at www.iupui.edu/prospects.htm.

Admission with Advanced Standing

Many prospective students may be eligible to begin their program of study in the School of Engineering and Technology at an advanced level. Eligibility for advanced standing will be established most frequently by transfer of credit from another college or university, by formal advanced placement courses in high school, by participation in the College Level Examination Program (CLEP), or by achievement of credit by examination.

Qualified applicants who have not previously attended another college or university may obtain specific information by writing the Office for Academic Programs, Purdue School of Engineering and Technology, Room 215, IUPUI, 799 W. Michigan Street, IUPUI, Indianapolis, IN 46202-5160.

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.

1. 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.
2. A Purdue University student from another campus must complete an official undergraduate application through the IUPUI Office of Admissions.
3. 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:

1. An IUPUI application for undergraduate admission and a copy of high school records must be submitted to the Office of Admissions.
2. An official transcript of all course work done, from all institutions previously attended, also must be forwarded to the Office of Admissions.
3. 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.
4. 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.
5. Individual academic programs may require that transfer students complete specific courses prior to admission with advanced standing.
6. 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.

Second Degrees or Additional Major Fields

Requirements for a Second Degree

Holders of bachelor's degrees who have additional academic objectives are generally encouraged to pursue appropriate graduate degree programs. Bachelor's degree holders may, however, obtain special permission to enroll in programs at either the associate or bachelor's degree level in the School of Engineering and Technology. Candidates must fulfill all academic requirements for the additional major field of study. Applicants for a second degree 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 credit hours must be in the major at the junior level or higher.

Graduates of the School of Engineering and Technology are permitted to pursue a second degree program.

Requirements for an Additional Major Field (Technology Programs Only)

Holders of Purdue University A.S. or B.S. degrees, whether from IUPUI or another campus, may enroll in technology courses typically taken by students completing degrees in a different major field. Upon successful completion of the requirements for the additional program, students will receive a notation on their transcripts that they have completed the equivalent of an additional major field of study.

Students working toward second degrees are required to complete all of the same courses in a plan of study as students majoring in the field for the same degree. The student may be required to complete a minimum number of credit hours that have not been used to fulfill requirements for any other major field of study or degree program.

Dual Majors and Dual Degrees

A student who will be completing the requirements for two or more degree programs simultaneously may be eligible to apply for more than one degree according to the following criteria:

1. If the degree programs are in different schools, the student must apply to each school for the appropriate degree. In the School of Engineering and Technology, the student must apply for the degree the semester prior to the one in which he or she expects to complete the degree requirements.
2. If the degree programs are both in the School of Engineering and Technology and lead to different degrees, the appropriate degrees shall be awarded.
3. In technology programs, students in all fields of study receive the same degree, an A.S. or a B.S. Therefore, a student who completes multiple fields of study will receive only one degree; the transcript will reflect the multiple fields of study.

Special Credit

Special credit by examination, by credentials, and/or by experience may be awarded in order to help qualified students earn their degrees more quickly. Each instructional department determines which of its courses are available for special credit and establishes procedures to determine student eligibility, administer evaluations for special credit, and grade them. The evaluations are as comprehensive as those given in the course and are graded as either satisfactory (performance comparable to that expected of students who receive grades of A through C– in the course) or unsatisfactory. Newly admitted students or currently enrolled students who have not received a grade or directed grade other than W (Withdrawal) in the course may request an examination for credit.

Responsibility for initiating a request for special credit in a specific course normally rests with the student. To find out if special credit can be awarded, the student should consider meeting first with the department chair, advisor, or course instructor.

Admission of International Students

Applicants from other countries are considered for admission on the basis of credentials certifying the completion of secondary school. They are not required to take the Scholastic Assessment Tests (SAT) or the American College Test (ACT). Official translations must accompany transcripts and other credentials not written in English. The applicant must demonstrate adequate English proficiency for admission by submitting results from the Test of English as a Foreign Language (TOEFL). A TOEFL score of at least 500 (or 173 on the computer-based TOEFL) is required for regular admission to all undergraduate programs offered by the School of Engineering and Technology. All international undergraduate students must take the IUPUI English as a Second Language (ESL) placement test before they can register for classes. They will be placed in language classes based on their performance on this examination.

International student applicants must also furnish sufficient evidence of adequate financial support for the entire period of their schooling. International applicants should submit all credentials at least six months prior to the semester in which they want to enroll. Inquiries should be directed to the IUPUI Office of International Affairs, 620 Union Drive, Indianapolis, IN 46202-5167.

Admission as a Nondegree Student

Applicants who want to study in any of the departments of the university without undertaking a regular plan of study and without becoming candidates for degrees may be admitted as nondegree students. Applicants must give evidence of prerequisite background for the course or courses in which they plan to enroll. Applicants who do not have bachelor's degrees should apply to the Office of Admissions, Cavanaugh Hall, Room 129, 425 University Boulevard, IUPUI, Indianapolis, IN 46202-5140. Regardless of whether they plan to take undergraduate or graduate courses, applicants who have bachelor's degrees should apply to the IUPUI Graduate Office, Union Building 518, 620 N. Union Drive, IUPUI, Indianapolis, IN 46202-5167; phone (317) 274-4023.

Auditing Courses

Auditors are students who want to take classes without receiving either credit or grades for these classes. Auditors may attend lecture classes when they have paid the appropriate fees and identified themselves as auditors to the instructor. Auditors are not admitted in courses with a credit hour laboratory component.

Academic Advising and Counseling

Faculty, department chairs, and the Office for Academic Programs are available to provide information about programs of study and career opportunities in engineering and technology.

Students who are admitted to the School of Engineering and Technology are assigned an academic advisor in their major department. Before they meet with their advisor for initial counseling and registration, beginning and transfer students are required to participate in IUPUI's placement testing program. The Office of Admissions will inform the students of this procedure and scheduling. Faculty are available in each department to assist students in planning their academic programs to meet graduation requirements. *It is the student's responsibility to meet periodically with advisors in order to assess progress toward an academic goal.* Students may be required by departments to see an advisor each semester to plan their course schedules.

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.

Undergraduate Engineering Admission Requirements

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

1. Graduation from a high school accredited by a state Department of Public Instruction.
2. The extent to which the student meets or exceeds the following minimum requirements:
   a. All applicants' high school records must include the following:

      8 semesters of mathematics, including precalculus, trigonometry, or math analysis. Calculus is recommended;

      8 semesters of English;

      6 semesters of science with labs including a year of chemistry. Physics is recommended;

      6 semesters of social sciences;

      4 semesters of additional college preparatory courses selected from mathematics, English, science, foreign language, and social sciences.

      Academic honors diploma is highly recommended.

      Indiana residents must rank in the upper half of their high school graduating class, and out-of-state resident must rank in the upper third of their high school graduating class.
   b. An applicant's admission as a new student into the Purdue School of Engineering and Technology at IUPUI is determined by a combination of rank in class, test scores, probability of success, grade average in college preparatory subjects, grades in courses related to the degree objective, trends in achievement, completion of high school subject matter requirements, and the strength of the college preparatory program. All applicants who have not completed a full year of college work are required to take the SAT-I or the ACT.
   c. 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 520 mathematics or minimum ACT scores of 20 English and 22 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:

1. Graduation from a high school accredited by a state Department of Public Instruction.
2. The extent to which the student meets or exceeds the following minimum requirements:
   a. All applicants' high school records must include the following:
      8 semesters of mathematics, including precalculus, trigonometry, or math analysis. Calculus is recommended;
      8 semesters of English;
      6 semesters of science with labs. Physics and chemistry are recommended;
      6 semesters of social sciences;
      4 semesters of additional college preparatory courses selected from mathematics, English, science, foreign language, and social sciences.
      Academic honors diploma is highly recommended.

      Indiana residents must rank in the upper half of their high school graduating class, and out-of-state residents must rank in the upper third of their high school graduating class.
   b. An applicant's admission as a new student into the Purdue School of Engineering and Technology at IUPUI is determined by a combination of rank in class, test scores, probability of success, grade average in college preparatory subjects, grades in courses related to the degree objective, trends in achievement, completion of high school subject matter requirements, and the strength of the college preparatory program.
   c. 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 450 verbal (critical

reading) and 500 mathematics or minimum ACT scores of 18 English and 21 mathematics are required.

d. Graduates of State of Indiana high school tech prep programs are eligible for admission if they have successfully completed the equivalent tech prep courses listed in paragraph 2a above and have complied with the requirements of paragraphs 2b and 2c above.

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.

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 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 will not 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*.

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. No check for a greater amount will be accepted. All payments must be made to the bursar at the registration site. Students who register before or during final registration may be able to pay fees using the two-installment option. For information about this option, refer to the IUPUI *Schedule of Classes*.

Credit Cards Students may use MasterCard, Visa, or Discover for payment of university fees and housing. Both Visa and MasterCard are accepted by the IUPUI bookstores. In the event that a student under age 21 wishes to use one of the above credit cards belonging to a parent, bank regulations require prior authorization by the parent.

Refunds

Refund credits are determined by the date the drop activity is processed by the IUPUI Office of the Registrar. Refunds are based on the following schedule.

1. For withdrawal during the first week of classes or through the drop/add period—100 percent refund.
2. For withdrawal during the second week of classes—75 percent refund.
3. For withdrawal during the third week of classes—50 percent refund.
4. For withdrawal during the fourth week of classes—25 percent refund.
5. For withdrawal during the fifth week and thereafter—NO REFUND.

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: 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 registrar.iupui.edu/va.html

Academic Policies and Procedures

Probation, Dismissal, Reinstatement

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 letter from the Office of the Associate Dean for Academic Programs, School of Engineering and Technology, when they are placed on academic probation. The letter 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

Full-time 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, Forgiveness, 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:

1. 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.
2. A grade may be replaced only by another grade for the same class.
3. A student may exercise the Grade Replacement Policy a *maximum of two times* for a single course.
4. The request to remove a grade from the cumulative GPA calculation by this method is irreversible.
5. 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

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.

1. 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)

2. 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.
3. 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.
4. 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.

1. 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.
2. 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.
3. This option is not available to students on probation.
4. This option is available for a maximum of two courses in any one semester and one course during a summer session.
5. 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.
6. 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 1.9 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.

Graduation Requirements for Undergraduates

Undergraduate Engineering 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 a graduation 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 1.9. 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 for one of the academic units at IUPUI and must complete at least one-half of the academic requirements for that certificate after admission to that certificate program. Although there are several admission and/or enrollment options open to certificate students, it is expected that all of this remaining course work will be in courses taught by one or more of the IUPUI academic units. 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 Enrichment 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) 215, 799 W. Michigan Street, IUPUI, Indianapolis, IN 46202-5160; (317) 278-1000.

Graduate Engineering Programs

Andrew Hsu, Associate Dean for Graduate Programs

The school offers six graduate degrees: the Doctor of Philosophy in Biomedical Engineering (Ph.D.), 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 be authorized to pursue the Ph.D. degree in electrical and computer engineering or mechanical engineering at IUPUI. Programs leading to the Ph.D. in electrical engineering and in mechanical engineering are administered with the respective approval of the School of Electrical Engineering and the School of Mechanical Engineering 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-directed areas.

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

Scholarships and Awards

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

At the conclusion of each semester, the recorder of the Office of Academic Programs determines which undergraduate students have earned grades reflecting outstanding scholastic work during the semester. The names of these students are publicly recognized and are posted in the school and on the school's Web pages. In addition, various activities are conducted to honor the academic success of qualifying students. The Dean's List is not compiled for summer sessions. In order to qualify for the Dean's List for a given

semester, students must meet all the following requirements:

1. Earn a semester grade index of 3.5 or higher.
2. Complete all courses in which they were enrolled at the end of the semester with a grade of C or higher, R, or P.
3. Complete at least 6 credit hours for a letter grade. A letter grade is an A, B, C, D (including +/–), F, or P, but not R.
4. Complete a minimum of 15 credit hours while registered as a student in the School of Engineering and Technology, including the credit hours earned in the semester under consideration.
5. Earn a semester grade point average that places the student in the top 10 percent of all students in the department or division who have completed at least 6 credit hours for a letter grade (as defined in item 3 above) that semester.

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:

1. 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.
2. 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.

School or Program Student Clubs

Engineering and Technology Student Societies

Engineering and technology students have the opportunity to participate in the activities of the following student society chapters:

American Foundrymen's Society
American Institute for Aeronautics and Astronautics (AIAA)
American Society of Mechanical Engineers (ASME)
Associated General Contractors of America (AGC)
Association for Computing Machinery (ACM)
Engineering and Technology Student Council
Engineering Graduate Student Organization
Institute of Electrical and Electronics Engineers (IEEE)
IUPUI Amateur Radio Association
IUPUI Robotics Team
National Society of Black Engineers (NSBE)
National Society of Professional Engineers
SIGGRAPH
Society for the Advancement of Management
Society of Automotive Engineers (SAE)
Society of Human Resource Management (SHRM)
Society of Manufacturing Engineers
Society of Student Constructors
Society of Women Engineers (SWE)
Student Design Organization (SDO)
Tau Alpha Pi
.NET

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.

General-Education Program

Each engineering program requires a specific number of general-education courses. Eight credit hours are required in communications courses: ENG W151, COMM R110, and TCM 360. A 1–credit hour course in engineering ethics (ECE 401 or ME 401) is also required. Other courses in humanities and social sciences must be selected from approved lists available in each engineering department.

Specific Degree Tracks

Undergraduate Engineering 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:

Degree Program	Administered by
Bachelor of Science in Biomedical Engineering (B.S.B.M.E.)	Department of Biomedical Engineering
Bachelor of Science in Computer Engineering (B.S.Cmp.E.)	Department of Electrical and Computer Engineering
Bachelor of Science in Engineering (Interdisciplinary Engineering) (B.S.E.)	Department of Electrical and Computer Engineering
Bachelor of Science in Engineering (Interdisciplinary Engineering) (B.S.E.)	Department of Mechanical Engineering
Bachelor of Science in Electrical Engineering (B.S.E.E.)	Department of Electrical and Computer Engineering
Bachelor of Science in Mechanical Engineering (B.S.M.E.)	Department of Mechanical Engineering

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 Lamm

Senior Lecturer Orono

Lecturer Gee

Freshman Engineering Counselor 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.

Department of Biomedical Engineering

Professors Berbari *(Chair)*, Turner

Assistant Professors Chu, Li, Morris, Schild, Yokota

Adjunct Faculty Ben-Miled, Burr, Chen, Chin, Eberhart, Foresman, Hsu, Hutchins, Kincaid, Lees, Liange, March, Moreno, Naumann, Pidaparti, Suzuki, Svirsky, Wiltz, Wu

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.

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.

Department of Electrical and Computer Engineering

Professors Y. Chen, Y. P. Chien, Eberhart *(Chair)*, El-Sharkawy, Needler, Rizkalla, Sinha, Yokomoto, Yurtseven

Associate Professors Koskie, Ramos

Assistant Professors Ben-Miled, Chu, Kim, King, Knieser, Koskie, Rovnyak, Salama

Adjunct Faculty Rajashekara, Svirsky

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 electronic design, control and robotics, communications and signal processing, biomedical engineering, 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, image processing, artificial intelligence, networking, software engineering, embedded systems, high performance computing, control, biomedical engineering, robotics, manufacturing, and 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

Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700.

The B.S.E.E. degree prepares students for career opportunities in the hardware and software aspects of design, development, and operation of electronic systems and components, hardware and software design, 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 minimum number of credit hours for graduation is 126, distributed as follows for each discipline:

1. Mathematics and Physical Sciences
   a. Calculus: **MATH 163, 164, 261,** and **262** 18
   b. Chemistry: **CHEM C105** 3
   c. Physics: **PHYS 152** and **251** 9
2. Communications and Ethics
   a. Speech: **COMM R110** 3
   b. Writing: **ENG W131** 3
   c. Communication in Engineering Practice: **TCM 360** 2
   d. Engineering Ethics and Professionalism: **ECE 400** and **401** 2
3. Humanities and Social Sciences
   a. Electives 15
4. Freshman Engineering Courses
   a. Introduction to the Engineering Profession: **ENGR 195** 1
   b. Introduction to Engineering: **ENGR 196** 3
   c. Programming Concepts: **ENGR 197** 3
5. Engineering Science
   a. Circuits: **ECE 201, 202,** and **207** 7
   b. Systems and Fields: **ECE 301, 302,** and **311** 9
   c. Unrestricted Elective 3
   d. C Programming: **ECE 264** 2
6. Engineering Design
   a. Electronics: **ECE 208** and **255** 4
   b. Digital Systems: **ECE 266, 267,** and **362** 8
   c. Communication Systems: **ECE 440** 4
   d. Control Systems: **ECE 382** and **340** 6
   e. Capstone Design: **ECE 492** 3
   f. Design Electives 15
7. Science/Technical Elective 3

126

Semester by semester, the 126 total credit hours should be distributed as follows:

Freshman Year

First Semester

ENGR 195 Introduction to the Engineering Profession 1
ENGR 196 Introduction to Engineering 3
CHEM C105 Chemical Science I....3
MATH 163 Integrated Calculus and Analytic Geometry....5
COMM R110 Fundamentals of Speech Communication 3
15

Second Semester

ENGR 197 Introduction to Programming Concepts 3
PHYS 152 Mechanics 4
ENG W131 Elementary Composition I 3
MATH 164 Integrated Calculus and Analytic Geometry II 5
Humanities or **Social Science** Elective[1] 3
18

Sophomore Year

Third Semester

ECE 201 Linear Circuit Analysis I....3
ECE 207 Electronic Measurement Techniques....1
ECE 264 Advanced C Programming 2
PHYS 251 Electricity and Optics....5
MATH 261 Multivariate Calculus 4
15

Fourth Semester

ECE 202 Circuit Analysis II 3
ECE 208 Electronic Design and Devices Lab....1
ECE 255 Introduction to Electronics Analysis and Design 3
ECE 266 Digital Logic Design 3
ECE 267 Digital Logic Design Laboratory....1
MATH 262 Linear Algebra Differential Equations....4
Humanities or **Social Science** Elective[1] 3
18

Junior Year

Fifth Semester

ECE 301 Signals and Systems....3
ECE 311 Electric and Magnetic Fields....3
ECE 362 Microprocessor Systems and Interfacing....4
ECE Elective[4] 3
Science[2] or **Technical**[3] Elective....3
16

Sixth Semester

ECE 302 Probabilistic Methods in Electrical Engineering 3
ECE 340 Simulation, Modeling, and Identification 3
ECE 382 Feedback System Analysis....3
ECE Elective[4] 3
TCM 360 Communications in Engineering Practice 2
Humanities or **Social Science** Elective[1] 3
17

Senior Year

Seventh Semester

ECE 400 Senior Seminar 1
ECE 440 Introduction to Communication Systems Analysis 4
ECE Electives[4]....6
Humanities or **Social Science** Elective[1] 3
14

Eighth Semester

ECE 401 Ethics....1
ECE 492 Senior Design....3
ECE Elective[4] 3
Unrestricted Elective[5] 3
Humanities or **Social Science** Elective[1] 3
13

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, parallel processing, 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 fifth or sixth semester to decide how to select these electives.

The Department of Electrical and Computer Engineering has expanded its upper-level elective courses in the biomedical engineering field. Thus students may both obtain a professional B.S.E.E. degree and prepare themselves for medical or dental school, with only a slight increase in the number of credit hours required for the basic B.S.E.E. degree. These courses are presently taught with the ECE 495 variable-topics designation and are announced in the printed class schedule each semester. Descriptions of experimental courses are not given in the bulletin, but the descriptions are available from the registrar each semester.

[1] From approved humanities or social science elective list.
[2] From approved science elective list.
[3] From approved technical elective list.
[4] From approved electrical engineering elective list.
[5] From lists 1-4.

ECE Elective Courses

ECE 305 Semiconductor Devices
ECE 321 Electromechanical Motion Devices
ECE 359 Data Structures
ECE 365 Introduction to the Design of Digital Computers
ECE 369 Discrete Mathematics for Computer Engineers
ECE 410 Introduction of Digital Signal Processing
ECE 411 Advanced Digital Signal Processing
ECE 424 Electromechanical Systems and Applied Mechatronics
ECE 427 Power Electronics
ECE 446 Digital Computational Techniques for Electronic Circuits
ECE 455 Integrated Circuit Engineering
ECE 456 Advanced Integrated Circuit Engineering
ECE 468 Introduction to Compilers and Translation
ECE 469 Operating Systems Engineering
ECE 471 Embedded Microcontrollers
ECE 483 Digital Control System Analysis and Design
ECE 489 Introduction to Robotics
ECE 491 Engineering Design Projects
ECE 495 Selected Topics in Electrical Engineering*
ECE 496 Electrical Engineering Design Projects
Any 500-level Electrical Engineering course

Science Elective Courses

BIOL K101 Concepts of Biology I
BIOL K103 Concepts of Biology II
BIOL K324 Cell Biology
CHEM C106 Principles of Chemistry II
CHEM C310 Analytical Chemistry
CHEM C341 Organic Chemistry I
CHEM C360 Elementary Physical Chemistry
CHEM C361 Physical Chemistry of Bulk Matter
CHEM C362 Physical Chemistry of Molecules
PHYS 310 Intermediate Mechanics
PHYS 342 Modern Physics
PHYS 400 Physical Optics
PHYS 442 Quantum Mechanics
PHYS 520 Mathematical Physics
PHYS 530 Electricity and Magnetism
PHYS 545 Solid State Physics
PHYS 550 Introduction to Quantum Mechanics

Technical Elective Courses

Any nonrequired ECE or CmpE elective course.
CSCI 437 Introduction to Computer Graphics
MATH 351 Elementary Linear Algebra **or** **MATH 511** Linear Algebra with Applications
MATH 510 Vector Calculus
MATH 520 Boundary Value Problems of Differential Equations
MATH 523 Introduction to Partial Differential Equations

*ECE 495 Selected Topics in Electrical Engineering is generally used to offer new courses every semester. Below is a list of titles offered since 1999:

Multimedia Applications
Software Engineering and Embedded Microsystems
Impact of Computer Architecture on Performance
Electrical Fundamentals of Electric Vehicles
Biomedical Instrumentation
Electromechanical Systems and Applied Mechatronics
Digital Signal Processor System Design
Digital Communications
Parallel Processor Theory
Introduction to Computer Communication Networks
Advanced Multimedia and Mobile Communications

MATH 525 Introduction to Complex Analysis
MATH 526 Principles of Mathematical Modeling
MATH 527 Advanced Mathematics for Engineering and Physics I
MATH 528 Advanced Mathematics for Engineering and Physics II
MATH 530 Functions of a Complex Variable I
MATH 531 Functions of a Complex Variable II
MATH 544 Real Analysis and Measure Theory
ME 200 Thermodynamics I
ME 270 Basic Mechanics I
ME 272 Mechanics of Materials
ME 274 Basic Mechanics II
ME 301 Thermodynamics II
ME 344 Introduction to Engineering Materials

Bachelor of Science in Computer Engineering

The objective of the Bachelor of Science in Computer Engineering (B.S.Cmp.E.) degree curriculum is 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, 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 structure, embedded systems, computer architecture, parallel, and advanced digital systems.

The minimum number of credit hours for graduation is 127, distributed as follows for each discipline:

1. Mathematics and Physical Sciences
   a. Calculus: **MATH 163, 164, 261,** and **262** 18
   b. Chemistry: **CHEM C105** 3
   c. Physics: **PHYS 152** and **251** 9
2. Communications and Ethics
   a. Speech: **COMM** R110 3
   b. Writing: **ENG W131** 3
   c. Communication in Engineering Practice: **TCM 360** 2
   d. Engineering Ethics and Professionalism: **ECE 400** and **401** 2
3. Humanities and Social Sciences
   a. Electives 15
4. Freshman Engineering Courses
   a. Introduction to the Engineering Profession: **ENGR 195** 1
   b. Introduction to Engineering: **ENGR 196** 3
   c. Programming Concepts: **ENGR 197** 3
5. Engineering Science
   a. Circuits: **ECE 201**, **202**, and **207** 7
   b. Systems and Fields: **ECE 301**, **302** 6
6. Engineering Design
   a. Electronics: **ECE 208** and **255** 4
   b. Digital Systems: **ECE 266**, **267**, **362**, and **365** 11
   c. Capstone Design: **ECE 492** 3
7. Computer Science
   a. Computing II: **ECE 264** and **CSCI 242** 4
   b. Advanced Programming: **CSCI 265** 3
   c. Discreet Computational Structures: **ECE 369** 3
   d. Data Structures: **ECE 359** 3
8. CmpE Electives 15
9. Science/Technology Electives 3
10. Unrestricted Electives 3

Semester by semester, the 127 total credit hours should be distributed as follows:

Freshman Year

First Semester

ENGR 196 Introduction to Engineering 3
ENGR 195 Introduction to the Engineering Profession 1
CHEM C105 Chemical Science I.....3
MATH 163 Integrated Calculus and Analytic Geometry.....5
COMM R110 Fundamentals of Speech Communication 3
15

Second Semester

ENGR 197 Introduction to Programming Concepts 3
PHYS 152 Mechanics 4
ENG W131 Elementary Composition I 3
MATH 164 Integrated Calculus and Analytic Geometry II 5
Humanities or **Social Science** Elective[1] 3
18

Sophomore Year

Third Semester

ECE 201 Linear Circuit Analysis I.....3
ECE 207 Electronic Measurement Techniques.....1
ECE 264 Advanced C Programming 2
PHYS 251 Electricity and Optics.....5
MATH 261 Multivariate Calculus 4
CSCI 242 Computing II.....2
17

Fourth Semester

ECE 202 Circuit Analysis II 3
ECE 255 Introduction to Electronics Analysis and Design 3
ECE 266 Digital Logic Design 3
ECE 267 Digital Logic Design Laboratory.....1
ECE 208 Electronic Design and Devices Lab.....1
MATH 262 Linear Algebra Differential Equations.....4
CSCI 265 Advanced Programming 3
18

Junior Year

Fifth Semester

ECE 301 Signals and Systems.....3
ECE 362 Microprocessor Systems and Interfacing....4
ECE 369 Discrete Math for Computer Engineers.....3
ECE 359 Data Structures 3
Science[2] or **Technical**[3] Elective.....3
16

Sixth Semester

ECE 302 Probabilistic Methods in Electrical Engineering 3
ECE 365 Introduction to the Design of Digital Computers.....3
CmpE Elective[4] 6
TCM 360 Communications in Engineering Practice 2
Humanities or **Social Science** Elective[1] 3
17

Senior Year

Seventh Semester

ECE 400 Senior Seminar 1
CmpE Elective[4] 6
Humanities or Social **Science** Elective[1] 6
13

Eighth Semester

ECE 401 Ethics.....1
ECE 492 Senior Design.....3
CmpE Elective[4] 3
Unrestricted Elective[5] 3
Humanities or **Social Science Elective**[1] 3
13

CmpE Elective Courses

ECE 305 Semiconductor Devices
ECE 311 Electric and Magnetic Fields
ECE 382 Feedback Systems Analysis and Design
ECE 410 Introduction to Digital Signal Processing
ECE 440 Introduction to Communication Systems Analysis
ECE 471 Embedded Microcontrollers
ECE 491 Engineering Design Projects
ECE 495 Selected Topics in Electrical Engineering*
ECE 496 Electrical Engineering Design Projects
ECE 536 Computational Intelligence
ECE 565 Computer Architecture
ECE 559 MOS VLSI Design
CSCI 355 Introduction to Programming Languages
CSCI 403 Introduction to Operating Systems
CSCI 414 Numerical Methods
CSCI 443 Database Systems
CSCI 463 Analysis of Algorithms
CSCI 475 Scientific Computing I
CSCI 476 Scientific Computing II
Any 500-level EE course

Science Elective Courses

BIOL K101 Concepts of Biology I
BIOL K103 Concepts of Biology II
BIOL K324 Cell Biology
CHEM C106 Principles of Chemistry II
CHEM C310 Analytical Chemistry
CHEM C341 Organic Chemistry I
CHEM C360 Elementary Physical Chemistry
CHEM C361 Physical Chemistry of Bulk Matter
CHEM C362 Physical Chemistry of Molecules
PHYS 310 Intermediate Mechanics
PHYS 342 Modern Physics
PHYS 400 Physical Optics
PHYS 442 Quantum Mechanics
PHYS 520 Mathematical Physics
PHYS 530 Electricity and Magnetism
PHYS 545 Solid State Physics
PHYS 550 Introduction to Quantum Mechanics

[1] From approved humanities or social science elective list.
[2] From approved science elective list.
[3] From approved technical elective list.
[4] From approved computer engineering elective list.
[5] From lists 1-4.

Technical Elective Courses

Any nonrequired ECE or CmpE elective course
CSCI 437 Introduction to Computer Graphics
MATH 351 Elementary Linear Algebra or
MATH 511 Linear Algebra with Applications
MATH 510 Vector Calculus
MATH 520 Boundary Value Problems of Differential Equations
MATH 523 Introduction to Partial Differential Equations
MATH 525 Introduction to Complex Analysis
MATH 526 Principles of Mathematical Modeling
MATH 527 Advanced Mathematics for Engineering and Physics I
MATH 528 Advanced Mathematics for Engineering and Physics II
MATH 530 Functions of a Complex Variable I
MATH 531 Functions of a Complex Variable II
MATH 544 Real Analysis and Measure Theory
ME 200 Thermodynamics I
ME 270 Basic Mechanics I
ME 272 Mechanics of Materials
ME 274 Basic Mechanics II
ME 301 Thermodynamics II
ME 344 Introduction to Engineering Materials

Bachelor of Science in Engineering—Interdisciplinary Engineering

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
   a. Calculus: **MATH 163, 164, 261,** and **262** 18
   b. Chemistry: **CHEM C105** and **C106** 6
   c. Physics: **PHYS 152** and **251** 9
2. Communications and Ethics
   a. Speech: **COMM R110** 3
   b. Writing: **ENG W131** 3
   c. Communication in Engineering Practice: **TCM 360** 2
   d. Engineering Ethics and Professionalism: **ECE 400** and **401** 2
3. Humanities and Social Sciences
   a. Electives 15
4. Freshman Engineering Courses
   a. Introduction to the Engineering Profession: **ENGR 195** 1
   b. Introduction to Engineering: **ENGR 196** 3
   c. Programming Concepts: **ENGR 197** 3
5. Electrical Engineering Courses
   a. ECE Core: **ECE 201**, **202**, **207**, **208**, **255**, **266**, **267**, **301**, and **362** 22
   b. ECE Electives (any ECE 300-, 400-, or 500-level course) 12
6. Technical Elective Course 3
7. Interdisciplinary Area
   a. Core Requirements 12
   b. Core Electives 12

126

Freshman Year

First Semester

ENGR 195 Introduction to the Engineering Profession 1
ENGR 196 Introduction to Engineering 3
CHEM C105 Principles of Chemistry I 3
COMM R110 Fundamentals of Speech Communication 3
MATH 163 Integrated Calculus and Analytic Geometry I 5

15

Second Semester

ENGR 197 Introduction to Programming Concepts 3
CHEM C106 Principles of Chemistry II 3
ENG W131 Elementary Composition I 3
MATH 164 Integrated Calculus and Analytic Geometry II 5
PHYS 152 Mechanics 4

18

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.), the Master of Science in Engineering (M.S.E.), and the Master of Science in Biomedical Engineering (M.S.Bm.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, and signal processing, and biomedical engineering 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 or mechanical engineering at IUPUI. Programs leading to the Ph.D. in electrical engineering and in mechanical engineering are administered with the respective approval of the School of Electrical and Computer Engineering and the School of Mechanical Engineering at Purdue University, West Lafayette.

Department of Mechanical Engineering

Professors Akay *(Chair),* J. Chen, Ecer, Hsu, Paydar, Pidaparti, Turner

Associate Professors Afolabi, El-Mounayri, Katona, Nalim

Assistant Professors Krishnan, Lamm

Senior Lecturer Orono

Adjunct Faculty Periaux, Oshida, Roberts

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 full-time faculty actively engaged in research in a variety of areas: 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. 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.

For more information, contact the Department of Mechanical Engineering at (317) 274-9717.

Bachelor of Science in Mechanical Engineering

Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (ABET), 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.

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* Course ECE 495 Selected Topics in Electrical Engineering is generally used to offer new courses every semester. Below is a list of titles offered since 1999:
  - Multimedia Applications
  - Software Engineering and Embedded Microsystems
  - Impact of Computer Architecture on Performance
  - Electrical Fundamentals of Electric Vehicles
  - Biomedical Instrumentation
  - Electromechanical Systems and Applied Mechatronics
  - Digital Signal Processor System Design
  - Digital Communications
  - Parallel Processor Theory
  - Introduction to Computer Communication Networks
  - Advanced Multimedia and Mobile Communications

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 the choosing of electives.

The number of credit hours required for graduation is 130, distributed as follows for each discipline:

1. Mathematics and Physical Sciences
   a. Calculus: **MATH 163**, **164**, **261**, and **262** 18
   b. Chemistry: **CHEM C105** 3
   c. Physics: **PHYS 152** and **251** 9
   d. Science Elective 3
2. Communications and Ethics
   a. Speech: **COMM R110** 3
   b. Writing: **ENG W131** 3
   c. Communication in Engineering Practice: **TCM 360** 2
   d. Engineering Ethics and Professionalism: **ME 401** 1
3. General Education
   a. Economics: **ECON E201** 3
   b. Electives 12
   c. Free Elective 3
4. Freshman Engineering Courses
   a. Introduction to the Engineering Profession: **ENGR 195** 1
   b. Introduction to Engineering: **ENGR 196** 3
   c. Introduction to Programming Concepts: **ENGR 197** 3
5. Mechanics and Materials
   a. Mechanics: **ME 270** and **ME 274** 6
   b. Materials: **ME 272** and **ME 344** 7
6. Design
   a. Mechanical Design: **ME 262** and **372** 7
   b. Engineering Design: **ME 462** 4
   c. Thermal-Fluid Systems Design: **ME 414** 3
7. Thermal Sciences
   a. Thermodynamics: **ME 200** 3
   b. Fluid Mechanics: **ME 310** 4
   c. Heat and Mass Transfer: **ME 314** 4
8. Electrical Engineering, Instrumentation, and Control
   a. Electrical Engineering: **ECE 204** 4
   b. Systems, Instrumentation, and Control: **ME 330**, **340**, and **482** 9
9. Technical Electives
   a. Mechanical Engineering Electives 9
   b. Statistics Elective 3

130

Semester by semester, the 130 total credit hours should be distributed as follows:

Freshman Year

First Semester

ENGR 195 Introduction to the Engineering Profession 1
ENGR 196 Introduction to Engineering....3
CHEM C105 Chemical Science I....3
COMM R110 Fundamentals of Speech Communication 3
MATH 163 Integrated Calculus and Analytic Geometry I....5
15

Second Semester

ENGR 197 Introduction to Programming Concepts....3
ENG W131 Elementary Composition I 3
MATH 164 Integrated Calculus and Analytic Geometry II 5
PHYS 152 Mechanics....4
Science Elective....3
18

Sophomore Year

Third Semester

ME 200 Thermodynamics I 3
ME 270 Basic Mechanics I 3
ECON E201 Introduction to Microeconomics 3
MATH 261 Multivariate Calculus 4
PHYS 251 Heat, Electricity, and Optics 5
18

Fourth Semester

ME 262 Mechanical Design I....3
ME 274 Basic Mechanics II....3
ECE 204 Introduction to Electrical and Electronic Circuits 4
MATH 262 Linear Algebra and Differential Equations 4
General Education Elective 3
17

Junior Year

Fifth Semester

ME 272 Mechanics of Materials 4
ME 310 Fluid Mechanics....4
ME 330 Modeling and Analysis of Dynamic Systems....3
Statistics Elective....3
General Education Elective 3
17

Sixth Semester

ME 344 Introduction to Engineering Materials....3
ME 314 Heat and Mass Transfer....4
ME 340 Dynamic Systems and Measurements 3
ME 372 Mechanical Design II 4
General Education Elective 3
17

Senior Year

Seventh Semester

ME 414 Thermal-Fluid Systems Design....3
TCM 360 Communication in Engineering Practice 2
ME Elective....3
ME Elective....3
General Education Elective 3
14

Eighth Semester

ME 401 Engineering Ethics and Professionalism 1
ME 462 Engineering Design 4
ME 482 Control Systems Analysis and Design 3
ME Elective....3
Free Elective 3
14

Approved Science Electives

BIOL K101 Concepts of Biology 1 3
BIOL K103 Concepts of Biology 2 3
BIOL N217 Physiology 3

CHEM C106 Principles of Chemistry II 3
CHEM C310 Analytical Chemistry 3
CHEM C341 Organic Chemistry I 3
CHEM C360 Elementary Physical Chemistry 3

PHYS 330 Intermediate Electricity and Magnetism 3
PHYS 342 Modern Physics 3
PHYS 400 Physical Optics 3
PHYS 442 Quantum Mechanics 3

CSCI 240 Computing II 4
CSCI 242 Computing for Engineers 2
CSCI 265 Advanced Programming 3
CSCI 362 Data Structures 3
CSCI 300 Systems Programming 3
CSCI 414 Numerical Methods 3

MATH 510 Vector Calculus 3
MATH 511 Linear Algebra with Applications 3
MATH 520 Boundary Value Problems of Differential Equations 3
MATH 525 Introduction to Complex Analysis 3
MATH 526 Principles of Mathematical Modeling 3

Approved Statistics Electives

STAT 350 Introduction to Statistics 3
STAT 511 Statistical Methods I 3
ECE 302 Probabilistic Methods 3

Approved Mechanical Engineering Electives

ME 402 Biomechanics of the Musculoskeletal System 3
ME 418 Heating and Air-Conditioning Analysis and Design 3
ME 430 Power Engineering 3
ME 433 Principles of Turbomachinery 3
ME 446 CAD/CAM Theory and Applications 3
ME 450 Introduction to Computer-Aided Engineering 3
ME 451 Computational Methods in Thermal Sciences 3
ME 458 Composite Materials 3
ME 472 Advanced Mechanics of Materials 3
ME 474 Vibration Analysis 3
ME 491 Engineering Design Project 1-2
ME 497 Selected Topics in Mechanical Engineering 3
ME 505 Intermediate Heat Transfer 3
ME 509 Intermediate Fluid Mechanics 3
ME 510 Gas Dynamics 2
ME 525 Combustion 3
ME 550 Advanced Stress Analysis 3
ME 551 Finite Element Analysis 3
ME 552 Advanced Applications of Finite Element Methods 3

ME 558 Composite Materials 3
ME 563 Mechanical Vibrations 3
ME 569 Mechanical Behavior of Materials 3
ME 581 Numerical Methods in Mechanical Engineering 3
ME 597 Selected Topics in Mechanical Engineering 3

Other Approved Engineering Electives

ECE 264 Advanced C Programming 2
ECE 266 Digital Logic Design 3
ECE 362 Microprocessor Systems and Interfacing 4
ECE 489 Introduction to Robotics 3

Approved General Education Electives

See ME Web site: www.engr.iupui.edu/me.

Approved Free Elective

Free electives can be selected from any of the above electives (Science or ME or Other Engineering or General Education)

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.), and Master of Science in Mechanical Engineering (M.S.M.E.). Qualified students may be authorized to pursue the Ph.D. degree in mechanical engineering at IUPUI. The program leading to the Ph.D. in mechanical engineering is administered with the approval of 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 in mechanical engineering and physics departments 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.

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 plans of study previously outlined in this section. 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 and engineering management. A description of the engineering management program follows. For information about other available options, please consult faculty in the Department of Mechanical Engineering.

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 133, distributed as follows for each discipline:

1. Mathematics and Physical Sciences
   a. Calculus: **MATH 163, 164, 261,** and **262** 18
   b. Chemistry: **CHEM C105** 3
   c. Physics: **PHYS 152** and **251** 9
2. Communications and Ethics
   a. Speech: **COMM R110** 3
   b. Writing: **ENG W131** 3
   c. Communication in Engineering Practice: **TCM 360** 2
   d. Engineering Ethics and Professionalism: **ME 401** 1
3. General Education
   a. Sociology: **SOC R100** 3
   b. Psychology: **PSY B104** 3
   c. Electives 6
4. Freshman Engineering Courses
   a. Introduction to Engineering Concepts: **ENGR 195** 1
   b. Introduction to Engineering: **ENGR 196** 3
   c. Introduction to Programming Concepts: **ENGR 197** 3
5. Engineering Courses
   a. Electrical Engineering: **ECE 204**, and **266** 7
   b. General Engineering 12
   c. Mechanical Engineering: **ME 200**, **270**, **272**, **274**, and **330** 16
   d. Materials: **ME 344** 3
6. Economics: **ECON E201**, **E202**, and **E270** 9
7. Business
   a. Accounting: **BUS A100**, **A201**, and **A202** 7
   b. Business Law: **BUS L203** 3
   c. Finance: **BUS F301** 3
   d. Management: **BUS Z302** 3
   e. Marketing: **BUS M301** 3
   f. Operations and System Management: **BUS P301** and **BUS P490** 6
   g. Computer: **BUS K201** 3

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Freshman Year

First Semester

ENGR 195 Introduction to the Engineering Profession 1
ENGR 196 Introduction to Engineering 3
CHEM 105 Chemical Science I 3
COMM R110 Fundamentals of Speech Communication 3
MATH 163 Integrated Calculus and Analytic Geometry I 5
15

Second Semester

ENGR 197 Introduction to Programming Concepts 3
ENG W131 Elementary Composition I 3
MATH 164 Integrated Calculus and Analytic Geometry II 5
PHYS 152 Mechanics 4
PSY B104 Psychology as a Social Science 3
18

Sophomore Year

Third Semester

ECE 201 Linear Circuit Analysis I 3
ECON E201 Introduction to Microeconomics 3
MATH 261 Multivariate Calculus 4
PHYS 251 Heat, Electricity, and Optics 5
BUS A100 Basic Accounting Skills 1
16

Fourth Semester

ME 270 Basic Mechanics I 3
ECE 207 Electronic Measurement Techniques....1
BUS A201 Introduction to Financial Accounting....3
BUS L203 Commercial Law I....3
ECON E202 Introduction to Macroeconomics....3
MATH 262 Linear Algebra and Differential Equations 4
17

Junior Year

Fifth Semester

ME 200 Thermodynamics I 3
ME 274 Basic Mechanics II....3
ECE 266 Digital Logic Design 3
BUS A202 Introduction to Managerial Accounting 3
ECON E270 Introduction to Statistical Theory in Economics....3
BUS K201 The Computer in Business....3
18

Sixth Semester

ME 272 Mechanics of Materials 4
ME 330 Modeling and Analysis of Dynamic Systems....3
TCM 360 Communication in Engineering Practice 2
SOC R100 Introduction to Sociology....3
Engineering Elective 3
15

Senior Year

Seventh Semester

BUS F301 Financial Management....3
BUS M301 Introduction to Marketing 3
BUS P301 Operations Management....3
Engineering Electives....6
General Education Elective 3
18

Eighth Semester

ME 401 Engineering Ethics and Professionalism....1
ME 344 Introduction to Engineering Materials 3
BUS Z302 Managing and Behavior in Organizations 3
BUS P490 Independent Study in Operations Management....3
General Education Elective 3
Engineering Elective 3
16

Engineering Course Descriptions

Key to Course Descriptions

The courses listed in this section will, for the most part, be offered during the 2004-06 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 202 Linear Circuit Analysis II (3 cr.) Class 3. P: 201. P or C: MATH 262. 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 trees, general loop and nodal equations, matrix formulations.

This listing indicates that the course number is ECE 202 with the title "Linear Circuit Analysis II" (a continuation of ECE 201). 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 202) is ECE 201. Another prerequisite or corequisite (i.e., a course that must be completed at the same time as ECE 202, if not sooner) is MATH 262. A brief course description then follows.

Please refer to the bulletin of the Purdue University Graduate School for descriptions of graduate courses not appearing in the following lists.

Electrical and Computer Engineering (ECE)

ECE 201 Linear Circuit Analysis I (3 cr.) Class 3. P or C: MATH 261 and PHYS 251. Recommended C: 207. 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 202 Linear Circuit Analysis II (3 cr.) Class 3. P: 201. P or C: MATH 262. 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 207 Electronic Measurement Techniques (1 cr.) Lab 3. P or C: 201. 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 208 Electronic Devices and Design Laboratory (1 cr.) Lab 3. P: 207. C: 255. 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 255 Introduction to Electronics Analysis and Design (3 cr.) Class 3. P: 201. Recommended C: 208. 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 264 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 270 Digital Logic Design (4 cr.) Class 3, Lab 1. P: 207 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 301 Signals and Systems (3 cr.) Class 3. P: 202 and MATH 262. 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 302 Probabilistic Methods in Electrical Engineering (3 cr.) Class 3. P or C: 301. An introductory treatment of probability theory, including distribution and density functions, moments, and random variables. Applications of normal and exponential distributions. Estimation of means and variances. Introduction to random processes, correlation functions, spectral density functions, and response of linear systems to random inputs.

ECE 305 Semiconductor Devices (3 cr.) Class 3. P: 255, MATH 262, and PHYS 251. Materials- and phenomena-based examination of devices, emphasizing the how and why of solid-state device operation.

ECE 311 Electric and Magnetic Fields (3 cr.) Class 3. P: MATH 262 and PHYS 251. 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 321 Principles of Electromechanical Energy Conversion (3 cr.) Class 3. P: ECE 202. C: ECE 311. 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 340 Simulation, Modeling, and Identification (3 cr.) Class 2, Lab 3. P: 207 and 301. 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 359 Data Structures (3 cr.) Class 3. P: ENGR 197. 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 362 Microprocessor Systems and Interfacing (4 cr.) Class 3, Lab 3. P: 266, 267, and ENGR 197. 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 365 Introduction to the Design of Digital Computers (3 cr.) Class 3. P: 362. 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 369 Discrete Mathematics for Computer Engineering (3 cr.) Class 3. P: 266. 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 382 Feedback System Analysis and Design (3 cr.) Class 3. P: 301 or ME 330 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 400 Electrical Engineering Undergraduate Seminar (1 cr.) Class 2. P: senior standing in electrical engineering. A lecture-demonstration series on electrical and electronic devices, procedures, systems, and career topics.

ECE 401 Engineering Ethics and Professionalism (1 cr.) Class 1. P: senior standing. Some ethical, social, political, legal, and ecological issues that practicing engineers may encounter. (401 and ME 401 are cross-listed courses; students will not get credit for both 401 and ME 401.)

ECE 410 Introduction to Digital Signal Processing (3 cr.) Class 2, Lab 3. P: 301. P or C: 362. 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 411 Advanced Techniques in Digital Signal Processing (3 cr.) Class 2, Recitation 2. P: 302. P or C: 410. Theory and algorithms for processing stochastic signals. Review of discrete-time transforms and stochastic process. Introduction to optimum and adaptive filtering, and to classical and modern spectral analysis.

ECE 417 Multimedia Applications (3 cr.) Class 3. P: 301 and 365. 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 427 Semiconductor Power Electronics (3 cr.) Class 2, Lab 3. P: 255 and 301. Introduction to power semiconductor devices, characteristics, and ratings. Emphasis on analysis and design of circuits with power semiconductors and associated devices. Power rectification, inversion, AC-to-AC power control, firing circuits, and microcomputer control of power circuits.

ECE 440 Transmission of Information (4 cr.) Class 3, Lab 3. P: 301 and 302. 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 455 Integrated Circuit Engineering (3 cr.) Class 3. P: 202 and 255. Recommended P or C: 305. Analysis, design, and fabrication of silicon, thin-film, and thick-film integrated circuits. Consideration of circuit design, layout, and fabrication techniques for integrated circuits. Circuit simulation studies aided by SPICE II software system. Integrated operational amplifiers and logic gates (T2L, I2L, MOS, and CMOS).

ECE 456 Advanced Integrated Circuit Engineering (3 cr.) Class 3. P: 455. A continuation of 455, with similar topics treated in greater depth. Additional material on epitaxy, sputtering, diffusion schedules, DMOS, VMOS, SOS, FET op-amps, Gummel-Poon models, threshold logic, flip-flops, and semiconductor memories is included. SPICE II simulations using macro models.

ECE 468 Introduction to Compilers and Translation Engineering (3 cr.) Class 3. P: 359, 362, and 365. 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 469 Operating Systems Engineering (3 cr.) Class 3. P: 359 and 365. Design and construction of modern operating systems. Basic process concepts in multiprogrammed computer systems, including concurrency, scheduling, resource sharing, synchronization, deadlock, mutual exclusion, and protection. The engineering of operating systems involving detailed examination and modification of an existing operating system, UNIX. Presentation of analytic modeling and performance evaluation techniques. Case studies of existing operating systems. A substantial part of the course involves projects, centered on modification of UNIX, that support concepts of OS design and construction, including primary and secondary storage management, file systems, I/O subsystems, CPU scheduling, and disk scheduling.

ECE 471 Embedded Microcontroller, Microprocessor, and DSP-Based Systems (3 cr.) Class 3. P: 362 and ENGR 197. 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 483 Digital Control System Analysis and Design (3 cr.) Class 3. P: 382. 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 489 Introduction to Robotics (3 cr.) Class 3. P or C: 382. 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 491 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 492 Senior Design (3 cr.) Class 1, Lab 5. P: senior standing and consent of department chair. General design methodology, consideration of alternative solutions, and project planning in design. Influence of safety, reliability, economics, and aesthetics on design of engineering systems. Interpretation of specifications and requests for proposals. Early in the course, teams of students will be assigned a major design problem that will be the focus throughout the course. Oral presentation and report writing required.

ECE 495 Selected Topics in Electrical Engineering (1-4 cr.) Engineering topics.

ECE 496 Electrical Engineering Projects P: consent of instructor. Hours and credits to be arranged.

ECE 522 Problems in the Measurement of Physiological Events (3 cr.) Class 3. P: consent of instructor. Lectures devoted to the methods used to measure physiological events with demonstrations and laboratory exercises to emphasize the practical aspects of quantitative measurements on living subjects. The systems covered are cardiovascular, respiratory, central and peripheral nervous, gastrointestinal, and renal.

ECE 536 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 537 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 538 Digital Signal Processing I (3 cr.) Class 3. P: 301 and 302 or equivalent. Theory and algorithms for processing of determinatic 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 544 Digital Communications (3 cr.) Class 3. P: 440 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 546 Digital Computational Techniques for Electronic Circuits (3 cr.) Class 3. P: 255 and 301 or graduate standing. Digital computer methods for DC, AC, and transient analysis of electronic circuits. Linear, nonlinear, and piecewise linear dynamic circuits. Actual usage of programs ECAP, SPICE, CORNAP, and SNAP in course work along with study of algorithms used in these programs.

ECE 547 Introduction to Computer Communication Networks (3 cr.) Class 3. P: 302 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 554 Electronic Instrumentation and Control Circuits (3 cr.) Class 3. P: 255 and 301 or graduate standing. Analysis and design of special amplifiers, pulse circuits, operational circuits, DC amplifiers, and transducers used in instrumentation, control, and computation.

ECE 559 MOS VLSI Design (3 cr.) Class 3. P: 305 and 365. 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 563 Programming Parallel Machines (3 cr.) Class 3. P: 264 and 463. 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 565 Computer Architecture (3 cr.) Class 3. P: 365 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 566 CISC Microprocessor System Design (3 cr.) Class 3. P: 365 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 569 Introduction to Robotic Systems (3 cr.) Class 3. P: 382. 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 570 Artificial Intelligence (3 cr.) Class 3. P: 359 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 574 Software Engineering Methodology (3 cr.) Class 3. P: 359 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 580 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 595 Selected Topics in Electrical Engineering Hours and credits to be arranged.

ECE 600 Random Variables and Signals (3 cr.) Class 3. P: 440 or 483 or 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 602 Lumped System Theory (3 cr.) Class 3. P: 301. 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 604 Electromagnetic Field Theory (3 cr.) Class 3. P: 311 or graduate standing. Review of general concepts (Maxwell's equations, materials interaction, boundary conditions, energy flow); statics (Laplace's equation, Poisson's equation); distributed parameter systems (classification of solutions, transmission lines, and waveguides); radiation and antennas (arrays, reciprocity, Huygen's principle); a selected special topic (e.g., magnetostatics, waves in anisotropic media, and optical fibers).

ECE 606 Solid-State Devices (3 cr.) Class 3. P: 305, graduate standing, or consent of instructor. A relatively broad, moderate-depth coverage of semiconductor devices and related topics. Semiconductor fundamentals required in the operational analysis of solid-state devices; detailed examination of the positive-negative (PN) junction diode and PN junction devices; heterojunction surface devices including Schottky diode, the MOS capacitor, and the MOSFET.

ECE 608 Computational Models and Methods (3 cr.) Class 3. P: 359 or equivalent or consent of instructor. 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 637 Digital Image Processing I (3 cr.) Class 3. P: 302 and 538, 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 645 Estimation Theory (3 cr.) Class 3. P: 600. 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 649 Speech Processing by Computer (3 cr.) Class 3. P: 301 (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 668 Introduction to Artificial Intelligence (3 cr.) Class 3. P: 600 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 680 Modern Automatic Control (3 cr.) Class 3. P: 602 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 696 Advanced Electrical Engineering Projects (cr. var.) 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 698 Research (M.S. thesis) (1-6 cr.) Research for M.S. thesis.

ECE Internship and Cooperative Education Programs

For the Co-operative Education (C) and Internship (I) programs and courses below, students should consult the Office of Student Placement Services at (317) 278-1000.

ECE C199, C299, C399, C494 and C499 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 I199, I299, I399, I494, I499 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.

Freshman Engineering (ENGR)

ENGR 195 Selected Topics in Engineering I (0-3 cr.) Selected topics in general or interdisciplinary engineering.

ENGR 195 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 196 Introduction to Engineering (3 cr.) Class 2, Lab 2. C: MATH 154 or 159 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 197 Introduction to Programming Concepts (3 cr.) Class 2, Lab 2. C: MATH 163. 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, subroutines, arrays, and elementary concepts in mathematical programming. Examples, homework, and applications of programming concepts make extensive use of Matlab and the C programming language.

Mechanical Engineering (ME)

ME 200 Thermodynamics I (3 cr.) Class 3. P: PHYS 152. C: MATH 261. First and second laws, entropy, reversible and irreversible processes, properties of pure substances. Application to engineering problems.

ME 262 Mechanical Design I (3 cr.) Class 2, Lab 2. P: 270 and ENGR 197. C: 274. 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 270 Basic Mechanics I (3 cr.) Class 3. P: PHYS 152. P or C: MATH 261. 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 272 Mechanics of Materials (4 cr.) Class 3, Lab 2. P: 270 or equivalent. Analysis of stress and strain; equations of equilibrium and compatibility; stress/strain laws; extension, torsion, and bending of bars; membrane theory of pressure vessels; elastic stability; selected topics. Experiments include testing of mechanical properties and failure analysis.

ME 274 Basic Mechanics II (3 cr.) Class 3. P: 270. P or C: MATH 262. 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 310 Fluid Mechanics (4 cr.) Class 3, Lab 2. P: 200 and 274. 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 314 Heat and Mass Transfer (4 cr.) Class 3, Lab 2. P: 310. Fundamental principles of heat transfer by conduction, convection, and radiation; mass transfer by diffusion and convection. Application to engineering situations.

ME 330 Modeling and Analysis of Dynamic Systems (3 cr.) Class 3. P: ECE 201 and MATH 262. Introduction to dynamic engineering systems; electrical, mechanical, fluid, and thermal components; linear system response; Fourier series and Laplace transform.

ME 340 Dynamic Systems and Measurements (3 cr.) Class 2, Lab 2. P: 330. 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 344 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 372 Mechanical Design II (4 cr.) Class 3, Lab 2. P: 262, 272, and 274. 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 401 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 402 Biomechanics of the Musculoskeletal System (3 cr.) Class 3. P: 272. 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 414 Thermal-Fluid Systems Design (3 cr.) Class 3. P: 262 and 310. C: 314. 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 418 Heating and Air-Conditioning Analysis and Design (3 cr.) Class 3. P: 314. Psychometrics, air-conditioning systems, equipment selection, duct design, and piping design. Heating and cooling loads, solar radiation, and heat transmission in buildings. Heat pumps. Application of air-conditioning to residences, computer rooms, light commercial, and high-rise buildings.

ME 430 Power Engineering (3 cr.) Class 3. P: 200. 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 433 Principles of Turbomachinery (3 cr.) Class 3. P: 200 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 446 CAD/CAM Theory and Application (3 cr.) Class 2, Lab 2, P: 262, ENGR 196, and ENGR 197, 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 450 Introduction to Computer-Aided Engineering (3 cr.) Class 3. P: 262 and 272. 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 451 Computational Methods in Thermal Sciences (3 cr.) Class 3. P: 314 and 330. Mathematical description of heat transfer and fluid flow problems, discretization methods, heat convection, convection and diffusion, incompressible flows, high speed flow.

ME 458 Composite Materials (3 cr.) Class 3. P: 272. 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 462 Engineering Design (4 cr.) Class 3, Recitation 2. P: 344 and 372. C: 314. Concurrent engineering design concept is introduced. Application of the design is emphasized. Design problems from all areas of mechanical engineering are considered.

ME 472 Advanced Mechanics of Materials (3 cr.) Class 3. P: 272 and MATH 262. 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 472 and 550.

ME 474 Vibration Analysis (3 cr.) Class 3. P: 272, 274, and 330. 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 482 Control System Analysis and Design (3 cr.) Class 3. P: 330 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 484 Engineering Industrial Practice IV (1-5 cr.) P: consent of the co-op advisor. For engineering students on cooperative assignment only.

ME 491 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 497 Selected Topics in Mechanical Engineering Hours and credits to be arranged.

ME 500 Advanced Thermodynamics (3 cr.) Class 3. P: 301. 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 505 Intermediate Heat Transfer (3 cr.) Class 3. P: 315. 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 506 Two-Phase Flow and Heat Transfer (3 cr.) Class 3. P: 314. Basic two-phase flow equations, homogeneous model, drift-flux model, flow regimes, pressure drop in two-phase flow. Nucleation and bubble dynamics, pool boiling, subcooled boiling, forced convection boiling, critical heat flux in pool boiling, critical heat flux in forced convection boiling, minimum heat flux, film boiling, post dryout heat transfer. Flow instabilities, choking in two-phase flow, film and dropwise condensation. Applications to heat exchangers. Special boiling and two-phase flow problems.

ME 509 Intermediate Fluid Mechanics (3 cr.) Class 3. P: 310 or equivalent. Fluid properties, basic laws for a control volume, kinematics of fluid flow, dynamics of frictionless incompressible flow, basic hydrodynamics, equations of motion of viscous flow, viscous flow applications, boundary layer theory, wall turbulence, and lift and drag of immersed bodies.

ME 510 Gas Dynamics (3 cr.) Class 3. P: 310. 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 525 Combustion (3 cr.) Class 3. P: 310 and CHEM C105. 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 550 Advanced Stress Analysis (3 cr.) Class 3. P: 272 and MATH 262. 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 551 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 552 Advanced Applications of Finite Element Method (3 cr.) Class 3. P: 551 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 558 Composite Materials (3 cr.) Class 3. P: 272. 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 560 Kinematics (3 cr.) Class 3. P: 372. 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 562 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 563 Mechanical Vibrations (3 cr.) Sem. 1. Class 3. P: 272 and 340 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 569 Mechanical Behavior of Materials (3 cr.) Class 3. P: 344 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 572 Analysis and Design of Robotic Manipulators (3 cr.) Class 3. P: 372. Introduction to the analysis and design of robotic manipulators. Kinematic configurations, forward and inverse position solutions, velocity and acceleration, path planning, offline programming, force and torque solutions, rigid body dynamics, motors and actuators, robot design, sensors and controls, computer simulation, and graphical animation.

ME 575 Theory and Design of Control Systems (3 cr.) Class 3. P: consent of instructor. Modern control techniques, state space representations, performance evaluation, controllability, observability, and observer design are introduced. The Bond graph is developed as a versatile computer-aided method of modeling coupled systems.

ME 581 Numerical Methods in Mechanical Engineering (3 cr.) Class 3. P: 314, 372, and ENGR 197 or its equivalent. 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 582 Thermal Stress Analysis (3 cr.) Offered in alternate years. Class 3. P: 272 and 314 or equivalent, ordinary differential equations, or consent of instructor. Methods for determining the deformations and stresses due to temperature changes in materials. Fundamentals of thermoelasticity. Solutions to two-dimensional thermoelastic problems. Thermal stresses in beams and plates. Thermoelastic buckling. Introduction to thermoviscoelasticity, thermal fracture, and fatigue. Applications to dissimilar materials such as ceramic coatings, glass-metal bonds, and composites.

ME 597 Advanced Mechanical Engineering Projects I (1-6 cr.) Sem. 1 and 2. Summer Session. (May be repeated for credit). P: master's standing. Projects or special topics of contemporary importance or of special interest that are outside the scope of the standard graduate curriculum can be studied under the Mechanical Engineering Projects courses. Interested students should seek a faculty advisor by meeting with individual faculty members who work in their area of special interest and then prepare a brief description of the work to be undertaken in cooperation with the advisor.

ME 614 Computational Fluid Dynamics (3 cr.) Class 3. P: 581 or AAE 516 or equivalent; 509 or 510

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 697 Advanced Mechanical Engineering Projects II (1-6 cr.) Sem 1 and 2. Summer Session. (May be repeated for credit.) Projects or special topics of contemporary importance or of special interest that are outside the scope of the standard graduate curriculum can be studied under the Mechanical Engineering Projects course. Interested students should seek a faculty advisor by meeting with individual faculty members who work in their area of special interest and then prepare a brief description of the work to be undertaken in cooperation with the advisor.

ME 698 Research (M.S. Thesis) (1-5 cr.) Research credit for students in M.S. thesis option.

ME Employment Enrichment Programs

For the Co-operative Education (C) and Internship (I) programs and courses below, students should consult the Office of Student Placement Services at (317) 278-1000.

ME C184, C284, C384, C483, and C484 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 preparedness for an intended career with a business, industry, or government agency. A comprehensive written report on the internship practice is required.

ME I184, I284, I384, I483, and I484 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.

Technology 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:

Program	Administered by
Architectural Technology	Department of Construction Technology
Biomedical Electronics	Department of Electrical and Computer Engineering Technology
Civil Engineering	Department of Construction Technology
Computer Engineering Technology	Department of Electrical and Computer Engineering Technology
Computer Graphics	Department of Mechanical Engineering Technology
Computer Integrated Manufacturing Technology	Department of Mechanical Engineering Technology
Computer Technology	Department of Computer and Information Technology
Electrical Engineering Technology	Department of Electrical and Computer Engineering Technology
Electronics Manufacturing	Department of Mechanical Engineering Technology
Interior Design	Department of Construction Technology
Mechanical Engineering Technology	Department of Mechanical Engineering Technology
Organizational Leadership and Supervision	Department of Organizational Leadership and Supervision

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:

Program	Administered by
Computer Engineering Technology	Department of Electrical and Computer Engineering Technology
Computer Engineering Technology	Department of Electrical and Computer Engineering Technology
Computer Graphics	Department of Mechanical Engineering Technology
Computer Integrated Manufacturing Technology	Department of Mechanical Engineering Technology
Computer Technology	Department of Computer and Information Technology
Construction Technology	Department of Construction Technology
Electrical Engineering Technology	Department of Electrical and Computer Engineering Technology
Mechanical Engineering Technology	Department of Mechanical Engineering Technology
Organizational Leadership and Supervision	Department of Organizational Leadership and Supervision

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

Technology Plans of Study

Semester-by-semester plans of study follow for the technology programs available in the school. These plans generally reflect the order in which courses are offered. In each plan, departmental courses are listed first, followed by courses outside the department or school that are required or recommended. Technology courses are described in the section "Technology Course Descriptions" in this bulletin.

In some technology plans of study, the word "selective" is used. This term refers to a course chosen from a list of particular courses recommended by the departments in a given area or subject. Students should get in touch with their faculty advisors for information about permissible electives or selectives.

Department of Computer and Information Technology (CIT)

Professors Ho *(Chair),* Jafari, McRobbie, Orr

Associate Professors Fernandez, Price, Williamson

Assistant Professors Starks

Clinical Assistant Professor Sullivan *(Director, CIT Online)*

Lecturers Catlin, Clark, Stevens, Watson

The Department of Computer and Information Technology (CIT) offers programs at both the associate and bachelor's degree levels. These programs are designed to provide an applications-oriented, practical education that prepares students for careers as systems analysts (people who design, install, and evaluate information systems); commercial and technical programmer/analysts (people who design, write, and maintain programs for a variety of applications); Web specialists (people who design, create and maintain Web sites); and network systems specialists (people who select, specify, and maintain the networking needs of a company).

The Purdue University Associate of Science degree in computer technology at IUPUI features one four-semester option designed to prepare graduates to work in commercial, Web-oriented, or technical areas. Students may choose to continue their education, rather than entering the job market, upon completion of their associate degree option. Others may return to college after a period of time in practical employment. Purdue University at IUPUI offers the educational opportunities of a B.S. degree to both types of students.

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 Technology (CIT) courses over 10 years old may have to be repeated. Students should check with a CIT advisor.

Purdue's Bachelor of Science degree in computer technology is available in four tracks: a standard track with selected concentrations to be determined by student and advisor, a business track that also earns a minor from the Indiana University Kelley School of Business, a Web development track with a concentration in Web-based applications, and a networking track with a concentration on the design and administration of network systems.

The Department of Computer and Information Technology has been a leader in offering degree courses that can be completed by distance education. Selected courses may be taken either partially or completely via the Web.

The department offers a minor in computer technology to students majoring in other areas of study at IUPUI. The computer technology minor provides a basic set of computer concepts and programming courses along with a sequence of computing specialty courses.

The department also offers two 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. The E-Commerce Development Certificate is targeted to individuals who already have some application development experience but in a non-Web environment. This six-course program focuses on advanced techniques for building data-driven e-commerce applications including Web-based programming and development techniques.

For more information, visit our Web site at cit.iupui.edu or contact the Department of Computer and Information Technology at (317) 274-9705 or cit@iupui.edu.

Associate of Science in Computer Technology

The commercial option of the A.S. degree program features a business-oriented approach to computer information systems. Students take basic computing courses covering programming, systems analysis, data communications, operating systems, databases, and current technology. Coupled with these computing courses are courses in interpersonal communications, business and technology, and general education. Graduates of this program option can apply their educational credits toward the B.S. degree, or they can enter the workforce directly. The A.S. commercial option is designed to provide the fundamental requirements for all four tracks of the B.S. in Computer Technology.

Associate of Science in Computer Technology

Program Plan of Study by Semester

Freshman Year

First Semester

Prerequisite Knowledge: **CIT 106** Using a Personal Computer, or its equivalent

CIT 115 Computer Information Systems Fundamentals	3
CIT 120 Quantitative Analysis I	3
ENG W131 Elementary Composition I	3
MATH 151 Algebra and Trigonometry	5
	14

Second Semester

CIT 140 Programming Constructs Laboratory[1]	3
CIT 223 Web Page Design	3
CIT 288 Using a Database Management System	3
BUS X100 Small Business Administration **or** **IET 104** Industrial Organization **or** **OLS 252** Human Behavior in Organizations[2,6]	3
COMM R110 Fundamentals of Speech Communication	3
	15

Sophomore Year

Third Semester

CIT 220 Quantitative Analysis II	3
CIT 233 Hardware/Software Architecture	3
CIT 262 Problem Solving and Programming **or** **CIT 270** Java Programming I **or CIT 242** ASP.NET[2,3]	3
CIT 254 Analysis and Design	3
TCM 220 Technical Report Writing	
	15

Fourth Semester

CIT 286 Operating Systems and Administration	3
CIT 307 Data Communications	4
CIT Selective[4]	3
BUS/OLS Elective **or** **IET 350** Engineering Economy **or** **NEWM N250** Team Building in Technology[5]	3
Free Elective (may substitute CIT 106 here)	3
	16

Total: 60-61 Credit Hours

Bachelor of Science in Computer Technology

General Requirements

1. Completion of the requirements for the Associate of Science degree in computer technology or an equivalent degree.
2. Completion of the core requirements of a selected track. The required minimum of 120 credit hours (depending on the selected track) includes credits earned within the A.S. degree. See the following summary table of the core requirements of selected tracks for more specifics concerning requirements and courses.
3. 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.

Core Requirements

The bachelor's degree core requirements are fulfilled by meeting all of the requirements of a selected track. Three tracks are available for a student to select: a standard track with selected concentrations, a business track that also earns a minor from the IU Kelley School of Business, a Web development track with a concentration in Web-based applications, and a networking track with a concentration on the design and administration of network systems.

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[1] Must be completed with a grade of C or higher.

[2] A student who plans to continue into the business track of the B.S. degree must take BUS A200.

[3] A student who plans to continue into the Web development track must take CIT 270.

[4] A student who plans to continue into the Web development track must take CIT 242. A student who plans to continue into the networking track must take CIT 317.

[5] A student who plans to continue into the business track of the B.S. degree must take BUS L203.

[6] A student who plans to continue into the networking track may take a free elective.

Core Requirements for Bachelor of Science Computer Technology

Track	Standard	Business	Web Development	Networking
Core Requirements (minimum of 39 credit hours at upper level)	120 credit hours	120 credit hours	120 credit hours	120 credit hours
General Education				
Communications [composition, speech, and report writing]	12	12	12	12
Humanities [creative arts, history, literature, religion, folklore, art appreciation, theatre, music, anthropology, philosophy, and languages]	3-6	3-6	3-6	3-6
Social Sciences [anthropology, economics, political science, psychology, sociology, and selected geography courses]	3-6	3-6	3-6	3-6
Mathematics/Science Science electives may come from chemistry, geology, physics, and life sciences; however, a laboratory must be associated with the course.	21	18	21	21
Business/Supervision	6	18	9	3
Upper Level Technical Science, Specialty, Design	29	27	29	27
Lower Level Technical Science, Specialty, Design	31	31	31	31
Electrical and Computer Engineering Technology Courses	None	None	None	8
Electives	12	5	9	9
Free Electives Students are strongly encouraged to select their electives from areas outside of CIT. The use of CIT courses as electives is allowed only with prior advisor approval.				

Specific Track Programs by Content Area—Junior and Senior Years

Standard Track

Mathematics/Science

MATH 221 Calculus for Technology I **or**
MATH M119 A Brief Survey of Calculus 3
MATH 222 Calculus for Technology II **or**
CIT 320 Quantitative Analysis III 3
Science Elective[1].....4
10

Technical Science, Specialty, Design

300-level Programming Language 3
CIT 336 Data Communications Lab 2
CIT Selectives (300/400 level).....18
CIT Selectives (any level) **or**
CGT 451 Multimedia Authoring II 6
29

Communications, Humanities, and Social Sciences

Upper-Level Technical Communications Elective.....3
Humanities Elective 3-6
Social Science Electives 3-6
12

Free Electives 9

Business Track

Mathematics/Science

MATH 119 Brief Survey of Calculus I.....3
Science Elective[1] 4
7

Technical Science, Specialty, Design

300-Level Programming Language.....3
CIT 336 Data Communications Lab 2
CIT 352 Decision Support and Information Systems.....3
CIT 374 Systems and Database Analysis.....4
CIT 384 Systems Design 3
CIT 410 Information Technology Ethics and Leadership.....3
CIT 484 Systems Analysis and Design Project 3
CIT Selectives (any level) **or**
CGT 451 Multimedia Authoring II 6
27

Communications, Humanities, and Social Sciences

Upper-Level Technical Communications Elective.....3
Humanities Elective 3-6
Social Science Electives 3-6
12

Business Minor Requirements

BUS F300 Introduction to Financial Management.....3
BUS M300 Introduction to Marketing Management.....3
BUS P300 Introduction to Operations Management.....3
BUS D301 International Business **or**
BUS Z302 Managing and Behavior in Organizations 3
12

Free Electives 2

[1] Science electives may come from chemistry, geology, physics, and life sciences; however, they must have a laboratory associated with the course.

Web Development

Mathematics/Science

MATH 221 Calculus for Technology I **or**
MATH M119 A Brief Survey of Calculus.....3
MATH 222 Calculus for Technology II **or**
CIT 320 Quantitative Analysis III 3
Science Elective[1] 4
10

Technical Science, Specialty, Design

CIT 312 Advanced Web Site Design 3
CIT 336 Data Communications Lab 2
CIT 329 Java Server Programming or
CIT 347 Advanced ASP.NET Programming 3
CIT 323 Multimedia 3
CIT 412 XML-Based Web Applications.....3
CIT 415 Advanced Network Administration 3
CIT 436 Advanced E-Commerce Development.....3
CIT 479 Database Implementation and
Administration.....3
CIT Selectives (any level) **or**
CGT 451 Multimedia Authoring II 6
29

Communications, Humanities, and Social Sciences

Upper-Level Technical Communications Elective.....3
Humanities Elective 3-6
Social Science Electives 3-6
12

BUS/OLS 300-level selective 3

Free Electives.....6

Networking Track

Mathematics/Science

MATH 221 Calculus for Technology I **or**
MATH M119 A Brief Survey of Calculus.....3
MATH 222 Calculus for Technology II **or**
CIT 320 Quantitative Analysis III 3
Science Elective[1].....4
10

Technical Science, Specialty, Design

300-level Programming Language 3
CIT 303 Communications Security and
Network Controls.....3
CIT 402 Design and Implementation of LANs 3
CIT 440 Communications Network Design 3
CIT 415 Advanced Network Administration 3
CIT 406 Advanced Network Security.....3
CIT 426 Enterprise Networks 3
CIT Selectives (any level) **or**
CGT 451 Multimedia Authoring II 6
27

Communications, Humanities, and Social Sciences

Upper-Level Technical Communications Elective.....3
Humanities Elective 3-6
Social Science Electives 3-6
12

ECET Requirements

ECET 309 Advanced Embedded Microcontrollers **or**
ECET 403 Data-Communications and
Telecommunications.....4
ECET 434 PC Systems II 4
8

Free Elective 3

Upper-Level Courses

CIT 303 Communications Security and Network
Controls.....3
CIT 307 Data Communications 3
CIT 312 Advanced Web Site Design 3
CIT 313 Commercial Web Site Development 3
CIT 315 Introduction to Multimedia
Programming 3
CIT 316 Introduction to Virtual Reality.....3
CIT 317 Systems and Networks Administration.....3
CIT 320 Quantitative Analysis III 3
CIT 323 Multimedia 3
CIT 325 Human-Computer Interaction 3
CIT 329 Java Server Programming 3
CIT 336 Data Communications Lab 3
CIT 347 Advanced ASP.Net Programming.....3
CIT 352 Decision Support and Information
Systems 3
CIT 362 Object Oriented Programming 3
CIT 374 Systems and Database Analysis 4
CIT 384 Systems Design 3
CIT 388 Topics in Programming Languages 3
CIT 402 Design and Implementation of
Local Area Networks 3
CIT 407 Fundamentals of Intelligent Agents.....3
CIT 410 IT Ethics and Leadership 3
CIT 412 XML-Based Web Applications.....3
CIT 419 Streaming Media Technology Design.....3
CIT 423 Electronic Commerce 3
CIT 426 Enterprise Networks 3
CIT 436 Advanced E-Commerce Development.....3
CIT 440 Communication Network Design 3
CIT 479 Database Physical Design and
Implementation 3
CIT 484 Systems Analysis and Design Project 3
CIT 490 Senior Project 1-4
CIT 499 Computer Technology 1-4

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.

[1] Science electives may come from chemistry, geology, physics, and life sciences; however, they must have a laboratory associated with the course.

The computer technology minor's core requirements (12 credit hours):

CIT 115 Computer Information Systems
Fundamentals **or**
BUS S302 Management Information Systems.....3
CIT 223 Web Page Design 3
CIT 140 Programming Constructs Laboratory 3
CIT 262 Problem Solving and Programming **or**
CIT 270 Java Programming I **or**
CIT 242 Intro to ASP.Net Programming.....3

Prior to continuing into the specialty sequences, a student must have:

(a) attained the mathematics and computer literacy ability that would be evidenced by college-level courses,

(b) completed the above computer technology minor's core requirements,

(c) completed 30 credit hours toward his or her major,

(d) 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:

Systems and database development (9-10 cr.)
CIT 288 Using a Database Management System
CIT 254 Analysis and Design **or**
BUS A337 Computer Based Accounting Systems Analysis
CIT 374 Systems and Database **or**
CIT 325 Human-Computer Interaction

Multimedia (9 cr.)
CIT 323 Multimedia
CIT 419 Streaming Media Technology Design
CGT 451 Multimedia Authoring II

Network systems (9 cr.)
CIT 307 Data Communications (4 cr.)
CIT 336 Data Communications Lab (2 cr.)
CIT 402 Design and Implementation of Local Area Networks or
CIT 440 Communications Network Design or
CIT 303 Communications Security and Network Controls

Web technologies (9 cr.)
CIT 214 Web Data Management
CIT 213 Web-Based Analysis and Design
CIT 312 Advanced Web Site Design **or**
CIT 423 Electronic Commerce

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 112 Information Technology Fundamentals 3
CIT 212 Web Site Design 3
CIT 213 Web-Based Analysis and Design 3
CIT 214 Web Data Management 3
CIT 215 Web Programming.....3
CIT 313 Commercial Web Site Development.....3
18

E-Commerce Development Certificate

The E-Commerce Development Certificate requires the completion of 18 credit hours. All of the courses are offered over the Web. The program covers advanced Web techniques in an e-commerce environment.

The E-Commerce Development Certificate requirements are:

CIT 213 Web-Based Analysis and Design 3
CIT 312 Advanced Web Site Design 3
CIT 412 XML-Based Web Applications 3
Web Programming (two-course sequence):
Java Thread
CIT 270 Introduction to Java 3
CIT 329 Java Server Programming 3
or
ASP.Net Thread
CIT 242 Introduction to ASP.Net 3
CIT 347 Advanced ASP.Net.....3
CIT 436 Advanced E-Commerce Development 3

Department of Construction Technology (CNT)

Professor Sener *(Chair)*

Assistant Professors Coles, Cowan, Cyr, Kim, Kinsey

Lecturers Lucas, McLaughlin

Adjunct Faculty Best, Fenske, Zody

Coordinator of Interior Design Shiel

The Department of Construction Technology (CNT) offers three Associate of Science (A.S.) degree programs: one in Architectural Technology, one in Civil Engineering Technology, and one in Interior Design. Upon satisfactory completion of an A.S. degree in either of the Architectural Technology or Civil Engineering Technology programs, students may continue to obtain the degree of Bachelor of Science (B.S.) with a major in Construction Technology. For their B.S. degree studies in Construction Technology, students follow the track in Construction Management. Students in all the above degree programs/majors may apply to enter the co-op or internship work programs following their freshman year.

For more information, contact the Department of Construction Technology at (317) 274-2413 or et_cnt@iupui.edu.

Associate of Science in Architectural Technology (ART)

Accredited by the Technology Accreditation Commission of the Accreditation Board of Engineering and Technology, Inc. (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700.

The Architectural Technology (ART) curriculum is a two-year Associate of Science (A.S.) degree program designed to provide students with the skills necessary to work in the areas of architectural drafting, detailing and presentation, simple structural design, helping architect and engineers, helping mechanical and electrical contractors and builders, architectural planning, construction materials estimating, construction inspection, construction materials testing, surveying, and sales. The curriculum is not intended to prepare students for registration as professional architects.

Emphasis is on basic architectural principles of mechanics, surveying, residential and commercial construction drawings, mechanical and electrical systems in buildings, architectural presentations, estimating, 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, engineering firms, construction firms, consulting companies, surveying companies, contractors and subcontractors, builders, construction materials testing companies, building material and equipment suppliers, land developers and various state, city, and governmental agencies.

Graduates are also eligible to pursue a Bachelor of Science in Construction Technology in the Construction (Management) Option.

Freshman Year

First Semester

ART 117 Construction Graphics and CAD 3
ART 165 Building Systems and Materials.....3
CNT 105 Introduction to Construction Technology ...3
ENG W131 Elementary Composition I 3
MATH 153 Algebra and Trigonometry I 3
15

Second Semester

ART 120 Architectural Presentation 3
ART 155 Residential Construction 3
ART 210 History of Architecture I 3
ART 285 Electrical Systems for Buildings 2
COMM R110 Fundamentals of Speech Communication 3
MATH 154 Algebra and Trigonometry II.....3
17

Sophomore Year

Third Semester

ART 222 Commercial Construction 3
ART 284 Mechanical Systems for Buildings 3
CET 104 Fundamentals of Surveying.....3
CET 160 Statics 3
PHYS 218 General Physics I 4
16

Fourth Semester

CET 260 Strength of Materials 3
CET 267 Materials Testing 2
CNT 280 Quantity Survey 3
TCM 220 Technical Report Writing.....3
MATH 221 Calculus for Technology I 3
PHYS 219 General Physics II.....4
18

Associate of Science in Civil Engineering Technology (CET)

Accredited by the Technology Accreditation Commission of the Accreditation Board of Engineering and Technology, Inc. (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700.

The program in Civil Engineering Technology (CET) is a two-year Associate of Science (A.S.) degree program designed to provide students with the skills necessary for work in the areas of civil engineering drafting and detailing, simple structural design, helping engineers, helping mechanical and electrical contractors, and builders, construction materials estimating, construction inspection, construction materials testing, surveying, and sales. The curriculum is not intended to prepare students for registration as professional engineers.

Emphasis is on basic engineering principles and mechanics, soils, surveying, construction materials estimating, mechanical and electrical systems in buildings, civil engineering drafting, construction accounting, 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 engineering firms, construction firms, consulting companies, surveying companies, contractors and subcontractors, builders, construction materials testing companies, building materials and equipment suppliers, land developers, highway departments, and various state, city, and governmental agencies.

Graduates may also continue their education by pursuing a Bachelor of Science (B.S.) in Construction Technology following the track in construction (management) option.

Freshman Year

First Semester

ART 117 Construction Graphics and CAD 3
ART 165 Building Systems and Materials.....3
CNT 105 Introduction to Construction Technology 3
ENG W131 Elementary Composition I 3
MATH 153 Algebra and Trigonometry I 3
15

Second Semester

ART 285 Electrical Systems for Buildings 2
CNT 110 Construction Accounting.....3
CNT Elective.....3
COMM R110 Fundamentals of Speech Communication 3
MATH 154 Algebra and Trigonometry II.....3
Humanities or Social Science Elective.....3
17

Sophomore Year

Third Semester

ART 284 Mechanical Systems for Buildings.....3
CET 104 Fundamentals of Surveying.....3
CET 160 Statics.....3
CET 275 Applied Civil Engineering Drafting.....3
PHYS 218 General Physics I.....4
16

Fourth Semester

CET 260 Strength of Materials.....3
CET 267 Materials Testing.....2
CNT 280 Quantity Survey.....3
MATH 221 Calculus for Technology I.....3
PHYS 219 General Physics II.....4
TCM 220 Technical Report Writing.....3
18

Associate of Science in Interior Design (INTR)

The Interior Design curriculum is a two-year Associate of Science (A.S.) degree program that employs faculty from the areas of interior design, architecture, and construction and uses the latest technology to provide students with the skills to work as interior design assistants and be able to sit for the National Council for Interior Design Qualification (NCIDQ) exam after 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 an awareness for environmental, business, ethical, and other contemporary issues; and linking classroom knowledge to application in the field.

Graduates typically find employment in residential and commercial design firms, as interior design assistants to interior designers and architects, sales associates in retail or manufacturing settings, manufacturer's reps for products used in the design and construction industries, CAD technicians for interior design, or as self-employed designers.

Freshman Year

First Semester

INTR 103 Introduction to Interior Design.....3
INTR 151 Textiles for Interiors.....3
ART 120 Architectural Presentation.....3
CNT 105 Introduction to Construction Technology.....3
ENG W131 Elementary Composition I.....3
COMM 110 Fundamentals of Speech Communication.....3
18

Second Semester

INTR 124 Space Planning for Interiors.....3
INTR 125 Color and Lighting of Interiors.....3
INTR 202 Interior Materials and Applications.....3
INTR 204 History of Interiors and Furniture.....3
ART 117 Construction Graphics and CAD.....3
ART 165 Building Systems and Material.....3
18

Sophomore Year

Third Semester

INTR 224 Residential Interior Design Studio.....3
INTR 225 Three-Dimensional Interior Design Studio.....3
ART 155 Residential Construction.....3
ART 210 History of Architecture I.....3
BUS A200 Foundations of Accounting **or** **CNT 110** Construction Accounting.....3
15

Fourth Semester

INTR 226 Commercial Interior Design Studio.....3
INTR 228 Interior Design for Contemporary Issues and Needs.....3
INTR 252 Interior Building Systems.....3
INTR 253 Business Practices of Interior Design.....3
INTR 290 Interior Design Experience.....1
Humanities or Social Science Elective.....3
16

Bachelor of Science in Construction Technology

Construction (Management) Option

Accredited by the Technology Accreditation Commission of the Accreditation Board of Engineering and Technology, Inc. (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700.

The Bachelor of Science (B.S.) degree program in Construction Technology (CNT) is open to students with an A.S. degree in Architectural Technology or Civil Engineering Technology or with an equivalent degree. The 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, site and subdivision development, 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 architects, contractors, building product companies, consulting engineering firms, construction material and equipment vendors, testing labs, utilities, and state and other government organizations. Occupations such as detailing, drafting, inspecting, estimating, project management, merchandising, supervising, and testing may also be filled by graduates of this program.

Graduates typically find employment with architectural firms, 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 architects or engineers.

Junior Year

Fifth Semester

CET 312 Construction and Route Surveying.....3
CET 350 Structural Design for Construction.....3
CNT 347 Construction Contract Administration and Specifications.....3
ECON E201 Introduction to Microeconomics.....3
Mathematics Selective.....3
15

Sixth Semester

CNT 302 Construction Law and Ethics.....3
CNT 341 Construction Scheduling and Project Control.....3
CNT 452 Construction Safety and Inspection.....3
CNT 499 Specialty Construction Topics[1].....3
Humanities or Social Science Elective.....3
15

Summer Session

CNT 390 Construction Work Experience[2].....1
1

Senior Year

Seventh Semester

CET 452 Hydraulics and Drainage.....3
CNT 330 Construction Field Operations.....3
CNT 342 Construction Cost and Bidding.....3
TCM 340 Correspondence in Business and Industry.....3
Science Selective.....4
16

Eighth Semester

CET 430 Soils and Foundations.....3
CNT 447 Construction Project Management.....3
CNT 470 Site Development.....3
CNT 494 Engineering Economics for Construction.....3
Humanities or Social Science Elective.....3
15

[1] Or CNT 110 Construction Accounting or Construction Elective.
[2] This course has a detailed time schedule; see department chair.

Construction Drafting Certificate

This certificate is designed to provide educational opportunities for those who have an aptitude for, and a desire to learn, the drafting skills needed in the construction industry. This program focuses on computer-aided drafting education, thus providing contemporary training in the use of the latest drafting technology in the construction industry. Those who earn the certificate will qualify for entry-level positions as draftspersons in architectural, engineering, or other construction-related firms and will be competent in employing the current technology.

Good candidates for the program are people who wish to acquire additional marketable skills in construction drafting, who wish to upgrade existing drafting skills, or who wish to earn tangible verification of acquired skills and bodies of knowledge related to construction drafting.

Curriculum

ART 117 Construction Graphics and CAD.....3
ART 120 Architectural Presentation 3
ART 155 Residential Construction.....3
ART 165 Building Systems and Materials.....3
ART 222 Commercial Construction 3
CNT 105 Introduction to Construction Technology...3
CET 275 Applied Civil Engineering Drafting.....3
INTR 103 Introduction to Interior Design.....3
24

Any student formally admitted to the university may be a candidate for this certificate except those pursuing a degree. Courses taken at other universities may be recognized as equivalent to selected required courses, and course credit may be given for appropriate job experience. There are prerequisites to above courses that may not be covered by the applicant's background or work experience. Applicants should see the department chair to obtain a detailed flowchart for the certificate program.

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

ART 165 Building Systems and Materials.....3
CNT 280 Quantity Survey.....3
CNT 330 Construction Field Operations 3
CNT 341 Construction Scheduling and Project Control.....3
CNT 342 Construction Cost and Bidding.....3
CNT 347 Construction Contract Administration and Specifications.....3
CNT 447 Construction Project Management 3
CNT 452 Construction Safety and Inspection 3
24

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.

Prerequisites: CET 160 Statics, TCM 220 Technical report Writing, CET 430 Soils and Foundations. Also CET 104 has a prerequisite of MATH 153 and a corerequisite of MATH 154; CET 275 has a prerequisite of ART 117.

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.

Department of Electrical and Computer Engineering Technology (ECET)

Professors Conrad, Needler *(Chair),* Pfile
Associate Professors Cooney, Lin, Reid
Assistant Professor Christe

The Department of Electrical and Computer Engineering Technology (ECET) offers degree programs at the associate and bachelor levels. Degree programs at the two-year associate level consist of the Associate of Science degree with a major in Biomedical Electronics Technology (BMET), the Associate of Science degree with a major in Electrical Engineering Technology (EET), and the Associate of Science degree with a major in Computer Engineering Technology (CpET). Graduates from associate degree programs are eligible for admission to the department's programs leading to the Bachelor of Science degree. The department offers Bachelor of Science degrees in Electrical Engineering Technology and Computer Engineering Technology.

For more information, contact the Department of Electrical and Computer Engineering Technology at (317) 274-2363, e-mail et_ecet@iupui.edu, or visit our Web site at www.engr.iupui.edu/ecet.

Associate of Science in Biomedical Electronics 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 electronics 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 both the day and evening.

Graduates of this program are eligible for admission to the Bachelor of Science degree program in electrical engineering technology. Approximately two additional years of study are necessary to complete the requirements for the B.S. in Electrical Engineering Technology.

Freshman Year

First Semester

BMET 105 Introduction to Biomedical Electronics Technology.....1
ECET 107 Introduction to Circuit Analysis 4
ECET 109 Digital Fundamentals 3
MATH 153 Algebra and Trigonometry I.....3
ENG W131 Elementary Composition I 3
COMM R110 Fundamentals of Speech Communication 3
17

Second Semester

ECET 157 Electronics Circuit Analysis.....4
ECET 159 Digital Applications 3
ECET 164 Applied Object-Oriented Programming 3
MATH 154 Algebra and Trigonometry II.....3
BMET 220 Applied Human Biology for BMET 3
16

Sophomore Year

Third Semester

ECET 207 AC Electronics Circuit Analysis.....4
ECET 209 Introduction to Microcontrollers 4
ECET 234 PC Systems I[1] 3
BMET 240 Introduction to Medical Electronics 3
PSY B104 Psychology as a Social Science.....3
17

[1] May substitute ECET 284 Computer Communications

Fourth Semester

BMET 320 Biomedical Electronics Systems 4
BMET 290 BMET Practicum.....4
PHYS 218 General Physics 4
MATH 221 Calculus for Technology I 4
15

Clinical Laboratory Equipment Technology Certificate Program

This certificate features instruction focused on the biomedical equipment principles for the clinical laboratory environment. Upon certificate completion, participants will be able to apply their knowledge of electronic principles to equipment within the clinical laboratory environment, including theory, function, operation. and problem solving. They will be able to function and communicate as part of a multidisciplinary medical team within the clinical laboratory setting as well as understand and apply safety issues within the clinical laboratory. Participants are expected to possess knowledge of active, passive, and digital prior to the certificate program.

Note: Materials for these courses are located on the World Wide Web and are supplemented with a textbook, handouts, software, and self-paced learning aids. Assignments and communication between students and faculty are maintained via OnCourse.

All students must complete the following courses with an overall G.P.A. of 2.0.

BMET 330 Electronics for the Clinical Laboratory Equipment Technician 3
BMET 360 Applied Human Biology for the Clinical Laboratory 3
BMET 370 Safety and Regulations in the Clinical Laboratory 3
BMET 380 Clinical Laboratory Equipment.....3
12

Associate of Science in Computer Engineering Technology

The purpose of the new Computer Engineering Technology (CpET) Program is to train engineering technicians and technologists to design, develop, and implement modern computer-based applications. The CpET program is offered by a partnership arrangement between the Departments of Electrical and Computer Engineering Technology and Computer Technology. The technical portion of the program is a combination of revised EET courses, CIT courses, and new CpET courses. A major emphasis of the CpET program is practice-oriented, "hands-on" training in laboratories for each CpET course to provide students and graduates with a rich experience in computer applications.

Two options within CpET are offered: the industrial computing option and the telecommunications option. The industrial computing option is recommended for students interested in computer-controlled systems and the telecommunications option is recommended for students interested in data communications and networking. Courses are offered in both the day and evening.

The two-year CpET associate graduates will have career opportunities in providing software support and implementing hardware for computer systems involving automation, controls, telecommunications, embedded systems, product development, and instrumentation with job titles such as software technician, automation technician, controls technician, and network technician. The associate degree program will also prepare graduates for admission to the Bachelor of Science degree program in CpET.

The Associate of Science study plan in Computer Engineering Technology for the Industrial Computing option and Telecommunications option are as follow.

Freshman Year

First Semester

ECET 103 Topics in Electrical and Computer Engineering 1
ECET 107 Introduction to Circuit Analysis 4
ECET 109 Digital Fundamentals 3
COMM R110 Fundamentals of Speech Communication 3
MATH 153 Algebra and Trigonometry I 3
ENG W131 Elementary Composition I 3
17

Second Semester

ECET 157 Electronics Circuit Analysis.....4
ECET 159 Digital Applications 3
CIT 140 Programming Constructs Lab 3
MATH 154 Algebra and Trigonometry II 3
ECET 164 Applied Object-Oriented Programming 3
16

Sophomore Year

Third Semester

ECET 209 Introduction to Microcontrollers 4
ECET 234 PC Systems I 3
MATH 221 Calculus for Tech I 3
CIT 270 Java Programming 3
PHYS 218 General Physics I 4
17

Fourth Semester

ECET 231 Electrical Power and Controls.....4
ECET 284 Computer Communications 4
CIT 286 Operating Systems and Administration 3
Communication, Humanities and Social Science Elective 3
14

Bachelor of Science in Computer Engineering Technology

The purpose of the new Computer Engineering Technology Program is to train engineering technicians and technologists to design, develop, and implement modern computer-based applications. The CpET program is offered by a partnership between the Departments of Electrical and Computer Engineering Technology and Computer Technology. The technical portion of the program is a combination of revised EET courses, CIT courses, and new CpET courses. A major emphasis of the CpET program is practice-oriented, "hands-on" training in laboratories for each CpET course to provide students and graduates with a rich experience in computer applications.

Two options within CpET are offered: the industrial computing option and the telecommunications option. The industrial computing option is recommended for students interested in computer-controlled systems and the telecommunications option is recommended for students interested in data communications and networking. Courses are offered in both the day and evening

B.S. degree graduates will be able to provide software design as well as support for computer systems for automation, controls, telecommunications, embedded systems, product development, and instrumentation. Graduates of the B.S. CpET program will have titles such as software technologist, automation engineer, applications engineer, telecommunications engineer, and network administrator.

The Bachelor of Science in Computer Engineering Technology study plan for the industrial computing option is as follows.

Junior Year

Fifth Semester

ECET 309 Advanced Embedded Microcontrollers 4
MATH 222 Calculus for Technology II.....3
ECET 302 Introduction to Control Systems 4
TCM 220 Technical Report Writing 3
14

Sixth Semester

ECET Elective.....4
ECET 434 PC Systems II 4
CIT 288 Using a Database Management System 3
TCM 370 Oral Practicum 3
Communication, Humanities and Social Science Elective 3
17

Senior Year

Seventh Semester

ECET 483 Networking Fundamentals with Microcontrollers 4
ECET 490 Senior Design Project Phase I 2
ECET Elective 4
ECET Elective 4
Communication, Humanities and Social Science Elective 3
17

Eighth Semester
ECET 491 Senior Design Project Phase II 2
ECET Elective 4
CIT 362/CIT 388 Object Oriented Programming/Java II 3
STAT 301/IET 150/ECON E270 Statistical Methods **or**
CHEM C101 and CHEM 121 Elementary Chemistry 3
Communication, Humanities and Social Science Elective 3
15

The Bachelor of Science in Computer Engineering Technology study plan for the telecommunications option is as follows.

Junior Year

Fifth Semester
ECET 403 Data-Communications and Telecommunications 4
ECET Elective 4
MATH 222 Calculus for Technology II 3
TCM 220 Technical Report Writing 3
14

Sixth Semester
ECET 434 PC Systems II 4
ECET Elective 4
CIT 288 Using a Database Management Systems 3
TCM 370 Oral Practicum 3
Communication, Humanities and Social Science Elective 3
17

Senior Year

Seventh Semester
ECET 453 Topics in Telecommunications 4
ECET 483 Networking Fundamentals with Microcontrollers 4
ECET 490 Senior Design Project Phase I 2
ECET Elective 4
Communication, Humanities and Social Science Elective 3
17

Eighth Semester
ECET 491 Senior Design Project Phase II 2
ECET Elective 4
CIT 303 Communication Security and Network Controls 3
STAT 301/IET 150/ECON E270 Statistical Methods **or**
CHEM C101 and CHEM 121 Elementary Chemistry 3
Elective 3
15

Associate of Science in Electrical Engineering Technology

Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700.

This two-year program provides a combination of courses in electricity, electronics, mathematics, science, and general academic areas that lead to the degree of Associate of Science. The program prepares students for careers as technicians in a wide variety of electronic, electrical, and related fields. Students find employment in automation, computer electronics, telecommunications, power, testing, quality assurance, field service, prototype fabrication, process management, cost estimating, and customer service. Courses in this program are offered in both the day and the evening.

Graduates of this program are eligible for admission to the Bachelor of Science degree program. Approximately two additional years of study are necessary to complete the requirements for the B.S. in Electrical Engineering Technology degree.

Freshman Year

First Semester
ECET 103 Topics in Electrical and Computer Engineering 1
ECET 107 Introduction to Circuit Analysis 4
ECET 109 Digital Fundamentals 3
MATH 153 Algebra and Trigonometry I 3
COMM R110 Fundamentals of Speech Communication 3
ENG W131 Elementary Composition I 3
17

Second Semester
ECET 157 Electronics Circuit Analysis 4
ECET 159 Digital Applications 3
ECET 164 Applied Object-Oriented Programming 3
MATH 154 Algebra and Trigonometry II 3
CGT 120 Electrical and Electronic Drafting 2
15

Sophomore Year

Third Semester
ECET 207 AC Electronics Circuit Analysis 4
ECET 209 Introduction to Microcontrollers 4
ECET 234 PC Systems I[1] 3
MATH 221 Calculus for Tech I 3
Tech Elective **or Tech** Specialty 3
17

Fourth Semester
ECET 231 Electrical Power and Controls 4
ECET 257 Power and RF Electronics 4
PHYS 218 General Physics 4
Communication, Humanities, and Social Science Elective 3
15

Bachelor of Science in Electrical Engineering Technology

Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700.

Students who receive the Associate of Science degree in electrical engineering technology or biomedical electronics technology are eligible to enter this Bachelor of Science degree program. The program provides additional study in electrical engineering technology as well as related technical and nontechnical areas essential in modern industry. Graduates of this program are qualified for high-level positions as technologists in diverse industries such as automotive electronics, computer electronics, military electronics, factory automation, broadcasting, electronics manufacturing, telecommunications, energy and power, consumer electronics, robotics, and instrumentation. The courses are offered both in the day and evening.

Six specialty tracks are available in the B.S. program: communication systems, control systems, digital/microprocessor systems, electronic devices and systems, electronics manufacturing, and power systems. Within each of these tracks, 65 credit hours beyond the A.S. degree are required in the areas of science and mathematics, technical specialty, communications, humanities and social science, and interdisciplinary technical electives. The B.S. requirements are listed below; the recommended curriculum for each specialty track follows.

Junior Year

Fifth Semester
ECET 307 Analog Network Signal Processing 4
ECET Elective 4
MATH 222 Calculus for Technology II 3
STAT 301 Elementary Statistics 3
TCM 220 Technical Report Writing 3
17

Sixth Semester
ECET Elective 4
ECET Elective 4
MET/IET/CIT Technical Elective 3
TCM 370 Oral Practicum for Technology 3
Communication, Humanities, and Social Science Elective 3
17

Senior Year

Seventh Semester
ECET Elective 4
ECET 490 Senior Design Project Phase I 2
CHEM C101 and C121 Elementary Chemistry I .....3&2
Communication, Humanities, and Social Science Elective 3
14

[1] May substitute ECET 284 Computer Communications.

Eighth Semester

ECET Elective 4
ECET 491 Senior Design Project Phase II 2
MET/IET/CIT Technical Elective 3
MET/IET/CIT Technical Elective 3
Communication, Humanities, and Social Science Elective 3
15

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 304 Introduction to Communications Systems
ECET 357 Real-Time Digital Signal Processing
ECET 403 Data-communications and Telecommunications
ECET 483 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.

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, processing industries, and other areas of commerce that use control systems.

ECET Technical Specialty Electives

ECET 309 Advanced Embedded Microcontrollers
ECET 357 Real-Time Digital Signal Processing
ECET 371 Automation, Instrumentation, and Process Control
ECET 472 Automatic Control Systems
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, military electronics, communications, and instrumentation.

ECET Technical Specialty Electives

ECET 309 Advanced Embedded Microcontrollers
ECET 357 Real-Time Digital Signal Processing
ECET 371 Automation, Instrumentation, and Process Control
ECET 417 Advanced Digital Systems Design with VHDL
ECET 483 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, 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 304 Introduction to Communications Systems
ECET 360 CIM in Electronics Manufacturing
ECET 417 Advanced Digital Systems Design with VHDL
ECET Electives

Interdisciplinary Technical Electives

Minimum of 9 credit hours with approval of advisor. See the effective plan of study for course suggestions.

Electronics Manufacturing

The electronics manufacturing track prepares graduates for career opportunities with a wide variety of manufacturers of electronic equipment. This fast-growing industry includes companies that manufacture audio, video, medical, computer, and consumer electronic equipment. Students in this track study computer interfacing, automated circuit board assembly, industrial automation, robotics, and process control.

ECET Technical Specialty Electives

ECET 309 Advanced Embedded Microcontrollers
ECET 360 CIM in Electronics Manufacturing
ECET 371 Automation, Instrumentation, and Process Control
ECET 417 Advanced Digital Systems Design with VHDL
ECET 483 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.

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 371 Automation, Instrumentation, and Process Control
ECET 381 Electrical Distribution Systems
ECET 472 Automatic Control Systems
ECET Elective
ECET 331 Generation and Transmission of Electrical Power **or ECET** Elective

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 163 Integrated Calculus and Analytic Geometry I (in place of MATH 221)
MATH 164 Integrated Calculus and Analytic Geometry II (in place of MATH 222)
MATH 261 and **262**
STAT 511 Statistical Methods I (in place of STAT 301)
PHYS 152 Mechanics (in place of PHYS 218)
PHYS 251 Heat, Electricity, and Optics (PHYS 219)
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, 159, and 207. In addition, one course from the following list must be completed: ECET 209, 231, or 257. 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.

Minor in Digital Electronics Technology

The minor in Digital Electronics Technology focuses on digital and microprocessor systems. It requires completion of a minimum of 22 credit hours of ECET courses. Required courses are ECET 107, 109, 159, 209 or 309, and 403 or 434. At least 12 hours of the minor must be completed in residence at IUPUI.

Students who wish to complete a minor in Digital Electronics Technology should consult a department advisor about prerequisite courses or credit for courses taken at other universities.

Electronics Manufacturing Certificate

A certificate in electronics manufacturing will allow students to train and prepare for a career in the fast-growing electronics industry. Students will study a wide range of topics in both electronics and manufacturing, including special processes used by today's industry, industrial organization, and quality techniques. For students who decide to continue their education, all the courses for the certificate will apply toward an associate degree in computer integrated manufacturing technology, electronics manufacturing option.

A total of 22 or 23 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:

MATH 159 or MATH 153/154 Algebra and Trigonometry 5
IET 150 Quantitative Methods for Technology 3
IET 240 Quality Techniques for Electronics Manufacturing 3
ECET M200 Electronics Manufacturing II 4
ECET M290 Projects in Electronics Manufacturing 4

Students must then choose from one of the following electives:

ECET 109 Digital Fundamentals I 3
ECET 116 Electrical Circuits 4
ECET M150 Electronics Manufacturing I 3
IET 104 Industrial Organization 3
MET 344 Materials II 3
22/23

Department of Mechanical Engineering Technology

Professors Bluestein, Zecher *(Chair)*

Associate Professor Rennels

Assistant Professors Acheson, Frettinger-Devor, Hylton, Kovach, Pellerano, Workman-Germann

Lecturer Siurek

The Department of Mechanical Engineering Technology offers three Associate of Science degree programs, three Bachelor of Science degree programs, and five certificate programs. The two-year Associate of Science degree programs offered by the department are in computer graphics technology, computer integrated manufacturing technology, and mechanical engineering technology. The four-year Bachelor of Science degree programs are in computer graphics technology, computer integrated manufacturing technology, and mechanical engineering technology. The short-duration certificate programs are in computer graphics, quality control, CAD/CAM, manufacturing systems, and electronics manufacturing.

For more information, contact the Department of Mechanical Engineering Technology at (317) 274-3428, or et_met@iupui.edu.

Associate of Science in Computer Graphics Technology

Interactive Multimedia Developer Track

Freshman Year

First Semester

CGT 100 Technical Graphics Lectures 1
CGT 111 Design for Visualization and Communication 3
CGT 112 Sketching for Visualization and Communication 3
CIT 106 Using a Personal Computer 3
ENG W131 Elementary Composition I 3
MATH 153 Algebra and Trigonometry I 3
16

Second Semester

CGT 116 Geometric Modeling for Visualization and Communication 3
CGT 117 Illustrating for Visualization and Communication 3
MATH 154 Algebra and Trigonometry II 3
COMM R110 Fundamentals of Speech Communication 3
Liberal Arts Elective 3
15

Sophomore Year

Third Semester

CGT 211 Raster Imaging for Computer Graphics 3
CGT 251 Principles of Creative Design 3
IET 104 Industrial Organization 3
CIT 140 Programming Constructs Lab 3
Science Elective 3
15

Fourth Semester

CGT 216 Vector Imaging for Computer Graphics 3
CGT 351 Multimedia Authoring I 3
CSCI N355 Introduction to Virtual Reality 3
PSY B104 Psychology as a Social Science 3
Elective 3
15

Total 61

Manufacturing Graphics Communication Track

Freshman Year

First Semester

CGT 100 Technical Graphics Lectures 1
CGT 111 Design for Visualization and Communication 3
CGT 112 Sketching for Visualization and Communication 3
CIT 106 Using a Personal Computer 3
ENG W131 Elementary Composition I 3
MATH 153 Algebra and Trigonometry I 3
16

Second Semester

CGT 116 Geometric Modeling for Visualization and Communication 3
CGT 117 Illustrating for Visualization and Communication 3
MATH 154 Algebra and Trigonometry II 3
COMM R110 Fundamentals of Speech Communication 3
Liberal Arts Elective 3
15

Sophomore Year

Third Semester

CGT 211 Raster Imaging for Computer Graphics 3
CGT 226 Introduction to Constraint-Based Modeling 3
IET 104 Industrial Organization 3
CIT 140 Programming Constructs Lab 3
Science Elective 3
15

Fourth Semester

CGT 216 Vector Imaging for Computer Graphics 3
CGT 323 Introduction to 3D Surface Geometry 3
CSCI N355 Introduction to Virtual Reality 3
MET 141 Materials I 3
CIT 288 Using a Database Management System 3
15

Total 61

Technical Animation and Spatial Graphics Track

Freshman Year

First Semester

CGT 100 Technical Graphics Lectures 1
CGT 111 Design for Visualization and Communication 3
CGT 112 Sketching for Visualization and Communication 3
CIT 106 Using a Personal Computer.....3
ENG W131 Elementary Composition I 3
MATH 153 Algebra and Trigonometry I 3
16

Second Semester

CGT 116 Geometric Modeling for Visualization and Communication 3
CGT 117 Illustrating for Visualization and Communication 3
MATH 154 Algebra and Trigonometry II.....3
COMM R110 Fundamentals of Speech Communication 3
Liberal Arts Elective 3
15

Sophomore Year

Third Semester

CGT 211 Raster Imaging for Computer Graphics 3
CGT 241 Introduction to Animation and Spatial Graphics.....3
IET 104 Industrial Organization 3
CIT 140 Programming Constructs Lab.....3
Science Elective.....3
15

Fourth Semester

CGT 216 Vector Imaging for Computer Graphics 3
CGT 340 Digital Lighting and Rendering.....3
CSCI N355 Introduction to Virtual Reality 3
Liberal Arts Elective 3
Elective.....3
15

Total 61

Bachelor of Science in Computer Graphics Technology

Interactive Multimedia Developer Track

Junior Year

Fifth Semester

CGT 241 Introduction to Animation and Spatial Graphics.....3
CGT 356 Hypermedia Authoring I.....3
CIT 262 Problem Solving and Programming **or** **CIT 270** Java Programming 3
TCM 370 Oral Practicum for Technical Managers 3
Humanities or Social Science Elective.....3
15

Sixth Semester

CGT 346 Digital Video and Audio 3
CGT 456 Hypermedia Authoring II 3
CIT 288 Using a Database Management System 3
TCM 220 Technical Report Writing **or** **TCM 340** Correspondence in Business and Industry.....3
Technical Elective 3
15

Senior Year

Seventh Semester

CGT 411 Contemporary Problems in Computer Graphics.....3
CGT 415 Seminar for Senior Design Project 1
CGT 451 Multimedia Authoring II.....3
BUS L203 Commercial Law I 3
Liberal Arts Elective 3
Technical Elective 3
16

Eighth Semester

CGT 416 Senior Design Project 3
IET 350 Engineering Economy.....3
OLS 274 Applied Leadership 3
Humanities or **Social Science** Elective.....3
Elective.....3
15

Total 122

Manufacturing Graphics Communication Track

Junior Year

Fifth Semester

CGT 241 Introduction to Animation and Spatial Graphics.....3
CGT 326 Manufacturing Graphics Standards 3
MET 142 Manufacturing Processes I 3
TCM 370 Oral Practicum for Technical Managers.....3
Liberal Arts Elective 3
15

Sixth Semester

CGT 251 Principles of Creative Design.....3
CGT 341 Animation of Computer Graphics 3
TCM 220 Technical Report Writing **or** **TCM 340** Correspondence In Business and Industry 3
MET 242 Manufacturing Processes II.....3
Technical Elective 3
15

Senior Year

Seventh Semester

CGT 411 Contemporary Problems in Computer Graphics.....3
CGT 415 Seminar for Senior Design Project 1
CGT 423 Manufacturing Document Production and Management 3
BUS L203 Commercial Law I 3
Liberal Arts Elective 3
Elective.....3
16

Eighth Semester

CGT 416 Senior Design Project 3
IET 350 Engineering Economy.....3
Technical Elective 3
Humanities or **Social Science** Elective.....3
Elective.....3
15

Total 122

Technical Animation and Spatial Graphics Track

Junior Year

Fifth Semester

CGT 251 Principles of Creative Design.....3
CGT 341 Animation of Computer Graphics 3
CIT 262 Problem Solving and Programming **or** **CIT 270** Java Programming 3
TCM 370 Oral Practicum for Technical Managers 3
Liberal Arts Elective 3
15

Sixth Semester

CGT 346 Digital Video and Audio 3
CGT 442 Advanced Computer Animation 3
CIT 288 Using a Database Management System 3
TCM 220 Technical Report Writing **or** **TCM 340** Correspondence In Business and Industry.....3
Technical Elective 3
15

Senior Year

Seventh Semester

CGT 351 Multimedia Authoring I **or** **CGT 356** Hypermedia Authoring I.....3
CGT 411 Contemporary Problems in Computer Graphics.....3
CGT 415 Seminar for Senior Design Project 1
BUS L203 Commercial Law I 3
Liberal Arts Elective 3
Technical Elective 3
16

Eighth Semester

CGT 416 Senior Design Project 3
IET 350 Engineering Economy.....3
SOC 317 Sociology of Work.....3
Humanities or **Social Science** Elective.....3
Elective.....3
15

Total 122

Associate of Science in Computer Integrated Manufacturing Technology

Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (ABET), 111 Market Place, Suite 1050, Baltimore MD 21202, (410) 347-7700.

Computer integrated manufacturing technology (CIMT) integrates all functions in manufacturing organizations and helps increase productivity, production efficiency, and profitability.

This program prepares students for a high-tech manufacturing environment. Graduates will be ready for positions in computer-aided design, computer numerical control, tool design, CAD/CAM, process planning, and quality control.

Successful completion of the program qualifies students for acceptance into the Bachelor of Science program in computer integrated manufacturing technology. Graduates of the A.S. degree program in computer integrated manufacturing technology are eligible for certification as manufacturing technologists. Co-op work programs with industry may be available to students.

Freshman Year

First Semester

CIMT 100 Introduction to Computer Integrated Manufacturing 1
ENG W131 Elementary Composition I 3
MATH 151 Algebra and Trigonometry 5
MET 105 Introduction to Engineering Technology 3
MET 141 Materials I 3
CGT 110 Technical Graphics Communication 3
18

Second Semester

COMM R110 Fundamentals of Speech Communication 3
ECET 116 Electrical Circuits 4
IET 150 Quantitative Methods for Technology 3
MET 102 Production Design and Specification 3
MET 142 Manufacturing Processes I 3
16

Sophomore Year

Third Semester

CIMT 260 Robotics and Automated Material Handling 3
MET 242 Manufacturing Processes II 3
PHYS 218 General Physics I 4
OLS 252 Human Behavior in Organizations 3
TCM 220 Technical Report Writing 3
16

Fourth Semester

CIMT 224 Production Control and MRP 3
MET 212 Applications of Engineering Mechanics 4
MET 271 Programming for Numerical Control 3
PHYS 219 General Physics II 4
Technical Elective 3
17

Total 67

Bachelor of Science in Computer Integrated Manufacturing Technology

Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700.

This program prepares graduates to take their new skills in computer-integrated manufacturing technology into traditional or fully integrated manufacturing environments. Typical areas of employment are traditional and nontraditional manufacturing processes, advanced manufacturing planning, CAD/CAM, robotics, production control, statistical quality control, process automation, computer integrated manufacturing, and manufacturing management.

IUPUI graduates with an A.S. in Computer Integrated Manufacturing Technology or Mechanical Engineering Technology are eligible for admission to the following two-year, add-on curriculum leading to a Bachelor of Science degree.

Junior Year

Fifth Semester

CIT 140 Programming Constructs Lab 3
ECET 231 Electrical Power and Controls 4
IET 104 Industrial Organization 3
IET 350 Engineering Economy 3
MATH 221 Calculus for Technology I 3
16

Sixth Semester

IET 300 Metrology for Quality Assurance 3
MATH 222 Calculus for Technology II 3
MET 230 Fluid Power 3
MET 240 Basic Foundry 3
TCM 340 Correspondence in Business and Industry 3
15

Senior Year

Seventh Semester

CIMT 245 CAD Tool and Fixture Design 3
CIMT 310 Plant Layout and Material Handling 3
IET 454 Statistical Quality Control 3
TCM 370 Oral Practicum for Technical Managers 3
Humanities or **Social Science** Elective 3
15

Eighth Semester

CHEM C101 and **C121** Elementary Chemistry I 5
CIMT 481 Integration of Manufacturing Systems 3
Humanities or **Social Science** Elective 3
Technical Selectives 6
17

Total 130

Associate of Science in Mechanical Engineering Technology

Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202, (410) 347-7700.

Mechanical Engineering Technology (MET) concerns the generation, transmission, and utilization of mechanical and fluid energy, as well as the design and production of tools, machines, and their products. This program prepares specialists in developing machines and products, in production processes, in installing and maintaining machines, and in solving repetitive engineering problems.

Graduates of this program are prepared to work as laboratory technicians, engineering aides, plant maintenance supervisors, layout designers, production assistants, and technical personnel. With additional experience, graduates may be promoted to such positions as industrial supervisor, machine and tool designer, technical buyer, production expeditor, and cost estimator.

Graduates of the A.S. degree program in mechanical engineering technology are eligible for certification as associate engineering technologists. In addition, successful completion of this program automatically qualifies a student for acceptance into the program leading to a Bachelor of Science in Mechanical Engineering Technology. Co-op work programs with industry may be available to students.

Freshman Year

First Semester

MET 105 Introduction to Engineering Technology 3
MET 141 Materials I 3
CGT 110 Technical Graphics Communication 3
MATH 153 Algebra and Trigonometry I 3
ENG W131 Elementary Composition I 3
15

Second Semester

MET 102 Production Design and Specifications 3
MET 111 Applied Statics 3
MET 142 Manufacturing Processes I 3
TCM 220 Technical Report Writing 3
OLS 252 Human Behavior in Organizations 3
MATH 154 Algebra and Trigonometry II 3
18

Sophomore Year

Third Semester

MET 211 Applied Strength of Materials 4
MET 242 Manufacturing Processes II 3
COMM R110 Fundamentals of Speech Communication 3
PHYS 218 General Physics I 4
MATH 221 Calculus for Technology I 3
17

Fourth Semester
MET 214 Machine Elements....3
MET 220 Heat/Power....3
MET 230 Fluid Power....3
PHYS 219 General Physics II....4
Technical Elective....3
16

Total 66

Bachelor of Science in Mechanical Engineering Technology

Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (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.

Graduates of the two-year A.S. degree program are eligible for admission to this two-year add-on curriculum leading to a B.S. degree.

Junior Year

Fifth Semester
MET 213 Dynamics....3
MET 320 Applied Thermodynamics....3
TCM 340 Correspondence in Business and Industry....3
IET 150 Quantitative Methods for Technology....3
MATH 222 Calculus for Technology II....3
15

Sixth Semester
MET 310 Computer-Aided Machine Design....3
MET 344 Materials II....3
MET 350 Applied Fluid Mechanics....3
ECET 116 Electrical Circuits....4
CIT 140 Programming Constructs Lab....3
16

Senior Year

Seventh Semester
MET 328 CAD/CAM for Mechanical Design....3
MET 384 Instrumentation....3
IET 104 Industrial Organization....3
IET 350 Engineering Economy....3
TCM 370 Oral Practicum for Technical Managers....3
15

Eighth Semester
MET 414 Design of Mechanical Projects....3
CHEM C101 & **C121** Elementary Chemistry I....5
Humanities or **Social Science** Electives....6
Technical Elective....3
17

Total 129

Associate of Science in Mechanical Engineering Technology

Advanced Curriculum Track

The advanced-degree Mechanical Engineering Technology Program includes classes in advanced mathematics, and science.

Freshman Year

First Semester
MET 105 Introduction to Engineering Technology....3
MET 141 Materials I....3
CGT 110 Technical Graphics Communication....3
MATH 163 Integrated Calculus and Analytical Geometry I....5
ENG W131 Elementary Composition....3
17

Second Semester
MET 111 Applied Statics....3
TCM 220 Technical Report Writing....3
MET 102 Production Design and Specifications....3
MET 142 Manufacturing Processes I....3
MATH 164 Integrated Calculus and Analytical Geometry II....5
17

Sophomore Year

Third Semester
MET 211 Applied Strength of Materials....4
COMM R110 Fundamentals of Speech Communication....3
PHYS 152 Mechanics....4
MET 242 Manufacturing Processes II....3
OLS 252 Human Behavior in Organizations....3
17

Fourth Semester
MET 214 Machine Elements....3
PHYS 251 Heat, Electricity, and Optics....5
MET 230 Fluid Power....3
MET 220 Heat/Power....3
Technical Elective....3
17

Total 68

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
MET 213 Dynamics....3
MET 320 Applied Thermodynamics....3
TCM 340 Correspondence in Business and Industry....3
IET 150 Quantitative Methods for Technology....3
MATH 261 Multivariate Calculus....4
16

Sixth Semester
MET 310 Computer-Aided Machine Design....3
MET 344 Materials II....3
MET 350 Applied Fluid Mechanics....3
ECET 116 Electrical Circuits....4
CIT 140 Programming Constructs Lab....3
16

Senior Year

Seventh Semester
MET 328 CAD/CAM for Mechanical Design....3
MET 384 Instrumentation....3
IET 104 Industrial Organization....3
IET 350 Engineering Economics....3
TCM 370 Oral Practicum for Technical Managers....3
15

Eighth Semester
MET 414 Design of Mechanical Projects....3
CHEM C101 and **C121** Elementary Chemistry I....5
Technical Elective....3
Humanities or **Social Science** Electives....6
17

Total 132

Computer Graphics Certificate Program

This program places emphasis on learning industry-standard graphics software programs and sketching as a means of communication. Topics include computer literacy, electronic publishing, computer-aided drafting, raster and vector-based drawing, parametric modeling, multimedia, and animation. Upon successful completion of the program, the student may continue working toward the Associate of Science in Computer Graphics Technology.

At total of 24 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:
CGT 111 Design for Visualization and Communication....3
CGT 112 Sketching for Visualization and Communication....3
CGT 116 Geometric Modeling for Visualization and Communication....3
CGT 117 Illustrating for Visualization and Communication....3
CGT 211 Raster Imaging for Computer Graphics....3
CGT 351 Multimedia Authoring I....3

Select one group from the following:
CGT 226 Introduction to Constraint-Based Modeling....3
and **CGT 326** Manufacturing Graphics Standards....3
or
CGT 241 Introduction to Computer Animation....3
and **CGT 341** Motion for Computer Animation....3
or
CGT 251 Principles of Creative Design....3
and **CGT 356** Hypermedia Authoring I....3
24

Quality Control 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.

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.

Curriculum

The courses are listed in the order in which they should be taken.

MATH 151 or **MATH 153/154** Algebra and Trigonometry.....5
IET 204 Techniques of Maintaining Quality **or** **IET 300** Metrology for Quality Assurance 3
IET 150 Quantitative Methods for Technology.....3
IET 364 Total Quality Control.....3
IET 374 Nondestructive Testing **or** **IET 474** Quality Improvement of Products and Processes 3
IET 454 Statistical Quality Control.....3
20

CAD/CAM Certificate Program

This certificate program provides a quick overview of modern manufacturing, with special emphasis on CAD/CAM.

A total of 23 credit hours, with 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:

CGT 110 Technical Graphics Communications **or** **CGT 116** Geometric Modeling for Visualization and Communication.....3
MATH 151 or MATH 153/154 Algebra and Trigonometry.....5
MET 242 Manufacturing Processes II.....3
CGT 226 Introduction to Constraint-Based Modeling.....3
MET 271 Programming for Numerical Control.....3
MET 328 CAD/CAM for Mechanical Design 3

Students must then choose one of the following electives:

MET 102 Production Design and Specifications 3
CGT 323 Introduction to 3D Surface Geometry 3
CGT 326 Manufacturing Graphics Standards 3
23

Manufacturing Systems Certificate Program

This certificate program provides an overview of the manufacturing system and the control of its various components. The program can greatly benefit individuals without a technical background in adjusting to the manufacturing environment. A total of 23 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:

MATH 159 or **MATH 153/154** Algebra and Trigonometry.....5
CIMT 260 Robotics and Automated Material Handling.....3
CIMT 224 Production Control and MRP.....3
IET 104 Industrial Organization.....3
IET 364 Total Quality Control.....3
CGT 110 Technical Graphics Communication.....3

Students must then choose one of the following electives:

MET 242 Manufacturing Processes II.....3
CIMT 310 Plant Layout and Material Handling 3
IET 350 Engineering Economy.....3
23

Department of Organizational Leadership and Supervision (OLS)

Associate Professors Goodwin *(Chair)*, Hundley
Assistant Professors Feldhaus, Fox
Lecturer Wolter

This program offers a broadbased education for those students who desire leadership roles in business, government, or industry. A guiding vision of the department is to close the gap between theory and practice.

Associate of Science (A.S.) and Bachelor of Science (B.S.) degrees are available. Specialized Certificates in Human Resource Management, Certificate in International Leadership, and Certificate in Leadership Studies are available. The Certificate in Leadership Studies is only available to non–Organizational Leadership and Supervision 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 technical concentration areas:

Computer and Information Technology (CIT)
Computer Integrated Manufacturing Technology (CIMT)
Construction Technology (CNT)
Electrical Engineering Technology (ECET)
Mechanical Engineering Technology (MET)
Interdisciplinary
Allied Health
Business
Informatics
Nursing
School of Public and Environmental Affairs (SPEA)

Course work for the A.S. degree provides a solid foundation for students who wish to enhance their employment opportunities or pursue more advanced degrees. The work is balanced enough to include the study of mathematics and science, as well as study of technology related to the student's intended career, general education, and supervisory leadership. Students develop abilities that can help them become effective contributors early in their employment.

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 seven areas of study: leadership and supervision, mathematics and science, communication, behavioral science, social science and humanities, related technology, and electives.

Students working toward their B.S. degrees may earn certificates in specialty areas in technology and in OLS. For example, by taking a combination of organizational leadership and supervision (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 Department of Organizational Leadership and Supervision agrees to accept credit hours earned at Ivy Tech and Vincennes University in their Associate in Science and Associate in Applied Science programs. Where applicable these credit hours will be distributed to satisfy the requirements for the Associate of Science and Bachelor of Science degree programs in OLS.

For more information, call (317) 278-0277 or e-mail et_ols@iupui.edu.

Associate of Science in Organizational Leadership and Supervision

The A.S. degree in Organizational Leadership and Supervision (OLS) requires a total of 61 credit hours. Program requirements for graduation are as follows:

1. 22 credit hours in OLS. OLS 100, 252, 263, 274, 327, 331, 378, and 390 are required.
2. 18 credit hours in an applied technology that complements OLS and directly relates to specific career interests. At least 3 credit hours must demonstrate computer competency. 12 credit hours must be in a single department or program such as CNT, CIT, ECET, MET, business, nursing, allied health, SPEA, informatics, etc. These courses must be related to a minor, or a certificate, or reflect some logical combination of courses. Note: Students must have the set of courses they plan to apply to the related technology area preapproved by an OLS academic counselor.
3. 3 credit hours in behavioral or social sciences, selected from courses in anthropology, psychology, sociology, economics, and/or geography (see an OLS advisor for approved geography courses with a social science dimension).
4. 9 credit hours in communications—ENG W131, COMM R110, and TCM 220.
5. 6 credit hours in mathematical skills, including MATH 153–154 or MATH M118–M119 or equivalent. If MATH 159 or an equivalent or higher-level 5 hour course is substituted, one additional credit hour approved by an OLS advisor must be earned.
6. 3 credit hours in statistics such as ECON E270, STAT 301.

Bachelor of Science in Organizational Leadership and Supervision

The B.S. degree in Organizational Leadership and Supervision requires a total of 124 credit hours. Of the 43 credit hours required in OLS, 28 must result from taking OLS 100, 252, 263, 274, 327, 331, 378, 390, 410, and 490. The balance of the requirements for graduation are as follows:

1. 15 additional credit hours of OLS course work beyond the required courses, for a total of 43 credit hours on Organizational Leadership and Supervision.
2. 24 credit hours in an applied technology competency that complements OLS and directly relates to specific career interests. 18 credit hours must be in a single department or program such as CNT, CIT, ECET, MET, business, nursing, allied health, SPEA, informatics, etc., and at least 3 credits must demonstrate computer competency. 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. 6 credit hours in behavioral or social sciences, selected from courses in anthropology, psychology, sociology, economics and/or geography (see an OLS advisor for approved geography courses with a social science dimension).
4. 18 credit hours in communication, including COMM R110, ENG W131, and TCM 220. The balance must be composed of speaking and writing courses.
5. 4 credit hours in a laboratory science elective. An approved 4 or 5 credit hour course in one of the basic sciences (3 credit hours of lecture and at least 1 credit hour of lab).
6. 6 credit hours in mathematical applications, which must include IET 350 and an introductory course in statistics. The introductory course in statistics must be selected after consultation with an OLS advisor.
7. 6 credit hours in mathematical skills, including MATH 153–154 or MATH M118–M119 or equivalent. If MATH 151 or an equivalent or higher-level 5 credit hour course is substituted, one additional credit hour approved by an OLS advisor must be earned.
8. 6 credit hours in humanities, selected from courses in art, history, literature, music, religion, and/or theater.
9. 11 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. Students should use these credits to improve their marketability in the workplace or to fill 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.

The Human Resource Management Certificate was jointly developed between the Department of Organizational Leadership and Supervision and the Human Resource Association of Central Indiana.

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.

Curriculum

Students are required to successfully complete a total of seven courses (21 credit hours) to earn the certificate.

Required Core Courses

All students must successfully complete all of the following courses:

OLS 383 Human Resources Management[1] 3
OLS 331 Occupational Safety and Health 3
OLS 368 Personnel Law 3
OLS 375 Training Methods 3
OLS 378 Labor Relations 3
OLS 476 Compensation Planning and Management 3
OLS 479 Staffing Organizations 3

Total Hours: 21

Certificate in International Leadership

This interdisciplinary certificate is appropriate for individuals who might pursue careers in which they have international supervisory leadership responsibilities and/or work with individuals from different countries. It is also appropriate for those students who wish to acquire knowledge, skills, and abilities to prepare for an overseas work assignment. A total of 27 credit hours is required for the certificate; of those 27 credits, 15 must be in core requirements (section I), at least 3 but not more than 7 credits from international experience and/or additional foreign language courses (section II), and the remainder from elective courses (section III). Transfer courses will be accepted, but at least half of the credits must be earned on the IUPUI campus. Any prerequisite courses may add additional credit hours, but those credits will not be counted toward the 27 credits required for the certificate.

[1] OLS 383 must be taken as a pre- or corequisite to any other certificate course.

SECTION I: Required Core Courses (15 hours)
OLS 327 Leadership for a Global Work Force (P: ENG W131, COMM R110)
OLS 328 Principles of International Management (P: OLS 327, MA 153 or equiv.)
COMM C482 Intercultural Communication (P: C180 or instructor's consent)
LANG Six hours of a single foreign language (not American Sign Language)

SECTION II: International Experience and/or Additional Language Electives (3 to 7 total hours)

INTERN Up to 3 credit hours from IUPUI-approved overseas internships
STUDY Up to 6 credit hours from an IUPUI-approved study-abroad program
LANG Up to 4 additional hours of the foreign language chosen in the core

SECTION III: Related International Electives (5 to 9 total hours)

As students develop a certificate plan of study, they must accumulate the balance of their elective credits from one of the following four sets of classes. The set chosen should relate to the student's individual leadership interests, and at least three credits must be at a 300 level or higher. The following elective list is not all-inclusive; students may propose other classes as substitutes but must be prepared to demonstrate why those particular courses are suitable. Students are responsible for determining and meeting any prerequisites for these classes and note that prerequisites do not count toward certificate requirements.

1. **Business and Economics focus**
   BUS D301 International Business Environment
   BUS D302 International Business Operations
   ECON E303 International Economics
   ECON E337 Economic Development
   ENG W331 International Business Communication
   GEOG G331 Economic Geography
   POLS Y217 Introduction to Comparative Politics
2. **Political focus**
   GEOG G355 Political Geography
   ECON E325 Comparative Economic Systems
   PHIL P323 Society and State in the Modern World
   POLS Y219 Introduction to International Relations
   POLS Y374 International Organization
3. **Social and Cultural focus**
   ANTH A304 Social and Cultural Behavior
   ANTH E300 Culture Areas and Ethnic Groups
   ANTH E391 Women in Developing Countries
   ANTH E402 Gender and Class—Cultural Perspectives
   ANTH E411 Wealth, Exchange, and Power in Anthropological Perspective
   ANTH E455 Anthropology of Religion
   ANTH E457 Ethnic Identity
   FLAC F200 World Cultures Through Literature
   LING G310 Social Speech Patterns
   REL R393 Comparative Religious Ethics
   SOC R338 Comparative Social Systems
4. **Area Studies focus**
   Students must propose a series of classes to the certificate counselor that demonstrate a logical study program for an area related to the chosen language competency. For example, students studying German may wish to enroll in courses such as:
   GEOG G321 Geography of Europe
   GER G265 German Culture in English Translation
   GER G384 Twentieth-Century German Literature in Translation
   HIST B361/2 Europe in the Twentieth Century I-II

   Other possible classes include (for the related language):
   ANTH E310 Cultures of Africa
   ANTH E326 Modern Greek Society
   ANTH E356 Cultures of the Pacific

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. 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 either the A.S. or B.S. degree in Organizational Leadership and Supervision (OLS). 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 252 Human Behavior in Organizations[1] 3
OLS 263 Ethical Decisions in Leadership[1] 3
OLS 274 Applied Leadership[1] 3
OLS 327 Leadership for a Global Workforce 3
OLS 390 Leadership Theories and Processes 3
OLS 3xx Any OLS 300- or 400-level Selective Course 3

Total Hours: 18

[1] OLS 252, 263, and 274 must be taken prior to any other OLS course.

Technical Communications Program

Assistant Professors Hovde, Worley *(Director)*
Adjunct Assistant Professor Fitzpatrick

The Technical Communications 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 9 credit hours of courses, including CIT 106 or 115 or an equivalent introductory computer course.

Required Courses: 9/10 credits

TCM 220, 320, or **360**—an introductory technical writing course
TCM 350 Visual Elements of Technical Documents
TCM 435 Portfolio Presentation
ENG W365 Theories and Practices of Editing

Selected Courses: 9/10 credits

ENG G205 Introduction to the English Language
ENG W315 Composing Computer-Delivered Text
TCM 370, COMM C401, **or**
COMM C402, a course in oral presentation of technical information
COMM R320 Advanced Public Communication **or**
COMM R321 Persuasion
COMM C228 Discussion and Group Methods **or**
COMM C380 Organizational Communication
OLS 374 Supervisory Management, **OLS 375** Training Methods, **or**
OLS 385 Leadership Strategies for Quality and Productivity
JOUR J463/J563 Desktop Publishing **or**
JOUR J390 Corporate Publications

IET 364 Total Quality Control
TCM 395 Independent Study in Technical Communication—selected topics
TCM 420 Field Experience in Technical Communication

Other courses may be approved by the TCM coordinator based on a student's particular interests and career objectives.

Portfolio

In order to obtain 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 of the Hoosier Chapter of the Society for Technical Communication.

Technology Course Descriptions

Key to Course Descriptions

The courses listed in this section will, for the most part, be offered during the 2004-2006 academic years. Additional information about course schedules may be obtained from the specific departments in the school. Courses are grouped under the appropriate program subject abbreviation. Course descriptions contain the following information, with some exceptions, in this order: course number, course title; number of credit hours (in parentheses); number of lecture hours per week; number of laboratory hours per week; number of recitation hours per week (group discussion and problem solving); and prerequisites (P) and/or corequisites (C), followed by a course description. For example, under Civil Engineering Technology (CET), a course description reads:

CET 104 Fundamentals of Surveying (3 cr.) Class 2, Lab 3. P: MATH 154 or equivalent. Measurement of vertical and horizontal distances and angles using the tape, level, transit, theodolite, and EDMI. Computations of grades, traverses, areas, and curves.

This listing indicates that the course number is CET 104 with the title "Fundamentals of Surveying." It is worth 3 credit hours. The class meets 2 hours a week for the lecture and 3 hours a week for the laboratory. The required prerequisite is MATH 154 or an equivalent course. A brief course description then follows.

The numbering system for courses reflects the following levels:

100-299: courses normally scheduled for freshmen and sophomores.

300-499: courses normally scheduled for juniors and seniors.

500-599: dual-level courses that may be scheduled for seniors and for graduate students for graduate credits.

Architectural Technology (ART)

ART 117 Construction Drafting and CAD (3 cr.) Class 1, Lab 4. P: high school geometry or equivalent. Introduction to drafting and CAD fundamentals, with emphasis on architectural and civil engineering topics. Development of basic drafting skills, using orthographic projections, auxiliary views, pictorial drawings, and drafting conventions.

ART 120 Architectural Presentation (3 cr.) Class 1, Lab 4. Techniques for production of presentation drawings for a client. Three-dimensional drafting techniques, including different perspective drawing 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 155 Residential Construction (3 cr.) Class 2, Lab 3. P: 165 or equivalent; 117 or equivalent; and CNT 105. Wood frame construction through a semester project requiring planning, preliminary, and working drawings. Outside lab assignments are required.

ART 165 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 210 History of Architecture I (3 cr.) Class 3. P or C: CNT 105. A survey of Western architecture from ancient times to the present day. Social, technological, and cultural influences on architectural styles are emphasized.

ART 222 Commercial Construction (3 cr.) Class 2, Lab 3. P: 155. Preparation of preliminary and working drawings for an intermediate-sized commercial building. At the instructor's option, the work may be done in groups.

ART 284 Mechanical Systems for Buildings (3 cr.) Class 3. P: MATH 153, CNT 105, and ART 165 or equivalent. Plumbing, heating, ventilation, air-conditioning, and other mechanical systems for buildings, including calculations and design for such systems.

ART 285 Electrical Systems for Buildings (2 cr.) Class 2. P: MATH 153 or equivalent, CNT 105, and ART 165. A survey of electrical and lighting system requirements for residential and commercial buildings. Lighting fundamentals and design, electric circuits, power requirements, and wiring layout used for building construction systems.

ART 299 Architectural Technology (1-4 cr.) Hours and subject matter to be arranged with staff. Course may be repeated for up to 9 credit hours.

ART 350 Energy Conservation in Buildings (3 cr.) Class 3. P: 284. Heat loss and heat gain calculations in buildings using computers. Principles of energy-conserving building construction and insulation methods as to details and materials. Life-cycle costing of construction alternatives.

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

ART 499 Architectural Technology (1-4 cr.) Hours, subject matter, and credit to be arranged with staff. Course may be repeated for up to 9 credit hours.

Biomedical Electronics Technology (BMET)

BMET 105 Introduction to Biomedical Electronics Technology (1 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 220 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 240 Introduction to Medical Electronics (3 cr.) Class 3. P: 220 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 310 Introduction to Radiography Systems (3 cr.) Class 3. P: 220 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 320 Biomedical Electronic Systems I (4 cr.) Class 3, Lab 3. P: 240 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 330 Electronics for the Clinical Laboratory Equipment Technician (3 cr.) Class 3. P: ECET 116 or equivalent (fundamental understanding of active, passive, and digital devices). This course provides a study of devices, circuits,

computers, test equipment, transducers, and sensors which are specific to the clinical laboratory. This course includes the analysis of applied electronics circuits incorporated in this environment.

BMET 360 Applied Human Biology for the Clinical Laboratory (3 cr.) Class 3. P: 330 or consent of instructor. This course provides an overview of human structure, function, and chemistry as they relate to the clinical laboratory environment. The class emphasizes the study of bodily fluids and commonly analyzed tissues under both normal and disease conditions. Fluids studied include blood components, urine, spinal fluid, and joint fluid. This class will also discuss medical terminology as well as the medical communication skills required to interface with hospital staff.

BMET 370 Safety and Regulations in the Clinical Laboratory (3 cr.) Class 3. P: 360 or consent of instructor. This course studies the codes and standards of the College of American Pathologists (CAP), the Clinical Laboratory Improvement Amendment (CLIA), and other governing bodies. In addition, this course investigates the prevention and control of chemical, electrical, biological, and radiological human hazards.

BMET 380 Clinical Laboratory Equipment (3 cr.) Class 3. P: 370 or consent of instructor. This course focuses on the theory of clinical laboratory instrumentation and the function, utilization, and problem-solving skills necessary for the support of laboratory equipment. Instruction emphasizes devices used for hematology, clinical chemistry, and microbiology. These devices include centrifuges, blood cell analyzers, immunochemistry analyzers, coagulation analyzers, and blood gas and co-oximetry machines. The course also presents fundamental pneumatics as a basis for clinical lab equipment.

Civil Engineering Technology (CET)

CET 104 Fundamentals of Surveying (3 cr.) Class 2, Lab 3. P or C: MATH 154 or equivalent. 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.

CET 160 Statics (3 cr.) Class 3. P: MATH 151 or MATH 154 or equivalent. P or C: PHYS 218. Forces acting on bodies at rest, including coplanar, concurrent, and nonconcurrent systems. Includes centroids, moments of inertia, and friction.

CET 204 Land Survey Systems (3 cr.) Class 3. P: MATH 153. Development, history, and elements of the U.S. Public Land System. Tiffin's Instructions. Methodology for the subdivision of sections, retracement survey concepts, related problems and solutions. Types of land descriptions and their plots. State Plane Coordinate System and its use in surveys. Records research of land. Modern land information system, implementation of such a system.

CET 210 Surveying Computations (3 cr.) Class 2, Lab 2. P: 104. Accuracy, precision, and error theory pertaining to surveying calculations. Includes manual lab sessions, as well as software use, if appropriate, related to calculations involving alignment, grade, route surveying, construction surveying, building layouts, areas, and earthwork.

CET 231 Soils Testing (3 cr.) Class 2, Lab 3. P: 160. P or C: TCM 220. The measurement of the engineering properties of soils in the laboratory and field. Identification and classification of soils by the Unified Soil Classification System and the American Association of State Highway and Transportation Officials System.

CET 260 Strength of Materials (3 cr.) Class 3. P: 160. C: 267. 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.

CET 267 Materials Testing (2 cr.) Class 1, Lab 3. C: 260. P or C: TCM 220. 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.

CET 275 Applied Civil Engineering Drafting (3 cr.) Class 2, Lab 3. P: ART 117, ART 165, and CNT 105. Preparation of structural construction drawings for buildings, bridges, roads, and topographic drawings.

CET 299 Civil Engineering Technology (1-4 cr.) Hours and subject matter to be arranged with staff. Course may be repeated for up to 9 credit hours.

CET 302 Geodesy (3 cr.) Class 3. P: 104. This course is designed to provide an overview of geodesy and includes the following: a brief history of geodesy, the geometry of the ellipsoid, the two-dimensional ellipse, the construction of an ellipse, the three-dimensional ellipsoid, geodetic transformations, geodetic datums, reduction of field observations to the ellipsoid, the geoid, and orthometric heights and leveling.

CET 304 Legal Descriptions for Surveyors (3 cr.) Class 3. P: 104 and 204. This course provides a foundation in basics necessary to write legal descriptions. Includes a brief history of surveying framework, supportive information, descriptive fundamentals, determining controls, general and water boundaries, interpretations, monuments, streets, occupations versus titles, easements, right-of-ways, and special shaped/section land. Participants will undertake land description writing exercises.

CET 305 Control Surveying (3 cr.) Class 3. P: 104 and 210. Theoretical fundamental and practical applications of establishing survey control networks, including open and closed traverses, route surveying networks, using GPS and EDMI in control surveying, differential leveling, and industry surveying standards.

CET 308 GPS and Geodesy for Surveyors (3 cr.) Class 2, Lab 2. P: 104, 210, and MATH 221. Practical application of GPS to land surveying, use of the GPS signal and receivers. Planning a GPS survey, conducting the observations, and analyzing GPS data processing procedures. The course also includes overview of geodesy, the geometry of the multidimensional ellipse and ellipsoids, geodetic transformations and datums, and the Geodetic Reference System.

CET 312 Construction and Route Surveying (3 cr.) Class 2, Lab 3. P: 104. 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.

CET 350 Structural Design for Construction (3 cr.) Class 3. P: 260 and PHYS 218. This course provides an overview of structural design for reinforced concrete, steel, and wood structures. Allowable and ultimate strength design methodologies are covered, including load factor design and load and resistance factor design. Structural design codes and design-construction interdependence in professional practice are emphasized.

CET 402 Surveying Law (3 cr.) Class 3. P: 104, 204, and 304 or equivalent. Surveying law defines the role and duties of a surveyor; rights and interests in land; the ownership and transfer of real property, land descriptions, statute law and common laws; sequential and simultaneous conveyances; easements and reversions; riparian rights; the public land system; and Rule 13.

CET 407 Property Surveying (3 cr.) Class 3. P: 204, 210, 304 and 402. The land surveyor in the context of real estate development/transfer. The rules and classifications of evidence and their use. Transfers of real estate and role of title companies. The process for a legal survey in Indiana. Retracement survey of a subdivision, evidence gathered and optimum resolution for the boundaries on such surveys. Plats and reports. This is a capstone course for the series of surveying courses offered by the department.

CET 430 Soils and Foundations (3 cr.) Class 2, Lab 3. P: 350. P or C: TCM 220. 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.

CET 452 Hydraulics and Drainage (3 cr.) Class 3. P: 260, 312, and senior standing. 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.

CET 490 Senior Project (1-6 cr.) Final project aimed at combining the skills and knowledge gained from the various areas of study. The student will be expected to report graphically, orally, and in written

form on a final project approved by the advisor. Presentation will be made to a representative board of the faculty determined by the advisor.

CET 499 Civil Engineering Technology (1-4 cr.) Hours, subject matter, and credit to be arranged with staff. Course may be repeated for up to 9 credit hours.

Computer Graphics Technology (CGT)

CGT 100 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 102 Graphic PC Basics (3 cr.) Class 2, Lab 4. 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 110 Technical Graphics Communication (3 cr.) Class 2, Lab 2. This course is an introduction to the graphic language used to communicate design ideas using CAD. Topics include sketching, multiview drawings, auxiliary views, pictorial views, working drawings, dimensioning practices, and section views.

CGT 111 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 112 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 116 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 117 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 120 Electrical and Electronic Drafting (2 cr.) Class 1, Lab 2. P: ECET 157. 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 155 Graphical Communication and Spatial Analysis (2 cr.) Class 1, Lab 2. The principles of engineering graphics are applied to the visualization, communication, and graphical analysis of problems. Included is the utilization of sketching and computer-aided design to create and analyze computer-generated geometric models. Manipulation of coordinate systems, methods for generating selected views, graphic and data base standards, and engineering drawing interpretation will be covered.

CGT 211 Raster Imaging for Computer Graphics (3 cr.) Class 2, Lab 2. P: 116 and 117. 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 216 Vector Imaging for Computer Graphics (3 cr.) Class 2, Lab 2. P: 211. 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 221 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 226 Introduction to Constraint-Based Modeling (3 cr.) Class 2, Lab 2. P: 116, 112, 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 241 Introduction to Computer Animation (3 cr.) Class 2, Lab 2. P: 116, C: 211. 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 242 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 251 Principles of Creative Design (3 cr.) Class 2, Lab 2. P: 117. 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 262 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 267 Applications of Construction Documentation I (3 cr.) Class 2, Lab 2. P: 112 and 116. 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 299 Selected Topics in Computer Graphics (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 321 Advanced Pictorial Representation (3 cr.) Class 1, Lab 4. P: 221. The importance of tone, texture, color, and entourage is stressed in the rendering of architectural interiors and exteriors.

CGT 323 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 326 Manufacturing Graphics Standards (3 cr.) Class 2, Lab 2. P: MET 242. 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 340 Digital Lighting and Rendering for Computer Animation (3 cr.) Class 2, Lab 2. P: 241. 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 341 Motion for Computer Animation (3 cr.) Class 2, Lab 2. P: 340. 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 346 Digital Video and Audio (3 cr.) Class 2, Lab 2. P: 241. 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 351 Multimedia Authoring I (3 cr.) Class 2, Lab 2. P: 251. 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 356 Hypermedia Authoring I (3 cr.) Class 2, Lab 2. P: 251. 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 362 Applications of Construction Documentation II (3 cr.) Class 2, Lab 2. P: 216, 266, and CIT 175. 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 411 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 415 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 416 Senior Design Project (3 cr.) Class 3; or Class 2, Lab 2. P: 415. 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 423 Manufacturing Document Production and Management (3 cr.) Class 2, Lab 2. P: 326. 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 442 Production for Computer Animation (3 cr.) Class 2, Lab 2. P: 341. 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 446 Technical Animation Production and Direction (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 451 Multimedia Authoring II (3 cr.) Class 2, Lab 2. P: 351. As a continuation of 351, 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 456 Hypermedia Authoring II (3 cr.) Class 3; or Class 2, Lab 2. P: 356. 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.

Computer Integrated Manufacturing Technology (CIMT)

CIMT 100 Introduction to CIM Technology (1 cr.) Class 1. This course presents students with a vision of how the techniques and tools of computer-integrated manufacturing (CIM) work together to support the operation of a manufacturing business.

CIMT 224 Production control and MRP (3 cr.) Class 3. P: MATH 151 or equivalent. Preproduction considerations of the most economical methods, operations, and materials for the manufacture of a product. Includes planning, scheduling, routing, and detailing of production control procedures.

CIMT 243 Automated Manufacturing I (3 cr.) Class 2, Lab 2. P: ECET 116 and CIT 140. Examination of how industrial controls, programmable logic controllers (PLCs), and industrial robots function in an automated manufacturing environment. Students learn the theory of operation, how to program, and the practical application of PLCs and electric robots. Introductory-level integration topics and commonly used industrial control devices are also addressed.

CIMT 244 Automated Manufacturing II (3 cr.) Class 2, Lab 2. P: MET 242 and CIT 140. Shop floor components of computer-integrated manufacturing are introduced. Emphasis is focused on current applications and programming practices of various computer automated manufacturing processes and technologies. Topics include CAD/CAM integration, computer-assisted numerical control programming, computer-assisted quality control, and automatic identification.

CIMT 245 CAD Tool and Fixture Design (3 cr.) Class 2, Lab 3. P: MET 102. Tool design methods; tooling materials and heat treatment; design of cutting tools; gage design; design of jigs and fixtures; design of tools for CNC machines; tool design using CAD systems. Tool design term projects using CAD systems required.

CIMT 260 Robotics and Automated Material Handling (3 cr.) Class 2, Lab 2. P: MATH 153 and MET 105. A survey of the types of industrial robots and their applications in manufacturing. Safety, application limitations, and economic justification will be considered. Automated material-handling equipment will be reviewed. Laboratory exercises will involve programming an educational robot using a teach pendant and microcomputers.

CIMT 310 Plant Layout and Material Handling (3 cr.) Class 3. P: MET 102. A study and analysis of material flow in a manufacturing facility; material-handling equipment; plant layout principles for manufacturing service, storage, and office areas; and industrial packaging techniques. Emphasis is on

application to manufacturing problems. Not open to students who have credit in IET 310.

CIMT 360 CIM in Electronics Manufacturing (4 cr.) Class 3, Lab 2. This course covers the manufacture and assembly of electronic printed circuit boards from component selection and board layout to soldering and test. Special emphasis is placed on high volume manufacturing techniques and state-of-the-art processes, such as surface mount technology (SMT). Laboratory projects include CAD circuit board layout, using automatic placement and soldering equipment, investigating thermal characteristics of circuit boards, process design, and evaluation using SPC techniques. Effects of manufacturing processes on electrical characteristics are considered.

CIMT 460 Motion and Time Study (3 cr.) Class 2, Lab 3. P: junior standing. Techniques of motion and time study, process charts, operation charts, multiple activity charts, micromotion study, therbligs, and stopwatch time study.

CIMT 481 Integration of Manufacturing Systems (3 cr.) Class 2, Lab 2. P: senior standing in CIMT program. This is a capstone course that emphasizes the integration of traditional manufacturing activities such as planning, facilities, materials handling, production control, etc. Students will analyze case studies and complete directed projects. Field trips may be required.

CIMT 497 Senior Project (3 cr.) Class 2, Lab 2. Directed work on individual projects for senior computer-integrated manufacturing technology students.

CIMT 499 Computer Integrated Manufacturing 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.

CIMT Internship and Cooperative Education Programs

For the Cooperative (C) education and Internship (I) programs and courses below, students should consult the Office of Student Placement Services at (317) 278-1000.

CIMT C198, C298, C398, C495, and C498 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.

CIMT I198, I298, I398, I495, and I498 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 a second career. A comprehensive written report on the internship experience is required.

Computer Technology (CIT)

CIT 102 Discovering Computer Technology (1 cr.) Class 1. This course introduces students to computer technology and campus resources. It is designed to help students develop essential writing and thinking skills along with the study and time-management skills needed for academic success in computer technology. Teaching/learning strategies will use campus technology and library resources as tools for completion of course requirements.

CIT 106 Using a Personal Computer (3 cr.) Class 2, Lab 2; or Class 3. This course explores the use of personal computer software. Students solve problems through hands-on experience with word processing, spreadsheets, data management, and presentation graphics. The course also surveys Internet tools, including electronic mail, World Wide Web, gopher, FTP, Telnet, and strategies for resource discovery.

CIT 112 Information Technology Fundamentals (3 cr.) Class 3. P: consent of instructor. 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.

CIT 115 Computer Information Systems Fundamentals (3 cr.) Class 3. This course provides students with a working knowledge of the terminology, processes, and components of information systems, information systems development, and hands-on experience with the Internet and World Wide Web as well as state-of-the-art hardware and software.

CIT 120 Quantitative Analysis I (3 cr.) Class 3. P: MATH 111. An introduction to both qualitative and quantitative problem solving, featuring a systems approach that relies on graphic models to describe such concepts as relations, sequences, and logic patterns. Course includes a brief introduction to set theory, logic, and descriptions of data.

CIT 123 Internet Skills (3 cr.) Class 2, Lab 2; or Class 3. This course is designed to be taken via the Internet. It uses the Internet both as the message and the media for presentation. It is designed to increase an individual's competency in the global communication environment. All assignments, examinations, and quizzes are structured so they may be executed via the Internet.

CIT 140 Programming Constructs Laboratory (3 cr.) Class 2, Lab 2. P: 106 and a course in problem solving, or consent of course coordinator. Application of problem-solving techniques, programming logic, program design, and development.

CIT 188 Microcomputer Applications Packages (variable title) (3 cr.) P: varies with course content. Introduction to the topics and skills associated with a selected microcomputer applications package. Because various applications packages may be offered under this title, this course may be repeated for up to 9 credit hours.

CIT 212 Web Site Design (3 cr.) Class 3. P or C: 112. This course is designed to give the students basic understanding of the proper process to be used for developing an effective commercial Web site. This course will cover the full development cycle including analysis, design, and construction components.

CIT 213 Web-Based Analysis and Design (3 cr.) Class 3. P or C: 215. Concepts, processes, and tools of systems analysis and system design. Object-oriented methods and tools are utilized. Web-based user interfaces and prototypes are developed by students.

CIT 214 Web Data Management (3 cr.) Class 3. P or C: 212. Introduction to Web database concepts. Extensive exploration of data manipulation using a relational DBMS and SQL in a Web environment. Students will create a database with a Web interface.

CIT 215 Web Programming (3 cr.) Class 3. P or C: 214. 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 Perl, ASP, and JavaScript.

CIT 220 Quantitative Analysis II (3 cr.) Class 3. P: 120 or ECET 109 and MATH 153. Continued investigation into problem-solving tools and techniques including functions and relations, Boolean algebra and switching theory, probability, statistical distributions (with emphasis on the normal and Poisson), and the use of appropriate software.

CIT 223 Web Page Design (3 cr.) Class 2, Lab 2; or Class 3. P: 106. This course is designed to give students a basic look at World Wide Web page and site creation. The course involves current HTML fundamentals, design concepts, links, anchors, use of color, placing graphics, utilization of tables, image maps, site structures, and the use of search engines.

CIT 233 Hardware/Software Architecture (3 cr.) Class 2, Lab 2; or Class 3. P: 115. 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.

CIT 242 Introduction to ASP.Net Programming (3 cr.) Class 2, Lab 2; or Class 3. P: 115 and 140 or consent of instructor. 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 254 Analysis and Design (3 cr.) Class 2, Lab 2; or Class 3. P: 140, 223, and 288. Concepts, processes, and tools of systems analysis and systems design. Object-oriented methods and tools are utilized. Web-based user interfaces and prototypes are developed by students.

CIT 262 Problem Solving and Programming (3 cr.) Class 3; or Class 2, Lab 2. P: 115 and 140. An introduction to object-oriented programming, with

emphasis on object design, construction, use, modification, and reuse.

CIT 270 Java Programming (3 cr.) Class 3. P: 115 and 140. 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 286 Operating Systems and Administration (3 cr.) Class 2, Lab 2; or Class 3. P: 233 or ECET 209, and 262 or 265 or 270. An introduction to computer operating systems and other systems software, with emphasis on both microcomputers and mainframes. Hardware architecture, multiprogramming and timesharing, command and control languages, memory management, scheduling, and interrupt handling.

CIT 288 Using a Database Management System (3 cr.) Class 2, Lab 2; or Class 3. P: 106, 115, and 120. Introduction to basic database development concepts. Extensive exploration of data manipulation using a relational DBMS and SQL. Students develop a microcomputer database application using Web database technology.

CIT 290 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 299 Computer Technology (1-4 cr.) Hours, credit, and subject matter to be arranged by staff.

CIT 303 Communications Security and Network Controls (3 cr.) P: CIT 307 or ECET 284 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 307 Data Communications (4 cr.) Class 4. P: 220. 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 internetworking, and diagnostic techniques.

CIT 312 Advanced Web Site Design (3 cr.) Class 2, Lab 2; or Class 3. P: 212 or 223 and 213, or 254. This course will cover both internal Web site design issues such as security, reusability, and architecture and external design issues such as user interfaces, load times, and multimedia.

CIT 313 Commercial Web Site Development (3 cr.) Class 3. P or C: 213. This course will provide students with the opportunity to work directly with local companies by developing a Web site to support the company's business activities. Students will be required to utilize many of the skills and techniques learned in the prior certificate courses.

CIT 315 Introduction to Multimedia Programming (3 cr.) Class 2, Lab 2; or Class 3. P: 223 or 212. An introduction to computing concepts in multimedia development. An integration of the science behind multimedia including compression algorithms, analog/digital conversions, media filtering, streaming media, and XML-based languages. Lecture and laboratory.

CIT 316 Introduction to Virtual Reality (3 cr.) Class 2, Lab 2; or Class 3. P: 223 or 212. Explore concepts of 3-D imaging and design, including primitive shapes, transformations, extrusions, facesets, texture mapping, shading, and scripting. Lecture and laboratory.

CIT 317 System and Network Administration (3 cr.) Class 2, Lab 2; or Class 3. P: 307 and 286. Fundamental concepts of system administration. 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 320 Quantitative Analysis III (3 cr.) Class 3. P: 220 and junior standing. 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 323 Multimedia (3 cr.) Class 2, Lab 2; or Class 3. P: junior standing. This course covers contemporary, interactive multimedia technology systems, focusing on types, applications, and theories of operation. Students learn how to digitize and manipulate images, voice, and video materials.

CIT 325 Human-Computer Interaction (3 cr.) Class 2, Lab 2; or Class 3. P: 223 or 212. Human-computer interaction (HCI) focuses on understanding how humans interact with computers and how they can use this knowledge to improve the design and evaluation of computer systems, particularly the user interface. This course will examine the development, evaluation, and testing of effective and efficient computer interfaces.

CIT 329 Java Server Pages (3 cr.) Class 2, Lab 2; or Class 3. P: 270. This course will cover the development of Java Server Pages (JSP) and Java Servlets in an e-commerce environment.

CIT 336 Data Communications Lab (2 cr.) Class 1, Lab 2. P or C: 307. This course is a companion to 307 and emphasizes hands-on lab work. In this course, students will implement hardware and software configurations to meet specific requirements of a data communications system. In addition, students will explore tools and network troubleshooting.

CIT 347 Advanced ASP.Net (3 cr.) Class 2, Lab 2; or Class 3. P: 242. 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 352 Decision Support and Information Systems (3 cr.) Class 3. P: 254. Definition of support and management information systems: similarities and differences. Use of decision support systems (DSS) and management information systems (MIS) in organizations. Tools for modeling and simulation. Application of system analysis and system design concepts to DSS and MIS situations.

CIT 362 Object-Oriented Programming (3 cr.) Class 3 or Class 2, Lab 2. P: CIT 262 after fall 2000 or CIT 362 prior to fall 2000 or equivalent C++ programming course. This course continues the study of object-oriented programming by introducing visual components. Students complete exercises and programs using an object oriented programming language in a visual environment.

CIT 374 Systems and Database Analysis (4 cr.) Class 2, Lab 4. P: 254 and 288. Intensive exploration of application and database analysis in a synergistic environment. Students engage in collaborative, project-based activities to learn about project management, requirements analysis, modeling, prototyping, employing problem solving, and team-building skills.

CIT 384 Systems Design (3 cr.) Class 2, Lab 2; or Class 3. P: 374. Application of tools and techniques for system designs through a semester project. Software selection decisions, conversion and implementation planning, post-operational review planning, and maintenance considerations are also discussed.

CIT 388 Topics in Programming Languages (variable title) (3 cr.) Class 3; or Class 2, Lab 2. P: one 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 402 Design and Implementation of Local Area Networks (3 cr.) Class 2, Lab 2; or Class 3. P: 307 or ECET 284. The design, implementation, and configuration of local area networks. Working in groups, students install the necessary hardware and software to set up a LAN server with several clients. Students will explore topics including inter-networking, network management, network performance, and security.

CIT 406 Advanced Network Security (3 cr.) P: 303. 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 407 Fundamentals of Intelligent Agents (3 cr.) Class 2, Lab 2; or Class 3. P: 254, 288, and a 300-level programming language. This course covers the concepts, applications, and theories of operations of intelligent agent technology. An intelligent agent is a software program that uses communication protocols to exchange information for automatic problem solving. Students will perform an in-depth analysis of an intelligent agent for a specific application and construct a prototype of it.

CIT 410 Information Technology Ethics and Leadership (3 cr.) Class 3. 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 412 XML-Based Web Applications (3 cr.) Class 2, Lab 2; or Class 3. P: 213 or 254 and 200-level programming course. 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), data binding, and the Document Object Model.

CIT 415 Advanced Network Administration (3 cr.) P: 317 or 321 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 419 Streaming Media Technology Design (3 cr.) Class 2, Lab 2; or Class 3. P: 323. This course focuses on the technology that allows the transmission of audio, video, and multimedia type content over the Internet or private network. Topics will focus on the understanding, design, and development of efficient and effective multimedia programs.

CIT 420 Digital Forensics (3 cr.) P: 415. This course is an introduction to 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 423 Electronic Commerce (3 cr.) Class 2, Lab 2; or Class 3. P: junior standing. Overview of current electronic commerce applications and the related legal and policy issues. Coverage of electronic payment systems, authentication, and security. Topics such as privacy, content selection and rating, and intellectual property rights are discussed.

CIT 426 Enterprise Networks (3 cr.) Class 2, Lab 2;, or Class 3. P: 402 or 440. An introduction to enterprise networks and the issues related to their design and implementation. This course examines the need for corporate networks and the role they play in the business environment. Students will learn how to integrate various technologies to meet the needs of an organization. Topics covered include network security, interoperability, performance, and integration.

CIT 431 Applied Secure Protocols (3 cr.) P: 303, 120 or a course in discrete math, and CIT 220 or a course in probability or statistics. 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 436 Advanced E-Commerce Development (3 cr.) Class 2, Lab 2; or Class 3. P: 312. P or C: 347 or 329. This course will allow students the opportunity to develop a data-driven e-commerce site for a small- to medium-size company.

CIT 440 Communication Network Design (3 cr.) Class 2, Lab 2; or Class 3. P: 307 or ECET 284. An introduction to wide area networking, 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 479 Database Implementation and Administration (3 cr.) Class 2, Lab 2; or Class 3. P: 288 and 286. 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, and programming activities using client/server technology.

CIT 484 Systems Analysis and Design Project (3 cr.) Class 3. P: 384. This is a seminar-styled course utilizing a collaborative learning approach to analyze and design a realistic information system of moderate complexity. Synthesis of system analysis and design concepts, principles, and practices are the major content components. Project management, group dynamics, and conflict resolution are experienced and discussed by the course participants.

CIT 490 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 499 Computer Technology (1-4 cr.) Hours, credit, and subject matter to be arranged by staff.

CIT Internship and Cooperative Education Programs

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CIT C198, C298, C398, C494, and C498 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 I198, I298, I398, I494, and I498 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.

Construction Technology (CNT)

CNT 105 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.

CNT 110 Construction Accounting (3 cr.) Class 2, Lab 2. P: 105 and ART 165. 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.

CNT 280 Quantity Survey (3 cr.) Class 2, Lab 3. P or C: ART 155 or CET 275 or consent of instructor. A study of methods to estimate quantities of materials required in construction. Practice in making quantity surveys.

CNT 302 Construction Law and Ethics (3 cr.) Class 3. P: junior standing and 347. 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.

CNT 330 Construction Field Operations (3 cr.) Class 3. P: 280, CET 260, and junior or senior standing. Study of types and uses of construction equipment and machinery in relation to diverse field operations. Analysis of equipment productivity and costs.

CNT 341 Construction Scheduling and Project Control (3 cr.) Class 2, Lab 3. P: 280 and 347. 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.

CNT 342 Construction Cost and Bidding (3 cr.) Class 2, Lab 3. P: 347 and junior or senior standing. 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.

CNT 347 Construction Contract Administration and Specifications (3 cr.) Class 2, Lab 2. P: CNT 280 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.

CNT 390 Construction Experience (1 cr.) P: junior or senior standing. 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.

CNT 447 Construction Project Management (3 cr.) Class 3. P: 341, 342, and senior standing. 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.

CNT 452 Construction Safety and Inspection (3 cr.) Class 3. P: 347 and 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.

CNT 470 Site Development (3 cr.) Class 2, Lab 2. P or C: CET 452 or consent of instructor. Principles and practices of land development considering market analysis, site selection, restrictions imposed by covenants and governmental regulations, costs, and financing. Lab work involving collection of data and preparation planning, design and platting drawings for land development.

CNT 490 Senior Project (3 cr.) P: senior standing. The development of a project that will combine the skill and knowledge gained from various areas of study. The student will be expected to present a project that has been approved by the faculty advisor to a panel of faculty chosen by the advisor. This presentation should include graphical material as well as oral and written communication.

CNT 494 Engineering Economics for Construction (3 cr.) Class 3. P: senior standing and 342. 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.

CNT 499 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.

CNT Internship and Cooperative Education Programs

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CNT I198, I298, I398, I496, and I498 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 and Computer Engineering Technology (ECET)

ECET 103 Topics in Electrical and Computer Engineering Technology (1 cr.) Class 1. This course includes specialized topics and skills associated with electrical and computer engineering technology. The level of coverage varies according to the audience.

ECET 107 Introduction to Circuit Analysis (4 cr.) Class 3, Lab 2. P or C: MATH 153. 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 109 Digital Fundamentals (3 cr.) Class 2, Lab 2. P or C: MATH 111 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 116 Electrical Circuits (4 cr.) Class 3, Lab 2. P or C: MATH 153. 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 157 Electronics Circuit Analysis (4 cr.) Class 3, Lab 2. P: 107 and MATH 153. 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 159 Digital Applications (3 cr.) Class 2, Lab 2. P: 109. A continuation of 109. Sequential logic circuits, flip-flops, counters, programmable device logic, shift registers, logic families, and introductory computer concepts.

ECET 164 Applied Object-oriented Programming (3 cr.) Class 2, Lab 2. P or C: MATH 153. 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 207 AC Electronics Circuit Analysis (4 cr.) Class 3, Lab 2. P: 157. 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 209 Introduction to Microcontrollers (4 cr.) Class 3, Lab 2. P: 159 and one of the following: CIT 140, ECET 164 or equivalent. 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 231 Electrical Power and Controls (4 cr.) Class 3, Lab 2. P: 157 and 159. P or C: PHYS 218. 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 234 PC Systems I (3 cr.) Class 2, Lab 2. P: 109. P or C: 164 or CIT 140. A study of PC hardware and software. Components of the computer including CPU, memory, ports, drives, and cards are covered as well as their setup, operation, and troubleshooting. Labs include topics within A+ certification and hardware/software interfacing using Visual Basic.

ECET 257 Power and RF Electronics (4 cr.) Class 3, Lab 2. P: 207. A study of the application of circuit analysis techniques to amplifiers used in power and r-f electronics, including bipolar junction transistors, field-effect transistors, thyristors, r-f amplifiers, phase-locked loops, switching power supplies, and appropriate applications. Computer-aided analysis of circuits is used.

ECET 284 Computer Communications (4 cr.) Class 3, Lab 2. P: 159. P or C: 157. 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 302 Introduction to Control Systems (4 cr.) Class 3, Lab 2. P: 231. 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 304 Intro to Communications Systems (4 cr.) Class 3, Lab 2. P: 257 and MATH 222 . 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 307 Analog Network Signal Processing (4 cr.) Class 3, Lab 2. P: 257. P or C: MATH 222. 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 309 Advanced Embedded Microcontrollers (4 cr.) Class 3, Lab 2. P: 209 or equivalent. 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 331 Generation and Transmission of Electrical Power (4 cr.) Class 3, Lab 2. P: 231. 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 357 Real-Time Digital Signal Processing (4 cr.) Class 3, Lab 2. P: 209. 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 360 CIM in Electronics Manufacturing (4 cr.) Class 3, Lab 2. P: 157. 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 371 Automation, Instrumentation, and Process Control (4 cr.) Class 2, Lab 4. P: 157, 207, and 231. 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 381 Electrical Distribution Systems (4 cr.) Class 3, Lab 2. P: 231. 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 403 Data Communications and Telecommunications (4 cr.) Class 3, Lab 2. P: 284. 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 417 Advanced Digital Systems Design with VHDL (4 cr.) Class 3, Lab 2. P: 159. 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 434 PC Systems II (4 cr.) Class 3, Lab 2. P: ECET 234 and one of the following: 164, CIT 270, or CIT 262. 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 453 Topics in Telecommunications (4 cr.) Class 3, Lab 2. P: 403. An advanced course in telecommunications that introduces and evaluates state-of-the-art systems, services, and applications for current and emerging networking technologies.

ECET 472 Automatic Control Systems (4 cr.) Class 3, Lab 2. P: 307 and 302. The transfer function approach to the study of feedback control systems to determine system performance and stability. Routh, Nyquist, Bode, and root-locus methods of analysis and design for cascade and feedback compensation are covered. Analog and digital simulation software is used. State-space analysis and digital control systems are introduced.

ECET 483 Network Fundamentals with Microcontrollers (4 cr.) Class 3, Lab 2. P: 234, 284. 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 490 Senior Design Project Phase I (2 cr.) P: three 300- or 400-level ECET electives. P or C: TCM 220. 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 491 Senior Design Project, Phase II (2 cr.) P: 490. P or C: TCM 370. A continuation of 490.

ECET 499 Electrical and Computer Engineering Technology (1-9 cr.) Class 0-4, Lab 2-9. Hours and subject matter to be arranged by staff.

ECET M150 Electronics Manufacturing I (3 cr.) Class 2, Lab 2. An introduction to the fabrication of electronic products. Topics include components, printed-circuit board layout and fabrication, PCB assembly and inspection, chassis hardware and assembly, and harness and cable fabrication. Students will fabricate and assemble a working prototype in the laboratory.

ECET M200 Electronics Manufacturing II (4 cr.) Class 2, Lab 2. P: M150 or 157. Methods for high-volume manufacturing of printed-circuit boards. Both through-hole and surface-mount assemblies are included. Topics include computer-aided circuit design, printed-circuit board layout, board fabrication, assembly, and test. System integration of the entire process and statistical quality control are stressed.

ECET M290 Projects in Electronics Manufacturing (4 cr.) Class 2, Lab 4. P: M200. A capstone course in electronics manufacturing. Students will be given a printed circuit board to lay out and assemble using automated techniques. They will develop test strategies and implement statistical process control. At the end of the course, each student will present written and oral reports on his or her part of the project. Students will evaluate each step of the manufacturing process.

ECET Internship and Cooperative Education Programs

For the Cooperative (C) education and Internship (I) programs and courses below, students should consult the Office of Student Placement Services at (317) 278-1000.

ECET C291, C292, C393, C394, and C395 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 I291, I292, I393, I394, and I395 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.

Industrial Engineering Technology (IET)

IET 104 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 150 Quantitative Methods for Technology (3 cr.) Class 3. P: MATH 159. 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 204 Maintaining Quality (3 cr.) Class 2, Lab 2. P: MATH 153 and MATH 154, or MATH 159. 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 240 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 300 Metrology for Quality Assurance (3 cr.) Class 2, Lab 2. P: MET 105 and MATH 159 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 301 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 340 Industrial Procurement (3 cr.) Class 3. The study of modern purchasing in a manufacturing firm, with emphasis on industrial organization, quantity and quality analysis, sources, legal requirements, and related topics. Includes case discussion and analysis.

IET 350 Engineering Economy (3 cr.) Class 3. P: MET 105. 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 250.

IET 364 Total 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 374 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 454 Statistical Process Control (3 cr.) Class 3. P: 150. Design and analysis of statistical process control charts and industrial sampling plans. Not open to students who have credit for 354.

IET 474 Quality Improvement of Products and Processes (3 cr.) Class 3. P: 454 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 (INTR)

INTR 103 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. Basic hand drafting is included.

INTR 124 Space Planning for Interiors (3 cr.) Class 2, Lab 2. P: 103. Introduction to the fundamentals of design for human activity, standards for space, programming, and graphic communication. Requirements for ADA and Universal Design will be included.

INTR 125 Color and Lighting of Interiors (3 cr.) Class 2, Lab 2. Exploration of the physiological, psychological, and phenomenal aspects of color and light in interior spaces. Application includes specification and selection of lighting fixtures and light sources.

INTR 151 Textiles for Interiors (3 cr.) Class 3. C: 103. An extensive study of textiles: fiber types, yarn production, fabric construction, finishing, coloring, and printing. Application of textiles for use in residential and commercial interiors.

INTR 202 Interior Materials and Applications (3 cr.) Class 2, Lab 2. P: 103 and 151. Analyzes information related to use of surfacing materials applied as interior finishes in interior design projects. The role of green design is introduced, and ecological issues are integrated into each category of materials analyzed.

INTR 204 History of Interiors and Furniture (3 cr.) Class 3. P: 103. A survey of historical development of interiors, furniture, and decorative arts from early history to the present. Emphasis is on design motifs, ornamentation, and furniture styles. Adaptation and use of period styles within contemporary design are included.

INTR 224 Residential Interior Design Studio (3 cr.) Class 2, Lab 2. P: 124. C: 202. This studio class will emphasize the design of residential space, recognizing design development as a process. Space design, working drawings, plans, and client presentations also will be covered. The course will utilize computer-aided drafting and design (CAD).

INTR 225 Three-Dimensional Interior Design Studio (3 cr.) Class 1, Lab 4. P: ART 120. C: 202. This studio class includes the fundamentals of three-dimensional design and drawing. Model building techniques will be taught as students design a piece of furniture that is functional, ergonomic, and aesthetic.

INTR 226 Commercial Interior Design Studio (3 cr.) Class 2, Lab 2. P: 202, 224. C: 252. This studio course emphasizes the elements used in development of nonresidential space. Studies include technological and building requirements; building and life-safety codes; square footage and space-planning standards.

INTR 228 Interior Design for Contemporary Issues and Needs (3 cr.) Class 1, Lab 4. P: 224. C: 226. A capstone course. For the A.S. two-year program. Students take a single project from job procurement through bid documentation.

INTR 252 Interior Building Systems (3 cr.) Class 3. P: 202. 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 253 Business Practices of Interior Design (3 cr.) Class 3. P: 202 and 224. Introduction to business principles and practices as they relate to the interior design profession. Includes business formation and management, professional ethics and organizations, certification and licensing issues, design liability, and project management.

INTR 290 Interior Design Experience (1 cr.) P: consent of instructor. Minimum of 10 weeks of work experience in the interior design field. Written report of the experience.

Mechanical Engineering Technology (MET)

MET 102 Production Design and Specifications (3 cr.) Class 1, Lab 5. P: CGT 110. 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 105 Introduction to Engineering Technology (3 cr.) Class 2, Lab 3. This course provides beginning engineering technology students with the basic tools necessary for success in their chosen technology degree program. Topics include survey of engineering technology careers, technology laboratories and report writing, use of calculators, engineering calculations, metrology, technology computer applications, use of spreadsheets for engineering calculations. Major emphasis on computer applications and QBASIC.

MET 111 Applied Statics (3 cr.) Class 2, Lab 2. P: 105 or equivalent and MATH 153. C: MATH 154. A

study of force systems, resultants and equilibrium, trusses, frames, centroids of areas, and center of gravity of bodies.

MET 112 Applied Mechanisms (3 cr.) Class 3; or Class 1, Lab 5. P: CGT 110 and MATH 151 or equivalent. An analysis of motions, displacements, velocities, instant centers, cams, linkages, and gears.

MET 141 Materials I (3 cr.) Class 2, Lab 2. An overview of structures, properties, and applications of metals, polymers, ceramics, and composites commonly used in industry is presented. Problem-solving skills are developed in the areas of materials selection, evaluation, measurement, and testing.

MET 142 Manufacturing Processes I (3 cr.) Class 2, Lab 3; or Class 3. P: 141. Basic casting, forming, and joining processes are surveyed. The course emphasizes the selection and application of various processes.

MET 211 Applied Strength of Materials (4 cr.) Class 3, Lab 2; or Class 4. P: 111 and 163 or 160. C: MATH 221. The principles of strength, stiffness, and stability are introduced and applied primarily to mechanical components.

MET 212 Applications of Engineering Mechanics (4 cr.) Class 4. Does not carry credit toward graduation in mechanical engineering technology. P: MATH 154. Applications of engineering mechanics are introduced, based on an elementary expansion of Newtonian physics as applied to static and dynamic for systems. Internal stresses and strains produced by these forces in selected machine elements are considered. Work, energy, and power are discussed.

MET 213 Dynamics (3 cr.) Class 2, Lab 2; or Class 3. P: 111. C: MATH 221. Kinematics and kinetics principles of rigid-body dynamics are introduced. Emphasis is on the analysis of bodies in plane motion.

MET 214 Machine Elements (3 cr.) Class 3. P: 211 and PHYS 218. 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 220 Heat/Power (3 cr.) Class 2, Lab 2; or Class 3. P: PHYS 218. This course is 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 230 Fluid Power (3 cr.) Class 2, Lab 2; or Class 3. P: 111 or PHYS 218. 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 240 Basic Foundry (3 cr.) Class 2, Lab 2. P: 141 and 142. 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 242 Manufacturing Processes II (3 cr.) Class 2, Lab 2. P: MET 141, MATH 159 or 154 or MET 162, CIT 135 or MET 163. 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 271 Programming for Numerical Control (3 cr.) Class 2, Lab 2. P: 242 and MATH 159 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 282 Introduction to Plastics (3 cr.) Class 2, Lab 3. P: 141 and 142. 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 299 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 310 Computer-Aided Machine Design (3 cr.) Class 2, Lab 2. P: 214 and 105. 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 320 Applied Thermodynamics (3 cr.) Class 3. P: 220 and MATH 221. Following a review of fundamental concepts, advanced power and refrigeration cycles are analyzed. Applications such as gas mixtures, air-vapor mixtures, and chemical reactions of combustion processes are presented.

MET 328 CAD/CAM for Mechanical Design (3 cr.) Class 2, Lab 2 plus 3 arranged. P: CGT 110 and MET 105 or equivalent. Basic operation of mechanical design-drafting. A PC CAD (2-D and 3-D) 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 340 Piping and Plumbing Design (3 cr.) Class 3. P: 220. 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 344 Materials II (3 cr.) Class 3. P: 141. Metals and polymers are studied. Topics include the bonding of atoms; the structures of crystals and polymers; the coldworking, alloying, and heat treating of metals; and the physical behavior of plastics. Course emphasis is on the development and control of material properties to meet engineering requirements and specifications.

MET 350 Applied Fluid Mechanics (3 cr.) Class 3. P: 220 and 111. 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 360 Heating, Ventilating, and Air Conditioning I (3 cr.) Class 3; or Class 2, Lab 2. P: 220. 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 374 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 384 Instrumentation (3 cr.) Class 2, Lab 3. P: MATH 221, PHYS 219, and IET 150. Introduction to the basic concepts and terminology of instruments. Procedures and techniques essential to industrial measurement and transmission of data. Emphasis on pressure, flow, temperature, level measurements, and computer control.

MET 414 Design of Mechanical Projects (3 cr.) Class 1, Lab 4. P: 102, 214, 230, and ECET 302. 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 426 Internal Combustion Engines (3 cr.) Class 2, Lab 3. P: 220. A study of the spark ignition, compression ignition, and continuous-burning internal combustion engines.

MET 428 Advanced CAD for Mechanical Design and Drafting (3 cr.) Class 2, Lab 3. P: 328 or equivalent. Mechanical and geometric modeling of complex surfaces, with manufacturing emphasis using wire-frame and shaded imaging techniques.

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

MET 499 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 Internship and Cooperative Education Programs

For the Cooperative (C) education and Internship (I) programs and courses below, students should consult the Office of Student Placement Services at (317) 278-1000.

MET C198, C298, C398, C496, and C498 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 I198, I298, I398, I496, and I498 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.

Organizational Leadership and Supervision (OLS)

OLS 100 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 110 Supervisory Leadership: Story Problems (1 cr.) Class 1. This course develops skills in leadership. Specific areas covered include planning and change, problem analysis and decision making, motivation, interpersonal communication, giving and receiving feedback on performance, organizational values, and human relations.

OLS 252 Human Behavior in Organizations (3 cr.) Class 3. Study of individual and group behavior in organizations. Special emphasis on typical supervisory relationships.

OLS 263 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 274 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 327 Leadership for a Global Workforce (3 cr.) Class 3. P: 252, 274, 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 328 Principles of International Management (3 cr.) Class 3. P: 327. 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 331 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 368 Personnel 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 371 Project Management (3 cr.) Class 3. P: ENG W131. This course provides the basics of the project management discipline and allows the student to apply these skills in team-based situations.

OLS 373 Case Studies in Leadership (3 cr.) Class 3. P: 252 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 375 Training Methods (3 cr.) Class 3. P: 252 and 274 or consent of department chair. 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 376 Personnel Supervision (3 cr.) Class 3. P: 374 or consent of instructor. Analysis of selected case problems, with emphasis on attitudes, philosophies, and responsibilities of supervisory personnel in relationship to the worker.

OLS 378 Labor Relations (3 cr.) Class 3. This course teaches the regulations concerning management, labor, the collective bargaining agreement, and grievance and arbitration procedures.

OLS 383 Human Resource Management (3 cr.) Class 3. 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 390 Leadership Theories and Processes (3 cr.) Class 3. P: 100, 252, 263, 274 and ENG W131. C: 327, 378, COMM R110, and TCM 220. 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 399 Special Topics (1-9 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 410 Survival Skills in Organizational Careers (3 cr.) Class 3. P: ENG W131, COMM R110, TCM 220, OLS 252, OLS 263, OLS 274, 3 cr. of Math (MATH M118/M119 or 153/154), 6 crs. of Applied Technology concentration and junior standing. Serves 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. 410 provides the proposal for the 490 senior research project. 410 may not be taken concurrently with 490.

OLS 476 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 479 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 487 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 490 Senior Research Project (3 cr.) P: OLS major, senior standing, 410, and consent of instructor. Using proposals developed in 410, 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 Internship and Cooperative Education Programs

For the Cooperative (C) education and Internship (I) programs and courses below, students should consult the Office of Student Placement Services at (317) 278-1000.

OLS C196, C198, C298, C398, and C498 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 I196, I198, I298, I398, and I498 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.

Other Technology Courses

Technical Communications (TCM)

TCM 220 Technical Report Writing (3 cr.) Class 3. P: ENG W131 or equivalent. Extensive application of the principles of clear writing in industrial reporting, with emphasis on adaptation to the audience; organization of ideas; and a concise, objective writing style.

TCM 320 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 340 Correspondence in Business and Industry (3 cr.) Class 3. P: ENG W131 or equivalent. The development and application of strategies and skills for writing letters for business and industry in technology and engineering. Applications may include resumes and letters of application, informational and persuasive letters, and in-house memoranda.

TCM 350 Visual Elements of Technical Documents (3 cr.) Class 3. P: 220 and 320 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 360 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 370 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 395 Independent Study in Technical Communications (1-3 cr.) P: consent of instructor. Individualized project approved by instructor consenting to direct it and by program coordinator. Credit varies with scope of the project. May be repeated for a total of 4 credit hours.

TCM 420 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. May be repeated for a total of 4 credit hours.

TCM 435 Portfolio Preparation (1 cr.) P: consent of instructor. Preparation of professional portfolio for review by representatives of the cooperating professional society (Society for Technical Communications). Includes readings and development of a professional career plan.

TCM 460 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 499 Selected Topics: Technical Communication (1-3 cr.) Hours and subject matter to be arranged by staff. May be repeated for up to 6 credit hours.

School of Engineering and Technology

Administrative Officers

H. Öner Yurtseven, Dean

Patricia L. Fox, Associate Dean for Administration and Finance

Kenneth E. Rennels, Associate Dean for Undergraduate Education

Yaobin Chen, Associate Dean for Research

Andrew Hsu, Associate Dean for Graduate Programs

Tim Diemer, Director of International Services

Paula Jenkins, Director of Development and External Relations

Nancy Lamm, Director of Freshman Engineering

Greg Smith, Director of Information Technology and Computer Network Center

Terri Talbert-Hatch, Director of Student Services

Thomas I. M. Ho, Chair of the Department of Computer and Information Technology

Erdogan Sener, Chair of the Department of Construction Technology

Russ Eberhart, Chair of the Department of Electrical and Computer Engineering

Richard Pfile, Chair of the Department of Electrical and Computer Engineering Technology

Hasan Akay, Chair of the Department of Mechanical Engineering

Jack Zecher, Chair of the Department of Mechanical Engineering Technology

Clifford Goodwin, Chair of the Department of Organizational Leadership and Supervision

Edward Berbari, Chair of the Department of Biomedical Engineering

Wanda Worley, Director of Technical Communications

Resident Faculty

Acheson, Douglas, *Associate Professor of Computer Graphics Technology (1997); B.S. Technical Graphics, 1993, M.S. Educational Computing, 1995, Purdue University*

Afolabi, Dare, *Associate Professor of Mechanical Engineering (1985); B.S. Mechanical Engineering, 1976, Thames Polytechnic, United Kingdom; M.S. Acoustics and Vibration Technology, 1978, Ph.D. Mechanical Engineering, 1982, Imperial College, United Kingdom*

Akay, Hasan U., *Professor of Mechanical Engineering and Chair of the Department 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*

Ben-Miled, Zina, *Associate Professor of Electrical and Computer Engineering (1998); B.S. Computer Engineering, 1988, Oregon State University; M.S. Computer Engineering, 1990, Ph.D. Computer Engineering, 1997, Purdue University*

Berbari, Edward, *Professor of Biomedical Engineering, Professor of Electrical and Computer Engineering, Chair of Department of Biomedical Engineering, and Professor of Medicine (1994); B.S.E.E. Electrical Engineering, 1971, Carnegie-Mellon University; M.S. Biomedical Engineering, 1973, University of Miami; Ph.D. Electrical Engineering, 1980, University of Iowa*

Bluestein, Maurice, *Professor of Mechanical Engineering Technology (1991); B.S. Mechanical Engineering, 1962, City College of New York; M.S. Mechanical Engineering, 1964, New York University; Ph.D. Biomedical Engineering, 1967, Northwestern University*

Catlin, Sally, *Lecturer of Computer Technology (2003); B.A. History, 1986, University of California; M.S. Education, 2003, Indiana University*

Chen, Jie, *Professor of Mechanical Engineering, Associate Professor of Orthodontics, School of Dentistry (1990); B.S. Mechanical Engineering, 1982, Tianjin University, China; M.S. Biomedical Engineering, 1984, Shanghai Second Medical College, China; Ph.D. Mechanical Engineering, 1989, Drexel University*

Chen, Yaobin, *Professor of Electrical and Computer Engineering and Associate Dean for Research (1990); B.S. Electrical Engineering, 1982, Nanjing Institute of Technology, China; M.S. Electrical Engineering, 1986, Ph.D. Electrical Engineering, 1988, Rensselaer Polytechnic Institute*

Chien, Y. P. Stanley, *Professor of Electrical and Computer Engineering (1989); B.S. Electrical Engineering, 1984, University of Wisconsin; M.S. Electrical Engineering, 1985, Ph.D. Electrical and Computer Engineering, 1989, Purdue University*

Christe, Barbara, *Associate Professor of Electrical and Computer Engineering Technology (1998) and Director of Biomedical Electronics Technology Program (1998); B.S. Engineering, 1984, Marquette University; M.S. Clinical Engineering, 1986, Rensselaer at Hartford*

Chu, Tien-Min (Gabriel), *Assistant Professor of Biomedical Engineering (2003); D.D.S. Dental Surgery, 1989, Kaohsiung Medical College, Ph.D. Materials Science, 1999, University of Michigan*

Clark, Jerome A., *Lecturer of Computer Technology (1999); B.S. Computer Technology, 1992, IUPUI; M.S. Management 1996, Indiana Wesleyan University*

Coles, Elizabeth A., *Assistant Professor of Interior Design (1997); B.S. Textiles, University of Maryland, 1968, M.S. Adult Education and Gerontology, Iowa State University, 1975, M.S. Interior Design, Colorado State University, 1997*

Conrad, William, *Professor of Electrical and Computer Engineering Technology (1991); B.S.E.E., 1966, Purdue University; M.Eng., General Engineering, 1968, Pennsylvania State University; P.E., Indiana*

Cooney, Elaine, *Associate Professor of Electrical and Computer Engineering Technology (1988); B.S.E. Electrical Engineering, 1984, General Motors Institute; M.S.E.E. 1986, Purdue University*

Cowan, David J., *Assistant Professor of Architectural Technology (2003); B.A. Visual Arts, 1973, University of Regina, Canada; M.S., Architecture, 1976; Ph.D. Candidate, Architecture, University of Calgary, Canada*

Cyr, Daphene E. *Assistant Professor of Construction Technology (2001); B.S. Building Construction Management, 1990, M.S. Construction Management, 1998, Ph.D. Candidate, Purdue University*

Eberhart, Russell, *Professor of Electrical and Computer Engineering and Chair of the Electrical and Computer Engineering Department (2001); B.S. Electrical Engineering, 1965, M.S. Electrical Engineering, 1969, Ph.D. Electrical Engineering, 1972, Kansas State University*

Ecer, Akin, *Professor 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*

El-Mounayri, Hazim, *Associate Professor of Mechanical Engineering (1997); B.S. Mechanical Engineering, 1989; M.Sc. Material Science, 1992, The American University in Cairo, Egypt; Ph.D. Mechanical Engineering, 1997, McMaster University, Canada*

El-Sharkawy, Mohamed, *Professor of Electrical and Computer Engineering (1992); B.S. Electrical Engineering, 1974, M.S. Electrical Engineering, 1979, Alexandria University, Egypt; Ph.D. Electrical Engineering, 1985, Southern Methodist University*

Feldhaus, Charles, *Assistant Professor of Organizational Leadership and Supervision (2001); B.A. Radio and Television, 1979, University of Southwestern Louisiana; M.S. Secondary Education, 1985, Indiana University; Ed.D. Educational Administration/Supervision, 1999, University of Louisville*

Fernandez, Eugenia, *Associate Professor of Computer Technology (1996); B.S. Mechanical Engineering, 1979, Worcester Polytechnic Institute; M.S.E. Computer, Information,and Control Engineering, 1984, University of Michigan; Ph.D. Management Information Systems, 1988, Purdue University*

Fox, Patricia L., *Assistant Professor of Organizational Leadership and Supervision, part-time, and Associate Dean for Administration and Finance (1983); B.S. Accounting, Indiana University, 1980; M.B.A., 1985, Butler University*

Frettinger-Devor, Sally A., *Assistant Professor of Industrial Engineering Technology (2001), B.S. Industrial Engineering, 1991, Purdue University; M.B.A., 2001, Indiana Wesleyan University*

Gee, Patrick, *Lecturer of Freshman Engineering (2000) ; B.S. Mechanical Engineering, 1992; M.S. Mechanical Engineering, 1998, Purdue University*

Goodwin, Clifford, *Associate Professor of Organizational Leadership and Supervision and Chair of the Department of Organizational Leadership and Supervision (1979); A.A.S. Aviation Technology, 1969; B.S. Supervision, 1970, Purdue University; M.S. Education, 1980, Ball State University; Ed.D., 1997, Indiana University*

Ho, Thomas I. M., *Professor of Computer Technology and Chair of the Department of Computer and Information Technology (1995); B.S. Computer Science, 1970, M.S. Computer Science, 1971, Ph.D. Computer Science, 1974, Purdue University*

Hovde, Marjorie Rush, *Associate Professor of Technical Communications and Assistant Professor of English (1996); B.A. English Education, 1979, Eastern Mennonite College; M.A. English Expository Writing, 1984, University of Iowa; Ph.D. English Rhetoric and Composition 1994, Purdue University*

Hsu, Andrew T., *Professor of Mechanical Engineering and Associate Dean for Graduate Programs (1999); B.S., Hydraulic Engineering, 1978, North China Institute of Hydro-Electrical Engineering, China; M.S., 1981, Tsinghua University, China; M.S. Aerospace Engineering, 1982, Ph.D. Aerospace Engineering, 1986, Georgia Institute of Technology*

Hundley, Stephen P., *Associate Professor of Organizational Leadership and Supervision (1997); B.S. Business Management, 1992, Virginia Commonwealth University; M.S. Human Resource Administration, 1994, Central Michigan University; M.Ed. Adult Education, 1995, Virginia Commonwealth University; Ph.D. Education/Organization Development, 1998, American University*

Hylton, Pete, *Assistant Professor of Mechanical Engineering Technology (2004); B.S. Mechanical Engineering, 1979, Purdue University; M.S. Mechanical Engineering, 1983, Rose-Hulman Institute of Technology*

Jafari, Ali, *Professor of Computer Technology (1995); B.S. Business Administration, 1978, University of Esfaban, Iran; M.S. Media Technology, 1981, University of Wisconsin-Stout; Ph.D. Telecommunication, 1988, Indiana University*

Katona, Thomas R., *Associate Professor of Mechanical Engineering, School of Engineering and Technology, and Associate Professor of Orthodontics, School of Dentistry (1990); M.S. Mechanical Engineering, 1972, Ph.D. Mechanical Engineering, 1981, D.M.D. Dentistry, 1982, University of Pennsylvania*

Kim, Chul Soo, *Assistant Professor of Construction Technology (2001); B. Architectural Engineering, 1982, Yousei University, Korea; B.P.S. in Architecture, 1985, State University of New York; M. Architecture, 1987, University of Illinois; M.S. Civil Engineering, 1997, University of Illinois; Ph.D. Civil Engineering, 2001, University of Illinois*

Kim, Dongsoo (Stephen), *Assistant Professor of Electrical and Computer Engineering (2000); B.S. Metallurgical Engineering, 1987, Korea University; M.S. Computer Science, 1993, University of Texas, Dallas; Ph.D. 1998, University of Minnesota*

King, Brian, *Assistant Professor of Electrical and Computer Engineering (2001); B.A. Mathematics, 1982, M.S. Mathematics, 1984, Ph.D. Mathematics, 1990, Ph.D. Computer Science, 2000, University of Wisconsin*

Kinsey, Brian D., *Assistant Professor of Construction Technology (1980); B.S. Engineering Sciences, 1972, M.S.E. Mechanical Engineering, 1975, Purdue University; Professional Engineer License., Indiana*

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Lamm, Nancy, *Assistant Professor of Engineering, part-time, and Director of Freshman Engineering (1987); A.B. Microbiology, 1969, Indiana University; B.S.E. Bioengineering, 1983, M.S.E. Interdisciplinary Engineering, 1989, Purdue University*

Lin, William, *Associate Professor of Electrical and Computer Engineering Technology (1999); B.Ed. Science Education (Physics), 1976, National College of Education Taiwan; M.S., Physics, 1981, University of Southern Mississippi; Ph.D. Electrical Engineering, 1987, The Pennsylvania State University*

Lucas, Laura, *Lecturer of Architectural Technology (1999); B.S. Architecture, 1981, Ball State University; M.B.A. Management, 1990, Indiana University, Registered Architect, Indiana*

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Pellerano, Armando, *Assistant Professor of Computer Graphics Technology (2002); B.A. University Studies, 1988, Southern Illinois University, Carbondale; M.S. New Media, 2002, Indiana University, Indianapolis*

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Pidaparti, Ramana M., *Professor of Mechanical Engineering and Director of Academic Programs in Mechanical Engineering (1989); B.S. Civil Engineering, 1980, Andhra University, India; M.S. Aeronautical Engineering, 1982, Indian Institute of Science, India; M.S. Aerospace Engineering, 1985, University of Maryland; Ph.D. Aeronautics and Astronautics, 1989, Purdue University*

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Salama, Paul, *Assistant Professor of Electrical and Computer Engineering (1999); B.S. Electrical Engineering, 1991, University of Khartoum; M.S.E.E., 1993, Ph.D. Electrical Engineering, 1999, Purdue University*

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Schild, John H., *Associate Professor of Electrical and Computer Engineering and Biomedical Engineering (1997); B.S. Biomedical Engineering, 1983, M.S. Biomedical Engineering, 1988, Case Western Reserve University; Ph.D. Electrical and Computer Engineering, 1994, Rice University*

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Starks, Joy, *Associate Professor of Computer Technology (1998); B.A. Theory and Composition, 1976, University of Missouri; B.S. Education, 1978, M.A. Education, 1981, Southern Illinois University*

Stevens, Janis, *Lecturer of Computer Technology (2000); B.S. Education, 1970, Bowling Green State University; M.S. Education, 1984, Butler University*

Sullivan, Edward T., *Clinical Assistant Professor of Computer Technology and Director of Computer Technology Online Program (1998); B.S. Economics, 1971, University of Kentucky; M.S.I. Industrial Administration, 1977, Purdue University*

Turner, Charles H., *Professor of Mechanical Engineering, Professor of Biomedical Engineering and Associate Director of Biomedical Engineering, School of Engineering and Technology, and Professor of Orthopaedic Surgery, School of Medicine (1991); B.S. Mechanical Engineering, 1983, Texas Tech University; Ph.D. Biomedical Engineering, 1987, Tulane University*

Watson, William, *Lecturer of Computer Technology (2003); B.A. English, 1998, M.S. Information Science, 2000, Indiana University*

Williamson, David M., *Associate Professor of Computer Technology (1986); B.S. Science, 1967, Purdue University; Ed.M. Education, 1974, University of Illinois; A.A.S. Computer Technology, 1981, Purdue University*

Wolter, Robert M., *Lecturer of Organizational Leadership and Supervision (1999); A.A.S. Organizational Leadership and Supervision, 1995, B.S. Organizational Leadership and Supervision, 1997, Purdue University; M.S. Adult Education, 2002, Indiana University*

Workman-Germann, Jamie, *Assistant Professor of Mechanical Engineering Technology (1999); B.S. Mechanical Engineering, 1992, M.S. in Mechanical Engineering, 1999, Purdue University*

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Yurtseven, H. Öner, *Professor of Electrical and Computer Engineering and Dean (1977); B.S. Electrical Engineering, 1967, Middle East Technical University, Turkey; Ph.D. Electrical Engineering, 1974, The Johns Hopkins University*

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Faculty Emeriti

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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*

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., *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*

Renda, R. Bruce, *Electrical and Mechanical Engineering (1974); B.S. Mechanical Engineering, 1952, M.S. Mechanical Engineering, 1957, Ph.D. Mechanical Engineering, 1957, Purdue University*

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Silence, Judith O., *Computer Technology (1978); A.B. Mathematics, 1962, M.S.Ed. Vocational Education, 1982, Indiana University*

Sinha, Akhouri S. C., *Professor of Electrical Engineering (1977); B.S. Mathematics, 1957, Bihar University, India; B.S. Electrical Engineering, 1961, Banaras Hindu University, India; M.S. Electrical Engineering, 1966, Ph.D. Electrical Engineering, 1969, University of Missouri*

Solinski, Edward M., *Computer Technology (1973); B.S. Engineering, 1960, Cleveland State University; M.S. Engineering Administration, 1964, Case Western Reserve University*

Tharp, Robert E., *Associate Professor of Mechanical Engineering Technology (1969); A.A.S. Mechanical Engineering Technology, 1960, B.S. Industrial Education, 1965, M.S. Industrial Education, 1968, Purdue University; C.Mfg.E.*

Westcott, Roy E., *Mechanical Engineering Technology (1981); B.S. Industrial Education, 1979, Purdue University; M.S.Ed. Vocational Education, 1981, Indiana University*

Wilkins, Harriet A., *Associate Professor of Technical Communications (1983), and Associate Professor of English (1996); B.A. English, 1959, College of Emporia; M.A. Linguistics, 1975, Louisiana State University; Ph.D. Language Education, 1991, Indiana University*