Purdue School of Engineering and Technology

Welcome to the Purdue School of Engineering and Technology!

The Purdue School of Engineering and Technology offers undergraduate and graduate programs that prepare students for life-long careers. The school is one of the largest degree-granting schools at IUPUI, with an enrollment of approximately 2,900 students. All degrees are awarded by Purdue University, with the exception of Indiana University degrees awarded through the Department of Music & Arts Technology.

History

History

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

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

Overview

Vision

The Purdue School of Engineering and Technology, IUPUI, will be regarded as one of America's premier urban schools of engineering and technology, recognized regionally, nationally, and internationally for its excellence in teaching and learning, research and creative activities, and civic engagement.

Mission

The Purdue School of Engineering and Technology, IUPUI, serves the greater Indianapolis metropolitan area, the State of Indiana, and the nation by providing a high-quality learning environment informed through the discovery and dissemination of knowledge via the scholarship of teaching and learning, research and creative activities, and civic engagement.

Values

The core values that define, inform, and guide the decisions within our School are as follows:

- **Excellence:** Academic excellence is our top priority. We pursue excellence in learning, teaching, research and creative activities, and civic engagement as the highest indicators of successful achievement.
- **Competition:** Competition enhances innovation. We strive to compete at the highest levels in the pursuit of extramural support for our students, as well as for our research and creative activities.
- **Collaboration:** We promote teamwork and partnerships for solving problems and disseminating and transferring knowledge, thus multiplying our accomplishments.
- **Diversity:** We value diversity in all of its forms in our research, curricula, and pedagogy and in our faculty, staff, and student composition.
- **Leadership:** We encourage and reward effective leadership at every level in the School.
- **Location:** We are fortunate to be located in the vibrant city of Indianapolis and we strive to capitalize on the urban setting to address the challenges of a global society.
- **Professionalism**: We foster and reward high standards of collegiality and integrity.
- **Responsiveness:** We are committed to community and professional service to meet the needs of our stakeholders.
- **Improvement:** We strive to continuously improve the implementation of our mission through efficient assessment and evaluation processes.
- **Identity:** We take pride in the Purdue University and Indiana University affiliations, while striving to advance the IUPUI campus identity, image, and reputation.

Accreditation & Licenses

Accreditation & Licenses

- Computer Engineering Technology
- Construction Engineering Management Technology
- Electrical Engineering Technology
- Mechanical Engineering Technology

The programs listed above are accredited by the Engineering Technology Accreditation Commission (ETAC) of ABET, http://www.abet.org

- Computer & Information Technology
- Computer Graphics Technology

The programs listed above are accredited by the Computing Accreditation Commission (CAC) of ABET, http://www.abet.org

- Mechanical Engineering
- Electrical Engineering
- Computer Engineering
- Biomedical Engineering

The programs listed above are accredited by the Engineering Accreditation Commission (EAC) of ABET, http://www.abet.org

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

Contact Information

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

Requirements

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

Undergraduate Admissions
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 IUPUI Office of Admissions, 420 University Boulevard, Campus Center 255, 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:

- Graduation from a high school accredited by a state Department of Public Instruction.
- The extent to which the student meets or exceeds the following minimum requirements:
  - High School GPA of 3.0.
  - Completion of Core 40 including chemistry and 4 years of math including trigonometry or pre-calculus.
  - Minimum SAT scores of 550 math and 480 critical reading or ACT scores of 24 math and 20 verbal.
- You must provide the results of your SAT or ACT, including the Written Section of the test (scores must be received at IUPUI by May 1). If your class has graduated and a fall semester has passed since you graduated, you do not need to take the SAT or ACT. Though test results are considered during the admission review, we do not deny students strictly based on their test results. The SAT or ACT is most important when considering you for dual admission to your intended major and scholarship consideration.
- For admission to the engineering programs, minimum SAT scores of 480 verbal (critical reading) and 550 mathematics or minimum ACT scores of 20 English and 24 mathematics are required.
- Because of a limitation on the total number of applicants that may be accepted as first-year students, out-of-state admissions may close at any time. When it becomes necessary to limit the number of Indiana residents accepted for a specific program, students will be offered admission to an alternate program or admission to the desired program for a subsequent semester.

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

- Graduation from a high school accredited by a state Department of Public Instruction.
- The extent to which the student meets or exceeds the following minimum requirements:
  - Complete Academic Honors Diploma, Core 40, or equivalent, with
    - High School GPA of 3.0 or higher, OR
    - Minimum SAT scores of 500 math and 450 verbal/critical reading, or equivalent ACT scores of 21 math and 19 verbal.
- You must provide the results of your SAT or ACT, including the Written Section of the test (scores must be received at IUPUI by May 1). If your class has graduated and a fall semester has passed since you graduated, you do not need to take the SAT or ACT. Though test results are considered during the admission review, we do not deny students strictly based on their test results. The SAT or ACT is most important when considering you for dual admission to your intended major and scholarship consideration.
- Because of a limitation on the total number of applicants that may be accepted as first-year students, out-of-state admissions may close at any time. When it becomes necessary to limit the number of Indiana residents accepted for a specific program, students will be offered admission to an alternate program or admission to the desired program for a subsequent semester.

Transfer Students

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

- IUPUI students or students in the IU system wishing to transfer into the School of Engineering and Technology must apply directly to their intended department. Transfers from the School of Engineering and Technology to another IUPUI school must be processed by the transfer school's recorder.
- A Purdue University student from another campus must complete an official undergraduate application through the IUPUI Office of Admissions.
- If a student seeking admission to the School of Engineering and Technology previously has been dismissed for academic reasons, he or she must file a petition for readmission that will be reviewed by the Committee on Readmissions. The petition may be obtained from the New Student Academic Advising Center, School of Engineering and Technology, 723

W. Michigan Street, Room 174, Indianapolis, IN 46202.

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

- An IUPUI application for undergraduate admission and a copy of high school records must be submitted to the Office of Admissions.
- An official transcript of all course work done, from all institutions previously attended, also must be forwarded to the Office of Admissions.
- For admission to an engineering or technology program, residents of Indiana must have a cumulative grade point average of at least 2.0 on a 4.0 scale, and out-of-state applicants must have an average of at least 2.5, for all courses previously taken at a recognized college or university. Transfer credits are evaluated by the Office of Admissions and distributed by the Office for Academic Programs in coordination with the department in which the student enrolls.
- There is a residency requirement to receive a degree: transfer students must complete a program of study that includes at least 32 credit hours for a bachelor's degree and at least 15 credit hours for an associate degree in the School of Engineering and Technology. For the associate degree, at least 6 out of the 15 credits are expected to be in the major. For the bachelor's degree, at least 12 out of the 32 credits are expected to be in the major at the junior level or higher.
- Individual academic programs may require that transfer students complete specific courses prior to admission with advanced standing.
- Transfer students must be in good academic and disciplinary standing at the college(s) previously attended. Students who have been dismissed for academic reasons by another college or university, or who have less than a 2.0 grade point average, must file a petition for readmission that will be reviewed by the committee on readmissions. The petition form may be obtained from the New Student Academic Advising Center, 723 W. Michigan Street, Room 174, Indianapolis, IN 46202.

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

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

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

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

Special Expenses

Fees and Payment Procedures

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

Residency Status
The criteria for establishing in-state residency and thus qualifying for in-state fee rates are very strict. Inquiry about establishing resident status for fee purposes should be made to the registrar, who is the proper source of this information. Contact the Office of the Registrar, Campus Center, Room 250, 420 N. University Boulevard, IUPUI, Indianapolis, IN 46202; phone (317) 274-1519 or visit http://registrar.iupui.edu/resident.html

General Fees
In order to support programs, services, and facilities that benefit all students at IUPUI each semester students are charged a fee. All students include every person enrolled in a credit bearing course - and may be graduate, undergraduate, full and/or part time.

Often these fees are mistaken for certain optional fees for which students may or may not choose. This fee is not optional and must be paid by all students.

More information is available at http://www.iupui.edu/~fees/

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

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

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

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

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

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

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

Payment Procedures
Payments must be made in cash or by bank draft, express order, postal money order, traveler's check, personal check, MasterCard, Visa, or Discover for the exact amount of fees due at the time of registration. For information about this fee payment, refer to the IUPUI *Schedule of Classes or IUPUI* Web site www.iupui.edu.

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

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 Student Financial Services Campus Center 250 420 N. University Boulevard IUPUI Indianapolis, IN 46202-5147 phone: (317) 274-4162 Web: http://www.iupui.edu/~finaid/

Application Procedures
Potential financial aid recipients must complete the Free Application for Federal Student Aid (FAFSA), which is available from high schools, on the Web, or at the Office of Student Financial Services. 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 Student Financial Services 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 Office of Student Employment, 815 W. Michigan Street, Taylor Hall Third Floor (317) 274-4856, 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 Student Financial Services.

Veterans Benefits
Information on benefits, including Veterans Administration paid tutorial assistance and work-study opportunities, is available from the veterans affairs representative at the Campus Center, Theater Level (lower Level), 420 University Blvd., IUPUI, Indianapolis, IN 46202; (317) 278-9163, or visit http://veterans.iupui.edu/.

General Requirements

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, 125 credit hours in the computer engineering program, 124 credit hours in the electrical engineering program, 128 credit hours in energy engineering, 120 credit hours in the engineering management program, 120 credit hours in the interdisciplinary engineering program, or 128 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.

Since the Mechanical Engineering (ME) program at IUPUC is part of our IUPUI Mechanical Engineering (ME) program and all courses can be taken on the Columbus campus, the IUPUI residency requirement is fulfilled for Mechanical Engineering students who complete at least two semesters of resident study at IUPUC. They must complete at least 32 credit hours of appropriate course work in residence, of which 12 credit hours must be completed in the major at the junior level or higher. (approved by Faculty Senate October 2013)

3. Students must be in active student status in the School of Engineering and Technology in order to have the degree awarded. (approved by Faculty Senate March 2013)

4. Students must have an index of 2.0 in required engineering courses in addition to an overall graduation index of 2.0 for all courses on the approved plan of study. Students who have completed all other requirements for a bachelor's degree but have failed to meet the minimum graduation index may register for additional courses, with the approval of an authorized representative of the dean, after a review of their record. The additional courses may not exceed 20 credit hours. Students may take a maximum of 9 of the 20 credit hours in another approved college or university, provided the courses are approved in advance and in writing by an authorized representative of the dean of the School of Engineering and Technology. A copy of the approval must be filed in the office of the engineering and technology recorder. Credit in these additional courses must be established within five years of the date on which all other degree requirements were met. Students will have fulfilled the requirements for graduation if graduation indexes, including extra courses, equal or exceed the minimum specified at the time when all other graduation requirements were satisfied.

5. Applicants for a second bachelor's degree, after they are admitted to the second bachelor's degree program, must complete at least 32 credit hours of appropriate course work, of which 12 credit hours must be completed in the major at the junior level or higher.

6. Courses taken under the Pass/Fail option and courses taken by correspondence may not be used to fulfill graduation requirements for engineering students.

Undergraduate Technology Requirements

Associate Degree
To earn an Associate of Science (A.S.) degree, students must satisfy the following requirements:
1. Students must complete the plan of study for the degree by resident course work, by examination, or by credit accepted from another institution. The dean of the school may refuse to accept as credit toward graduation any course that was completed 10 or more years previously, and former students will be notified of all such decisions upon reentering. Substitutions of courses required for graduation may be made by the dean of the School of Engineering and Technology.

2. Students must complete at least two semesters of resident study at IUPUI, and they must complete at least 15 credit hours of appropriate course work, of which 6 credit hours must be in the major. Students seeking an associate degree in healthcare engineering technology management must complete at least 20 hours of course work in the associate degree program in order to ear the degree. 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 in active student status in the School of Engineering and Technology in order to have the degree awarded. (approved by Faculty Senate March 2013)

4. Students must have a minimum graduation index of 2.0. Students who have completed all other requirements for an A.S. degree but have failed to meet the minimum graduation index (the average of grades earned in courses required for a degree) may register for additional courses, with the approval of an authorized representative of the dean of the school, after a review of their record. These additional courses may not exceed 10 credit hours, and credit in these courses must be established within three years of the date on which all other degree requirements were met. Students will have fulfilled the requirements for graduation if their graduation indexes, including the extra courses, equal or exceed the minimum specified at the time when all other graduation requirements were satisfied.

5. Applicants for a second A.S. degree must complete at least 15 credit hours at IUPUI of appropriate course work after admission to the second associate degree program. At least 6 of the 15 credit hours must be completed in the major. A second associate degree may not be earned in the same program.

Bachelor's Degree
To earn a Bachelor of Science (B.S.) degree, students must satisfy the following requirements.

1. Students must complete the program of study for the degree by resident course work, by examination, or by credit accepted from another institution. The dean may refuse to accept as credit toward graduation any course that was completed 10 or more years previously, and former students will be notified of all such decisions upon reentering. Substitution of courses required for graduation may be made by the dean of the school.

2. Students must complete at least two semesters of resident study at IUPUI, and they must complete at least 32 credit hours of appropriate course work, of which 12 credit hours are required to be in the major at the junior level or higher. Students are generally expected to complete the senior year in residence; however, with the approval of the dean, students who have had at least four semesters of resident study may complete a maximum of 20 credit hours of the senior year in another approved college or university. For the purpose of this rule, two summer sessions are considered equivalent to one semester.

3. Students must be in active student status in the School of Engineering and Technology in order to have the degree awarded. (approved by Faculty Senate March 2013)
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.

Second Bachelor's Degrees
Applicants for a second bachelor's degree, whose first degree was from an institution other than IUPUI, IU or Purdue, 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.

Policy for Awarding Engineering and Technology Minors

Minimum number of credits required for a minor will be consistent with campus definitions. At least one-half of the required courses for the minor will be completed in residency at IUPUI. For returning students, at least half of the minor coursework must be completed within the past 10 years and the student must be actively enrolled at IUPUI in order to apply for the minor. Applications for the minor must be completed while the student is actively pursuing a bachelor's degree. Minors are awarded at the same time as the bachelor's degree. This policy will apply retroactively for students currently taking courses toward a minor in the School. (Approved by Faculty Senate April 2011)

Policy for Awarding Undergraduate Certificate Programs

Minimum number of credits required for a certificate will be consistent with campus definitions. At least one-half of the required courses for the certificate will be completed in residency at IUPUI. For returning students, at least half of the certificate coursework must be completed within the past 10 years and the student must be actively enrolled at IUPUI in order to apply for graduation for the certificate. Applications for Graduation for a certificate must be completed while the student is in active status. Students who have met the criteria above may complete the Application for Graduation within the same term as or one term following completion for the coursework. In all cases, the student will be placed into graduation review for the earliest possible completion date if all certificate coursework is completed. This policy will apply

retroactively for students currently taking courses toward a certificate in the School. (Approved by Faculty Senate April 2011)

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) 141, 799 W. Michigan Street, IUPUI, Indianapolis, IN 46202-5160; (317) 274-0805.

Undergraduate

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

Undergraduate Engineering Degree Programs

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

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

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

Undergraduate Engineering Curriculum
All 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 students' 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. Engineering curricula provide wide experience in mathematical, physical, and engineering

sciences as well as in social sciences and the humanities. In this way a student obtains both thorough training in engineering and a well-rounded education. Such an approach provides the best preparation for an 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 only on the basis of technical skills, 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 skills, can provide a solution.

Minor in Business for Engineering Students
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: D. King
Senior Lecturer: P. Orono
Lecturer: P. Gee
Assistant Professor of Engineering, Part-Time and Academic Advisor: N. Lamm

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 19500 Introduction to the Engineering Profession and ENGR 19600 Introduction to Engineering. 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 New Student Academic Advising Center (NSAAC) has full-time staff available year round. Prospective students and their families are invited to contact the NSAAC regarding any questions they may have concerning engineering and the engineering degree programs offered at IUPUI. The advisors in the NSAAC provide academic counseling and advising to prospective and continuing students. New students in engineering receive individualized attention while completing the basic core of freshman engineering courses. Transfer and second-degree students likewise work closely with freshman engineering advisors until all transfer credit issues are resolved. The office has an open-door policy, and students are encouraged to consult with advisors about any issues that might affect their academic progress.

Technology Degree Programs

The School of Engineering and Technology offers a variety of technology programs at the bachelor's degree level and two at the associate level. Programs for full-time students pursuing these technology degrees 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
The Associate of Science degrees offered in the School of Engineering and Technology at IUPUI are awarded upon successful completion of the degree requirements.

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

- **Healthcare Engineering Technology Management (Department of Engineering Technology)**
- **Interior Design (Department of Engineering Technology)**

Bachelor of Science
The School offers Bachelor of Science degrees in eleven diverse technology areas including applied engineering, interior design, computer and graphics technologies, music technology, organizational leadership, and technical communication. These degrees combine theory and application within a discipline, along with a general education core. In this way, a student obtains both thorough training in technology and a well-rounded education.
The following technology bachelor's degree programs are available to qualified students:

- Computer Engineering Technology
- Computer Graphics Technology
- Computer & Information Technology
- Construction Engineering Management Technology
- Electrical Engineering Technology
- Healthcare Engineering Technology Management
- Interior Design Technology

- Mechanical Engineering Technology
- Music Technology
- Organizational Leadership and Supervision
- Technical Communication

Transfer students must meet all departmental requirements.

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

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

Awards & Scholarships

Awards & Scholarships
The Purdue School of Engineering and Technology offers scholarships through IUPUI's Office of Student Scholarships. Early admission to IUPUI is the best way to be assured of scholarship opportunities. The Purdue School of Engineering and Technology offers scholarships to incoming freshmen and continuing students. Most scholarships are merit-based awards offered at the departmental level, but some are designated specifically for new students, or for minority, women, and other students from underrepresented populations.

Information on all scholarships can be found at http://www.iupui.edu/~scentral/

Scholastic Recognition

Dean's List
All undergraduate students in the School of Engineering and Technology who complete at least 6 credit hours during a semester, who have a semester grade point average of 3.8 or higher, a cumulative GPA of 2.5 or higher, and who are approved by the program faculty are placed on the Dean's List. These honor students receive certificates from the Dean recognizing their meritorious efforts. ***Approved by Faculty Senate on May 12, 2009 with policy effective fall 2009.***

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

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

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

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

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

Degree Programs

Engineering Degree Programs

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

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

- Architectural Technology
- Healthcare Engineering Technology Management
- Interior Design Technology

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

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

Student Learning Outcomes

Student Learning Outcomes
The School of Engineering & Technology has organized its Student Learning Outcomes (SLOs) by department. Please choose the appropriate department in the links below, or the left-hand navigation, and then find the program you are looking for. You can also click the link for the program below and it will take you directly to that program's SLOs. Students in all programs will graduate with a Bachelor of Science degree unless otherwise noted.

Please note that certificate program learning outcomes can be found under the appropriate department below the degree program learning outcomes. Any questions or concerns about the Student Learning Outcomes should be

directed to the department of the program in question, or the Office of Academic Programs in ET 215.

Engineering

- Biomedical Engineering
  - Biomedical Engineering
- Electrical and Computer Engineering
  - Computer Engineering
  - Electrical Engineering
- Mechanical Engineering
  - Mechanical Engineering
  - Energy Engineering
  - Interdisciplianary Engineering
- Motorsports Engineering

Technology

- Computer Information and Graphics Technology
  - Computer & Information Technology
  - Computer Graphics Technology
  - Computer Technology Applications Certificate
  - E-Commerce Certificate
  - Information Technology Certificate
  - Network Security Certificate
- Engineering Technology
  - Computer Engineering Technology
  - Construction Engineering Management Technology
  - Electrical Engineering Technology
  - Healthcare Engineering Technology Management
  - Interior Design
  - Mechanical Engineering Technology
  - Motorsports Engineering
  - Construction Management Certificate
  - Lean Six Sigma Certificate
  - Motorsports Engineering Technology Certificate
  - Quality Assurance Certificate
- Music & Arts Technology*
  - Music Technology
- Technology Leadership and Communication
  - Organizational Leadership & Supervision
  - Technical Communication
  - Human Resource Management Certificate
  - International Leadership Certificate
  - Leadership Studies Certificate
  - Technical Communication Certificate

*Music & Arts Technology students are awarded Indiana University degrees.

Computer & Information Technology

Computer & Information Technology, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate mastery of core computing and mathematical concepts.
2. Analyze user needs and identify the computing requirements appropriate to an IT solution.
3. Plan, design, implement, and evaluate IT-based systems to meet desired needs.
4. Function effectively on teams to accomplish a common goal.
5. Acknowledge diverse opinions in regards to professional, ethical, legal, and social issues in a global perspective.
6. Communicate effectively with a wide range of audiences.
7. Analyze and explain the impact of IT on individuals, organizations and societies.
8. Explain the need to engage in continuing professional development.
9. Use current technical concepts, techniques and practices in the information technologies within the student’s area of expertise.
10. Apply the best practices and standards within the student's area of expertise.

Computer Technology Applications Certificate

Computer Technology Applications Certificate
Upon completion of this program, students will be able to:

1. Use traditional application software at the highest level.
2. Customize and modify application software for end users.
3. Train end users of application software in best practices.
4. Research, learn, and apply new software techniques.
5. Create sophisticated and interactive Web interfaces using application software.
6. Use Web 2.0 tools to further their career.

Computer Graphics Technology

Computer Graphics Technology, B.S.
Upon completion of this program, students will be able to:

1. An ability to correctly demonstrate and implement computer literacy practices.
2. An ability to effectively apply algebra and trigonometry principles appropriate to visual communication projects and applications.
3. An ability to analyze a specific problem, by identifying and defining the component parts of the problem, properly documenting the principles requirements of the solutions(s), and effectively documenting and reporting the associated requirements appropriate to its solution(s).
4. An ability to design, implement and evaluate a computer-based system, process, component, or programs to meet desired visual communication needs.
5. An ability to function effectively on teams and in a collaborative setting to accomplish a common goal.

6. An understanding of professional, ethical, legal (including copyright), security, and social issues and responsibilities.
7. An ability to communicate effectively with a wide range of audiences, and diverse populations in both domestic and international settings.
8. An ability to analyze the local and global impact of computer generated images and applications on individuals, organizations, and society.
9. An ability to demonstrate how to identify professional development needs, and implement a plan to ensure continuing professional development.
10. An ability to demonstrate how to identify and use current techniques, skills, and tools necessary for computing practice related to visual communication problems.

E-Commerce Certificate

E-Commerce Certificate
Upon completion of this program, students will be able to:

1. Apply tools and techniques for effective Web site planning and analysis.
2. Allow individuals to develop dynamic web applications in a variety of programming languages.
3. Explore sophisticated data management and information exchange as it applies to interactive and e-commerce applications.
4. Apply optimal Web design strategies to deploy usable Web applications for a global audience.
5. Utilize current web development standards appropriately.

Information Technology Certificate

Information Technology Certificate
Upon completion of this program, students will be able to:

1. Apply tools and techniques for effective Web site planning and analysis.
2. Introduce fundamental client and server side languages for developing dynamic websites.
3. Explore database development and technologies used to build database-driven web applications.
4. Apply optimal Web design strategies to deploy usable Web applications for a global audience.
5. Research, learn and apply new web technologies.

Network Security Certificate

Network Security Certificate
Upon completion of this program, students will be able to:

1. Apply information assurance and security principles to secure systems and networks.
2. Conduct accurate and comprehensive digital forensics investigations and apply appropriate rules of evidence.
3. Use an appropriate analytic framework to assess risk and recommend strategies for mitigation.
4. Analyze and produce comprehensive security policies, standards, and procedures.
5. Analyze and create comprehensive business continuity plan to include incident response, disaster recovery, and continuous operations.

Interior Design Technology

Interior Design Technology, A.S. and B.S.
Upon completion of this program, students will be able to:

1. Retain a global view and weigh design decisions within the parameters of ecological, socio-economic and cultural contexts.
2. Create work through informed knowledge of behavioral science and human factors.
3. Apply all aspects of the design process to creative problem solving.
4. Engage in multi-disciplinary collaborations and consensus building.
5. Be effective communicators
6. Use ethical and accepted standards of practice, be committed to professional development and the industry, and understand the value of their contribution to the built environment.
7. Apply knowledge of interiors, architecture, art and the decorative arts within a historical and cultural context.
8. Apply elements and principles of tow- and three-dimensional design.
9. Apply color principles and theories.
10. Select and specify furniture, fixtures, equipment and finish materials in interior spaces.
11. Use the principles of lighting, acoustics, thermal comfort, and indoor air quality to enhance the health, safety, welfare and performance of building occupants.
12. Retain knowledge of interior construction and building systems.
13. Use laws, codes, standards, and guidelines that impact the design of interior spaces.

Engineering Technology

Engineering Technology

Biomedical Engineering Technology, A.S. and B.S.
Upon completion of tthis program, students will be able to:

1. Demonstrate knowledge and skills in the use of the electrical and/or computer components of medical equipment systems as encountered in the degree program's courses. Demonstrate a working medical vocabulary and knowledge of clinical safety requirements and regulations as encountered in the degree program's classes.
2. Use current knowledge of mathematics, science and emerging technology tools to solve problems and demonstrate solutions.
3. Identify, analyze and integrate the technical equipment requirements with the needs of medical staff and patients as required in the degree program's courses.
4. Apply and design solutions for issues identified in heallth care technology as demonstrated in a senior project.

5. Conduct, analyze and interpret experiments, and access results.
6. Function as a member of a 2-4 person team to complete a task in a timely manner. Demonstrate ability to organize work done by team members.
7. Write technical reports; present data and results coherently in oral and graphic formats.
8. Demonstrate skills for lifelong learning by locating, evaluating and applying relevant information using external resources such as the Internet, data books, trade publications and library resources.
9. Demonstrate ethical conduct as described in the university student code of conduct. Demonstrate knowledge of professional code of ethics.
10. Demonstrate a respect for diversity as described in the university civility statement. Recognize contemporary professionals, societal and global issues in case studies and course projects.
11. Demonstrate quality, timeliness and ability to complete increasingly complex homework and projects throughout the degree experience.

Computer Engineering Technology, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate knowledge, techniques (including the use of modern tools), and skills in the use of microprocessors, programs, networks and systems encountered in the degree program's cources.
2. Use current knowledge of mathematics, science and emerging technology tools of their discipline to solve problems and demonstrate solutions.
3. Identify, analyze, and solve technical problems as required in the degree program's courses.
4. Apply and design hardware, systems, and software programs in their specialty area demonstrated in a senior project.
5. Conduct, analyze and interpret experiments, and assess results.
6. Function asa member of a 2-4 person team to complete a task in a timely manner. Demonstrate ability to organize work done by team members.
7. Write technical reports; present data and results coherently in oral and graphic formats.
8. Demonstrate skills for lifelong learning by locating, evaluating and applying relevant information using external resources such as the Internet, data books, trade publications and library resources.
9. Demonstrate ethical conduct as described in the university student code of conduct. Demonstrate knowledge of the professional code of ethics.
10. Demonstrate respect for diversity as described in the university civility statement. Recognize contemporary professional, societal and global issues in case studies and course projects.
11. Demonstrate quality, timeliness and ability to complete increasingly complex homework and projects throughout the degree experience.

Construction Engineering Management Technology, B.S.
Upon completion of this program, students will be able to demonstrate:

1. An appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines.
2. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology.
3. An ability to conduct, analyze and interpret experiments and apply experimental results to improve processes.
4. An ability to apply creativity in the design of systems, components or processes appropriate to program objectives.
5. An ability to function effectively in teams.
6. An ability to identify, analyze and solve technical problems.
7. An ability to communicate orally.
8. An ability to communicate writen and visual.
9. Recognition of the need for, and ability to engage in lifelong learning.
10. An ability to understand professional, ethical and social responsibilities.
11. A respect for diversity and knowledge of contemporary professional, societal and global issues.
12. A committment to quality, timeliness, and continuous improvement.

Electrical Engineering Technology, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate knowledge, techniques (including the use of modern tools), and skills in the use of components, circuits, programs and systems encountered in the degree program's courses.
2. Use current knowledge of mathematics, science and emerging technology tools of their discipline to solve problems and demonstrate solutions.
3. Identify, analyze and solve technical problems as requires in the degree program's courses.
4. Apply and design components, circuits, systems and software programs in their specialty area as demonstrated in a senior project.
5. Conduct, analyze and interpret experiments and assess results.
6. Function as a member of a 2-4 person team to complete a task in a timely manner. Demonstrate ability to organize work done by team members.
7. Write technical reports; present data and results coherently in oral and graphic formats.
8. Demonstrate skills for lifelong learning by locating, evaluating and applying relevant information using external resources such as the Internet, data books, trade publications and library resources.
9. Demonstrate ethical conduct as described in the university student code of conduct. Demonstrate knowledge of professional code of ethics.
10. Demonstrate a respect for diversity as described in the university civility statement. Recognize contemporary professional, societal and global issues in case studies and course projects.
11. Demonstrate quality, timeliness and ability to complete increasingly complex homework and projects throughout the degree experience.

Mechanical Engineering Technology, B.S.

Upon completion of this program, students will be able to:

1. Demonstrate an appropriate mastery of the knowledge, techniques, skills, and modern tools of their discipline within designated courses which provide laboratory components.
2. Apply current knowledge in mathematics, science, engineering and technology, and recognize emerging applications in these areas.
3. Conduct experiments, analyze and interpret experimental data, and apply experimental parameters in order to improve and/or modify processes.
4. Apply creativity in the design of systems, components, or processes within Mechanical Engineering Technology projects.
5. Function effectively as a member of a project team, or with group projects.
6. Identify, analyze , and solve technical problems.
7. Communicate effectively in written, oral and graphical modes.
8. Recognize the need for lifelong learning, and participate in educational and professional opportunities to expand your knowledge base.
9. Understand and communicate professional, ethical, and social responsibilities as a practitioner of MET.
10. Demonstrate a respect for diversity and a knowledge of contemporary professional, societal, and global issues.
11. Demonstrate via actions a commitment to quality, timeliness, and continuous improvement.

Healthcare Engineering Technology Management

Healthcare Engineering Technology Management
At the time of graduation, bachelor's degree students will be able to:

1. Demonstrate knowledge and skills in the use of the electrical and/or computer components of medical equipment systems as encountered in the degree program's courses. Demonstrate a working medical vocabulary and knowledge of clinical safety requirements and regulations as encountered in the courses of the degree program.
2. Use current knowledge of mathematics, science and emerging technology tools to solve problems and demonstrate solutions.
3. Identify, analyze and integrate the technical equipment requirements with the needs of medical staff and patients as required in the courses of the degree program.
4. Apply and design solutions for issues identified in health care technology as demonstrated in a senior project.
5. Conduct, analyze and interpret experiments, and access results.
6. Function as a member of a 2-4 person team to complete a task in a timely manner. Demonstrate ability to organize work done by team members.
7. Write technical reports; present data and results coherently in oral and graphic formats.
8. Demonstrate skills for continued self-directed learning and professional development.
9. Demonstrate ethical conduct as described in the university's Student Code of Conduct. Demonstrate knowledge of professional code of ethics.
10. Demonstrate a respect for diversity as described in the university Civility statement. Recognize contemporary professional, societal and global issues in case studies and course projects.
11. Demonstrate quality, timeliness and ability to complete increasingly complex homework and projects throughout the degree experience.

Electrical Engineering Technology

Electrical Engineering Technology, B.S.
At the time of graduation, students will be able to:

1. Demonstrate knowledge, techniques (including the use of modern tools), and skills in the use of components, circuits, programs and systems encountered in the degree program's courses.
2. Use current knowledge of mathematics, science and emerging technology tools of their discipline to solve problems and demonstrate solutions.
3. Identify, analyze and solve technical problems as required in the degree program's courses.
4. Apply and design components, circuits, systems and software programs in their specialty area as demonstrated in a senior project.
5. Conduct, analyze and interpret experiments and assess experimental results to improve processes.
6. Function as a member of a 2-4 person team to complete a task in a timely manner. Demonstrate ability to organize work done by team members.
7. Write technical reports; present data and results coherently in oral and graphic formats.
8. Demonstrate skills for life-long learning by locating, evaluating and applying relevant information using external resources such as the Internet, data books, trade publications and library resources.
9. Demonstrate ethical conduct as described in the university's Student Code of Conduct. Demonstrate knowledge of professional code of ethics. Demonstrate a respect for diversity as described in the university civility statement.
10. Recognize contemporary professional, societal and global issues in case studies and course projects. Identify appropriate standards and comply with them in course assignments, exams or projects.
11. Demonstrate a commitment to quality, timeliness and continuous improvement by exhibiting the ability to complete increasingly complex homework and projects throughout the degree experience.

Computer Engineering Technology

Computer Engineering Technology, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate knowledge, techniques (including the use of modern tools), and skills in the use of microprocessors, programs, networks and systems encountered in the degree program's courses.
2. Use current knowledge of mathematics, science and emerging technology tools of their discipline to solve problems and demonstrate solutions.

3. Identify, analyze, and solve technical problems as required in the degree program's courses.
4. Apply and design hardware, systems, and software programs in their specialty area as demonstrated in a senior project.
5. Conduct, analyze and interpret experiments, and assess results to improve processes.
6. Function as a member of a 2-4 person team to complete a task in a timely manner. Demonstrate ability to organize work done by team members.
7. Write technical reports; present data and results coherently in oral and graphic formats.
8. Demonstrate skills for life-long learning by locating, evaluating and applying relevant information using external resources such as the Internet, data books, trade publications and library resources.
9. Demonstrate ethical conduct as described in the university's Student Code of Conduct. Demonstrate knowledge of the professional code of ethics. Demonstrate a respect for diversity as described in the university civility statement.
10. Recognize contemporary professional, societal and global issues in case studies and course projects. Identify appropriate standards and comply with them in course assignments, exams or projects.
11. Demonstrate a commitment to quality, timeliness and continuous improvement by exhibiting the ability to complete increasingly complex homework and projects throughout the degree experience.

Construction Engineering Management Technology

Construction Engineering Management Technology, B.S.
At the time of graduation, a student will be able to demonstrate:

1. An ability to select and apply the knowledge, skills and modern tools of the discipline to broadly defined engineering technology utilizing techniques that are appropriate to administer and evaluate construction contracts, documents, and codes.
2. An ability to select and apply a knowledge of mathematics, science, engineering and technology to engineering technology problems that require the application of principles and applied procedures or methodologies by applying fundamental computational methods and elementary analytical techniques in sub-disciplines related to construction engineering.
3. An ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments, and to apply experimental results to improve processes; an ability to select appropriate construction materials and practices, estimate costs, estimate quantities, evaluate materials for construction projects, and perform economic analyses and cost estimates related to design, construction, and maintenance of systems associated with construction engineering and utilizing measuring methods, hardware, and software that are appropriate for field, laboratory, and office processes related to construction.
4. An ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program education objectives.
5. An ability to function effectively as a member or leader on a technical team.
6. An ability to identify, analyze and solve broadly-defined engineering technology problems and an ability to perform standard analysis and design in at least on sub-discipline related to construction engineering.
7. An ability to apply written, oral, and graphical communication in both technical and nontechnical environments; identify and use appropriate technical literature, produce and utilize design, construction, and operations documents.
8. An understanding of the need for and an ability to engage in self-directed continuing professional development.
9. An understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity by applying appropriate principles of construction management, law, and ethics.
10. A knowledge of the impact of engineering technology solutions in a societal and global context.
11. A commitment to quality, timeliness, and continuous improvement.

Mechanical Engineering Technology

Mechanical Engineering Technology, B.S.
At the time of graduation, a student will possess:

1. An ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities.
2. An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.
3. An ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; to apply experimental results to improve processes.
4. An ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives.
5. An ability to function effectively as a member or leader on a technical team.
6. An ability to identify, analyze, and solve broadly-defined engineering technology problems.
7. An ability to apply written, oral, and graphical communication in both technical and nontechnical environments; an ability to identify and use appropriate technical literature.
8. An understanding of the need for and an ability to engage in self-directed continuing professional development.
9. An understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity.
10. Knowledge of the impact of engineering technology solutions in a societal and global context.

11. A commitment to quality, timeliness, and continuous improvement.

Construction Management Certificate

Construction Management Certificate
Upon completion of this program, students will be able to demonstrate:

1. An appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines.
2. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology.
3. An ability to conduct, analyze and interpret experiments and apply experimental results to improve processes.
4. An ability to apply creativity in the design of systems, components or processes appropriate to program objectives.
5. An ability to function effectively in teams.
6. An ability to identify, analyze and solve technical problems.
7. An ability to communicate orally.
8. An ability to communicate writen and visual.
9. Recognition of the need for, and ability to engage in lifelong learning.
10. An ability to understand professional, ethical and social responsibilities.
11. A respect for diversity and knowledge of contemporary professional, societal and global issues.
12. A committment to quality, timeliness, and continuous improvement.

Motorsports Engineering Technology Certificate

Motorports ngineering Technology Certificate
Upon completion of this program, students will be able to demonstrate:

1. An appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines.
2. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology.
3. An ability to conduct, analyze and interpret experiments and apply experimental results to improve processes.
4. An ability to apply creativity in the design of systems, components or processes appropriate to program objectives.
5. An ability to function effectively in teams.
6. An ability to identify, analyze and solve technical problems.
7. An ability to communicate orally.
8. An ability to communicate writen and visual.
9. Recognition of the need for, and ability to engage in lifelong learning.
10. An ability to understand professional, ethical and social responsibilities.
11. A respect for diversity and knowledge of contemporary professional, societal and global issues.
12. A committment to quality, timeliness, and continuous improvement.

Quality Assurance Certificate

Quality Assurance Certificate
At the time of graduation, a student will possess:

1. An ability to select and apply the knowledge, techniques, skills, and modern tools of Lean Six-Sigma to broadly-define process improvement activities.
2. An ability to select and apply a knowledge of statistics, science, engineering, and technology to process improvement problems that require the application of principles and applied methodologies of Lean Six-Sigma.
3. An ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; to apply experimental results to improve processes.
4. An ability to design systems, components, or processes for broadly-defined process problems.
5. An ability to function effectively as a member or leader on a process improvement team.
6. An ability to apply written, oral, and graphical communication in both technical and nontechnical environments.
7. An understanding of the need for and an ability to engage in self-directed continuing professional development.
8. An understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity.
9. Knowledge of the impact of process improvement solutions in a societal and global context.
10. A commitment to quality, timeliness, and continuous improvement.

Motorsports Engineering

Motorsports Engineering
The MSTE program at IUPUI has established the following outcomes to ensure its graduates are equipped to accomplish the expected objectives. These outcomes require each student to show competency as detailed below, and reflect those established ABET. Graduates of the program will:

1. Demonstrate an appropriate mastery of the knowledge, techniques, skills, and modern tools of the following disciplines within designated courses which provide laboratory components:
    - Thermodynamics/Engine Design
    - Dynamics/Vehicle Dynamics/Aerodynamics
    - Static & Dynamic Loading/Modeling and Analysis of Loaded Structures
    - Electronics/Instrumentation/Data Acquisition
    - System Analysis & Design

2. Apply current knowledge in mathematics, science, engineering and technology, and recognize emerging applications in these areas.
3. Conduct experiments, analyze and interpret experimental data, and apply experimental parameters in order to improve and/or modify processes.
4. Apply creativity in the design of systems, components, or processes as displayed in motorsports related projects.
5. Function effectively as a member of a project teams, or with group projects.
6. Identify, analyze, and solve technical problems.
7. Communicate effectively in written, oral, and graphical modes.
8. Recognize the need for lifelong learning, and participate in educational and professional opportunities to expand your knowledge base.
9. Understand and communicate professional, ethical, and social responsibilities as a practitioner of engineering .
10. Demonstrate a respect for diversity and a knowledge of contemporary professional, societal, and global issues.
11. Demonstrate via actions a commitment to quality, timeliness, and continuous improvement.

Lean Six Sigma Certificate

Lean Six Sigma Certificate
Upon completion of this program, students will be able to demonstrate:

1. An ability to select and apply the knowledge, techniques, skills, and modern tools of Lean Six-Sigma to broadly-defined process improvement activities.
2. An ability to select and apply a knowledge of statistics, science, engineering, and technology to process improvement problems that require the application of principles and applied methodologies of Lean Six-Sigma.
3. An ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; to apply experimental results to improve processes.
4. An ability to design systems, components, or processes for broadly-defined process problems.
5. An ability to function effectively as a member or leader on a process improvement team.
6. An ability to apply written, oral, and graphical communication in both technical and nontechnical environments.
7. An understanding of the need for and an ability to engage in self-directed continuing professional development.
8. An understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity.
9. Knowledge of the impact of process improvement solutions in a societal and global context.
10. A commitment to quality, timeliness, and continuous improvement.

Computer, Information & Leadership Technology

Technology Leadership and Communication

Computer & Information Technology, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate mastery of core computing and mathematical concepts.
2. Analyze user needs and identify the computing requirements appropriate to an IT solution.
3. Plan, design, implement, and evaluate IT-based systems to meet desired needs.
4. Function effectively on teams to accomplish a common goal.
5. Acknowledge diverse opinions in regards to professional, ethical, legal, and social issues in a global perspective.
6. Communicate effectively with a wide range of audiences.
7. Analyze and explain the impact of IT on individuals, organizations and societies.
8. Explain the need to engage in continuing professional development.
9. Use current technical concepts, techniques and practices in the information technologies within the student's area of expertise.
10. Apply the best practices and standards within the student's area of expertise.

Organizational Leadership Supervision, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate and apply knowledge of:
    1. the process and roles of leadership.
    2. leadership traits.
    3. leadership behavior concepts.
    4. situational approaches to leadership.
    5. power and influence.
    6. leading during times of uncertainty, turbulence, and change.
2. Design and conduct research, as well as analyze and interpret data in order to:
    1. evaluate their personal leadership effectiveness.
    2. evaluate their organization's effectiveness and sustainability.
    3. evaluate their organization's social and environmental impact.
3. Lead an organization, or processes and functions within it that meet or exceeds desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, and sustainability.
4. Function on multi-disciplinary teams.
5. Identify, formulate, and solve organizational problems.
6. Understand professional and ethical responsibility.
7. Communicate effectively verbally and nonverbally to all size audiences.
8. Understand the impact of leadership and supervision in a global, economic, environmental and societal context.

9. Demonstrate knowledge of contemporary organizational issues.
10. Use the techniques, skills, tools and concepts necessary for effective strategic and tactical planning.

Technical Communication

Technical Communication B.S.
Students with a B.S. in Technical Communication will be able to:

1. Understand theories and principles that inform technical communication
2. Apply best practices of usability and user-centered design
3. Understand the impact of technical communication in a global workplace context
4. Understand the need for sensitivity to differences in workplace international communication
5. Clearly communicate complex technical concepts visually, orally, and in writing
6. Effectively use technology to create communication products in a variety of environments
7. Plan and manage all aspects of technical communication projects
8. Function effectively in diverse groups
9. Effectively identify, analyze, interpret, and synthesize data
10. Understand and use different style guides appropriately
11. Ethically address challenges that arise in workplace technical communication contexts
12. Metacognitively reflect on their own communication skills and abilities
13. Recognize the need to engage in life-long learning

Organizational Leadership and Supervision

Organizational Leadership Supervision, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate and apply knowledge of:
    1. the process and roles of leadership.
    2. leadership traits.
    3. leadership behavior concepts.
    4. situational approaches to leadership.
    5. power and influence.
    6. leading during times of uncertainty, turbulence, and change.
2. Design and conduct research, as well as analyze and interpret data in order to:
    1. evaluate their personal leadership effectiveness.
    2. evaluate their organization's effectiveness and sustainability.
    3. evaluate their organization's social and environmental impact.
3. Lead an organization, or processes and functions within it that meet or exceeds desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, and sustainability.
4. Function on multi-disciplinary teams.
5. Identify, formulate, and solve organizational problems.
6. Understand professional and ethical responsibility.
7. Communicate effectively verbally and nonverbally to all size audiences.
8. Understand the impact of leadership and supervision in a global, economic, environmental and societal context.
9. Demonstrate knowledge of contemporary organizational issues.
10. Use the techniques, skills, tools and concepts necessary for effective strategic and tactical planning.

Human Resource Management Certificate

Human Resource Management Certificate
Upon completion of this program, students will be able to:

1. Describe, use, and evaluate tactical and strategic human resource management principles.
2. Develop, implement and provide a safe and effective work environment.
3. Comply with local, state, and federal employment law and related public policies.
4. Promote training and development of individuals, work teams, and organizations.
5. Assess, design, develop, implement, and evaluate learning solutions in various organizational contexts.
6. Promote positive, productive employer-employee relationships.
7. Create, negotiate, and manage regulations concerning collective bargaining, grievance, and arbitration procedures.
8. Leverage compensation, benefits, rewards, and recognition to attract, motivate, and retain talent.
9. Develop policy, practice, and procedure to select talent aligned with the strategic direction of the organization.

International Leadership Certificate

International Leadership Certificate
Upon completion of this program, students will be able to:

1. Demonstrate Techniques to analyze and solve intercultural problems that typically occur within diverse organizations.
2. Apply knowledge and techniques to devise strategies for successfully leading a diverse workforce within an international organization.
3. Use knowledge and techniques to devise strategies for successfully managing diversity within an international organization.
4. Demonstrate substantial knowledge of at least one foreign country, or region, (or distinct subculture within the USA), including demographic profile, economic status, political climate, commerce, history, language, and cultural norms as a result of intensive experience and/or study.

Leadership Studies Certificate

Leadership Studies Certificate
Upon completion of this program, students will be able to:

1. Define and defend their personal philosophy of leadership and ethical behavior.
2. Describe behavior in organizational settings at the individual, team/group, and macro-organization levels.
3. Identify the stages of team development that offers within organizations.
4. Make leadership-oriented decisions that are ethically, legally, morally, and strategically sound.
5. Apply concepts of supervisory management, team building, personnel selection and development, decision-making, resource allocation, conflict resolution, and strategic planning to the solving of individual, team/group, and organizational problems.
6. Explain the importance of attracting, managing, and motivating a globally-diverse workforce.
7. Improve individual and organizational performance by applying the appropriate leadership theories and processes in practice.
8. Evaluate the appropriateness of leadership behaviors in given situations, and make suggestions for improving those behaviors.

Technical Communication Certificate

Technical Communication Certificate
Students with a Certificate in Technical Communication will be able to:

1. Understand theories and principles that inform technical communication
2. Clearly communicate complex technical concepts visually, orally, and in writing
3. Effectively use technology to create communication products in a variety of environments
4. Understand and use different style guides appropriately
5. Metacognitively reflect on their own communication skills and abilities

Computer, Information & Leadership Technology

Computer & Information Technology, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate mastery of core computing and mathematical concepts.
2. Analyze user needs and identify the computing requirements appropriate to an IT solution.
3. Plan, design, implement, and evaluate IT-based systems to meet desired needs.
4. Function effectively on teams to accomplish a common goal.
5. Acknowledge diverse opinions in regards to professional, ethical, legal, and social issues in a global perspective.
6. Communicate effectively with a wide range of audiences.
7. Analyze and explain the impact of IT on individuals, organizations and societies.
8. Explain the need to engage in continuing professional development.
9. Use current technical concepts, techniques and practices in the information technologies within the student's area of expertise.
10. Apply the best practices and standards within the student's area of expertise.

Organizational Leadership Supervision, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate and apply knowledge of:
    1. the process and roles of leadership.
    2. leadership traits.
    3. leadership behavior concepts.
    4. situational approaches to leadership.
    5. power and influence.
    6. leading during times of uncertainty, turbulence, and change.
2. Design and conduct research, as well as analyze and interpret data in order to:
    1. evaluate their personal leadership effectiveness.
    2. evaluate their organization's effectiveness and sustainability.
    3. evaluate their organization's social and environmental impact.
3. Lead an organization, or processes and functions within it that meet or exceeds desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, and sustainability.
4. Function on multi-disciplinary teams.
5. Identify, formulate, and solve organizational problems.
6. Understand professional and ethical responsibility.
7. Communicate effectively verbally and nonverbally to all size audiences.
8. Understand the impact of leadership and supervision in a global, economic, environmental and societal context.
9. Demonstrate knowledge of contemporary organizational issues.
10. Use the techniques, skills, tools and concepts necessary for effective strategic and tactical planning.

Music & Arts Technology

Music & Arts Technology

Music Technology, B.S.
Upon completion of this program, students will be able to:

1. Think, speak, and write clearly and effectively.
2. Demonstrate acquaintance with mathematical and experimental methods of the physical and biological sciences; including analysis and historical and quantitative techniques
3. Address culture and history from a variety of perspectives.
4. Understand and experience thinking about moral and ethical problems.

5. Respect, understand, and evaluate work in a variety of disciplines.
6. Explain and defend one's views effectively and rationally.
7. Understand and have experience with art forms other than music.
8. Hear, identify, and work conceptually with the elements of music-rhythm, melody, harmony, and structure.
9. Understand compositional process, aesthetic properties of style, and the ways these shape and are shaped by artistic and cultural forces.
10. Demonstrate acquaintance with a wide selection of musical literature - the principal eras, genres, and cultural sources.
11. Develop and defend musical judgments.
12. Perform in areas appropriate to the student's needs and interests.
13. Sight read.
14. Understand procedures for realizing a variety of musical styles.
15. Demonstrate capacity to create derivative or original music both extemporaneously and in written form.
16. Compose and improvise at a basic level in one or more musical languages
17. Understand how technology serves the field of music as a whole.
18. Demonstrate a working knowledge of the technological developments applicable to their area of specialization.
19. Work independently on a variety of musical problems by combining their capabilities in performance; aural, verbal and visual analysis; composition and improvisation; and history and repertory.
20. Form and defend judgments about music.
21. Acquire the tools of work with a comprehensive repertory, including music from various cultures of the world and music of their own time.
22. Understand basic interrelationships and interdependencies among the various professions and activities that constitute the musical enterprise.
23. Acquire the skills necessary to assist in the development and advancement of their careers.
24. Develop teaching skills, particularly as related to their major area of study.
25. Develop improvisational skills in all areas of musicianship
26. Experience a broad range of repertory through attendance at events such as recitals, concerts, opera and music theatre productions, and other types of performances.
27. Explore areas of individual interest related to music in general or to the major.
28. Explore multidisciplinary issues that include music.
29. Practice synthesis of a broad range of musical knowledge and skills, particularly through independent study that involves a minimum of faculty guidance, where the emphasis is on evaluation at completion.

Certificates

Certificates

Computer Technology Applications Certificate
Upon completion of this program, students will be able to:

1. Use traditional application software at the highest level.
2. Customize and modify application software for end users.
3. Train end users of application software in best practices.
4. Research, learn, and apply new software techniques.
5. Create sophisticated and interactive Web interfaces using application software.
6. Use Web 2.0 tools to further their career.

E-Commerce Certificate
Upon completion of this program, students will be able to:

1. Apply tools and techniques for effective Web site planning and analysis.
2. Allow individuals to develop dynamic web applications in a variety of programming languages.
3. Explore sophisticated data management and information exchange as it applies to interactive and e-commerce applications.
4. Apply optimal Web design strategies to deploy usable Web applications for a global audience.
5. Utilize current web development standards appropriately.

Information Technology Certificate
Upon completion of this program, students will be able to:

1. Apply tools and techniques for effective Web site planning and analysis.
2. Introduce fundamental client and server side languages for developing dynamic websites.
3. Explore database development and technologies used to build database-driven web applications.
4. Apply optimal Web design strategies to deploy usable Web applications for a global audience.
5. Research, learn and apply new web technologies.

Network Security Certificate
Upon completion of this program, students will be able to:

1. Apply information assurance and security principles to secure systems and networks.
2. Conduct accurate and comprehensive digital forensics investigations and apply appropriate rules of evidence.
3. Use an appropriate analytic framework to assess risk and recommend strategies for mitigation.
4. Analyze and produce comprehensive security policies, standards, and procedures.
5. Analyze and create comprehensive business continuity plan to include incident response, disaster recovery, and continuous operations.

Human Resource Management Certificate
Upon completion of this program, students should be able to:

1. Describe, use, and evaluate tactical and strategic Human resource management principles.
2. Develop, implement and provide a safe and effective work environment.

3. Comply with local, state, and federal employment law and related public policies.
4. Promote training and development of individuals, work teams, and organizations.
5. Assess, design, develop, implement, and evaluate learning solutions in various organizational contexts.
6. Promote positive, productive employer-employee relationships.
7. Create, negotiate, and manage regulations concerning collective bargaining, grievance, and arbitration procedures.
8. Leverage compensation, benefits, rewards, and recognition to attract, motivate, and retain talent.
9. Develop policy, practice, and procedure to select talent aligned with the strategic direction of the organization.

International Leadership Certificate
Upon completion of this program, students will be able to:

1. Demonstrate techniques to analyze and solve intercultural problems that typically occur within diverse organizations.
2. Apply knowledge and techniques to devise strategies for successfully leading a diverse workforce within an international organization.
3. Use knowledge and techniques to devise strategies for successfully managing diversity within an international organization.
4. Demonstrate substantial knowledge of at least one foreign country, or region, (or distinct subculture within the USA), including demographic profile, economic status, political climate, commerce, history, language, and cultural norms as a result of intensive experience and/or study.

Leadership Studies Certificate
Upon completion of this program, students will be able to:

1. Define and defend their personal philosophy of leadership and ethical behavior.
2. Describe behavior in organizational settings at the individual, team/group, and macro-organization levels.
3. Identify the stages of team development that occurs within organizations.
4. Make leadership-oriented decisions that are ethically, legally, morally, and strategically sound.
5. Apply concepts of supervisory management, team building, personnel selection and development, decision-making, resource allocation, conflict resolution, and strategic planning to the solving of individual, team/group, and organizational problems.
6. Explain the importance of attracting, managing, and motivating a globally-diverse workforce.
7. Improve individual and organizational performance by applying the appropriate leadership theories and processes in practice.
8. Evaluate the appropriateness of leadership behaviors in given situations, and make suggestions for improving those behaviors.

Biomedical Engineering, B.S.B.M.E.

Biomedical Engineering, B.S.B.M.E.

Upon completing the undergraduate B.M.E. degree, our students will possess:

1. An ability to apply knowledge of mathematics, science, and engineering.
2. An ability to design and conduct experiments, as well as to analyze and interpret data.
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. An ability to function on multi-disciplinary teams.
5. An ability to identify, formulate, and solve engineering problems.
6. An understanding of professional and ethical responsibility.
7. An ability to communicate effectively
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
9. A recognition of the need for, and an ability to engage in lifelong learning.
10. A knowledge of contemporary issues.
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Computer, Information & Leadership Technology

Computer & Information Technology, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate mastery of core computing and mathematical concepts.
2. Analyze user needs and identify the computing requirements appropriate to an IT solution.
3. Plan, design, implement, and evaluate IT-based systems to meet desired needs.
4. Function effectively on teams to accomplish a common goal.
5. Acknowledge diverse opinions in regards to professional, ethical, legal, and social issues in a global perspective.
6. Communicate effectively with a wide range of audiences.
7. Analyze and explain the impact of IT on individuals, organizations and societies.
8. Explain the need to engage in continuing professional development.
9. Use current technical concepts, techniques and practices in the information technologies within the student's area of expertise.
10. Apply the best practices and standards within the student's area of expertise.

Organizational Leadership Supervision, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate and apply knowledge of:
    1. the process and roles of leadership.
    2. leadership traits.
    3. leadership behavior concepts.
    4. situational approaches to leadership.

5. power and influence.
6. leading during times of uncertainty, turbulence, and change.

2. Design and conduct research, as well as analyze and interpret data in order to:
    1. evaluate their personal leadership effectiveness.
    2. evaluate their organization's effectiveness and sustainability.
    3. evaluate their organization's social and environmental impact.
3. Lead an organization, or processes and functions within it that meet or exceeds desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, and sustainability.
4. Function on multi-disciplinary teams.
5. Identify, formulate, and solve organizational problems.
6. Understand professional and ethical responsibility.
7. Communicate effectively verbally and nonverbally to all size audiences.
8. Understand the impact of leadership and supervision in a global, economic, environmental and societal context.
9. Demonstrate knowledge of contemporary organizational issues.
10. Use the techniques, skills, tools and concepts necessary for effective strategic and tactical planning.

Certificates

Certificates

Computer Technology Applications Certificate
Upon completion of this program, students will be able to:

1. Use traditional application software at the highest level.
2. Customize and modify application software for end users.
3. Train end users of application software in best practices.
4. Research, learn, and apply new software techniques.
5. Create sophisticated and interactive Web interfaces using application software.
6. Use Web 2.0 tools to further their career.

E-Commerce Certificate
Upon completion of this program, students will be able to:

1. Apply tools and techniques for effective Web site planning and analysis.
2. Allow individuals to develop dynamic web applications in a variety of programming languages.
3. Explore sophisticated data management and information exchange as it applies to interactive and e-commerce applications.
4. Apply optimal Web design strategies to deploy usable Web applications for a global audience.
5. Utilize current web development standards appropriately.

Information Technology Certificate
Upon completion of this program, students will be able to:

1. Apply tools and techniques for effective Web site planning and analysis.
2. Introduce fundamental client and server side languages for developing dynamic websites.
3. Explore database development and technologies used to build database-driven web applications.
4. Apply optimal Web design strategies to deploy usable Web applications for a global audience.
5. Research, learn and apply new web technologies.

Network Security Certificate
Upon completion of this program, students will be able to:

1. Apply information assurance and security principles to secure systems and networks.
2. Conduct accurate and comprehensive digital forensics investigations and apply appropriate rules of evidence.
3. Use an appropriate analytic framework to assess risk and recommend strategies for mitigation.
4. Analyze and produce comprehensive security policies, standards, and procedures.
5. Analyze and create comprehensive business continuity plan to include incident response, disaster recovery, and continuous operations.

Human Resource Management Certificate
Upon completion of this program, students should be able to:

1. Describe, use, and evaluate tactical and strategic Human resource management principles.
2. Develop, implement and provide a safe and effective work environment.
3. Comply with local, state, and federal employment law and related public policies.
4. Promote training and development of individuals, work teams, and organizations.
5. Assess, design, develop, implement, and evaluate learning solutions in various organizational contexts.
6. Promote positive, productive employer-employee relationships.
7. Create, negotiate, and manage regulations concerning collective bargaining, grievance, and arbitration procedures.
8. Leverage compensation, benefits, rewards, and recognition to attract, motivate, and retain talent.
9. Develop policy, practice, and procedure to select talent aligned with the strategic direction of the organization.

International Leadership Certificate
Upon completion of this program, students will be able to:

1. Demonstrate techniques to analyze and solve intercultural problems that typically occur within diverse organizations.
2. Apply knowledge and techniques to devise strategies for successfully leading a diverse workforce within an international organization.
3. Use knowledge and techniques to devise strategies for successfully managing diversity within an international organization.

4. Demonstrate substantial knowledge of at least one foreign country, or region, (or distinct subculture within the USA), including demographic profile, economic status, political climate, commerce, history, language, and cultural norms as a result of intensive experience and/or study.

Leadership Studies Certificate
Upon completion of this program, students will be able to:

1. Define and defend their personal philosophy of leadership and ethical behavior.
2. Describe behavior in organizational settings at the individual, team/group, and macro-organization levels.
3. Identify the stages of team development that occurs within organizations.
4. Make leadership-oriented decisions that are ethically, legally, morally, and strategically sound.
5. Apply concepts of supervisory management, team building, personnel selection and development, decision-making, resource allocation, conflict resolution, and strategic planning to the solving of individual, team/group, and organizational problems.
6. Explain the importance of attracting, managing, and motivating a globally-diverse workforce.
7. Improve individual and organizational performance by applying the appropriate leadership theories and processes in practice.
8. Evaluate the appropriateness of leadership behaviors in given situations, and make suggestions for improving those behaviors.

Mechanical Engineering

Mechanical Engineering

Computer & Information Technology, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate mastery of core computing and mathematical concepts.
2. Analyze user needs and identify the computing requirements appropriate to an IT solution.
3. Plan, design, implement, and evaluate IT-based systems to meet desired needs.
4. Function effectively on teams to accomplish a common goal.
5. Acknowledge diverse opinions in regards to professional, ethical, legal, and social issues in a global perspective.
6. Communicate effectively with a wide range of audiences.
7. Analyze and explain the impact of IT on individuals, organizations and societies.
8. Explain the need to engage in continuing professional development.
9. Use current technical concepts, techniques and practices in the information technologies within the student's area of expertise.
10. Apply the best practices and standards within the student's area of expertise.

Organizational Leadership Supervision, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate and apply knowledge of:
    1. the process and roles of leadership.
    2. leadership traits.
    3. leadership behavior concepts.
    4. situational approaches to leadership.
    5. power and influence.
    6. leading during times of uncertainty, turbulence, and change.
2. Design and conduct research, as well as analyze and interpret data in order to:
    1. evaluate their personal leadership effectiveness.
    2. evaluate their organization's effectiveness and sustainability.
    3. evaluate their organization's social and environmental impact.
3. Lead an organization, or processes and functions within it that meet or exceeds desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, and sustainability.
4. Function on multi-disciplinary teams.
5. Identify, formulate, and solve organizational problems.
6. Understand professional and ethical responsibility.
7. Communicate effectively verbally and nonverbally to all size audiences.
8. Understand the impact of leadership and supervision in a global, economic, environmental and societal context.
9. Demonstrate knowledge of contemporary organizational issues.
10. Use the techniques, skills, tools and concepts necessary for effective strategic and tactical planning.

Mechanical Engineering

Mechanical Engineering, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate and apply knowledge of mathematics, science, and engineering with:
    1. Knowledge in chemistry and calculus-based physics in depth.
    2. Mathematics through multivariate calculus, differential equations, and linear algebra.
    3. Probability and statistics.
    4. Mechanical engineering sciences: solid mechanics, fluid-thermal sciences, materials science, systems dynamics.
2. Design and conduct experiments methodically, analyze data, and interpret results.
3. Design a system, component, or process to meet desired needs with applications to:
    1. Mechanical systems.
    2. Thermal systems.
4. Function in teams to carry out multidisciplinary projects.
5. Identify, formulate, and solve engineering problems.
6. Understand professional and ethical responsibilities.

7. Communicate effectively in writing and orally.
8. Understand the impact of engineering solutions in a global and societal context through broad education.
9. Recognize the need to engage in lifelong learning.
10. Demonstrate knowledge of contemporary issues.
11. Use the techniques, skills, and modern tools of engineering effectively and correctly in engineering practice with:
    1. Mechanical engineering analysis tools. (e.g., ProMechanica)
    2. Engineering design and manufacturing tools. (e.g., ProEngineer)
    3. Internet and library information resources
    4. Mathematical computing and analysis tools. (e.g., Matlab, C, Excel, LabView)

Certificates

Certificates

Computer Technology Applications Certificate
Upon completion of this program, students will be able to:

1. Use traditional application software at the highest level.
2. Customize and modify application software for end users.
3. Train end users of application software in best practices.
4. Research, learn, and apply new software techniques.
5. Create sophisticated and interactive Web interfaces using application software.
6. Use Web 2.0 tools to further their career.

E-Commerce Certificate
Upon completion of this program, students will be able to:

1. Apply tools and techniques for effective Web site planning and analysis.
2. Allow individuals to develop dynamic web applications in a variety of programming languages.
3. Explore sophisticated data management and information exchange as it applies to interactive and e-commerce applications.
4. Apply optimal Web design strategies to deploy usable Web applications for a global audience.
5. Utilize current web development standards appropriately.

Information Technology Certificate
Upon completion of this program, students will be able to:

1. Apply tools and techniques for effective Web site planning and analysis.
2. Introduce fundamental client and server side languages for developing dynamic websites.
3. Explore database development and technologies used to build database-driven web applications.
4. Apply optimal Web design strategies to deploy usable Web applications for a global audience.
5. Research, learn and apply new web technologies.

Network Security Certificate
Upon completion of this program, students will be able to:

1. Apply information assurance and security principles to secure systems and networks.
2. Conduct accurate and comprehensive digital forensics investigations and apply appropriate rules of evidence.
3. Use an appropriate analytic framework to assess risk and recommend strategies for mitigation.
4. Analyze and produce comprehensive security policies, standards, and procedures.
5. Analyze and create comprehensive business continuity plan to include incident response, disaster recovery, and continuous operations.

Human Resource Management Certificate
Upon completion of this program, students should be able to:

1. Describe, use, and evaluate tactical and strategic Human resource management principles.
2. Develop, implement and provide a safe and effective work environment.
3. Comply with local, state, and federal employment law and related public policies.
4. Promote training and development of individuals, work teams, and organizations.
5. Assess, design, develop, implement, and evaluate learning solutions in various organizational contexts.
6. Promote positive, productive employer-employee relationships.
7. Create, negotiate, and manage regulations concerning collective bargaining, grievance, and arbitration procedures.
8. Leverage compensation, benefits, rewards, and recognition to attract, motivate, and retain talent.
9. Develop policy, practice, and procedure to select talent aligned with the strategic direction of the organization.

International Leadership Certificate
Upon completion of this program, students will be able to:

1. Demonstrate techniques to analyze and solve intercultural problems that typically occur within diverse organizations.
2. Apply knowledge and techniques to devise strategies for successfully leading a diverse workforce within an international organization.
3. Use knowledge and techniques to devise strategies for successfully managing diversity within an international organization.
4. Demonstrate substantial knowledge of at least one foreign country, or region, (or distinct subculture within the USA), including demographic profile, economic status, political climate, commerce, history, language, and cultural norms as a result of intensive experience and/or study.

Leadership Studies Certificate
Upon completion of this program, students will be able to:

1. Define and defend their personal philosophy of leadership and ethical behavior.
2. Describe behavior in organizational settings at the individual, team/group, and macro-organization levels.
3. Identify the stages of team development that occurs within organizations.

4. Make leadership-oriented decisions that are ethically, legally, morally, and strategically sound.
5. Apply concepts of supervisory management, team building, personnel selection and development, decision-making, resource allocation, conflict resolution, and strategic planning to the solving of individual, team/group, and organizational problems.
6. Explain the importance of attracting, managing, and motivating a globally-diverse workforce.
7. Improve individual and organizational performance by applying the appropriate leadership theories and processes in practice.
8. Evaluate the appropriateness of leadership behaviors in given situations, and make suggestions for improving those behaviors.

Energy Engineering

Mechanical Engineering

Energy Engineering, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate and apply knowledge of mathematics, science, and engineering with:
    1. Knowledge in chemistry and calculus-based physics in depth.
    2. Mathematics through multivariate calculus, differential equations, and linear algebra.
    3. Probability and statistics
    4. Mechanical engineering sciences: solid Mechanics, fluid-thermal science, material science, system dynamics.
2. Design and conduct experiments methodically, analyze data, and interpret results.
3. Design a system, component, or process to meet desired needs with applications to:
    1. Mechanical systems
    2. Thermal systems
4. Function in teams to carry out multidisciplinary projects.
5. Identify, formulate, and solve engineering problems.
6. Understand professional and ethical responsibilities.
7. Communicate effectively, in writing and orally.
8. Understand the impact of engineering solutions in a global and societal context through broad education.
9. Recognize the need to engage in lifelong learning.
10. Demonstrate knowledge of contemporary issues.
11. Use the techniques, skills, and modern tools of engineering effectively and correctly in engineering practice with:
    1. Mechanical engineering analysis tolls (e.g,. ProMechanica)
    2. Engineering design and manufacturing tools (e.g., ProEngineer)
    3. Internet and library resources
    4. Mathematical computing and analysis tools (e.g., Matlab, C, Excel, LabView)

Interdisciplinary Engineering

Mechanical Engineering

Interdisciplinary Engineering
Upon completion of this program, students will be able to:

1. Demonstrate and apply knowledge of mathematics, science, and engineering with:
    1. Knowledge in chemistry and calculus-based physics in depth.
    2. Mathematics through multivariate calculus, differential equations, and linear algebra.
    3. Probability and statistics.
    4. Mechanical engineering sciences: solid mechanics, fluid-thermal sciences, materials science, systems dynamics.
2. Design and conduct experiments methodically, analyze data, and interpret results.
3. Design a system, component, or process to meet desired needs with applications to:
    1. Mechanical systems.
    2. Thermal systems.
4. Function in teams to carry out multidisciplinary projects.
5. Identify, formulate, and solve engineering problems.
6. Understand professional and ethical responsibilities.
7. Communicate effectively in writing and orally.
8. Understand the impact of engineering solutions in a global and societal context through broad education.
9. Recognize the need to engage in lifelong learning.
10. Demonstrate knowledge of contemporary issues.
11. Use the techniques, skills, and modern tools of engineering effectively and correctly in engineering practice with:
    1. Mechanical engineering analysis tools. (e.g., ProMechanica)
    2. Engineering design and manufacturing tools. (e.g., ProEngineer)
    3. Internet and library information resources
    4. Mathematical computing and analysis tools. (e.g., Matlab, C, Excel, LabView)

Computer, Information & Leadership Technology

Computer & Information Technology, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate mastery of core computing and mathematical concepts.
2. Analyze user needs and identify the computing requirements appropriate to an IT solution.
3. Plan, design, implement, and evaluate IT-based systems to meet desired needs.
4. Function effectively on teams to accomplish a common goal.
5. Acknowledge diverse opinions in regards to professional, ethical, legal, and social issues in a global perspective.
6. Communicate effectively with a wide range of audiences.
7. Analyze and explain the impact of IT on individuals, organizations and societies.

8. Explain the need to engage in continuing professional development.
9. Use current technical concepts, techniques and practices in the information technologies within the student's area of expertise.
10. Apply the best practices and standards within the student's area of expertise.

Organizational Leadership Supervision, B.S.
Upon completion of this program, students will be able to:

1. Demonstrate and apply knowledge of:
    1. the process and roles of leadership.
    2. leadership traits.
    3. leadership behavior concepts.
    4. situational approaches to leadership.
    5. power and influence.
    6. leading during times of uncertainty, turbulence, and change.
2. Design and conduct research, as well as analyze and interpret data in order to:
    1. evaluate their personal leadership effectiveness.
    2. evaluate their organization's effectiveness and sustainability.
    3. evaluate their organization's social and environmental impact.
3. Lead an organization, or processes and functions within it that meet or exceeds desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, and sustainability.
4. Function on multi-disciplinary teams.
5. Identify, formulate, and solve organizational problems.
6. Understand professional and ethical responsibility.
7. Communicate effectively verbally and nonverbally to all size audiences.
8. Understand the impact of leadership and supervision in a global, economic, environmental and societal context.
9. Demonstrate knowledge of contemporary organizational issues.
10. Use the techniques, skills, tools and concepts necessary for effective strategic and tactical planning.

Certificates

Certificates

Computer Technology Applications Certificate
Upon completion of this program, students will be able to:

1. Use traditional application software at the highest level.
2. Customize and modify application software for end users.
3. Train end users of application software in best practices.
4. Research, learn, and apply new software techniques.
5. Create sophisticated and interactive Web interfaces using application software.
6. Use Web 2.0 tools to further their career.

E-Commerce Certificate
Upon completion of this program, students will be able to:

1. Apply tools and techniques for effective Web site planning and analysis.
2. Allow individuals to develop dynamic web applications in a variety of programming languages.
3. Explore sophisticated data management and information exchange as it applies to interactive and e-commerce applications.
4. Apply optimal Web design strategies to deploy usable Web applications for a global audience.
5. Utilize current web development standards appropriately.

Information Technology Certificate
Upon completion of this program, students will be able to:

1. Apply tools and techniques for effective Web site planning and analysis.
2. Introduce fundamental client and server side languages for developing dynamic websites.
3. Explore database development and technologies used to build database-driven web applications.
4. Apply optimal Web design strategies to deploy usable Web applications for a global audience.
5. Research, learn and apply new web technologies.

Network Security Certificate
Upon completion of this program, students will be able to:

1. Apply information assurance and security principles to secure systems and networks.
2. Conduct accurate and comprehensive digital forensics investigations and apply appropriate rules of evidence.
3. Use an appropriate analytic framework to assess risk and recommend strategies for mitigation.
4. Analyze and produce comprehensive security policies, standards, and procedures.
5. Analyze and create comprehensive business continuity plan to include incident response, disaster recovery, and continuous operations.

Human Resource Management Certificate
Upon completion of this program, students should be able to:

1. Describe, use, and evaluate tactical and strategic Human resource management principles.
2. Develop, implement and provide a safe and effective work environment.
3. Comply with local, state, and federal employment law and related public policies.
4. Promote training and development of individuals, work teams, and organizations.
5. Assess, design, develop, implement, and evaluate learning solutions in various organizational contexts.
6. Promote positive, productive employer-employee relationships.
7. Create, negotiate, and manage regulations concerning collective bargaining, grievance, and arbitration procedures.
8. Leverage compensation, benefits, rewards, and recognition to attract, motivate, and retain talent.

9. Develop policy, practice, and procedure to select talent aligned with the strategic direction of the organization.

International Leadership Certificate
Upon completion of this program, students will be able to:

1. Demonstrate techniques to analyze and solve intercultural problems that typically occur within diverse organizations.
2. Apply knowledge and techniques to devise strategies for successfully leading a diverse workforce within an international organization.
3. Use knowledge and techniques to devise strategies for successfully managing diversity within an international organization.
4. Demonstrate substantial knowledge of at least one foreign country, or region, (or distinct subculture within the USA), including demographic profile, economic status, political climate, commerce, history, language, and cultural norms as a result of intensive experience and/or study.

Leadership Studies Certificate
Upon completion of this program, students will be able to:

1. Define and defend their personal philosophy of leadership and ethical behavior.
2. Describe behavior in organizational settings at the individual, team/group, and macro-organization levels.
3. Identify the stages of team development that occurs within organizations.
4. Make leadership-oriented decisions that are ethically, legally, morally, and strategically sound.
5. Apply concepts of supervisory management, team building, personnel selection and development, decision-making, resource allocation, conflict resolution, and strategic planning to the solving of individual, team/group, and organizational problems.
6. Explain the importance of attracting, managing, and motivating a globally-diverse workforce.
7. Improve individual and organizational performance by applying the appropriate leadership theories and processes in practice.
8. Evaluate the appropriateness of leadership behaviors in given situations, and make suggestions for improving those behaviors.

Electrical Engineering

Electrical Engineering, B.S.
Upon completion of this program, students will be able to demonstrate:

1. an ability to apply knowledge of mathematics, science, and engineering.
2. an ability to design and conduct experiments, as well as to analyze and interpret data.
3. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. an ability to function on multidisciplinary teams.
5. an ability to identify, formulate, and solve engineering problems.
6. an understanding of professional and ethical responsibility.
7. an ability to communicate effectively.
8. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
9. a recognition of the need for, and an ability to engage in lifelong learning.
10. a knowledge of contemporary issues.
11. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Computer Engineering B.S.C.E.

Computer Engineering B.S.C.E.
Upon completion of this program, students will be able to demonstrate:

1. an ability to apply knowledge of mathematics, science, and engineering.
2. an ability to design and conduct experiments, as well as to analyze and interpret data.
3. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. an ability to function on multidisciplinary teams.
5. an ability to identify, formulate, and solve engineering problems.
6. an understanding of professional and ethical responsibility.
7. an ability to communicate effectively.
8. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
9. a recognition of the need for, and an ability to engage in lifelong learning.
10. a knowledge of contemporary issues.
11. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Graduate Programs

M. Razi Nalim, Associate Dean for Research and Graduate Programs

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

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

Students completing a master’s or doctoral degree in engineering or a master's degree in engineering technology will be prepared to enter the work force at a

high level of responsibility and expertise. Knowledge of the dynamics of expanding new technologies and the strategic importance of high productivity prepares master's degree graduates to advance rapidly in today's business and industries.

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

For more information, call (317) 278-4960, send e-mail to et_grad@iupui.edu, or visit the Web site: www.engr.iupui.edu/main/academics/grad/index.php.

General Requirements

Degree Programs

Degree Programs
Contact: Valerie Lim Diemer, Director of Graduate Programs and Admissions

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

*Jointly offered with Purdue University, West Lafayette.

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.B.M.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.

For more information about the M.S.B.M.E visit http://engr.iupui.edu/bme/ms_bme_pos.shtml?menu=ms.

For more information about the PhD program visit https://engineering.purdue.edu/BME/Academics/BMEGraduateProgram/Admissions/.

Graduate Programs in Electrical and Computer Engineering
Students can earn the Master of Science in Electrical and Computer Engineering (M.S.E.C.E.), and the Master of Science in Engineering (M.S.E.), through the Department of Electrical and Computer Engineering at the Purdue School of Engineering and Technology at IUPUI. The M.S.E.C.E. degree is organized into several areas of study, including computer engineering, controls and automation, communication and signal processing, and VLSI and circuit design. The M.S.E. degree is interdisciplinary in nature and is primarily for Bachelor's degree holders in fields other than electrical or computer engineering. Students holding a bachelor's degrees in fields other than electrical or computer engineering may pursue the M.S.E.C.E. if they complete a prescribed list of prerequisite courses.

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

For more information about electrical and computer engineering graduate programs visit http://et.engr.iupui.edu/departments/ece/grad/index.php.

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

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

For more information about http://engr.iupui.edu/me/bulletin/GraduatePrograms.shtml?menu=academics.

Master of Science in Technology

The School of Engineering and Technology offers graduate education in technology with the primary goal of developing advanced technical skills for practitioners in industry. The Master of Science in Technology degree program is designed so that graduates holding a B.S. degree in a technology discipline or a related area can complete their degrees as a full-time student or while working full-time. The graduate degree program offers concentrations in Computer Education, Engineering Technology Education, Facilities Management (an online program) and Motorsports. Additional areas of specialization are available in Applied Information Technology, Construction Engineering Management Technology and Organizational Leadership and Supervision in addition to more interdisciplinary plans of study that draw courses from the full complement of technology programs in the School. The curriculum consists of a total of 33 credit hours with programs of study ranging from course only to those which include a directed research project.

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

Too view the program requirements visit http://et.engr.iupui.edu/sites/graduateprograms/index.php.

Student Learning Outcomes

Student Learning Outcomes
The School of Engineering & Technology has organized its Graduate Student Learning Outcomes by program. Please choose the appropriate program in the links below, or the left-hand navigation.

Any questions or concerns about the Student Learning Outcomes should be directed to the Office of Academic Programs in ET 215.

Engineering
- Master of Science in Biomedical Engineering
- Master of Science in Electrical & Computer Engineering
- Master of Science in Mechanical Engineering

Technology
- Master of Science in Technology
- Master of Science in Music Technology*
- Master of Science in Music Therapy*

*Music & Arts Technology students are awarded Indiana University degrees.

Biomedical Engineering

Biomedical Engineering
Upon completion of the Master's degree (**with thesis**) in Biomedical Engineering at IUPUI, students will be able to:

1. Assess the quality and relevance of published results from the literature.
2. Apply appropriate laboratory, computational, and analysis techniques in the service of answering a research question or contributing to product development relevant to biomedical engineering.
3. Communicate (in speech, writing, and appropriate supporting visuals) the results and implications of biomedical research.

Upon completion of the Master's degree (**non-thesis**) in Biomedical Engineering at IUPUI, students will be able to:

1. Apply the tools of mathematics, science, and engineering to solve problems at the interface of engineering and biology.
2. Demonstrate knowledge of biological and physiological principles that advance the broad spectrum of life science application areas that is biomedical engineering.
3. Communicate (in speech, writing, and appropriate supporting visuals) information related to the theory and practice of biomedical engineering in research, clinical or industrial settings.

Technology

Technology
Upon program completion, students will be able to:

1. Identify, explain, and compare the major quantitative and qualitative approaches in measurement and evaluation within industrial, technological, educational and/or organizational contexts.
2. Use appropriate quantitative and qualitative approaches to measure and evaluate a variety of phenomena in industrial, technological, educational, and organizational settings.
3. Explain, identify, apply and utilize quantitative and qualitative processes to develop and sustain organizational cultures that emphasize quality, productivity, and continuous improvement.
4. Recognize the importance of evidence-based decision-making in industrial, technological, educational, and organizational contexts.
5. Locate and evaluate the credibility and appropriateness of research and applied studies for use in problem-solving in industrial, technological, educational, and organizational contexts.
6. Select and plan an in-depth area of study in industry, technology, education, and/or organizational leadership related to the one's personal, academic, and/or professional objectives.
7. Identify, explain, and apply major theories, concepts, models, and approaches from an in-depth discipline within industry, technology, educational, and/or organizational leadership.
8. Design and implement an appropriate project related to a specifically-identified research or applied problem in an industrial, technological, educational, or organizational context.
9. Conduct a literature review or benchmarking analysis, gather and analyze relevant data, develop sound conclusions and recommendations, and present findings in professionally-presented oral and written reports.

Electrical & Computer Engineering

Electrical & Computer Engineering

Graduates of the Masters program in ECE will have the ability to:

1. Apply their knowledge and skills to solve advanced Electrical and Computer Engineering problems.
2. Conduct research in topics within the electrical and computer engineering area.
3. Communicate effectively.

Mechanical Engineering

Mechanical Engineering
Upon completion of the Master's degree (**with thesis**) in Mechanical Engineering at IUPUI, students will be able to:

1. Assess the quality and relevance of published results from the literature.
2. Apply appropriate laboratory, computational, and analysis techniques in the service of answering a research question or contributing to product development relevant to mechanical engineering.
3. Communicate (in speech, writing, and appropriate supporting visuals) the results and implications of mechanical engineering research.

Upon completion of the Master's degree (**non-thesis**) in Mechanical Engineering at IUPUI, students will be able to:

1. Apply the tools of mathematics, science, and engineering to solve problems in the broad area of mechanical engineering.
2. Demonstrate knowledge of mechanical engineering principles that advance the broad spectrum of application areas that is mechanical engineering.
3. Communicate (in speech, writing, and appropriate supporting visuals) information related to the theory and practice of mechanical engineering in research or industrial settings.

Music Technology

Music Technology
Upon completion of the program, students will be able to:

GENERAL

1. Investigate the components of music technology.
2. Assess commonly used music software and hardware.
3. Determine best-fit music production models for creative operations.
4. Assess personal skills and knowledge of music production field.
5. Investigate the components of music technology.
6. Explain the basic computing concepts of music sequencing and notation, including the digital electronic process with some analysis of microchips and microprocessors.
7. Describe the function and operational technique of hardware components used in a typical computer music system.
8. Explain the basic computing concepts of music sequencing and notation, including the digital electronic process with some analysis of microchips and microprocessors.
9. Determine project cost analysis for human resources and materials.
10. Develop a theoretical position on ethical use of technology.
11. Discuss the ethical considerations and legal implications of using software.
12. Final Project Example: Develop a new tool, resource, application, artistic production, literary work, or another form of informed expression that utilizes new technologies. Take the project through planning, production and completion stages, and writing pre and post assessments.
13. Identify and evaluate innovative entities in a specific area of music technology.
14. Develop a music program design utilizing storyboard and flowchart modeling.
15. Apply software to create music notation, sound samples, and music graphics.
16. Develop a music program design utilizing storyboard and flowchart modeling.
17. Define Musical Instrument Digital Interface (MIDI) and outline its development.
18. Review major software applications related to music sequencing, timing codes, editing, notation, multimedia, and computer-assisted instruction.
19. Demonstrate conceptual understanding of the multimedia project design process.
20. Demonstrate understanding of psychological concepts that affect multimedia project design.
21. Learn about standard media formats that are used to create media products.
22. Create a CD that employs sound, text, video and or animation.
23. Submit a revised proposal draft for the final project or internship.
24. Develop a multimedia project through the final project proposal. These include determining project parameters, using flowcharts to display project organization, generating subject content, scripting, storyboarding, testing a beta version of the project, and submitting a full proposal.
25. Engage in ownership and responsibility for his or her culminating set of personal, academic, and professional experiences related to the internship.
26. Apply APA style guidelines in citations and written reviews.
27. Complete a report of the final project in APA style.
28. Describe the nature, purposes, and types of research in technology-based arts.
29. Access and use databases, journals, and other sources of research reports and summaries, including library-based medias and online resources.
30. Recognize and interpret the basic language and vocabulary of statistics used in selected research reports.
31. Describe the structure of selected research.
32. Evaluate research in a systematic manner; analyze and review research.
33. Retrieve, critique, and summarize research independently.
34. Develop and review a researchable question in a written proposal.

PERFORMANCE/COMPOSITION/OTHER CREATIVE ACTIVITIES

1. Collaborate in a music production as a team member to produce a music recital.
2. Describe the function and operational technique of hardware components used in a typical computer music system.
3. Enter simple to complex music into a computer utilizing a QWERTY and synthesizer keyboard and a mouse with correct notational aesthetics.
4. Demonstrate, in a musical composition, the use of the synthesizer keyboard programming techniques and controller features (multitimbral channels, sound envelope manipulation, wheel, pedal, and sliders).
5. Use a software application to capture, edit, organize and perform with or otherwise use digital sounds.
6. Delineate the elements of MIDI messages in relation to musical performance or composition (e.g. bits, commands, status and data bytes to pitch, amplitude, velocity; and channel numbers to multitimbral composition).
7. Discuss and give examples of serial and parallel transmission including function of the MIDI connector for MIDI, out and thru.
8. Demonstrate the use of MIDI control surfaces.

PROGRAMMING

1. Program a computer, using MIDI, to orchestrate and playback notated music on a synthesizer.
2. Explain the MIDI specs relating to transmission and reception of messages, and explain the Central Processing Unit.
3. Discuss and give examples of serial and parallel transmission including function of the MIDI connector for MIDI, out and thru.
4. Explain the relationship between various MIDI numbering systems (decimal, binary, octal, and hexadecimal) and some elements of musical expression (pitch, velocity).
5. Recognize and analyze channel voice and mode messages, system commas, real time, and exclusive messages.
6. Review major software applications related to music sequencing, timing codes, editing, notation, multimedia, and computer-assisted instruction.

SCHOLARSHIP

1. Develop a theoretical position on ethical use of technology.
2. Develop a music program design utilizing storyboard and flowchart modeling.
3. Describe the function and operational technique of hardware components used in a typical computer music system.
4. Define Musical Instrument Digital Interface (MIDI) and outline its development.

MUSIC EDUCATION, SCIENCE, THERAPY/, AND HEALTH RELATED STUDIES

1. Identify and evaluate cognitive theories that apply to computer-based training.
2. Test feedback models and human interface designs.
3. Determine project cost analysis for human resources and materials.
4. Describe the function and operational technique of hardware components used in a typical computer music system.
5. Final Project Example: Develop research projects utilizing new technologies for music classroom environments, and prepared final software project model as an educational proposal presentation for a school governing board.
6. Describe the function and operational technique of hardware components used in a typical computer music system.
7. Explain the basic computing concepts of music sequencing and notation, including the digital electronic process with some analysis of microchips and microprocessors.
8. Describe the role of technology as it relates to communication, information competency, creativity, and music education.

BUSINESSS AND MUSIC INDUSTRY

1. Collaborate in a music production as a team member to produce a music recital.
2. Identify and evaluate companies involved in music technology production.
3. Develop a music program design utilizing storyboard and flowchart modeling.
4. Apply software to create music notation, sound samples, and music graphics.
5. Develop a music program design utilizing storyboard and flowchart modeling.
6. Select and apply software tools to project management and timeline projections.
7. Determine project cost analysis for human resources and materials.
8. Present final software project model as a proposal presentation for a client.
9. Describe the function and operational technique of hardware components used in a typical computer music system.
10. Explain the basic computing concepts of music sequencing and notation, including the digital electronic process with some analysis of microchips and microprocessors.
11. Broaden experience and realistic understanding of applied arts technology within a selected industry (or, industries).
12. Synthesize, integrate, and extend their development of applied arts technology skills in the context ofcorporate environments and IT needs.
13. Construct, implement, and evaluate units of work based on appropriate learning experiences which address assigned project outcomes and capstone requirements.
14. Extend their appreciation of the role of music and arts technology within the chosen industry through discussion, reflection and/or demonstration of work projects.
15. Broaden their understanding of the role of project design, evaluation, and reporting in the implementation of arts technology within a given industry through facilitated, mentored, guided, and independent learning experiences.

16. Describe the components of self-marketing and entrepreneurship.
17. Review jobs in the music industry: managers, lawyers, producers, agents, manufacturers, sales, promoters, media and technical.

Music Therapy

Music Therapy
Upon program completion, students will be able to:

1. Apply knowledge from music therapy, music medicine, music technology, biological and behavioral sciences to investigate health phenomena.
    - Understand history of music therapy research.
    - Use criteria to evaluate theories related to individual's focus area.
    - Synthesize knowledge from psychometric theories and research as it relates to reliability and validity of measurement instruments.
    - Synthesize empirical literature (integrative review) in focus domain such that development of proposal of research builds on background knowledge.
    - Define health/or health-related concept as the phenomena of concern for research focus.
    - Explain types of knowledge and methods for knowledge generation and philosophy of science underpinnings.
    - Synthesize knowledge from minor to apply to focus domain. 1.8 Demonstrate skill in critiquing proposals.
    - Describe the nature, purposes, and types of research in technology-based arts.
    - Investigate the components of music technology.
    - Describe the role of technology as it relates to communication, information competency, creativity, and music education/therapy.
    - Identify and evaluate companies involved in music technology production.
    - Assess commonly used music software and hardware.
    - Identify and evaluate cognitive theories that apply to computer-based training.
    - Identify problem in practice that require application of research findings.
    - Access and use databases, journals, and other sources of research reports and summaries, including library-based medias and online resources.
    - Apply software to create music notation, sound samples, and music graphics.
    - Develop a music program design utilizing storyboard and flowchart modeling.
    - Ability to synthesize research literature and identify gaps in knowledge.
    - Submit an integrative review article in research focus area.
    - Demonstrate skills in scientific writing.
2. Utilize analytical and empirical methods to extend music therapy knowledge and scholarship.
    - Know research vocabulary.
    - Know how to do a literature search.
    - Describes research designs and methods for application to research questions.
    - Recognize and interpret the basic language and vocabulary of statistics used in selected research reports.
    - Understand the process of design and implementation of a research project.
    - Review, summarize and critiques journal articles.
    - Critically analyzes various forms of analytical and empirical methods to generate knowledge and scholarship in music therapy. Domain: Integration and Application of Knowledge.
    - Explore potential application of knowledge utilization in clinical practice.
    - Interpret research findings appropriately for application to practice.
    - Apply knowledge of descriptive and interferential analytical methods to answer research questions.
    - Explore potential application of knowledge utilization in clinical practice.
    - Apply skill in quantitative research methodology.
    - Apply knowledge of qualitative design and analytical methods.
    - Apply knowledge of analytical methods to experimental design.
    - Formulate research questions or hypotheses.
    - Demonstrate ability to logically link problem identification to research hypothesis and application to practice.
    - Demonstrate data management skills.
    - Choose data collection methods or instruments consistent with theory and research question.
    - Determine best-fit music production models for creative operations.
    - Apply APA style guidelines in citations and written reviews.
    - Develop and present a convincing written argument that supports the significance of a specified problem.
    - Develop and present a convincing written and oral argument that supports the method of choice for thesis.
    - Prepare a research proposal that builds on current research and theory.
    - Complete a report of the final project in APA style.
    - Conduct and communicate research that advances the body of scientific knowledge.
    - Prepare a data-based manuscript based on research experiences.
3. Conduct and communicate research that advances the body of scientific knowledge.
    - Identify and describe major and changing forces in healthcare and the music therapy profession.
    - Broaden their understanding of the role of project design, evaluation, and reporting in the implementation of arts technology within

a given industry through facilitated, mentored, guided, and independent learning experiences.
- Conduct and communicates research that advances the body of scientific knowledge.
- Select and apply software tools to project management and timeline projections.
- Test feedback models and human interface designs.
- Determine project cost analysis for human resources and materials.
- Demonstrate oral presentation skills.
- Demonstrate poster presentation skills.
- Develop and present a convincing written argument that supports the significance of a specified problem.
- Prepare a thesis proposal that builds on current research and theory.
- Present final software project model as a proposal presentation for a client.

4. Discuss the ethical considerations and legal implications of using software.
5. Develop a theoretical position on ethical use of technology.
6. Discuss ethical considerations when utilizing human subjects in research.
7. Be aware of support resources available consistent with level of competency expected.
8. Engage in ownership and responsibility for his or her culminating set of personal, academic, and professional experiences.
9. Work effectively as a working member of a research team.

Contact Information

Graduate Programs Office
799 West Michigan Street
Indianapolis, IN 46202-5160
Phone: 317.274.2533
Fax: 317.274.4567
gradengr.iupui.edu or gradtech@iupui.edu

Dept. of Biomedical Engineering
723 West Michigan Street, SL 220
Indianapolis, IN 46202-5132
Phone: 317.278.2416
Fax: 317.278.2455

Dept. of Electrical and Computer Engineering
723 West Michigan Street, SL 160
Indianapolis, IN 46202-5160
Phone: (317) 278-9726
Fax: (317) 274-4493
ecegrad@iupui.edu

Dept. of Mechanical Engineering
723 West Michigan Street, SL 260
Indianapolis, IN 46202-5132

Phone: 317.274.5900
Fax: 317.274.97443

Dept. of Music and Arts Technology
535 West Michigan Street, IT 352
Indianapolis, IN 46202

Phone: 317.274.4000

Master's Programs

Master's Programs
Application Deadlines
Applicants Applying From Within the USA
Fall (August) Admission:

- **January 2** (priority considerations for University Fellowships and assistantships or financial aid)
- **June 1** (final deadline for applications and all supporting documentations)

Spring (January) Admission:

- **November 1** (University Fellowships are not available for admission in this session)

International Applicants Applying From Overseas
Fall (August) Admission:

- **January 2** (priority considerations for University Fellowships and assistantships or financial aid)
- **May 1** (final deadline for applications and all supporting documentations)

Spring (January) Admission:

- **August 31** (University Fellowships are not available for admission in this session)

MS in Music Technology

MS in Music Technology
The Master of Science in Music Technology (MSMT) curriculum provides post-baccalaureate education in areas of computer-based music technology, multimedia and interactive design and multimedia production techniques. The primary objective of the program is to bring new and emerging digital arts technologies to students as they relate to a new discipline defined as music technology. The curriculum establishes the creative application of multimedia technology to video, audio and graphic production of arts and educational materials. Included in this field are foundations, methods and theoretical courses which underpin the development of production skills required in using technology in a creative environment.

Application Requirements
- Submission of the online application to the University
- Submission of the Department of Music and Arts Technology application
- Bachelor's degree and evidence of substantial music instruction, performance and literacy
- All official transcripts of undergraduate and graduate study
- Minimum Grade Point Average of 3.0 (on a 4.0 scale) for the undergraduate degree
- Performance videotape, audio cassette, CD, DVD or on-campus audition on a musical instrument or conducting of a music ensemble
- Three letters of recommendation in support of the application (they may be on business letterhead, submitted through the online application link, or from the recommendation forms included in

the Department of Music and Arts Technology application packet)
- Any additional information that demonstrates personal experience in music technology and musicianship (e.g., authored CDs or websites, original compositions)
- In-person or telephone interview with the Head of Graduate Studies
- $50 application fee ($60 for an International applicant), payable through the online application.

Please note: The GRE is NOT required for application to the MSMT program.
International applicants from other than English speaking countries must take the TOEFL.

Degree Requirements
30 credit hours* for degree, including:

- 18 credit hours in Core courses (at the 500 level or above);
- 6 credit hours in Cognate courses (at the 400 level) to be selected from Music, Business, Education, Communications, Computer Science, Fine Arts or Law;
- 6 hours of approved electives (at the 400 level or above) from the cognate field or other fields with approval of the head of the graduate studies.

Minimum grade point average:

- 3.0 average to continue;
- No grades lower than "B" in core courses and cognate fields will be counted toward the degree
- No grades lower than "C" will be counted toward the degree;
- Residency requirement (on-campus student only), 3 consecutive summers or 1 summer and a contiguous academic term.

Current Tuition Rates (Fall 2012 - Summer 2013)
Indiana Resident: $352.10 per credit hour
Non-Resident (out-of-state, international) $1007.00 per credit hour.

Download Information Guide
Click to download the Information Guide .
You might need to install Adobe Acrobat Reader to open the file.

Apply Now
You need to complete **both** the Department Application and the University online application.

MS in Music Therapy

MS in Music Therapy
The Master of Science in Music Therapy program is designed to provide professional board-certified music therapists (http://www.cbmt.org) with advanced research skills and clinical practice in music therapy, and to teach music therapists how to utilize the array of tools available in music technology for such purposes. Within music therapy clinical practice and research, music technology will: 1) facilitate the collection and analysis of data generated during clinical sessions; 2) apply compositional and improvisational techniques with patients, and; 3) exploit the multi-mediated environment of the MIDI workstation where visual, auditory, and tactile senses can work interchangeably to support therapeutic strategies.

Application Requirements
- Submission of the online application to the University
- Submission of the Department of Music and Arts Technology application
- Bachelor's degree and evidence of substantial music instruction, performance and literacy
- All official transcripts of undergraduate and graduate study
- Minimum Grade Point Average of 3.0 (on a 4.0 scale) for the undergraduate degree
- Performance videotape, audio cassette, CD, DVD or on-campus audition on a musical instrument or conducting of a music ensemble
- Three letters of recommendation in support of the application (they may be on business letterhead, submitted through the online application link, or from the recommendation forms included in the Department of Music and Arts Technology application packet)
- Any additional information that demonstrates personal experience in music technology and musicianship (e.g., authored CDs or websites, original compositions)
- In-person or telephone interview with the Head of Graduate Studies
- $50 application fee ($60 for an International applicant), payable through the online application.

Degree Requirements
30 credit hours* for degree, including:

- 18 credit hours in Core courses (at the 500 level or above);
- 6 credit hours in Cognate courses (at the 400 level) to be selected from Music, Business, Education, Communications, Computer Science, Fine Arts or Law;
- 6 hours of approved electives (at the 400 level or above) from the cognate field or other fields with approval of the head of the graduate studies.

Minimum grade point average:

- 3.0 average to continue;
- No grades lower than "B" in core courses and cognate fields will be counted toward the degree
- No grades lower than "C" will be counted toward the degree;
- Residency requirement (on-campus student only), 3 consecutive summers or 1 summer and a contiguous academic term.

Current Tuition Rates (Fall 2012- Summer 2013)
Indiana Resident: $352.10 per credit 1007.00 per credit hour.

Download Information Guide
Click to download the Information Guide .
You might need to install Adobe Acrobat Reader to open the file.

Apply Now
You need to complete **both** the Department application and the University online application.

MS in Technology (Facilities Management)

MS in Technology (Facilities Management)
If you are currently working in the field of facility management (or have an interest in this career field) as a planner, property manager, plant manager, facility manager, plant engineer or other related areas you can enhance job opportunities while earning a formal credential sitting at your computer. This 100% online program is designed for working professionals and can be completed in ONLY 2 years. You will share a virtual classroom with facility management professionals from around the world while earning a Purdue University degree. This is a unique program that will increase your knowledge and professionalism and therefore, your value as a facilities manager.

Description: The M.S. Degree in Technology, Facilities Management Emphasis is an on-line graduate program designed for the working student. The program provides an integrated experience in facilities management with emphasis on project and contract management, engineering systems management and energy management. The program also requires an independent direct project in the area of facilities management.

You may apply for admission to the program, if you:

- Have completed or will be completing a bachelor's degree from an accredited university.
- Coursework or knowledge of trigonometry and statistics.
- Obtained an undergraduate cumulative GPA of 3.0 or higher on a 4.0 scale.
- Have taken the GMAT. General test.

Information about admissions and the GMAT can be obtained from:
Office of Graduate Programs
Purdue School of Engineering and Technology
723 West Michigan Street, SL 164
Indianapolis, IN 46202
Telephone: 317/278-4960
Email: gradtech@iupui.edu
International students who are graduates of non-US institutions and whose first language is not English are required to take the Test of English as a Foreign Language (TOEFL). A minimum score of 550 on the paper version or 213 on the computer version is required.

Apply Now
Visit http://www.engr.iupui.edu/gradprogs/application.shtml to apply for admission to the **Masters in Technology** degree program. If you are a US Citizen, please select the domestic student application form. International students should download the Instruction sheet for application and review the required checklist.

MS in Technology

MS in Technology

You are eligible to apply for admission to the program, if you:

- Have completed or will be completing a bachelor's degree from an accredited technology, engineering, or a related discipline.
- Obtained an undergraduate GPA (grade point average) of 3.0 or higher on a 4.0 scale, or overall "B" average equivalent.
- Have taken either GMAT or GRE test. Contact the school for more information regarding the required examination.
- And for international applicant: Have taken the TOEFL test and met the minimum scores requirement.

PhD in Biomedical Engineering

PhD in Biomedical Engineering
To apply for admission to the Ph.D. program in Biomedical Engineering, you must complete the Purdue University online application; select West Lafayette campus and apply directly to the Weldon School of Biomedical Engineering at Purdue University, West Lafayette. Obtain information and specific application instructions at this Purdue University BME website: https://engineering.purdue.edu/BME/Academics/BMEGraduateProgram/Admissions/

PhD in Electrical & Computer Engineering

PhD in Electrical & Computer Engineering
To apply for admission to the Ph.D. program in Electrical and Computer Engineering, you must follow these specific steps and instructions to apply:

1. Complete the Purdue University online application and select *West Lafayette campus*.
2. Submit a Statement of Purpose (300-500 words) and Resume. Send hardcopies if you are unable to submit the your application.*
3. Send two (2) copies of official transcripts from the Registrar in a sealed envelope. Transcript/Class Rank Form
4. Send official GRE Test scores for ETS only (no photocopies).
5. For degree-seeking whose native language is not English, submit official TOEFL scores from ETS only, no photocopies. We also accept IELTS scores in place of TOEFL – please send the official score sheet.
6. Submit three (3) letters of recommendation.
7. In the supplemental ***ECE Web Application*** form where it asks for "Campus Preference", state **IUPUI** as your campus preference.
8. Notify the Coordinator of Graduate Engineering and Technology Programs at IUPUI by email wvlim@iupui.edu after you have submitted the Purdue University application and have sent all application materials to the ECE Graduate Office at Purdue University.

*In your **Statement of Purpose** you must state clearly that you wish to be admitted to the Ph.D. program to study at the **IUPUI (Indianapolis) campus**. You should also specify in the Statement the research area/s you are

interested in and the **IUPUI professor/s** you wish to study with.

Go to the Purdue University ECE website to begin the application process.

NOTE: To inquire about your application status send email directly to the Admissions Representative in the ECE Graduate Office at Purdue University, West Lafayette: ecegrad@purdue.edu.

Bachelor's level students are normally considered for admission into the Master's program; however, bachelor's level students with exceptionally strong undergraduate records may apply for and be considered for direct admission into the Ph.D. degree program.

Doctoral Program Basic Requirements

- *Undergraduate Cumulative Grade Point Average:* 3.25 or equivalent required
- *Master's Degree Completion:* Required, with a grade point average of 3.3 or equivalent, or superior performance in a bachelor's program
- *Graduate Record Examination (GRE):* Required -- no minimum score set

International Applicant Requirements

- *TOEFL for Non-Native English Speakers:* Minimum Paper-Based Test (PBT) Score Required: 550
  Minimum Internet-Based Test (IBT) Overall Score Required: 77
  With the following minimum section requirements:
  Reading: 19
  Listening: 14
  Speaking: 18
  Writing: 18
- *IELTS (Academic Module):* An alternative to the TOEFL, scores of 6.5 or higher will be accepted
- *Pearson Test of English (PTE) (Academic Module):* An alternative to the TOEFL, scores of 58 or higher will be accepted
- *TWE for Non-Native English Speakers* Not required, but recommended
- *Or New IELTS*

Application Deadlines

Fall Admission:

- **January 5** (for completed applications for priority consideration for financial support)
- **May 1** (final deadline)

Spring Admission:

- **September 15** (for completed applications)

Summer Admission:

- Summer session is only available to applicants admitted for fall who wish to start research early through an agreement with their professor.

Contact Information

Name: Karen Jurss
Admissions Representative
Phone: (765) 494-3392
E-mail: ecegrad@ecn.purdue.edu

In order to expedite the processing of your application, we ask that you submit all supporting documents in ***one large envelope***.

Mail all required application materials directly to:

Graduate Office
School of Electrical and Computer Engineering
Purdue University
465 Northwestern Avenue
West Lafayette, IN 47907-2035
USA

PhD in Mechanical Engineering

PhD in Mechanical Engineering
Application Deadlines
Domestic Applicants (U.S. citizens and U.S. permanent residents)

The following is a list of items required for your application. Use this checklist to help you in gathering all the necessary documents.

1. Complete the online graduate application and submit a $50 application fee (pay online with a valid credit card).
2. #A Statement of Purpose located in the online application. A 400-500 word essay detailing your specific area/s of focus in graduate study and summarizing your academic goals and career objectives in relation to your educational background and professional experience, if relevant.
3. #Two (2) official sets of final academic transcripts (not photocopied) are required from **all** colleges/ universities attended. You may print the Purdue University Graduate School Request for Official Transcript form for use to order your transcripts. Use one form for each institution that you are requesting official transcripts from. Transcripts must be sent directly to our office from the academic institution/s.
4. Certified copy of Bachelor's Degree (diploma) awarded, if degree conferred is not posted on final transcript.
5. Certified copy of Master's Degree (diploma) awarded, if degree conferred is not posted on final transcript.
6. Three (3) recommendations for graduate admission are required.*
7. #Complete the program department application (for Mechanical Engineering only).
8. The GRE General Test is required if you are applying for admission to an engineering program. Official GRE score report from ETS needs to be sent directly to IUPUI. Institution code: 1325.

Foreign-born Naturalized U.S. Citizens and U.S. Permanent Residents: If you are either a foreign-born naturalized U.S. citizen or a U.S. permanent resident and have completed your Bachelor's (undergraduate) degree or Master's (graduate) degree from a university or college outside the United States of America, the official TOEFL test score report from ETS is required for your application. In addition, include with your application two (2) photocopies of your U.S. permanent resident card ("green card") or your U.S. Passport for verification.

*Persons writing your recommendations should be your present or former professors/instructors, advisors, project leaders, or managers/supervisors who you report to professionally, and are expected to comment on your academic performance, intellectual abilities, and scholastic aptitudes. Recommendations from friends, acquaintances, peers, or family members/relatives are **not acceptable**.

Recommenders may complete and submit web-based recommendations within your online application. Instructions are available in the online application on how a recommender may complete and submit an online recommendation; however, if a recommender prefers to complete a paper recommendation form, print the following Purdue University Graduate School recommendation form in pdf format for use: Recommendation for Admission to Graduate School.

Mail all application materials to the following:

Graduate Programs Office

IUPUI - Purdue School of Engineering & Technology

799 West Michigan Street, ET 215
Indianapolis, IN 46202-5160

International Applicants

The following is a list of items required for your application. Use this checklist to help you in gathering all the necessary documents.

1. Complete the online graduate application and submit a $60 application fee (pay online with a valid credit card).
2. #A Statement of Purpose located in the online application. A 400-500 word essay detailing your specific area/s of focus in graduate study and summarizing your academic goals and career objectives in relation to your educational background and professional experience, if relevant.
3. #Two (2) official sets of final academic transcripts (not photocopied) are required from **all** colleges/ universities attended (Do not include secondary or high school transcripts). You may print the Purdue University Graduate School Request for Official Transcript form for use to order your transcripts. Use one form for each institution that you are requesting official transcripts from. Transcripts must be sent directly to our office from the academic institution/s.
4. #Two (2) official sets of English translations of final academic transcripts, if official language of home country is not English.
5. Two (2) official copies of undergraduate (Bachelor's) and graduate (Master's) degree diplomas received in official language of home country.
6. Two (2) official English translations of undergraduate (Bachelor's) and graduate (Master's) degree diplomas received, if official language of home country is not English.
7. Three (3) recommendations for graduate admission are required.*
8. #Complete the program department application (for Mechanical Engineering only).
9. The GRE General Test is required if you are applying for admission to an engineering program. Official GRE score report from ETS needs to be sent directly to IUPUI. Institution code: 1325.
10. Official TOEFL score report to be sent from testing agency (ETS) directly to IUPUI. Institution code: 1325
11. Form " Financial Information for International Students " to be completed by you and your sponsor.
12. Official letter or statement from a bank verifying that your sponsor has required funds to pay total expenses/cost for at least two years. Submit a recent, original bank letter or bank statement. Original only. Photocopies or fax copies are not acceptable.
13. If you have a government or institutional scholarship: Provide an official letter from the sponsoring agency that specifies the amount of the award or scholarship.
14. #A photocopy of your current visa and/or I-20 documents, if you are already in the U.S.A.
15. #Letter of financial support from your research advisor or major professor. Note: This letter of support will only be prepared and provided AFTER your application has been reviewed for admission AND a professor has indicated his/her interest in providing full financial support for your Ph.D. education.

*Persons writing your recommendations should be your present or former professors/instructors, advisors, project leaders, or managers/supervisors who you report to professionally, and are expected to comment on your academic performance, intellectual abilities, and scholastic aptitudes. Recommendations from friends, acquaintances, peers, or family members/relatives are **not acceptable**.

Recommenders may complete and submit web-based recommendations within your online application. Instructions are available in the online application on how a recommender may complete and submit an online recommendation; however, if a recommender prefers to complete a paper recommendation form, print the following Purdue University Graduate School recommendation form in pdf format for use: Recommendation for Admission to Graduate School.

Mail all application materials to the following:

Graduate Programs Office

IUPUI - Purdue School of Engineering & Technology

799 West Michigan Street, ET 215
Indianapolis, IN 46202-5160

Admissions

Admissions

For information and details regarding application and admission to graduate engineering or technology programs offered by the School go to this website:

www.engr.iupui.edu/gradprogs/indes.shtml

MS in Technology Engineering Technology Education

MS in Technology Engineering Technology Education
The M.S. Degree in Technology, Engineering Technology Education area of specialization, can prepare you for a career in teaching Engineering Technology Education and, optionally Computer Education, at the middle school, junior high, and high school levels (grades 5-12). Those who are interested in Computer Education must also fulfill all the requirements for Engineering Technology Education teacher preparation and should have computer programming competencies.

There is also an interdisciplinary, customized learning program for developing your skills and career in teaching Engineering Technology Education at the post-secondary, college level. If you are a college instructor, or would like to be a professor, this interdisciplinary, customized M.S. degree program will provide you with additional subject area competencies, teacher, and leadership competencies. The Purdue master's degree is a valuable credential for teaching at a community or four year college as it provides faculty recognition of advancement professional development, critical to college program accreditation and your career as a professor.

The Department of Technology Leadership and Communication (TLC) collaborates with the Indiana University School of Education at IUPUI and the Purdue School of Science at IUPUI to build bridges to teaching professions for students who have completed or will complete undergraduate degrees in science, technology, engineering, or mathematics. There is a specific set of School of Engineering and Technology courses and School of Education courses to take for preparing you to teach in grades 5-12. This includes a full-time grades 5-12 student teaching residency during the fall and spring terms of the first academic year. Classes are taken starting in the summer before the first fall semester and the teaching license is earned after the following summer. Completion of the M.S. degree can be done part- time after teaching employment is obtained. There are currently scholarship opportunities for those that will commit to teaching in STEM areas in Indiana high needs public schools.

You may apply for admission to the Engineering Technology Education program, if you:

- Have completed or will be completing a bachelor's degree in engineering or technology areas from an accredited university.
- Have obtained an undergraduate cumulative GPA of 3.0 or higher on a 4.0 scale.
- Have taken the GRE or, for those in the grades 5-12 Engineering Technology Education teacher preparation program, the Pearson Core Academic Skills Assessment (CACA).

Information about admissions and the GRE and CASA can be obtained from:
Office of Graduate Programs
Purdue School of Engineering and Technology
723 West Michigan Street, SL 164
Indianapolis, IN 46202
Telephone: 317/278-4960
Email: gradtech@iupui.edu
International students who are graduates of non-US institutions and whose first language is not English are required to take the Test of English as a Foreign Language (TOEFL). A minimum score of 550 on the paper version or 213 on the computer version is required.

Apply Now
Visit http://www.engr.iupui.edu/gradprogs/application.shtml to apply for admission to the **Masters in Technology** degree program. If you are a US Citizen, please select the domestic student application form. International students should download the Instruction sheet for application and review the required checklist.

MS in Technology Motorsports

MS in Technology Motorsports

This program is applicable for either students seeking additional motorsport industry training immediately after completion of their bachelor's degree in an engineering or technology program or for industry professionals wishing to resume their studies to complete a master's degree.

This is a unique program that will increase your knowledge of the motorsports industry while earning a Purdue University degree.

Description: The M.S. Degree in Technology, Motorsports emphasis provides and integrated experience in motorsports with emphasis on race engineering, project management. The program also requires an independent direct project in an area related to the motorsports industry.

You may apply for admission to the program, if you:

- Have completed or will be completing a bachelor's degree from an accredited university.
- Coursework or knowledge of trigonometry and statistics.
- Obtained an undergraduate cumulative GPA of 3.0 or higher on a 4.0 scale.
- Have taken the GRE.

Information about admissions and the GRE can be obtained from:
Office of Graduate Programs
Purdue School of Engineering and Technology
723 West Michigan Street, SL 164
Indianapolis, IN 46202
Telephone: 317/278-4960
Email: gradtech@iupui.edu
International students who are graduates of non-US institutions and whose first language is not English are required to take the Test of English as a Foreign Language (TOEFL). A minimum score of 550 on the paper version or 213 on the computer version is required.

Apply Now
Visit http://www.engr.iupui.edu/gradprogs/application.shtml to apply for admission to the **Masters in Technology** degree program. If you are a US Citizen, please select the domestic student application form. International students should download the Instruction sheet for application and review the required checklist.

Departments & Centers

Departments & Centers

Engineering

- Department of Biomedical Engineering BS,MS (BME)
  - Doctor of Philosophy in Biomedical Engineering (Ph.D.)
- Department of Electrical and Computer Engineering (ECE)
  - Computer Engineering BS (CmpE)
  - Electrical Engineering BS (EE)
  - Electrical & Computer Engineering MS (ECE)
  - Doctor of Philosophy in Electrical and Computer Engineering (Ph.D.)
- Department of Mechanical Engineering (ME)
  - Energy Engineering BS (EEN)
  - Mechanical Engineering BS (ME)
  - Mechanical Engineering MS (ME)
  - Doctor of Philosophy in Mechanical Engineering (Ph.D.)

Technology

- Department of Computer, Information, & Graphics Technology (CIGT)
  - Computer & Information Technology BS (CIT)
  - Computer Graphics Technology BS (CGT)
- Department of Engineering Technology (ENT)
  - Architectural Technology AS (ART) (Discontinued as of Summer 2013)
  - Construction Engineering Management Technology BS (CEMT)
  - Computer Engineering Technology BS (CpET)
  - Electrical Engineering Technology BS (EET)
  - Healthcare Engineering Technology Management AS, BS (HETM)
  - Interior Design Technology AS, BS (INTR)
  - Mechanical Engineering Technology BS (MET)
  - Motorsports Engineering BS (MSTE)
  - Quality Assurance Certificate Program
  - Architectural and Interior Design Graphics Certificate Program
  - Lean Six Sigma Certificate
- Department of Music & Arts Technology (MAT)*
  - Music Therapy MS (MSMTh)
  - Music Technology MS (MSMT)
  - Music Technology BS (BSMT)
- Department of Technology Leadership & Communication (TLC)
  - Organizational Leadersip & Supervision BS (OLS)
  - Technical Communication (TCM)

Centers
New Student Academic Advising Center (NSAAC)

New Student Academic Advising Center (NSAAC)

New Student Academic Advising Center (NSAAC)

Director: D. King
Senior Lecturer: P. Orono Lecturer: N. Lamm, P. Gee

The New Student Academic Advising Center for the School of Engineering and Technology was formed in 2007. The center is the advising unit for all students new to the School of Engineering and Technology, including beginners, transfers, second degree, and returning students. The center provides services that include orientation programs, transfer credit analysis, and academic advising through the first year of student's enrollment. In addition to providing academic advising, the center coordinates the curriculum and teaching for the freshman engineering courses as well as the learning community courses required for all beginning students.

All qualified students interested in pursuing an engineering degree at IUPUI are admitted to the Freshman Engineering Program. This includes second-degree and transfer students as well as beginning students. While in this program, beginning students complete the basic sequence of courses common to all engineering majors. These courses include calculus I and II, chemistry and physics for science and engineering majors, English composition, and public speaking. Freshman engineering courses include: ENGR 19500 Introduction to the Engineering Profession, ENGR 19600 Introduction to Engineering, ENGR 19700 Introduction to Programming Concepts, and ENGR 29700 Computer Tools for Engineering. The Freshman Engineering Program provides students with an opportunity to explore the various engineering disciplines before making a commitment to a specific curriculum.

Biomedical Engineering (BME)

Biomedical Engineering (BME)

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

Biomedical engineering is a discipline that advances knowledge in engineering, biology, and medicine to improve human health through cross-disciplinary activities that integrate the engineering sciences with the biomedical sciences and clinical practice. Students work in the development of new devices, algorithms, processes, and systems that advance biology and medicine and improve medical practice and health care delivery. Many students choose BME because it is people-oriented.

The mission of the Biomedical Engineering Department is to strive to attain world-class research and to provide the

highest quality educational experience for our students. We expect and value excellence in conducting research, and training students to participate in research activities and professional practice. We accomplish our Mission as follows:

- By exploiting the most modern and innovative approaches, we are leaders in interdisciplinary biomedical engineering research and discovery.
- By providing students with an education in engineering principles, design, and modern biomedical science, we develop in them the knowledge and skills for productive careers in biomedical engineering.
- By committing to service to advance biomedical engineering, we contribute to the field.

Bachelor of Science in Biomedical Engineering

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, as well as from clinical and industrial partners. 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 in 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.

Biomedical Engineering Program Objectives

The program educational objectives of our biomedical engineering undergraduate program are to integrate engineering and life science principles into a comprehensive curriculum that produces graduates who can achieve the following career and professional accomplishments, if desired:

- Meet employer expectations in medical device companies or other health or life science related industries.
- Pursue and complete advanced graduate degrees in biomedical engineering, or related engineering or life science areas.
- Pursue and complete advanced professional degree programs in medicine, law, business, or other professional areas.

The above program objectives are based on achieving a set of assessable program outcomes at the time the students have completed the undergraduate curriculum and are outlined below:

Program Outcomes

Upon completing the undergraduate BME degree, our students will possess:

a. an ability to apply knowledge of mathematics, science, and engineering

b. an ability to design and conduct experiments, as well as to analyze and interpret data

c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

d. an ability to function on multi-disciplinary teams

e. an ability to identify, formulate, and solve engineering problems.

f. an understanding of professional and ethical responsibility

g. an ability to communicate effectively

h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

i. a recognition of the need for, and an ability to engage in life-long learning

j. a knowledge of contemporary issues

k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Transfer Students

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

requesting transfer into Biomedical Engineering must submit a brief application.

Admission into Biomedical Engineering

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

Graduate Programs in Biomedical Engineering

Biomedical engineering is an interdisciplinary program and a joint effort of the Purdue School of Engineering and Technology, the Purdue School of Science, and the Indiana University Schools of Medicine and Dentistry at Indiana University-Purdue University 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.B.M.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.

For more information about the M.S.B.M.E. visit http://engr.iupui.edu/bme/ms_bme_pos.shtml?menu=ms.

For more information about the Ph.D. program visit https://engineering.purdue.edu/BME/Academics/BMEGraduateProgram/Admissions/.

Plan of Study

Bachelor of Science Plan of Study

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

Freshman Year	**Credit Hours**
First Semester	
BIOL-K 101 Concepts of Biology I	5
ENGR 19500 Engineering Seminar	1
ENGR 19600 Engineering Problem Solving	3
MATH 16500 Integrated Calculus and Analytic Geometry	4
ENG W 131 Elementary Composition I	3
ENGR 19700 Intro to Computing (C Programming)	2
TOTAL	18
Second Semester	
CHEM-C 10500 Principles of Chemistry I	3
CHEM 12500 Experimental Chemistry I	2
PHYS 15200 Mechanics	4
MATH 16600 Integrated Calculus and Analytic Geometry II	4
MATH 17100 Multidimensional Mathematics	3
ENGR 29700 Intro to Computing (MATLAB)	1
TOTAL	17
Sophomore Year	
First Semester	
MATH 26100 Multivariate Calculus	4
PHYS 25100 Elec., Heat, Optics	5
BME 22200 Biomeasurements	4
CHEM-C 106 Principles of Chemistry II	3
TOTAL	16
Second Semester	
MATH 26200 Linear Algebra Differential Eqns.	3
BIOL K32400 Cell Biology	3
BIOL K32500 Cell Biology Lab	2
BME 24100 Intro. Biomechanics	4
Comm. R110 Fund of Speech Communication	3
General Education Elective	3
TOTAL	18
Junior Year	
First Semester	
CHEM-C 34100 Organic Chemistry I	3

CHEM-C 34300 Organic Chemistry Lab I	2
BME 38100 Implantable Materials & Biological Response	3
BME 38300 Problems in Implantable Materials & Biological Response	1
BME 33100 Biosignals and Systems	3
BME 33400 Biomedical Computing	3
General Education Elective	3
TOTAL	18

Second Semester

BME 32200 Probability & Statistics for BME	3
BME 35200 Tissue Behavior and Properties	3
BME 35400 Problems in Tissue Behavior and Properties	1
BME Gateway Elective*	3
General Education Elective	3
BME 40200 BME Seminar	1
TCM 36000 Communications in Engineering Practice	2
TOTAL	16

Senior Year

First Semester

BME 49100 Biomedical Engineering Design I	3
BME 41100 Quantitative Physiology	3
BME 44200 Biofluid and Biosolid Mechanics	3
BME/SCI/TECH Elective*	3
BME/SCI/Tech Elective	3
TOTAL	15

Second Semester

BME 49200 Biomedical Engineering Design II	3
BME 46100 Transport Processes in BME	3
BME/Tech Elective	3
General Education Elective	3
TOTAL	12

*The four BME/SCI/Tech electives must be selected in consultation with an advisor to form an appropriate Depth Area.

Electrical and Computer Engineering (ECE)

Electrical and Computer Engineering (ECE)

Professors Y. Chen (*Chair*), S. Chien, M. El-Sharkawy, M. Rizkalla, D. Russomanno, P. Salama, P. Schubert, K. Varahramyan
Associate Professors D. Kim, B. King, S. Koskie, J. Lee, S. Rovnyak
Assistant Professors L. Christopher, E. dos Santos, L. Li
Research Professors M. Agarwal, S. Shrestha
Lecturer S. Shayesteh

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 department also offers a minor in Electrical and Computer Engineering. The B.S.E. degree program is designed for students who desire broad flexibility and the opportunity for interdisciplinary study; it does not have a designated professional curriculum. Additional information about the B.S.E. program can be obtained from the faculty in the Department of Electrical and Computer Engineering. The programs leading to the B.S.E.E. and B.S.Cmp.E. are described in this section. Graduate programs in electrical and computer engineering are described in the section entitled "Graduate Engineering Programs" in this bulletin.

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

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

offer opportunities for applying and deepening students' expertise.

An undergraduate education in electrical and computer engineering provides a strong foundation in the 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 communication skills and the appreciation of human and social issues necessary to translate engineering achievements into advances for society.

Minor in Electrical and Computer Engineering

The minor in Electrical and Computer Engineering provides students in related science and engineering programs with the opportunity to gain fundamental knowledge in the field of Electrical and Computer Engineering, and to participate in interdisciplinary study.

The total credit hours required is 21 credit hours. A student must take at least 12 required credit hours in the IUPUI ECE department and cannot count more than nine equivalent credit hours in ECE minor. The minor will be posted to the student's transcript concurrent with the major bachelor's degree.

Student must take all of the following courses (or equivalent courses) and receive at least a C grade for each course.

- ECE 20400 Introduction to Electrical and Electronics Circuits - 4 credit hours
- ECE 26100 Engineering Programming Lab l - 1 credit hour
- ECE 26300 Introduction to Computing in Electrical Engineering - 3 credit hours
- ECE 30100 Signals and Systems - 3 credit hours
- ECE 30200 Probabilistic Methods in Electrical Engineering - 3 credit hours
- ECE 36200 Microcomputer System Design and Applications - 4 credit hours

Students must take at least one of following courses (or equivalent courses) and receive at least a C grade for the course.

- ECE 25500 Introduction to Electronics Analysis and Design - 3 credit hours
- ECE 32100 Electromechanical Motion Devices - 3 credit hours
- ECE 36500 Introduction to the Design of Digital Computers - 3 credit hours
- ECE 38200 Feedback System Analysis and Design - 3 credit hours
- ECE 44000 Transmission of Information - 4 credit hours

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

B.S in Electrical Engineering

B.S in Electrical Engineering

This program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

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

The Program Educational Objectives of the Electrical Engineering degree program are to prepare graduates who will be successful in their chosen career paths by:

1. becoming productive and valuable engineers in the private or public sector
2. pursuing and completing graduate studies, and/or
3. taking on leadership roles in their professions, as well as in their communities and the global society

The minimum number of credit hours for graduation is 124, distributed as follows for each discipline:

1. Mathematics and Physical Sciences
   - Calculus: MATH -16500, 16600, 17100, 26100, 26600 - 18 credit hours
   - Chemistry: CHEM C10500 - 3 credit hours
   - Physics: PHYS 15200 and 25100 - 9 credit hours
   - Math/Science/Technical elective - 3 credit hours
2. Communications and Ethics
   - Speech: COMM R110 - 3 credit hours
   - Writing: ENG W131 - 3 credit hours
   - Communication in Engineering Practice: TCM 36000 - 2 credit hours
   - Engineering Ethics and Professionalism: ECE 21000, ECE 40100 - 2 credit hours
3. General Education
   - ECON-E 201 or ECE 32700 - 3 credit hours
   - General Education Electives - 12 credit hours
4. Freshman Engineering Courses
   - Introduction to the Engineering Profession: ENGR 19500 - 1 credit hour
   - Introduction to Engineering: ENGR 19600 - 3 credit hours
   - Comp Tools for Engr: ENGR 29700 - 1 credit hour
5. Engineering Science
   - Circuits: ECE 20100, 20200, and 20700 - 7 credit hours
   - Systems and Fields: ECE 30100, 30200, and 31100 - 9 credit hours
   - C Programming: ECE 26100 and ECE 26300 - 4 credit hours
   - ME 29500 - 3 credit hours
6. Engineering Design

- Electronics: ECE 20800 and 25500 - 4 credit hours
- Digital Systems: ECE 27000 and 36200 - 8 credit hours
- Communication Systems: ECE 44000 - 4 credit hours
- Control Systems: ECE 38200 - 3 credit hours
- Capstone Design: ECE 48700 and 48800 - 3 credit hours

7. Electrical Engineering Electives - 15 credit hours
8. Restricted Electives - 1 credit hours

Semester by semester, the 124 total credit hours can be distributed as follows:

Freshman Year

First Semester (17 credit hours)

- ENGR 19500 Introduction to the Engineering Profession - 1 credit hour
- ENGR 19600 Introduction to Engineering - 3 credit hours
- CHEM C10500 Chemical Science I - 3 credit hours
- MATH 16500 Analyt. Geometry and Calc. I - 4 credit hours
- COMM R110 Fundamentals of Speech Communication - 3 credit hours
- General Education Elective (Arts & Humanities)[1] - 3 credit hours

Second Semester (17 credit hours)

- PHYS 15200 Mechanics - 4 credit hours
- MATH 16600 Analyt. Geometry and Calc. II - 4 credit hours
- Math 17100 Multidimensional Math - 3 credit hours
- ENG W131 Reading, Writing, and Inquiry - 3 credit hours
- General Education Elective (Cultural Understanding)[1] - 3 credit hours

Sophomore Year

Third Semester (17 credit hours)

- MATH 26100 Multivariate Calculus - 4 credit hours
- PHYS 25100 Electricity and Optics - 5 credit hours
- ECE 20100 Linear Circuit Analysis I - 3 credit hours
- ECE 20700 Electronic Measurement Techniques - 1 credit hour
- ECE 26300 C Programming - 3 credit hours
- ECE 26100 C Programming Lab - 1 credit hour

Fourth Semester (16 credit hours)

- MATH 26600 Ordinary Diff. Eqn - 3 credit hours
- ECE 20200 Circuit Analysis II - 3 credit hours
- ECE 25500 Introduction to Electronics Analysis and Design - 3 credit hours
- ECE 20800 Electronic Design and Devices Lab - 1 credit hour
- ECE 27000 Digital Logic Design and Lab - 4 credit hours
- ENGR 29700 Computer Tools for Engineers - 1 credit hour
- ECE 21000 Sophomore Seminar - 1 credit hour

Junior Year

Fifth Semester (15 credit hours)

- ECE 30100 Signals and Systems - 3 credit hours
- ECE 31100 Electric and Magnetic Fields - 3 credit hours
- ECE 36200 Microprocessor Systems and Interfacing - 4 credit hours
- TCM 36000 Comm. In Engineering Practice - 2 credit hours
- ME 29500 Mechanics and Heat - 3 Credit hours

Sixth Semester (15 credit hours)

- ECE 30200 Probabilistic Methods in Electrical Engineering - 3 credit hours
- ECE 38200 Feedback System Analysis - 3 credit hours
- ECE 32700 Engineering Economics (General Education Social Sciences) - 3 credit hours
- Math/Science/Technical Elective[2] - 3 credit hours
- EE Elective[4] - 3 credit hours

Senior Year

Seventh Semester (15 credit hours)

- ECE 44000 Introduction to Communication Systems Analysis - 4 credit hours
- ECE 48700 Senior Design I - 1 credit hour
- ECE 40100 Ethics - 1 credit hour
- EE Electives[4] - 6 credit hours
- General Education Elective (Humanities or Social Sciences)[1] - 3 credit hours

Eighth Semester (12 credit hours)

- ECE 48800 Senior Design II - 2 credit hours
- EE Electives[4] - 6 credit hours
- Restricted Elective[5] - 1 credit hours
- General Education Elective[1] - 3 credit hours

After completing a rigorous, broad education in electrical and computer engineering during the first five semesters, juniors and seniors may select advanced electrical and computer engineering courses and technical elective courses from an approved list. Careful selection of these elective courses allows a student to concentrate in a specialized area of electrical engineering. A listing of acceptable electrical engineering and technical elective courses is given below. The actual course selection will depend on the schedule, as not every course is available every semester. Existing upper-level electrical engineering courses are offered in the areas of signal processing, imaging, robotics, control systems, VLSI,

electronic circuits and manufacturing, nano technology, energy systems, network and data communication, software engineering, and embedded systems design. The Department of Electrical and Computer Engineering groups these and other allowable courses into several areas of tracks. An electrical and computer engineering student should file a plan of study with an academic advisor in the sophomore year to decide how to select these electives.

[1] From approved general education elective list.

[2] From approved math/science elective list.

[3] From approved technical elective list.

[4] From approved electrical engineering elective list.

[5] From lists 1-4.

EE Elective Courses choose 15 credit hours

Any non-required ECE 30000-level or above, except ECE 32600 or ECE 32700.

Students wishing to take a 50000-level course must meet with an academic advisor for permission to register for the course.

Math/Science/Technical Elective Courses: Choose 3 credit hours from the list of Math/Science Electives or the list of Technical Electives.

Math/Science Elective

- MATH 33300: Chaotic Dynamical Systems
- MATH 35100: Elementary Linear Algebra
- MATH 51000: Vector Calculus
- MATH 52000: Boundary Value Prob. of Diff. Eqn.
- MATH 51100: Linear Algebra with Applications
- MATH 52300: Introduction to Partial Diff. Eqn.
- MATH 52500: Introduction to Complex Analysis
- MATH 52600: Principles of Math. Modeling
- MATH 52700: Advanced Math. Eng. & Physics I
- MATH 52800: Advanced Math. Eng. & Physics II
- MATH 53000: Functions of a Complex Variable I
- MATH 53100: Functions of a Complex Variable II
- MATH 54400: Real Analysis and Measure Theory
- BIOL K10100: Concepts of Biology I
- BIOL K10300: Concepts of Biology II
- BIOL K32400: Cell Biology
- CHEM C10600: Principles of Chemistry II
- CHEM C31000: Analytical Chemistry
- CHEM C34100: Organic Chemistry
- CHEM C36000: Elementary Physical Chemistry
- CHEM C36100: Phys. Chemistry of Bulk Matter
- CHEM C36200: Phys. Chemistry of Molecules
- PHYS 31000: Intermediate Mechanics
- PHYS 34200: Modern Physics
- PHYS 40000: Physical Optics
- PHYS 40000: Quantum Mechanics
- PHYS 52000: Mathematical Physics
- PHYS 53000: Electricity & Magnetism
- PHYS 54500: Solid State Physics
- PHYS 55000: Introduction to Quantum Mechanics
- Any 30000-level or above math/science course with prior written approval of students' advisory committee

Technical Elective Courses

- Any non-required course from lists of Electrical Engineering Electives or Computer Engineering Electives
- ECE 32600: Engineering Project Management
- CSCI 43700: Introduction to Computer Graphics
- ME 20000: Thermodynamics I
- ME 27000: Basic Mechanics I
- ME 27200: Mechanics of Materials
- ME 27400: Basic Mechanics II
- ME 30100: Thermodynamics II
- ME 34400: Introduction to Engineering Material, or
- Students complete three or more 1-credit sessions of either
  - ENGR 20000, ENGR 25000, ENGR 30000, ENGR 35000, OR ENGR 40000
  - ENGR 20010, ENGR 25010, OR ENGR 30010

*ECE 49500 Selected Topics in Electrical Engineering is generally used to offer new courses.

Restricted Elective: Choose 1 credit hour from any of the aforementioned elective lists.

B.S in Computer Engineering

B.S in Computer Engineering

This program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

The Bachelor of Science in Computer Engineering (B.S.Cmp.E.) degree curriculum provides an in-depth education in the analytical skills, hardware, and software aspects of modern computer systems. The program builds on a strong foundation in engineering design, including traditional analog and digital circuit design. The three main areas of emphasis within the computer-engineering program are embedded systems, telecommunications and networking, and software engineering and distributed computing. Extensive laboratory experiences support the theoretical aspects of the course work. Students gain valuable digital hardware design and software design experiences throughout the curriculum. The junior and senior years strengthens the student's expertise with courses in data structures, embedded systems, computer architecture, parallel and high performance computing systems, advanced digital systems, and computer communications networks and network security.

The Program Educational Objectives of the Computer Engineering degree program are to prepare graduates who will be successful in their chosen career paths by:

1. becoming productive and valuable engineers in the private or public sector
2. pursuing and completing graduate studies, and/or
3. taking on leadership roles in their professions, as well as in their communities and the global society.

The minimum number of credit hours for graduation is 125, distributed as follows for each discipline:

1. Mathematics and Physical Sciences
   - MATH 16500, 16600, 17100, and 26100, 26600 - 18 credit hours
   - Chemistry: CHEM C10500 - 3 credit hours
   - Physics: PHYS 15200 and 25100 - 9 credit hours
2. Communications and Ethics
   - Speech: COMM R110 - 3 credit hours
   - Writing: ENG W131 - 3 credit hours
   - Communication in Engineering Practice: TCM 36000 - 2 credit hours
   - Engineering Ethics and Professionalism: ECE 21000 and ECE 40100 - 2 credit hours
3. General Education
   - ECON-E 201 or ECE 32700 - 3 credit hours
   - General Education Electives - 12 credit hours
4. Freshman Engineering Courses
   - Introduction to the Engineering Profession: ENGR 19500 - 1 credit hour
   - Introduction to Engineering: ENGR 19600 - 3 credit hours
   - Comp Tools for Engineers: ENGR 29700 - 1 credit hour
5. Engineering Science
   - Circuits: ECE 20100, 20200, and 20700 - 7 credit hours
   - Systems and Fields: ECE 30100, 30200 - 6 credit hours
6. Engineering Design
   - Digital Systems: ECE27000, 36200, and 36500 - 11 credit hours
   - Capstone Design: ECE48700, 48800 - 3 credit hours
7. Computer Science
   - Computing: ECE 26100, 26300, and CSCI 24000 - 8 credit hours
   - UNIX Programming: ECE 28200 - 1 credit hour
   - Discrete Math: CSCI 34000 - 3 credit hours
   - Data Structures: CSCI 36200 - 3 credit hours
   - Operating Systems: ECE 40800 - 3 credit hours
8. CmpE Electives[4] - 9 credit hours
9. Advanced CmpE Electives[5] - 6 credit hours
10. Math/Science/Technical Electives[2] - 3 credit hours
11. Restricted Electives[6] - 2 credit hours

[1] From approved general education elective list.

[2] From approved math/science elective list.

[3] From approved technical elective list.

[4] From approved computer engineering elective list.

[5] From lists 1-4.

Semester by semester, the 125 total credit hours may be distributed as follows:

Freshman Year

First Semester (17 credit hours)

- ENGR 19500 Introduction to the Engineering Profession - 1 credit hour
- ENGR 196 Introduction to Engineering - 3 credit hours
- MATH 16500 Analytic Geometry and Integrated Calculus I - 4 credit hours
- CHEM C10500 Chemical Science I - 3 credit hours
- COMM R110 Fundamentals of Speech Communication - 3 credit hours
- General Education Elective (Arts & Humanities) - 3 credit hours

Second Semester (17 credit hours)

- PHYS 15200 Mechanics - 4 credit hours
- MATH 16600 Analytic Geometry and Integrated Calculus II - 4 credit hours
- MATH 17100 Multidimensional Math - 3 credit hours
- ENG W131 Reading, Writing, and Inquiry - 3 credit hours
- General Education Elective (Cultural Understanding) - 3 credit hours

Sophomore Year

Third Semester (17 credit hours)

- MATH 26100 Multivariate Calculus - 4 credit hours
- PHYS 25100 Electricity and Optics - 5 credit hours
- ECE 20100 Linear Circuit Analysis I - 3 credit hours
- ECE 20700 Electronic Measurement Techniques - 1 credit hour
- ECE 26100 C programming Lab - 1 credit hour
- ECE 26300 C Programming - 3 credit hours

Fourth Semester (16 credit hours)

- MATH 26600 Ordinary Differential Equations - 3 credit hours
- CSCI 24000 Advanced Programming - 4 credit hours
- ECE 20200 Circuit Analysis II - 3 credit hours
- ECE 27000 Digital Logic Design and Lab - 4 credit hours
- ENGR 29700 Computer Tools for Engineers - 1 credit hour
- ECE 21000 Sophomore Seminar - 1 credit hour

Junior Year

Fifth Semester (16 credit hours)

- ECE 30100 Signals and Systems - 3 credit hours
- ECE 36200 Microprocessor Systems and Interfacing - 4 credit hours
- CSCI 340 Discrete Math - 3 credit hours
- Math/Science/Tech Elective[2] - 3 credit hours
- General Education Elective (Humanities or Social Sciences)[1]- 3 credit hours

Sixth Semester (15 credit hours)

- ECE 302 Probabilistic Methods in Electrical Engineering - 3 credit hours
- ECE 282 UNIX Programming for Engineers - 1 credit hour
- CSCI 362 Data Structures - 3 credit hours
- CmpE Elective[4] - 3 credit hours
- TCM 36000 Comm. In Engineering Practice - 2 credit hours
- ECE 32700 Engineering Economics (General Education Social Sciences) - 3 credit hours

Senior Year

Seventh Semester (14 credit hours)

- ECE 365 Introduction to the Design of Digital Computers - 3 credit hours
- ECE 48700 Senior Design I - 1 credit hour
- ECE 40100 Engineering Ethics - 1 credit hour
- Advanced Computer Engineering Elect.[5] - 3 credit hours
- CmpE Elective[4] - 3 credit hours
- General Education Elective - 3 credit hours

Eighth Semester (13 credit hours)

- ECE 40800 Operating Systems - 3 credit hours
- ECE 48800 Senior Design - 2 credit hours
- Advanced CmpE Elective[4] - 3 credit hours
- CmpE Elective - 3 credit hours
- Restricted Elective[5] - 2 credit hours

[1] From approved general education elective list.

[2] From approved math/science elective list.

[3] From approved technical elective list.

[4] From approved computer engineering elective list.

[5]From approved advanced computer engineering elective list

[6] From lists 1-4.

Advanced Computer Engineering Elective Courses

- ECE 42100 Advanced Digital Systems Design
- ECE 46100 Software Engineering
- ECE 46300 Intro to Computer Communication Networks
- ECE 46800 Introduction to Compilers and Translation Engineering
- ECE 47100 Embedded Systems

Students may also use the 50000-level version of any of these classes.

CmpE Elective Courses

Computer Engineering Elective: Choose 9 credit hours from the following list. At least 3 credit hours must be at or above 400-level.

- Any non-required ECE 30000 or above courses, except ECE 32600 or ECE 32700
- ECE 25500: Intro. to Electronic Analysis & Design
- CSCI 35500: Intro. to Programming Languages
- MATH 41400: Numerical Analysis
- CSCI 43700: Intro. to Computer Graphics
- CSCI 43500: Multimedia Information Systems
- CSCI 43800: Computer Graphics II
- CSCI 48100: Data mining
- CSCI 44300: Database Systems

* Course ECE 49500 Selected Topics in Electrical Engineering is generally used to offer new courses.

Math/Science/Technical Elective Courses

Math/Science Elective

- MATH 33300: Chaotic Dynamical Systems
- MATH 35100: Elementary Linear Algebra
- MATH 51000: Vector Calculus
- MATH 52000: Boundary Value Prob. of Diff. Eqn.
- MATH 51100: Linear Algebra with Applications
- MATH 52300: Introduction to Partial Diff. Eqn.
- MATH 52500: Introduction to Complex Analysis
- MATH 52600: Principles of Math. Modeling
- MATH 52700: Advanced Math. Eng. & Physics I
- MATH 52800: Advanced Math. Eng. & Physics II
- MATH 53000: Functions of a Complex Variable I
- MATH 53100: Functions of a Complex Variable II
- MATH 54400: Real Analysis and Measure Theory
- BIOL K10100: Concepts of Biology I
- BIOL K10300: Concepts of Biology II
- BIOL K32400: Cell Biology
- CHEM C10600: Principles of Chemistry II
- CHEM C31000: Analytical Chemistry
- CHEM C34100: Organic Chemistry
- CHEM C36000: Elementary Physical Chemistry
- CHEM C36100: Phys. Chemistry of Bulk Matter
- CHEM C36200: Phys. Chemistry of Molecules
- PHYS 31000: Intermediate Mechanics
- PHYS 34200: Modern Physics
- PHYS 40000: Physical Optics
- PHYS 40000: Quantum Mechanics
- PHYS 52000: Mathematical Physics
- PHYS 53000: Electricity & Magnetism
- PHYS 54500: Solid State Physics
- PHYS 55000: Introduction to Quantum Mechanics
- Any 300-level or above math/science course with prior written approval of student's advisory committee

Technical Elective:

- Any non-required course from lists of Electrical Engineering Electives or Computer Engineering Electives or Advanced Computer Engineering Electives
- ECE 32600: Engineering Project Management
- CSCI 30000: Systems Programming
- CSCI 44100: Client-Server Database Systems
- CSCI 48700: Artificial Intelligence
- ME 29500: Engineering Mechanics & Heat

or student can complete three or more 1-credit sessions of either

- ENGR 20000, ENGR 25000, ENGR 30000, ENGR 35000, ENGR 40000, or
- ENGR 20010, ENGR 25010, OR ENGR 30010,

Restricted elective course: Choose 1 credit hour from any of the aforementioned elective lists.

B.S in Engineering - Interdisciplinary Engineering

B.S in Engineering - Interdisciplinary Engineering

This program is not accredited by the Engineering Accreditation Commission of ABET.

The Electrical and Computer Engineering Department offers a Bachelor of Science in Engineering (B.S.E.) degree program for students wishing to supplement a strong core curriculum in electrical and computer engineering science and design with courses from mathematics, science, business, biomedicine, or another engineering discipline. While not ABET-accredited, the B.S.E. degree program offers the student greater flexibility to create a plan of study to accommodate broad interdisciplinary interests and objectives. The plan coincides with the traditional B.S.E.E. curriculum through the sophomore year and then diverges to include ECE electives and courses from interdisciplinary areas in the remainder of the curriculum.

The minimum number of credit hours for graduation is 120, distributed as follows for each discipline:

1. Mathematics and Physical Sciences
   - Calculus: MATH 16500, 16600, 17100, 26100, and 26600 - 18 credit hours
   - Chemistry: CHEM C10500 - 3 credit hours
   - Physics: PHYS 15200 and 25100 - 9 credit hours
2. Communications and Ethics
   - Speech: COMM R110 - 3 credit hours
   - Writing: ENG W131 - 3 credit hours
   - Communication in Engineering Practice: TCM 36000 - 2 credit hours
   - Engineering Ethics and Professionalism: ECE 21000 and 40100 - 2 credit hours
3. Humanities, Social Sciences, and Cultural Understanding
   - Electives - 12 credit hours
   - ECE 32700 or ECON-E 201 (Social Sciences) - 3 credit hours
4. Freshman Engineering Courses
   - Introduction to the Engineering Profession: ENGR 19500 - 1 credit hour
   - Introduction to Engineering: ENGR 19600 - 3 credit hours
   - Programming Concepts: ENGR 19700 - 2 credit hours
   - ENGR 29700 - 1 credit hour
5. Electrical Engineering Courses
   - ECE Core: ECE 20100, 20200, 20700, 20800, 25500, 27000, 30100, and 36200 - 22 credit hours
   - ECE Electives (any ECE 30000-, 40000-, or 50000-level course, except ECE 32600 and ECE 32700) - 9 credit hours
6. Math/Science/Technical Elective Course - 3 credit hours
7. Interdisciplinary Area
   - Core Requirements - 12 credit hours
   - Core Electives - 12 credit hours

Freshman Year

First Semester (14 credit hours)

- ENGR 19500 Introduction to the Engineering Profession - 1 credit hour
- ENGR 19600 Introduction to Engineering - 3 credit hours
- CHEM C10500 Principles of Chemistry I - 3 credit hours
- COMM R110 Fundamentals of Speech Communication - 3 credit hours
- MATH 16500 Analytic Geometry and Integrated Calculus I - 4 credit hours

Second Semester (17 credit hours)

- ENGR 19700 Programming Concepts - 2 credit hours
- CHEM C10600 Principles of Chemistry II - 3 credit hours
- ENG W13100 Reading, Writing, and Inquiry - 3 credit hours
- MATH 16400 Integrated Calculus and Analytic Geometry II - 5 credit hours
- PHYS 15200 Mechanics - 4 credit hours

The remainder of the interdisciplinary plan of study is individualized. Students should speak to their academic advisors regarding course selection.

Graduate Programs in ECE

Graduate Programs in ECE

Students can earn the Master of Science in Electrical and Computer Engineering (M.S.E.C.E.), and the Master of Science in Engineering (M.S.E.), through the Department of Electrical and Computer Engineering at the Purdue School of Engineering and Technology at IUPUI. The M.S.E.C.E. degree is organized into several areas of study, including computer engineering, controls and automation, communication, signal processing, VLSI/ASIC design, and power systems, while the M.S.E. degree is interdisciplinary in nature and is primarily for non-electrical engineering undergraduates. Qualified students may be authorized to pursue the Ph.D. degree in electrical and computer engineering at IUPUI. Programs leading to the Ph.D. in electrical and computer engineering is jointly administered with the School of Electrical and Computer Engineering at Purdue University, West Lafayette. For more information about graduate electrical and computer

engineering programs visit http://et.engr.iupui.edu/departments/ece/grad/msece/index.php.

Mechanical Engineering (ME)

Mechanical Engineering (ME)

Professors J. Chen *(Chair),* R. Nalim, N. Paydar
Associate Professors S. Anwar, H. El-Mounayri, A. Jones, T. Katona, T. Wasfy, J. Xie
Assistant Professors Y. Fu, J. Ryu, A Tovar, H. Yu, J. Zhang, L. Zhu
Lecturers A Razban, K. Salehpoor, S. Yang

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.), the Bachelor of Science in Energy Engineering (B.S.E.E.N.), and the Bachelor of Science in Engineering (B.S.E.), an interdisciplinary degree. Students enrolled in the department study under faculty actively engaged in research in a variety of areas: advanced materials, biomechanics, combustion, composites, computational fluid dynamics, computer-aided design, control, experimental mechanics, fluid mechanics, finite element methods, fracture, heat transfer, manufacturing, renewable energy, battery technology, fuel cell technology, mechatronics, hybrid electric vehicles technology, robotics, solid and structural mechanics, turbomachinery, and vibration. For more information, contact the Department of Mechanical Engineering at (317) 274-9717 or visit the Department's website at **www.engr.iupui.edu/me**.

B.S. in Mechanical Engineering

B.S. in Mechanical Engineering

This program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

Mechanical engineering has its foundation in the basic sciences, including mathematics, physics, and chemistry, and requires an understanding of such areas as solid and fluid mechanics, materials, thermodynamics, heat and mass transfer, manufacturing processes, instrumentation, and control. Mechanical engineers are engaged in a variety of activities including design, manufacturing, research, development, testing, construction, operations, sales, management, consulting, and teaching.

The mechanical engineering curriculum provides a broad base on which to build an engineering career. Traditional subjects in mechanical engineering are complemented by extensive computer experience in such areas as computer-aided design and numerical problem solving. The program's flexibility allows students to specialize in their area of interest through choosing electives. Part-time employment is available to students in the research laboratories of the department. Such experience enhances course work and is particularly valuable to those who later undertake graduate study.

The Mechanical Engineering Program Educational Objectives are:

1. Serve as competent mechanical engineering professionals that meet or exceed the expectations of their employers.

2. Pursue advanced degrees in Mechanical or other related fields of engineering. Pursue other professional degrees, such as law or business.

3. Assume leadership roles in government and industry, as well as in their communities and the global society.

The number of credit hours required for graduation is 128.

Freshman Year
First Semester (14 credit hours)

- ENGR 19500 Introduction to the Engineering Profession: 1 credit hour
- ENGR 19600 Introduction to Engineering: 3 credit hours
- CHEM-C 10500 Chemical Science I: 3 credit hours
- COMM-R 110 Fundamentals of Speech Communication: 3 credit hours
- MATH 16500 Analytic Geometry and Calculus I: 4 credit hours

Second Semester (16 credit hours)

- ENGR 19700 Introduction to Programming Concepts: 2 credit hours
- ENG-W 131 Reading, Writing, and Inquiry: 3 credit hours
- MATH 16600 Analytic Geometry and Calculus II: 4 credit hours
- PHYS 15200 Mechanics: 4 credit hours
- MATH 17100 Multidimensional Mathematics: 3 credit hours

Sophomore Year

Third Semester (16 credit hours)

- ENGR 29700 Computer Tools for Engineering: 1 credit hour
- ME 20000 Thermodynamics I: 3 credit hours
- ME 27000 Basic Mechanics I: 3 credit hours
- MATH 26100 Multivariate Calculus: 4 credit hours
- PHYS 25100 Heat, Electricity, and Optics: 5 credit hours

Fourth Semester (16 credit hours)

- ME 32700 Engineering Economics or ECON-E 201 Intro to Microeconomics: 3 credit hours
- ME 26200 Engineering Design, Ethics and Entrepreneurship: 3 credit hours
- ME 27400 Basic Mechanics II: 3 credit hours
- ECE 20400 Introduction to Electrical and Electronic Circuits: 4 credit hours
- MATH 26600 Ordinary Differential Equations: 3 credit hours

Junior Year

Fifth Semester (16 credit hours)

- ME 27200 Mechanics of Materials: 3 credit hours
- ME 33000 Modeling and Analysis of Dynamic Systems: 3 credit hours
- ME 31000 Fluid Mechanics: 4 credit hours

- Statistics Elective: 3 credit hours
- General Education Elective: 3 credit hours

Sixth Semester (17 credit hours)

- ME 34400 Introduction to Engineering Materials: 3 credit hours
- ME 31400 Heat and Mass Transfer: 4 credit hours
- ME 37200 Design of Mechanisms: 3 credit hours
- ME 39700 Mechanical Engineering Lab: 1 credit hour
- ME 34000 Dynamic Systems and Measurements: 3 credit hours
- General Education Elective: 3 credit hours

Senior Year

Seventh Semester (17 credit hours)

- ME 41400 Thermal-Fluid Systems Design or ME 49700 Machine Design: 3 credit hours
- ME 48200 Control Systems Analysis and Design: 3 credit hours
- TCM 36000 Communication in Engineering Practice: 2 credit hours
- TECH Elective: 3 credit hours
- General Education Elective: 3 credit hours
- General Education Elective: 3 credit hours

Eighth Semester (16 credit hours)

- ME 40500 FE Exam Preparation and Seminar: 1 credit hour
- ME 46200 Capstone Design: 3 credit hours
- TECH Elective: 3 credit hours
- TECH Elective: 3 credit hours
- Science/TECH Elective: 3 credit hours
- Restricted Elective: 3 credit hours

The complete list of approved electives can be found at http://et.engr.iupui.edu/departments/me/courses/me/index.php and the curriculum may be found by clicking: http://et.engr.iupui.edu/departments/me/undergrad/bsme/curriculum.php

B.S. in Energy Engineering

B.S. in Energy Engineering

Energy Engineering at IUPUI is an interdisciplinary engineering degree housed in the Mechanical Engineering Department. It is a four-year Purdue University Bachelor's degree that is only offered on the IUPUI campus in Indianapolis, IN. For more details, visit the Energy Engineering website: http://et.engr.iupui.edu/departments/me/undergrad/bseen/index.php.

We combine courses from chemistry, mechanical engineering, physics and electrical engineering to create a strong knowledge base essential to success in this industry. Students also have the opportunity to take courses concentrating on critical energy issues such as green building, hybrid and electric transportation, fuel cells and bio fuels, and energy systems such as wind, solar and nuclear.

Whether entering the workforce directly or continuing on to further education, graduates of this program will leave equipped to tackle the exciting and meaningful challenges ahead on the energy horizon.

The Energy Engineering Program Educational Objectives are:

1. Serve as competent energy engineering professionals that meet or exceed the expectations of their employers.
2. Pursue advanced degrees in energy or other related fields of engineering. Pursue other professional degrees, such as law or business.
3. Assume leadership roles in government and industry, as well as in their communities and the global society.

Semester by semester, the 128 total credit hours are distributed as follows:

Freshman Year

First Semester (17 credit hours)

- ENGR 19500 Introduction to Engineering Profession: 1 credit hour
- ENGR 19600 Introduction to Engineering: 3 credit hours
- MATH 16500 Integrated Calculus and Analytic Geometry: 4 credit hours
- CHEM-C 105 Chemical Science I: 3 credit hours
- COMM-R 110 Fundamentals of Speech Communication: 3 credit hours
- ENG-W 131 Reading, Writing, and Inquiry: 3 credit hours

Second Semester (16 credit hours)

- ENGR 19700 Introduction to Programming Concepts: 2 credit hours
- MATH 17100 Multidimensional Mathematics: 3 credit hours
- MATH 16600 Integrated Calculus and Analytic Geometry II: 4 credit hours
- PHYS 15200 Mechanics: 4 credit hours
- General Education Elective: 3 credit hours

Sophomore Year

Third Semester (17 credit hours)

- ENGR 29700 Computer Tools for Engineering: 1 credit hour
- MATH 26100 Multivariate Calculus: 4 credit hours
- PHYS 25100 Heat, Electricity, and Optics: 5 credit hours
- EEN 22000 Fundamentals of Electrochemical Materials & Energy Engineering: 4 credit hours
- 20000 Thermodynamics I: 3 credit hours

Semester (17 credit hours)

- ECE 20400 Introduction to Electrical and Electronic Circuits: 4 credit hours
- MATH 26600 Differential Equations: 3 credit hours
- EEN 24000 Basic Mechanics: 4 credit hours
- EEN 26000 Sustainable Energy: 3 credit hours
- ME/EEN 26200 Engr. Design, Ethics and Entrepreneurship: 3 credit hours

Junior Year

Fifth Semester (16 credit hours)

- ECE 49500 Fundamentals of Electrical Energy Engineering: 3 credit hours
- EEN 33000 Dynamic Systems Modeling and Measurements: 4 credit hours
- ME 27200 Strength of Materials: 3 credit hours
- EEN 31000 Fluid Mechanics and Heat Transfer: 3 credit hours
- ME 32700 or ECON E-201 Engineering Economics: 3 credit hours

Sixth Semester (16 credit hours)

- ME 31400 Heat and Mass Transfer: 4 credit hours
- EEN 34500 Renewable Energy Systems and Design: 3 credit hours
- EEN Elective Energy System Elective: 3 credit hours
- EEN Elective Energy System Elective: 3 credit hours
- GEN ED Elective General Education Elective: 3 credit hours

Senior Year

Seventh Semester (17 credit hours)

- EEN 41000 Clean Power Generation: 3 credit hours
- ECE 32100 Electromechanical Motion Devices: 3 credit hours
- ME 48200/ECE 38200 Control Systems Analysis and Design: 3 credit hours
- EEN Elective Energy Systems Elective: 3 credit hours
- TECH Elective Technical Elective: 3 credit hours
- TCM 36000 Communication in Engineering Practice: 2 credit hours

Eighth Semester (12 credit hours)

- EEN 46200 Capstone Design: 3 credit hours
- TECH Elective Technical Elective: 3 credit hours
- EEN Elective Energy Systems Elective: 3 credit hours
- General Education Elective General Education Elective: 3 credit hours

B.S. in Engineering - Interdisciplinary Engineering

B.S. in Engineering - Interdisciplinary Engineering

Interdisciplinary engineering provides an opportunity for students whose interests and talents, while oriented toward engineering and science, do not coincide with the plan of study outlined for the B.S.M.E. student. Interdisciplinary engineering does not have a designated professional curriculum, but it is constituted to accommodate a degree objective with broad flexibility and opportunity for interdisciplinary studies.

Students cooperate with their faculty advisors to develop a personalized plan of study leading to the Bachelor of Science in Engineering (B.S.E.) degree with interdisciplinary engineering identified as the major field of study. The Department of Mechanical Engineering has prepared plans of study with such major program areas as Construction Engineering Management and Engineering Management. The "Major Area" on a B.S.E. plan of study includes a minimum of 24 credit hours. At least 15 of the engineering credits must be at the 300 level or higher with the degree totaling 120 credit hours.

Major program area plans of study can be found at:

- Construction Engineering Management
- Engineering Management

http://et.engr.iupui.edu/departments/me/undergrad/bse/index.php

For information about other available options, please consult faculty in the Department of Mechanical Engineering or visit the Department's Undergraduate Programs website.

Major area courses should be discussed with the Associate Chair.

Graduate Programs in Mechanical Engineering

Graduate Programs in Mechanical Engineering

The Department of Mechanical Engineering has an outstanding and dedicated faculty with expertise and research interests in the areas of advanced manufacturing, bioengineering and biological systems, combustion and new engine design, design optimization, fluid mechanics, heat transfer, hybrid & electic vehicles, materials processing, mechanics and vibration, nanotechnology, renewable energy, and control systems. The faculty actively engaged in the frontiers of research and technologies in real-world engineering challenges in the above areas.

The department offers graduate programs of study that lead to various graduate certificates and the degrees of Master Science (M.S.), Master of Science in Engineering (M.S.E.), Master of Science in Mechanical Engineering (M.S.M.E.), and Doctor of Philosophy (Ph.D.). The program leading to the Ph.D. in mechanical engineering is jointly administered with the School of Mechanical Engineering at Purdue University, West Lafayette.

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

For more information about graduate programs visit http://engr.iupui.edu/me/bulletin/GraduatePrograms.shtml?menu=academics.

Computer, Information, & Graphics Technology (CIGT)

Computer Information & Graphics Technology (CIGT)

Chair: Eugenia Fernandez, Associate Professor of Computer & Information Technology

Associate Chair: Dan Baldwin, Director and Assistant Clinical Professor of Computer Graphics Technology

The Department of Computer Information and Graphics Technology houses degree and certificate programs in Computer and Information Technology (CIT), Computer Graphics Technology (CGT), and a Master of Science in Technology.

Our department partners two dynamic programs, bringing together talented faculty and staff who continue to develop innovative and creative opportunities for teaching and learning both on and off campus. CIT's Living Lab programs all serve as powerful tool for experiential learning for our students, and are exemplars of IUPUI's RISE to the Challenge Initiative.

Both CGT and CIT degree programs are accredited by ABET Inc. a process involving voluntary review to ensure the program meets established quality standards. By participating in ABET accreditation we focus on continuous quality improvement, a hallmark of all successful organizations.

As a CIGT student, graduate, or industrial partner, you are an integral part of tomorrow's technology community. Technical skills and professional leadership competencies continue to make our graduates distinctive, unique, and highly marketable in meeting the needs of employers today. All industries seek strong, effective, and mature leaders with the technological knowledge to compete in a global workforce. CIGT programs will be the resource of choice to meet that needs and each of you will benefit from the synergy created in our department.

Computer & Information Technology

Computer & Information Technology

Professors: A. Jafari **Associate Professors:** E. Fernandez (*Chair*), J. Starks, H. Wu
Assistant Professors: F. Li, H. Liu
Clinical Assistant Professor: C. Justice **Lecturers:** S. Catlin, J. Clark, R. Elliott, N. Evans

The Computer and Information Technology (CIT) program offers a Purdue Master of Science degree in Technology, a Bachelor of Science degree in Computer and Information Technology, a minor in Computer and Information Technology, and four certificate programs in web development, e-commerce development, computer applications, and network security. Courses in any of the certificate programs may be applied directly to the Bachelor's degree in Computer and Information Technology.

As a CIT graduate, you will become an integral part of tomorrow's computer information technology industry community. Technical skills and professional leadership competencies continue to make our graduates distinctive, unique, and highly marketable in meeting the needs of employers today. We make IT work.

CIT has been a leader in offering degree courses that can be completed via distance education. Selected courses may be taken either partially or completely via the web.

Master of Science in Technology

The primary goal of the Technology Graduate program is to prepare the next generation of STEM professionals, practitioners, researchers, and teachers. The program provides opportunities to obtain advanced training and credentials. Successful graduates of the program earn a Master of Science (MS) in Technology awarded by Purdue University.

The MS in Technology program is designed so that graduates holding a BS degree in a technology discipline or a related area can complete their degree either as a full time student or as a part time student working full time. The program could typically be completed in 4 semesters (2 academic years) and must be completed within five years.

The MS in Technology curriculum incorporates a core set of courses, but is extremely flexible and multidisciplinary in approach. Students have the opportunity to customize the program to meet their unique needs.

The curriculum consists of a total of 33 credit hours as follows:

- Required Core Technology Courses (9 credit hours)
- Secondary Area of Study (21-24 credit hours)
- Directed Project (3 credit hours optional)

For more information, visit our Web site at http://et.engr.iupui.edu/sites/graduateprograms/academic-programs/mstech/index.php or contact Computer and Information Technology at (317) 274-9705 or via email: cit@iupui.edu.

Bachelor of Science in Computer & Information Technology

The Bachelor of Science in Computer Information Technology program is accredited by the Computing Accreditation Commission of ABET, http://www.abet.org.

The Bachelor of Science degree is available with four concentrations: Web Development, Data Management, Networking Systems, and Information Security. These concentrations are designed to provide an applications-oriented, practical education that prepares students for careers as application developers (people who design, write, install and maintain a variety of IT systems, with an emphasis on Web applications); data managers (people who design, implement, program and maintain databases); network systems specialists (people who design, configure, secure and maintain IT networks); and information security specialists (people who protect information assets of an organization).

Our Program Educational Objectives provide broad statements of what CIT graduates will know and be able to do within 3-5 years after graduation. They are based on the needs of our constituents and were developed after consultation with our faculty and Industrial Advisory Board. The Program Objectives for the B.S. in Computer and Information Technology are:

1. Design, implement, and evaluate solutions to meet the IT needs of industry.

2. Provide Leadership and project management for IT-related projects and services.
3. Expand technical expertise in information technology.

Students who must interrupt their course of study for two calendar years or more will be required to meet all requirements for the program as it stands at the time of their return. Computer and Information Technology (CIT) courses over 10 years old may have to be repeated. Students should check with a CIT advisor.

The bachelor's degree has a prerequisite of computer applications (evidenced by completion of CIT 10600 or equivalent). The bachelor's degree requirements are fulfilled by meeting all of the requirements of a selected concentration. An overview of the requirements is provided below. For more complete information, visit our CIT BS degree website page http://www.engr.iupui.edu/departments/cigt/undergrad/bscit/index.php.

CIT BS Requirements

Overall - completion of 120 credit hours, meeting the following minimums:

- 39 credit hours in upper level courses
- 32 credit hours in residence in the School of Engineering & Technology
- 12 credit hours in upper level CIT courses
- 2.0 graduation index
- 2.0 cumulative GPA

In addition, students are required to complete at least two of the four RISE experiences - research, international, service learning, and experiential learning. See an advisor for details.

Course Distribution - degree requirements include courses in the following area:

- CIT Core (must be completed with a grade of C or better)
- CIT Concentration (must be completed with a grade of C or better)
- CIT Selectives (must be completed with a grade of C or better)
- Leadership
- Mathematics/Science
- General Education
- Free Electives

The general education requirements include 30 hours of the IUPUI General Education Core which aligns with the Principles of Undergraduate Learning.

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

Minor in Computer Technology

The minor in computer technology is available to students majoring in other areas of study at IUPUI.

A minor in computer technology requires the completion of 24 credit hours of computer technology courses, plus prerequisite requirements in mathematics. Required courses in computer technology are provided in two groupings: (a) core requirements (12 credit hours), and (b) a specialty sequence (12 credit hours). At least 12 credit hours of the minor must be taken at IUPUI. All core and specialty courses must be completed with a grade of C or better.

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 completed a mathematics competency as evidenced by completing MATH-M 118 and M 119 or MATH 15300 and 15400, or MATH 15900.

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

1. attained the mathematics and computer literacy ability evidenced by college-level courses
2. completed the computer technology minor's core requirements
3. completed 30 credit hours toward his or her major
4. earned a cumulative grade point average (GPA) of 2.0 or higher

The student who has met these conditions then selects one of the specialty sequences and proceeds to complete the three courses of that selected specialty.

The computer technology specialty sequences are:

- **Application Development**
- **Network Systems**
- **Web Technologies**
- **Database Systems**
- **Information Security**

For more information and a list of required courses, visit our CIT Minor web page**.**

IT Certificate for Web Development

The IT Certificate for Web Development program requires the completion of 18 credit hours which can be completed via distance education. The IT Certificate for Web Development 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, and database integration and implementation.

Students who complete the Information Technology Certificate will be able to:

- Apply the tools and techniques for effective Web site planning and analysis
- Create dynamic data driven web sites
- Utilize both client and server side languages in developing e-commerce sites.
- Apply optimal Web design strategies to deploy e-commerce Web applications for a global audience
- Research, learn and apply new web technologies

All courses in the certificate must be completed with a grade of C or better.

For more information and a list of required courses, visit our: IT Certificate for Web Development web page.

E-Commerce Development Certificate

The E-Commerce Development Certificate requires the completion of 18 credit hours, which can be completed via distance education.

The E-Commerce Development Certificate focuses on Web-based application development. Interested students should have at least two to three years of application development experience or have completed the IT Certificate for Web Development. Students in the E-Commerce Development certificate can choose to develop their programming skills using either ASP.NET or Java.

Students who complete the E-Commerce Development Certificate will be able to:

- Apply tools and techniques for effective Web site planning and analysis.
- Allow individuals to develop dynamic web applications in a variety of programming languages.
- Explore sophisticated data management and information exchange as it applies to interactive and e-commerce applications.
- Apply optimal Web design strategies to deploy usable Web applications for a global audience using a variety of browsers and platforms.
- Utilize current web development standards appropriately.

All courses in the certificate must be completed with a grade of C or better.

For more information and a list of required courses, visit our E-Commerce Development Certificate web page.

Computer Technology Applications Certificate

The Computer Technology Applications Certificate (CTAC) requires the completion of 18 credit hours which may be completed via distance education. The CTAC is designed to give you a strong background in computer applications. It will equip you with technology expertise to support your professional academic endeavors and help you transition to the technology of the future. In the required courses, you will use software applications rather than programming to build web sites, develop software training modules, create other interactive IT products, and complete a service learning project. Electives allow you to explore personal-use topics such as IT for the consumer, home networking, and protecting yourself in cyberspace or professional topics such as ethics, IT fundamentals, HTML, and desktop publishing.

Students who complete the Computer Technology Applications Certificate will be able to:

- Use traditional office application software at the highest level
- Customize and modify application software for end users
- Train end users of application software in best practices
- Research, learn, and apply new software techniques
- Create sophisticated and interactive Web interfaces using application software
- Use Web 2.0 tools to further their career

All courses in the certificate must be completed with a grade of C or better.

For more information and a list of required courses, visit our Computer Technology Applications Certificate web page.

Network Security Certificate

The Network Security Certificate (NSC) requires the completion of 18 credit hours, half of which can be completed via distance education. This program is accredited by the Committee on National Security Systems (CNSS) that addresses the ever-growing need in security. The NSC provides information assurance and security education and training to students and professionals. This program is hands-on and requires students to have some networking and systems experience. Completion of the NSC provides students with a solid foundation in security techniques and prepares participants to work in information assurance and network security.

Students who complete the Network Security Certificate (NSC) will be able to:

- Apply information assurance and security principles to secure systems and networks.
- Conduct accurate and comprehensive digital forensics investigations and apply appropriate rules of evidence.
- Use an appropriate analytic framework to assess risk and recommend strategies for mitigation.
- Analyze and produce comprehensive security policies, standards, and procedures.
- Analyze and create comprehensive business continuity plan to include incident response, disaster recovery, and continuous operations.

All courses in the certificate must be completed with a grade of C or better.

For more information and a list of required courses, visit our Network Security Certificate web page.

Computer Graphics Technology

Computer Graphics Technology

Associate Professor: M. Bannatyne
Assistant Professor: C. Rogers
Clinical Assistant Professor: D. Baldwin
Lecturer: J. Guy
Visiting Lecturer: X. Guan

The Computer Graphics Technology (CGT) prepares visually oriented students to succeed in a wide range of industries, spanning careers in 3D animation, visual effects, web and multimedia design, video production, and graphics design. CGT offers a Purdue Master of Science degree in Technology and a Bachelor of Science degree in Computer Graphics Technology.

CGT students are creative and technological problem solvers, and our graduates are consistently hired in this multi-billion dollar industry for their expertise in both areas.

Master of Science in Technology

The primary goal of the Technology Graduate program is to prepare the next generation of STEM professionals, practitioners, researchers, and teachers. The program provides opportunities to obtain advanced training and credentials. Successful graduates of the program earn a Master of Science (MS) in Technology awarded by Purdue University.

The MS in Technology program is designed so that graduates holding a BS degree in a technology discipline or a related area can complete their degree either as a full-time student or as a part-time student working full time. The program could typically be completed in 4 semesters (2 academic years) and must be completed within five years.

The MS in Technology curriculum incorporates a core set of courses, but is extremely flexible and multidisciplinary in approach. Students have the opportunity to customize the program to meet their unique needs.

The curriculum consists of a total of 33 credit hours as follows:

- Required Core Technology Courses (9 credit hours)
- Secondary Area of Study (21-24 credit hours)
- Directed Project (3 credit hours optional)

For more information, visit our Web site at http://et.engr.iupui.edu/sites/graduateprograms/academic-programs/mstech/index.php or contact the Department of Computer Information and Graphics Technology at (317) 274-9705.

Bachelor of Science in Computer Graphics Technology

The Bachelor of Science in Computer Graphics Technology program is accredited by the Computing Accreditation Commission of ABET, http://www.abet.org.

Consistent with the criteria set by (ABET), the Program Educational Objectives of the CGT program are "*To product graduates who, during the first few years of professional practice, will...*":

- Create computer graphics solutions through the application of technical capabilities in visual communication, diverse software programs, and related supporting fields aligned with their profession.
- Continue their professional development through life-long learning opportunities and obtaining advanced degrees.
- Provide leadership and project management within their area of expertise.

Students seeking the Bachelor of Science degree in CGT can choose to study Interactive Multimedia Development or Technical Animation and Spatial Graphics alongside our outstanding and award-winning faculty, rich with industry experience.

CGT BS Requirements

Interactive Multimedia Developer (IMD) Plan of Study - completion of 120 credit hours, meeting the following minimums:

- *26 credit hours of 300-400 level CGT courses*
- 32 credit hours in residency in the School of Engineering and Technology
- 12 credit hours of Computer Information Technology (CIT) courses
- 15 credit hours of Free or Technical Electives
- 2.0 Cumulative GPA

Course Distribution - degree requirements include courses in the following areas:

- CGT Core (must be completed with a grade of C- or better)
- CGT Selectives (must be completed with a grade of C- or better)
- ART and Design
- Leadership
- Technical Communications
- Mathematics/Science
- General Education
- Free Electives

Technical Animation and Spatial Graphics (ASG) Plan of Study - completion of 120 credit hours, meeting the following minimums:

- 35 credit hours of 300-400 level CGT courses
- 32 credit hours in residency in the School of Engineering and Technology
- 12 credit hours of Free or Technical Electives
- 2.0 Cumulative GPA

Course Distribution - degree requirements include courses in the following area:

- CGT Core (must be completed with a grade of C- or better)
- CGT Selectives (must be completed with a grade of C- or better)
- Art and Design
- Leadership
- Technical Communications
- Mathematics/Science
- General Education
- Free Electives

The general education requirements include 30 hours of the IUPUI General Education Core which aligns with the Principles of Undergraduate Learning.

For more information and a list of required courses, visit our CGT B.S. degree web page.

Engineering Technology (ENT)

Engineering Technology (ENT)

Chair: E. Cooney, Professor of Electrical and Computer Engineering Technology Program Directors:
ART- J. Cowan
CEMT - T. Iseley
CpET - B. Lin
EET - E. Cooney
HETM - B. Christe
INTR - E. McLaughlin
MET - P. Yearling

MSTE - P. Hylton

The Department of Engineering Technology offers two degree program at the associate level and seven degree programs at the bachelor's level. ENT offers an Associate of Science degree with a major in Healthcare Engineering Technology Management (HETM) and Associate of Science with a major in Interior Design (INTR). Graduates from the HETM and INTR associate degree programs can continue their education for an additional two years of full time study and complete the course work leading to a Bachelor of Science degree. The department offers Bachelor of Science degrees in Healthcare Engineering Technology Management, Computer Engineering Technology, Construction Engineering Management Technology, Electrical Engineering Technology, Interior Design, Mechanical Engineering Technology, and Motorsports Engineering. The ENT programs are well-suited for individuals who are curious about how things work and want a practice-oriented education. The department faculty members all have practical engineering work experience in their fields of expertise and are able to offer an educational experience that provides graduates with the skills necessary to quickly become productive employees. The faculty is dedicated to teaching and is very focused on meeting the educational needs of students. Daytime, evening and selected web-based courses are offered.

For more information, contact the Department of Engineering Technology at (317) 274-2363, e-mail aland@iupui.edu, or visit our Web site at **http://www.engr.iupui.edu/ent**.

Architectural Technology

Architectural Technology

Associate Professor and Director: J. Cowan
Assistant Clinical Professor: D. Nickolson

NOTE: EFFECTIVE SUMMER 2013, ARCHITECTURAL TECHNOLOGY NO LONGER OFFERS AN ASSOCIATE OF SCIENCE DEGREE. THE ARCHITECTURAL TECHNOLOGY PROGRAM AT IUPUI PROVIDES A SERIES OF COURSES THAT SUPPORT DEGREE AND CERTIFICATE PROGRAMS, SUCH AS INTERIOR DESIGN TECHNOLOGY, SUSTAINABLE TECHNOLOGIES, AND COMPUTER GRAPHICS TECHNOLOGY.

The Architectural Technology (ART) curriculum offers a two-year associate degree program designed to provide students with the skills to work in the areas of architectural visualization, detailing, building information modeling (BIM), fundamental structural design, space planning, materials testing, inspection, and sales. The curriculum is not intended to prepare students for registration as professional architects.

Emphasis is on building science and technical design, residential and commercial construction drawings, mechanical and electrical systems in buildings, and the graphic depiction of these systems using building information modeling software. Also included are courses in mathematics, physical sciences, social sciences, communications, interior design, and the humanities.

Graduates typically find employment with architectural firms, design agencies, construction firms, building material suppliers, and various governmental agencies. Graduates are also eligible to pursue a Bachelor's degree in Computer Graphics Technology with an emphasis on Architectural Visualization. This combination of courses and skills also prepares students to apply for graduate programs in the design field (e.g., architecture, computer graphics).

The career educational objectives for Architectural Technology are:

- Demonstrate excellent technical capabilities in architectural technology and related fields.
- Be responsible citizens.
- Continue professional advancement through life-long learning
- Apply sound design methodology in multidisciplinary fields of architectural technology that is sensitive to the health, safety and welfare of the public.
- Competently use mathematical, measurement, instrumentation, and testing techniques.
- Practice effective oral, written and visual communication skills.
- Understand the environmental, ethical, diversity, cultural and contemporary aspects of their work.
- Work effectively and collaboratively in architectural, engineering and construction industries.

Associate of Science in Architecture Technology

Freshman Year

First Semester (17 credit hours)

- ART 16500 Building Systems and Materials, 3 credits
- ART 10300 Introduction to Interior Design, 3 credits
- MATH 15900 Pre-Calculus, 5 credits**
- ENG-W131 Reading, Writing, and Inquiry, 3 credits
- COMM-R 110 Fundamentals of Speech Communication, 3 credits

Second Semester (18 credit hours)

- ART 11700 Intro to Construction Graphics with CAD, 3 credits
- ART 12000 Architectural Presentation, 3 credits
- INTR 20200 INTR Materials & Applications, 3 credits
- INTR 12500 Color and Lighting of Interiors, 3 credits
- CEMT 10400 Fundamentals of Surveying, 3 credits
- Humanities/Social Science Elective, 3 credits

Sophomore Year

Third Semester (17 credit hours)

- ART 15500 Residential Construction, 3 credits
- CEMT 16000 Statics, 3 credits
- CEMT 21500 Mechanical & Electrical Systems, 4 credits
- Lab Science Selective, 4 credits
- CGT 21100 Raster Imaging for Computer Graphics, 3 credits

Fourth Semester (17 Credits)

- ART 21000 History of Architecture, 3 credits
- ART 22000 Commercial Construction, 3 credits
- TCM 22000 Technical Report Writing, 3 credits
- CEMT 26000 Strength of Materials, 3 credits
- CEMT 26700 Materials Testing, 2 credits
- INTR 12400 Space Planning for Interiors, 3 credits

***MATH 15300 and 15400 are can be substituted for MATH 15900*

Construction Engineering Management Technology

Construction Engineering Management Technology

Professor: T. Iseley (Program Director)
Assistant Professor: D. Koo
Lecturer: J. W. White
Visiting Lecturer: M. Ray

The Construction Engineering Management Technology program offers students a B.S. degree.

For more information, contact the Department of Engineering Technology at (317) 274-2363 or email aland@iupui.edu or visit our Web site at http://et.engr.iupui.edu/departments/ent/about/programs/cemt.php

Bachelor of Science in Construction Engineering Management Technology

Accredited by the Engineering Technology Accreditation Commission (ETAC), of ABET http://www.abet.org.

The Construction Engineering Management Technology curriculum is intended to further students' knowledge in areas of construction contract administration, specification writing, construction field operations, construction scheduling/project control, construction costs and bidding, construction law and ethics, construction safety and inspection, construction project monitoring and control, soils and foundations, hydraulics and drainage, construction economics, and construction management. Additional course work includes microeconomics, mathematics, and lab sciences, as well as training in written and oral communications. Students may 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 typically find employment with engineering firms, construction firms, consulting companies, surveying companies, contractors and subcontractors, builders, construction materials testing companies, building products, materials and equipment suppliers, land developers, highway departments, utilities, and various state, city, and governmental agencies and work with titles such as project manager, project supervisor, project engineer*, contract administrator, specifications writer, safety supervisor, project estimator, project scheduler, contractor, sub-contractor, builder, surveyor, testing supervisor, product representative (typically construction materials and equipment).

*The curriculum does not prepare students for registration as professional engineers in Indiana. For other states, consultation with the state's licensing agency is recommended.

In addition to all the school and university requirements, this degree requires that both the IU Cumulative GPA and the Degree GPA be equal to or greater than 2.000.

Program Educational Objectives in Construction Engineering Management Technology

The Program Educational Objectives reflect career and professional accomplishments of the program's graduates a few years after graduation. They are as follows:

1. Meet the needs of construction industry employers through successful support, management, or administration of construction-related operations.
2. Receive professional recognition and/or advancement consistent with a successful career in construction management.
3. Demonstrate continued interest in professional growth by participating in professional organizations, education and industry service.

Following is a list of all required courses to achieve a Bachelor of Science degree, by semester.

Freshman Year

First Semester (16 credit hours)

- TECH 10200 Discovering Technology:1 credit hours
- CEMT 10500 Introduction to Construction Technology: 3 credit hours
- TECH 10500 Introduction to Engineering Technology: 3 credit hours
- BUS-X 100 Introduction to Business Administration: 3 credit hours
- ENG W131 Reading, Writing, and Inquiry: 3 credit hours
- MATH 15300 Algebra and Trigonometry I: 3 credit hours

Second Semester (15 credit hours)

- CEMT 10400 Surveying Fundamentals: 3 credit hours
- CEMT 12000 Construction Materials and Methods: 3 credit hours
- COMM R110 Fundamentals of Speech Communication: 3 credit hours
- MATH 15400 Algebra and Trigonometry II: 3 credit hours
- TCM 22000 Technical Report Writing: 3 credit hours

Sophomore Year

Third Semester (16 credit hours)

- CEMT 11000 Construction Accounting: 3 credit hours
- CEMT 21500 Constr Mech & Elec: 3 credit hours
- CEMT 27500 Applied Civil Engineering Drafting: 3 credit hours
- TCM 34000 Correspondence in Bus & Ind: 3 credit hours
- PHYS 218 General Physics I: 4 credit hours

Fourth Semester (15 credit hours)

- CEMT 16000 Statics: 3 credit hours
- CEMT 28000 Quantity Survey: 3 credit hours
- ECON-E 201 Microeconomics: 3 credit hours
- MATH 22100 Calculus for Technology I: 3 credit hours
- Gen Ed Electives (see approved course list: Arts & Humanities): 3 credit hours

Junior Year

Fifth Semester (14 credit hours)

- CEMT 26000 Strength of Materials: 3 credit hours
- CEMT 26700 Materials Testing: 2 credit hours
- CEMT 31200 Construction surveying: 3 credit hours
- CEMT 30200 Construction Law & Ethics: 3 credit hours
- CEMT 34200 Construction Cost & Bidding: 3 credit hours

Sixth Semester (16 credit hours)

- CEMT 34100 Construction Scheduling: 3 credit hours
- CEMT 34700 Constr. Contract Admin & Specs: 3 credit hours
- CEMT 48400 Wood, Timber and Formwork Design: 3 credit hours
- Science Elective (see approved course list): 4 credit hours
- Stat Elective (see approved course list): 3 credit hours

Senior Year

Seventh Semester (16 credit hours)

- CEMT 33000 Construction Field Operations: 3 credit hours
- CEMT 35000 Construction Project Cost & Project Control: 3 credit hours
- CEMT 39000** Construction Experience: 1 credit hour
- CEMT 45200 Hydraulics and Drainage: 3 credit hours
- CEMT 45500 Constr. Safety & Inspection: 3 credit hours
- CEMT 48600 Reinforced Concrete Des & Const: 3 credit hours

Eighth Semester (12 credit hours)

- CEMT 43000 Soils and Foundations: 3 credit hours
- CEMT 44700 Project Management: 3 credit hours
- CEMT 49400 Engineering Economics for Construction: 3 credit hours
- Gen Ed Elective (see approved course list: Cultural Understanding: 3 credit hours

**NOTE: CEMT 39000 requires that a minimum of a 400 hour internship be completed prior to enrolling in the course. The internship must be in areas related to the mission of the program. This experience should include estimating, scheduling, construction surveying, construction administration, field engineering, etc.

Construction Management Certificate

This certificate is designed to provide educational opportunities for those who need or desire to learn contemporary construction management techniques and skills and employ the latest technology in doing so. This program emphasizes developing the skills required by the construction industry and relies on the use of computers, whenever possible, to provide a contemporary education in the use of the latest technology in the management process. Those who earn the certificate will qualify for entry-level positions as superintendents, project managers, estimators, or schedulers for construction-related firms and will be competent in using the latest technology.

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

Curriculum (27 credit hours)

- CEMT 11000 Construction Accounting: 3 credit hours
- CEMT 28000 Quantity Survey: 3 credit hours
- CEMT 33000 Construction Field Operations: 3 credit hours
- CEMT 34100 Construction Scheduling and Project Control: 3 credit hours
- CEMT 34200 Construction Cost and Bidding: 3 credit hours
- CEMT 34700 Construction Contract Administration and Specifications: 3 credit hours
- CEMT 44700 Construction Project Management: 3 credit hours
- CEMT 45500 Construction Safety and Inspection: 3 credit hours
- CEMT 49400 Engr Economics for Construction: 3 credit hours

Any student who has 8 credit hours in college-level technical mathematics, including algebra, trigonometry, and calculus; proven computer competency; the ability to read and interpret construction documents; and is formally admitted to the university, may be a candidate for this certificate. Courses taken at other universities may be recognized as equivalent to selected required courses.

Please see the Program Director 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 CEMT bachelor's degree are not eligible for this certificate.

Computer Engineering Technology

Computer Engineering Technology

Professors: E. Cooney *(Chair)*
Clinical Associate Professor: W. Lin *(Program Director)*
Assistant Professors: D. Goodman
Visiting Lecturer: E. Freije

Bachelor of Science degree with a major in Computer Engineering Technology

Accredited by the Engineering Technology Accreditation Commission (ETAC) of ABET, http://www.abet.org

The purpose of the Computer Engineering Technology Program is to train engineering technologists to design, develop, and implement computer-based applications. The CpET program is offered by a partnership between the Department of Engineering Technology and the Computer and Information Technology program. A major emphasis of the CpET program is practice-oriented, "hands-on" training in laboratories to provide students and graduates with a rich experience in computer applications.

B.S. degree graduates will be able to provide technical support for computer systems in advanced manufacturing systems, control systems, networks, telecommunication systems, embedded systems, product development, and instrumentation. Graduates of the B.S. CpET program will have titles such as software engineer, automation engineer, applications software engineer, systems analyst, telecommunications engineer, network administrator and system test engineer.

In addition to all the school and university requirements, this degree requires that both the IU Cumulative GPA and the Degree GPA be equal to or greater than 2.000.

Program Educational Objectives for Computer Engineering Technology

Three to five years after graduation, alumni of the Computer Engineering Technology program at IUPUI will be able to:

1. Meet expectations of employers in technical and professional careers related to the field of Computer Engineering Technology.
2. Achieve recognition and/or advancement consistent with their education.
3. Continue growth in professional knowledge through additional education, certification or licensing.

The Bachelor of Science in Computer Engineering Technology study plan is as follows.

Freshman Year

First Semester (16 credit hours)

- TECH 10200 Discovering Technology: 1 credit hour
- TECH 10500 Introduction to Engineering Technology: 3 credit hours
- TECH 10400 Tech Graphics Communication: 3 credit hours
- ECET 10900 Digital Fundamentals: 3 credit hours
- ENG W131 Reading, Writing, and Inquiry: 3 credit hours
- Gen Ed Elective (see approved course list: Arts & Humanities): 3 credit hours

Second Semester (16 credit hours)

- ECET 10700 Introduction to Circuit Analysis: 4 credit hours
- ECET 15500 Digital Fundamentals II: 3 credit hours
- COMM R110 Fund of Speech Communication: 3 credit hours
- MATH 221 Calculus for Technology I: 3 credit hours
- Gen Ed Elective (see approved course list: Cultural Understanding): 3 credit hours

Sophomore Year

Third Semester (17 credit hours)

- ECET 15700 Electronics Circuit Analysis: 4 credit hours
- ECET 16400 Applied Object Oriented Programming: 3 credit hours
- ECET 20900 Intro to Microcontrollers: 4 credit hours
- IET 15000 Quantitative Methods for Technology: 3 credit hours
- MATH 22200 Calculus for Technology II: 3 credit hours

Fourth Semester (15 credit hours)

- CIT 21400 Introduction to Data Management: 3 credit hours
- ECET 28400 Computer Communications: 4 credit hours
- ECET 23100 Electrical Power & Controls: 4 credit hours
- TCM 2XX (Oral technical presentation): 1 credit hour
- MATH Tech Selective (see approved course list: 3 credit hours

Junior Year

Fifth Semester (15 credit hours)

- ECET 35700 Real-Time Digital Signal Processing: 4 credit hours
- PHYS 21800 General Physics I: 4 credit hours
- TCM 3XX (technical documentation): 1 credit hour
- CIT 27000 Java Programming: 3 credit hours
- ECET Elective (see approved course list): 3 credit hours

Sixth Semester (15 credit hours)

- ECET Elective (see approved course list): 3 credit hours
- ECET Elective (see approved course list): 3 credit hours
- ECET 48404 Emerging Information, Communications & Technologies: 4 credit hours
- BUS X-100 Business Administration: Introduction: 3 credit hours
- ECET 49300 Ethics & Professionalism in Technology: 1 credit hour
- TCM 3XX (technical documentation): 1 credit hour

Senior Year

Seventh Semester (14 credit hours)

- ECET Elective (see approved course list): 3 credit hours
- ECET 49000 Senior Design Project Phase I: 1 credit hour
- TCM 4XX (oral & written design reports): 1 credit hour
- IET 36400 Total Quality Control: 3 credit hours
- CHEM C101 Elementary Chemistry I LEC: 3 credit hours
- CIT 20300 Information Security Fundamentals: 3 credit hours

Eighth Semester (12 credit hours)

- ECET 49100 Senior Design Project Phase II: 2 credit hours
- ECET Elective (see approved course list): 3 credit hours
- TCM 4XX (oral & written design reports): 1 credit hour
- Gen Ed Elective (see approved course list: Social Science): 3 credit hours
- Sustainability Selective (see approved course list): 3 credit hours

Electrical Engineering Technology

Electrical Engineering Technology

Professors: E. Cooney *(Chair)*
Clinical Associate Professor: W.Lin
Assistant Professors: A. Izadian, D. Goodman
Visiting Lecturer: E. Freije

Bachelor of Science degree with a major in Electrical Engineering Technology

Accredited by the Engineering Technology Accreditation Commission (ETAC) of ABET, http://www.abet.org.

Graduates of this program are qualified for high-level positions as technologists with job titles such as product engineer, process automation specialist, quality engineer, audio engineer, manufacturing system integration engineer, product engineer, field service engineer, substation engineer, controls engineer, calibration specialist, and sales engineer. The courses are offered both in the day and evening.

In addition to all the school and university requirements, this degree requires that both the IU Cumulative GPA and the Degree GPA be equal to or greater than 2.000.

Program Educational Objectives for Electrical Engineering Technology

Three to five years after graduation, alumni of the Electrical Engineering Technology program at IUPUI will be able to:

1. Meet expectations of employers in technical and professional careers related to the field of Electrical Engineering Technology.
2. Achieve recognition and/or advancement consistent with their education.
3. Continue growth in professional knowledge through additional education, certification or licensing.

Freshman Year

First Semester (16 credit hours)

- TECH 10200 Discovering Technology: 1 credit hour
- TECH 10500 Introduction to Engineering Technology: 3 credit hours
- TECH 10400 Technical Graphics Communications: 3 credit hours
- ECET 10900 Digital Fundamentals: 3 credit hours
- ENG W131 Reading, Writing, and Inquiry: 3 credit hours
- Gen Ed Elective (see approved course list: Arts & Humanities): 3 credit hours

Second Semester (16 credit hours)

- ECET 10700 Introduction to Circuit Analysis: 4 credit hours
- ECET 15500 Digital Fundamentals II: 3 credit hours
- COMM R110 Fundamentals of Speech Communication: 3 credit hours
- MATH 22100 Calculus for Technology: 3 credit hours
- Gen Ed Elective (See approved course list: Cultural Understanding): 3 credit hours

Sophomore Year

Third Semester (13 credit hours)

- ECET 15700 Electronics Circuit Analysis: 4 credit hours
- ECET 16400 Applied Object Oriented Programming: 3 credit hours
- IET 15000 Quantitative Methods for Technology: 3 credit hours
- MATH 22200 Calculus for Technology II: 3 credit hours

Fourth Semester (16 credit hours)

- ECET 20700 AC Electronics Circuit Analysis: 4 credit hours
- ECET 28400 Computer Communications: 4 credit hours
- TCM 2XX Oral Technical Presentation: 1 credit hour
- MATH/TECH Selective (See approved course list): 3 credit hours
- ECET 23100 Electrical Power and Controls: 4 credit hours

Junior Year

Fifth Semester (15 credit hours)

- ECET 20900 Introduction to Microprocessors: 4 credit hours
- TCM 3XX Technical Documentation: 1 credit hour
- PHYS 21800 General Physics: 4 credit hours
- ECET Elective: see approved course list: 3 credit hours
- IET 35000 Engineering Economics: 3 credit hours

Sixth Semester (15 credit hours)

- ECET Elective (see approved course list): 3 credit hours
- ECET Elective (see approved course list): 3 credit hours
- ECET 30700 Analog Network Signal Processing: 4 credit hours
- BUS X-100 Business Administration: Introduction: 3 credit hours
- ECET 49300 Ethics & Professionalism in Technology: 1 credit hour
- TCM 3XX Technical Documentation: 1 credit hour
-

Senior Year

Seventh Semester (14 credit hours)

- ECET Elective (see approved course list): 3 credit hours

- ECET 49000 Senior Design Project Phase I: 1 credit hour
- TCM 4XX (oral & Written Design Reports: 1 credit hour
- TECH Elective (see approved course list): 3 credit hours
- CHEM C101 Elementary Chemistry I LEC: 3 credit hours
- IET 36400 Total Quality Control: 3 credit hours

Eighth Semester (15 credit hours)

- ECET Elective (see approved course list): 3 credit hours
- ECET Elective (see approved course list): 3 credit hours
- ECET 49100 Senior Design Project Phase II: 2 credit hours
- TCM 4XX (oral & written design reports): 1 credit hour
-
- Gen Ed Elective (see approved course list: Social Science): 3 credit hours
- TECH Elective (see approved course list): 3 credit hours

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 10700, 10900, 15700, 15500, and 20700. In addition, one course from the following list must be completed: ECET 20900, 23100 or 28400. At least 12 credit hours of minor must be completed in residence at IUPUI. Students with credit for ECET 11600 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.

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 EET courses. Required courses are EET 10900, 11600, 15500, 20900, and 30900. In addition, one of the following must be completed: EET 35700 or 48404. 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.

Healthcare Engineering Technology Management

Healthcare Engineering Technology Management

Associate Professor: B. Christe (Program Director)
Lecturer: J. Tabas

Associate of Science with a major in Healthcare Engineering Technology Management

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 hospitals located on the IUPUI campus and with other area hospitals.

The healthcare engineering technology management (HETM) curriculum enables graduates to find employment as biomedical equipment technicians, medical equipment sales personnel, medical equipment servicing/ maintenance technicians, and research technicians.

The curriculum satisfies the educational requirements of the Association for the Advancement of Medical Instrumentation (AAMI) and the Certified Biomedical Equipment Technician Examination. Courses are offered in the day, evening, and online. Not all courses are offered in all formats.

In addition to all the school and university requirements, this degree requires that both the IU Cumulative GPA and the Degree GPA be equal to or greater than 2.000.

Graduates of this program may choose to work toward the Bachelor of Science degree program in healthcare engineering technology management. Approximately two additional years of full-time study are necessary to complete the requirements for the B.S. in engineering technology with a major in Healthcare Engineering Technology Management.

Freshman Year of the associate degree curriculum

First Semester (15 credit hours)

- BMET 10500 Introduction to HETM: 1 credit hour (recommended not required)
- ECET 10900 Digital Fundamentals: 3 credit hours
- MATH 15300 Algebra and Trigonometry I: 3 credit hours
- ENG W131 Reading, Writing, and Inquiry: 3 credit hour
- TECH 102 Discovering Technology: 1 credit hour (recommended not required)
- TECH 105 Introduction to Engineering Technology: 3 credit hours
- Gen Ed Elective (see approved course list: Arts & Humanities or Social Science): 3 credit hours

Second Semester (19 credit hours)

- ECET 10700 Introduction to Circuit Analysis: 4 credit hours
- BMET 22000 Applied Human Biology: 3 credit hours
- ECET 15500 Digital Fundamentals II: 3 credit hours
- COMM R110 Fundamentals of Speech Communication: 3 credit hours
- MATH 15400 Algebra and Trigonometry II: 3 credit hours
- Gen Ed Elective (see approved course list: Arts & Humanities): 3 credit hours

Sophomore Year in the associate degree curriculum

Third Semester (17 credit hours)

- ECET 15700 Electronics and Circuit Analysis: 4 credit hours
- BMET 21900 PC & Microcomputers for HETM: 3 credit hours
- BMET 24000 The Technology of Patient Care: 3 credit hours
- MATH 22100 Calculus for Technology I: 3 credit hours
- PHYS 21800 General Physics: 4 credit hours

Fourth Semester (16 credit hours)

- CIT 20200 Network Fundamentals: 3 credit hours
- BMET 32500 Healthcare Devices and Systems: 3 credit hours
- BMET 29500 HETM Internship: 1 credit hour
- PSY B110 Introduction to Psychology: 3 credit hours
- CHEM C110 The Chemistry of Life LEC: 3 credit hours
- Gen Ed Elective (see approved course list: Cultural Understanding): 3 credit hours

Bachelor of Science with a major in Healthcare Engineering Technology Management

Students focus on developing skills necessary to support the safe and effective use of technology in patient care. Students integrate the technical/electrical/computer aspects of medical equipment with the needs of the medical staff and patients. Graduates will become integral members of the health care team, demonstrating excellent problem solving skills blended with an emphasis on customer service toward the medical staff to result in safe and effective patient care. Some graduates may elect to work directly for medical equipment manufacturers, investigating device design, integration, sales or support.

In addition to all the school and university requirements, this degree requires that both the IU Cumulative GPA and the Degree GPA be equal to or greater than 2.000.

Program Educational Objectives for Healthcare Engineering Technology Management

The program educational objectives of the HETM program are to produce graduates who will hold these attributes, as measured in the early years of their careers following graduation:

1. Obtain and advance professionally in technical and multidisciplinary positions that require collaboration and customer service, successfully supporting the use of technology in healthcare.
2. Achieve recognition and/or advancement consistent with education.
3. Continue growth in professional knowledge through additional education, certification, or specialized training.

Freshman Year of the bachelor's degree curriculum

First Semester (16 credit hours)

- BMET 10500 Intro to HETM: 1 credit hour
- TECH 10200 Discovering Technology: 1 credit hour (recommended not required)
- TECH 10500 Introduction to Engineering Technology: 3 credit hours
- ECET 10900 Digital Fundamentals: 3 credit hours
- Gen Ed Elective (see approved course list: Arts & Humanities or Social Science): 3 credit hours
- ENG W131 Reading, Writing, and Inquiry: 3 credit hours

Second Semester (16 credit hours)

- ECET 10700 Introduction to Circuit Analysis: 4 credit hours
- ECET 15500 Digital Fundamentals II: 3 credit hours
- MATH 15400 Algebra & Trigonometry II: 3 credit hours
- COMM R110 Fundamentals of Speech Communication: 3 credit hours
- BMET 22000 Applied Human Biology for HETM: 3 credit hours

Sophomore Year of the bachelor's degree curriculum

Third Semester (17 credit hours)

- ECET 15700 Electronics and Circuit Analysis: 4 credit hours
- BMET 21900 PC & Microcomputers for HETM: 3 credit hours
- BMET 24000 The Technology of Patient Care: 3 credit hours
- MATH 22100 Calculus for Technology I: 3 credit hours
- PHYS 21800 General Physics: 4 credit hours

Fourth Semester (13 credit hours)

- CIT 20200 Network Fundamentals: 3 credit hours
- BMET 32500 Healthcare Devices and Systems: 3 credit hours
- BMET 29500 HETM Internship: 1 credit hour
- PSY B110 Introduction to Psychology: 3 credit hours
- CHEM C110 The Chemistry of Life LEC: 3 credit hours

Junior Year

Fifth Semester (15 credit hours)

- BMET 31500 Introduction to Imaging Modalities: 3 credit hours
- TCM 22000 Technical Report Writing: 3 credit hours
- IET 15000 Quantitative Methods for Technology: 3 credit hours
- CIT 40200 DES & Implem Local Area Network: 3 credit hours
- Gen Ed Elective (see approved course list: Cultural Understanding): 3 credit hours

Sixth Semester (16 credit hours)

- MATH 22200 Calculus for Technology II: 3 credit hours
- ECET 20700 AC Electronics Circuit Analysis: 4 credit hours
- Gen Ed Elective (see approved course list: Arts & Humanities): 3 credit hours
- BMET 42000 Techn & Patient Populations: 3 credit hours
- TCM 32000 Written Communication for Science & Industry: 3 credit hour

Senior Year

Seventh Semester (14 credit hours)

- BMET 44000 Codes Reg & Patient Safety: 3 credit hours
- BMET 49000 Project Planning & Design: 1 credit hour
- BMET 49300 HETM Ethics and Professionalism: 1 credit hour
- TCM 38000 Tech Comm in the Healthcare Profession: 3 credit hours
- OLS Elective: 3 credit hours
- BMET 40200 Networking for Healthcare Systems: 3 credit hours

Eighth Semester (13 credit hours)

- BMET 40100 Clinical Applications of RFID: 3 credit hours
- BMET 49200 Capstone Project: 1 credit hour
- OLS Elective: 3 credit hours
- BUS A200 Foundations of Accounting: 3 credit hours
- Technical Elective (see approved course list): 3 credit hours

Interior Design Technology

Interior Design Technology

Assistant Clinical Professor: E. McLaughlin (Program Director)
Assistant Clinical Professor: D. Nickolson
Senior Lecturer: M.A. Frank
Lecturer: B. Huffman

Associate of Science in Interior Design Technology

The Interior Design curriculum is a two year Associate of Science (A.S.) degree program that uses the latest technology while employing faculty from the areas of interior design, architecture, fine arts, and computer graphics to provide students with the skills necessary to work as interior design assistants and be able to sit for the National Council for Interior Design Qualification (NCIDQ) exam after approximately four years of work experience.

The emphasis is on technical knowledge, methodology, and aesthetic appreciation of interior design for the health, safety, and welfare of the public; equipping students with visual presentation and communication skills; imparting awareness for environmental, business, ethical, and other contemporary issues; and linking classroom knowledge to applications in the field. These graduates can address complex design problems and manage projects. The educational objectives for the A.S. Interior Design are:

1. Demonstrate technical knowledge and application of the design process.
2. Solve problems that are quantitative in nature.
3. Analyze complex issues and apply sound design methodology in multidisciplinary fields of interior design technology.
4. Practice effective communication skills in, oral, written and visual presentations.
5. Increase knowledge and demonstrate solutions sensitive to health, safety and welfare of the public.
6. Work collaboratively and effectively in technology and design related industries.
7. Continue professional advancement through life-long learning.
8. Understand the environmental, ethical, diversity, cultural and contemporary aspects of their work.
9. Be responsible citizens.

Graduates typically find employment in residential design fields in retail settings as sales associates or as manufacture's reps for products, in the kitchen and bath industry, as CAD technicians for the interior design or architecture fields, or as self-employed designers.

Freshman Year

First Semester (15 credits)

- COMM-R 110 Fundamentals of Speech Communication: 3 credits hours
- ENG-W 131 Reading, Writing, and Inquiry: 3 credits hours
- MATH 15300 Algebra & Trig I: 3 credits hours
- HER E109 Color and Design: 3 credits hours
- INTR 10300 Introduction to Interior Design: 3 credits hours

Second Semester (15 credits)

- ART 11700 Introduction to Construction Drafting with CAD: 3 credit hours
- ART 12000 Architectural Presentation: 3 credit hours
- INTR 12400 Space Planning for Interiors: 3 credit hours
- MATH 15400 Algebra & Trigonometry II: 3 credit hours
- Life or Physical Science Selective: 3 credit hours

Sophomore Year

Third Semester (15 credits)

- ART 15500 Residential Construction: 3 credit hours
- HER E209 Drawing for Interior Design: 3 credit hours
- INTR 12500 Color and Lighting: 3 credit hours
- INTR 20200 Interior Materials and Applications: 3 credit hours
- Social Science Selective: 3 credit hours

Fourth Semester (15 credits)

- INTR 20400 History of Interiors I: 3 credit hours
- INTR 22400 Residential I, Kitchen and Bath: 3 credit hours
- INTR 22600 Commercial Systems I: 3 credit hours
- Life of Physical Science Selective: 3 credit hours
- HER H221 Art Past and Present: 3 credit hours

Bachelor of Science in Interior Design Technology

The Interior Design curriculum is a four-year Bachelor of Science (B.S.) degree program that employs faculty from the areas of interior design, architecture, fine arts, computer graphics, and organizational leadership to provide students with the skills necessary to work as professional interior designers and be able to sit for the National Council for Interior Design Qualification (NCIDQ) exam after approximately two years of work experience.

The emphasis is on technical knowledge, methodology, and aesthetic appreciation of interior design for the health, safety, and welfare of the public; equipping students with visual presentation and communication skills; imparting an awareness for environmental, business, ethical, and other

contemporary issues; and linking classroom knowledge to application in the field. These graduates can address complex design problems and manage projects.

The educational objectives for the B.S. Interior Design are:

1. Demonstrate technical knowledge and application of the design process.
2. Solve problems that are quantitative in nature.
3. Analyze complex issues and apply sound design methodology in multidisciplinary fields of interior design technology.
4. Practice effective communication skills in, oral, written and visual presentations.
5. Increase knowledge and demonstrate solutions sensitive to health, safety and welfare of the public.
6. Work collaboratively and effectively in technology and design related industries.
7. Continue professional advancement through life-long learning.
8. Understand the environmental, ethical, diversity, cultural and contemporary aspects of their work.
9. Be responsible citizens.

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

Freshman Year

First Semester (15 credits)

- COMM-R 110 Fundamentals of Speech Communication: 3 credit hours
- ENG-W 131 Reading, Writing, and Inquiry: 3 credit hours
- MATH 15300 Algebra & Trig I: 3 credit hours
- HER E109 Color and Design: 3 credit hours
- INTR 10300 Introduction to Interior Design: 3 credit hours

Second Semester (15 credits)

- ART 11700 Introduction to Construction Drafting with CAD: 3 credit hours
- ART 12000 Architectural Presentation: 3 credit hours
- INTR 15100 Textiles for Interiors: 3 credit hours
- CGT 21100 Raster Imaging for Computer Graphics: 3 credit hours
- MATH 15400 Algebra and Trigonometry II: 3 credit hours

Sophomore Year

Third Semester (15 credits)

- ART 15500 Residential Construction: 3 credit hours
- INTR 12400 Space Planning for Interiors: 3 credit hours
- INTR 12500 Color and Lighting: 3 credit hours
- INTR 20200 Interior Materials and Applications: 3 credit hours
- HER E209 Drawing for Interior Design: 3 credit hours

Fourth Semester (15 credits)

- ART 21000 History of Architecture: 3 credit hours
- ART 22200 Commercial Construction: 3 credit hours
- INTR 22400 Residential I, Kitchen and Bath: 3 credit hours
- INTR 20400 History of Interiors I: 3 credit hours
- INTR 22600 Commercial Systems I: 3 credit hours

Junior Year

Fifth Semester (15 credits)

- INTR 30400 History of American Interiors and Furn: 3 credit hours
- INTR 32400 Residential Interior Design Studio II: 3 credit hours
- INTR 32500 Environmental Lighting Design: 3 credit hours
- CGT 22100 Graphical Represent. in Arch. Docs: 3 credit hours
- INTR 22500 3D Interior Design Studio: 3 credit hours

Sixth Semester (15 credits)

- INTR 32600 Commercial Interiors II: 3 credit hours
- CGT 32100 Advanced Digital Pictorial Illustration: 3 credit hours
- HER H221 Art Past and Present: 3 credit hours
- TECH 30010 Internship: 3 credit hours
- OLS 25200 Human Behavior in Organizations: 3 credit hours

Senior Year

Seventh Semester (15 credits)

- OLS 37100 Project Management: 3 credit hours
- Life Science Elective: 3 credit hours
- INTR 42600: Healthcare Design Studio: 3 credit hours
- INTR 45200: Building Systems: 3 credit
- INTR 45300: Business Practices: 3 credit hours

Eighth Semester (15 credits)

- INTR 42800 Capstone: 3 credit hours
- INTR 48000 Senior Thesis: 3 credit hours
- INTR 49500 Sustainable Design: 3 credit hours
- Life Science elective: 3 credit hours
- Social Science Elective: See Approved List: 3 credit hours

NOTE: A grade of a C or higher must be obtained in all INTR courses in order to progress in the program.

Plan of Study effective fall 2013.

Interior Minor

The Interior Design Technology minor presents the opportunity for any student to gain simple interior design proficiencies and knowledge through coursework that may be used to supplement their primary degree while exposing the student to an innovative and diverse area of study. Studio based requirements will challenge students to complete experiential exercises and projects, while lecture based coursework required through the minor will offer the student the ability to study specialty topics such as design history, textiles or sustainability, further augmenting their comprehension of the industry.

Upon completion of the Interior Design Technology minor, students will be able to:

- Recognize and apply the basic elements and principles of design to interior environments.

- Comprehend the design process as utilized on all design projects.
- Manually draft basic floor plans precisely.
- Plan both residential and commercial spaces accurately.
- Understand the fundamental proficiencies and aptitudes required for a career in interior design.
- Effectively communicate design ideas through written, verbal, and graphic means.

Note: While the minor will supplement any student's primary discipline with additional knowledge, the minor will **not** qualify an individual to work exclusively in the field.

Curriculum (6 courses/18 credit hours)

Required Courses (2 courses)

- INTR 10300 - Introduction to Interior Design
- INTR 12400 - Space Planning for Interiors

Studio-based Elective Courses (2 courses; select from the following list:)

- ART 11700 - Introduction to Construction Drafting with CAD
- ART 12000 - Architectural Presentation
- INTR 12500 - Color and Lighting (Prereq HER-E 109)
- INTR 20200 - Interior Materials and Applications
- INTR 22400 - Residential I, Kitchen and Bath

Lecture-based Elective Courses (2 courses: select from the following list:)

- ART 21000 - History of Architecture
- INTR 15100 Textiles for Interiors
- INTR 20400 - History of Interiors I
- INTR 30400 - History of American Interiors and Furniture
- INTR 49500 - Sustainable Design

A grade of C is required in all course work credited toward the minor.

Mechanical Engineering Technology

Mechanical Engineering Technology

Associate Professors: D. Acheson, K. Rennels, P. Hylton, R. Chen
Assistant Clinical professor: P Yearling (Program Director)
Lecturer: R. Durkin
Visiting Lecturers: L. Silvian, E. McGraw

The Department of Engineering Technology offers a Bachelor of Science degree in mechanical engineering technology. In addition, students are encouraged to enhance their knowledge base through the School of Engineering and Technology certificate program.

For more information, contact the Department of Engineering Technology at (317) 274-2363, or email aland@iupui.edu , or visit our Web site at: www.engr.iupui.edu/met. Certificate Program Website: http://www.engr.iupui.edu/main/academics/undergrad/certificates.php

Bachelor of Science in Mechanical Engineering Technology

Accredited by the Engineering Technology Accreditation Commission (ETAC) of ABET http://www.abet.org

This program emphasis is on putting knowledge into action, students become skilled in the generation, transmission, and utilization of mechanical and fluid energy, as well as the design and production of tools, materials, machines and their products. Graduates of this program find positions as Process Engineers, Production Engineers, Quality Engineers, Maintenance Engineers, Quality Specialists, Reliability and Test Engineers, and Facilities Managers. The courses are offered both in the day and evening.

In addition to all the school and university requirements, this degree requires that both the IU Cumulative GPA and the Degree GPA be equal to or greater than 2.000.

Program Educational Objectives for Mechanical Engineering Technology

Three to five years after graduation, alumni of the Mechanical Engineering Technology Program at IUPUI will be able to:

1. Work competently in technical and professional careers related to the field of Mechanical Engineering Technology.
2. Achieve recognition and/or advancement consistent with their education.
3. Continue growth in professional knowledge through additional education, certification, or licensing.

Freshman Year

First Semester (15 credit hours)

- ENG-W 131 Reading, Writing, and Inquiry: 3 credit hours
- MATH 15900 Precalculus: 5 credit hours
- TECH 10200 Technology Learning Community: 1 credit hour
- TECH 10400 Technical Graphics Communication: 3 credit hours
- TECH 10500 Introduction to Engineering Technology: 3 credit hours

Second Semester (17 credit hours)

- CHEM-C 101 Elementary Chemistry I: 3 credit hours
- MET 11100 Applied Statics: 3 credit hours
- MET 20400 Introduction to Design: 3 credit hours
- IET 10400 Industrial Organization: 3 credit hours
- COMM-R 110 Fundamentals of Speech Communication: 3 credit hours

Sophomore Year

Third Semester (15 credit hours)

- MATH 22100 Calculus for Technology I: 3 credit hours
- MET 21100 Applied Strength of Materials: 4 credit hours
- TCM 2XX Introduction to Report Writing: 1 credit hours
- MET 21300 Dynamics: 3 credit hours

- PHYS 21800 General Physics I: 4 credit hours

Fourth Semester (15 credit hours)

- MATH 22200 Calculus for Technology II: 3 credit hours
- MET 21400 Machine Elements: 3 credit hours
- MET 23000 Fluid Power: 3 credit hours
- MET 22000 Heat and Power: 3 credit hours
- Gen Ed Elective (see approved course list: Arts and Humanities): 3 credit hours

Junior Year

Fifth Semester (14 credit hours)

- MET 32000 or MET 32900 Applied Thermodynamics or Introduction to Heat Transfer: 3 credit hours
- TCM 3XX Technical Report Writing: 1 credit hours
- IET 15000 Quantitative Methods for Technology: 3 credit hours
- MET 32800 CAD/CAM for Mechanical Design: 3 credit hours
- MET 34800 Engineering Materials: 4 credit hours

Sixth Semester (16 credit hours)

- ECET 11600 Electrical Circuits: 3 credit hours
- IET 35000 Engineering Economics: 3 credit hours
- MET 31000 Computer Aided Machine Design: 3 credit hours
- TCM 3XX Technical Report Writing: 1 credit hour
- MET 35000 Applied Fluid Mechanics: 3 credit hours
- ECET 16400 Object Oriented Programming: 3 credit hours

Senior Year

Seventh Semester (16 credit hours)

- ECET 35100 Instrumentation and Controls: 3 credit hours
- MET 33800 Manufacturing Process: 4 credit hours
- Technical Selective Sustainability List: 3 credit hours
- Gen Ed Elective (see approved course list: Social Science): 3 credit hours
- Technical Selective MET, IET, or TECH 5XX: 3 credit hours

Eighth Semester (14 credit hours)

- MET 41400 Design of Mechanical Projects: 3 credit hours
- TCM 4XX Oral & Written Design Reports: 1 credit hours
- Gen Ed Elective (see approved course list: Cultural Understanding): 3 credit hours
- Gen Ed Elective (see approved course list: Arts or Social Science): 3 credit hours
- Technical Selective MET, IET, or TECH 5XX: 3 credit hours
- ECET 49300 Ethics & Professionalism: 1 credit hour

Motorsports Engineering

Motorsports Engineering

Associate Professor P. Hylton *(Program Director)*

Lecturer C. Finch, S. Raymond

IUPUI is the first University in the United States to offer a bachelor's degree in motorsports engineering

The motorsports industry is growing and expected to continue to grow at a rapid pace. By most accounts, Indiana, North Carolina, and England are recognized as the three leading local motorsports economies. Indianapolis, while generally known as the home of open-wheel racing has a broad appeal. It is also known for sprint cars, midgets, karting, NHRA, and many other forms of racing. It is estimated that there are over 400 motorsports-related firms in the Indianapolis region including companies that produce engines, brakes, shocks, springs, and other racing products.

Bachelor of Science in Motorsports Engineering

This 4-year Bachelor of Science of Degree in Motorsports Engineering was approved in May, 2008. This program, which aims to prepare graduates for careers in the motorsports industry, as well as automotive-related companies, focuses on teaching fundamentals of engineering and will include hands-on projects that involve designing, analyzing, and building of actual systems for motorsports.

Freshman Year

First Semester (17 credit hours)

- ENG-W 131 - Reading, Writing and Inquiry: 3 credit hours
- MATH 16500 - Calculus I: 4 credit hours
- ENGR 19500 - Learning Community: 1 credit hour
- CHEM C 10500 - Chemistry II: 3 credit hours
- MSTE 27200 - Intro to Motorsports: 3 credit hours
- COMM-R 110 - Fundamentals of Speech Communication

Second Semester (18 credit hours)

- MSTE 31200 - Business of Motorsports: 4 credit hours
- MATH 16600 - Calculus II: 4 credit hours
- PHYS 15200 - General Physics I: 4 credit hours
- MSTE 29800 - Computer Modeling & Programming: 2 credit hours
- MATH 17100 - Multidimensional Math: 3 credit hours
- MSTE 29700 - Modeling for Motorsports: 1 credit hour

Sophomore Year

Third Semester (18 credit hours)

- MSTE 26100 - Multivariate Calculus: 4 credit hours
- PHYS 25100 - General Physics II: 5 credit hours
- MSTE 35000 - Computer Aided Design and Mfg.: 3 credit hours
- MSTE 21000 - Statics and Dynamics: 4 credit hours
- MSTE 21700 - Motorsports Practicum I: 1 credit hour

Fourth Semester (17 credit hours)

- MET 33800 - Manufacturing Processes: 3 credit hours
- ECE 20400 - Electrical & Electronics Circuits: 4 credit hours
- ME 27200 - Strength of Materials: 4 credit hours

- MSTE 32000 - Motorsports Design I: 3 credit hours
- ME 20000 - Thermodynamics: 3 credit hours

Junior Year

Fifth Semester (17 credit hours)

- MSTE 47200 - Vehicle Dynamics: 3 credit hours
- MSTE 33000 - Data Acquisition in Motorsports I: 3 credit hours
- MATH 26600 - Ordinary Diff. Equations: 3 credit hours
- ME 31000 - Fluid Mechanics: 4 credit hours
- MSTE 31700 - Motorsports Practicum II: 1 credit hours
- Gen Ed Elective - See approved Course List: 3 credit hours

Sixth Semester (15 credit hours)

- MSTE I 4100 - Internship: 1 credit hour
- MSTE 33100 - Data acquisition in Motorsports II: 3 credit hours
- MSTE 3400 - Dynamic Systems and Signals: 3 credit hours
- IET 15000 - Statics: 3 credit hours
- ME 34400 - Materials: 3 credit hours
- TCM 36000 - Communications/Writing: 2 credit hours

Senior Year

Seventh Semester (13 credit hours)

- MSTE 48200 - Motorsports Aero: 3 credit hours
- ME 48200 - Control Systems Analysis and Des.: 3 credit hours
- Gen Ed Elective - See approved course list: 3 credit hours
- Technical Selective - See approved course list: 3 credit hours
- MSTE 41700 - Motorsports Practicum III: 1 credit hour

Eighth Semester (14 credit hours)

- MSTE 41400 - Motorsports Design II: 3 credit hours
- MSTE 42600 - Internal Combustion Engines: 3 credit hours
- Tech Elective - See approved course list: 2 credit hours
- Gen Ed Elective - See approved course list: 3 credit hours
- PHIL P120 - Ethics: 3 credit hours

Motorsports Engineering Certificate

This certificate provides an educational opportunity in the basics of the motorsports industry. Motorsports is a rapidly expanding segment of the Indiana employment market. This certificate will assist in developing technical skills in this area. A certificate and transcript notation will be awarded upon completion of the course work.

A total of 27 credit hours and a cumulative grade point average of 2.0 on a 4.0 scale is required to receive the certificate. Two versions of the motorsports certificate exists, one with a Mechanical (MET) emphasis and one with an Electrical (EET) emphasis.

All students must complete the following courses or their equivalents.

Mechanical Engineering Technology (MET) Emphasis:

- MATH 15900 - Algebra & Trigonometry or Math 15300/15400 Algebra & Trigonometry I & II: 5 credit hours
- MET 11100 - Statics: 3 credit hours
- MET 21300 - Dynamics: 3 credit hours
- MET 38800 - Thermodynamics & Heat and Power: 4 credit hours
- MSTE 27200 - Intro to Motorsports: 3 credit hours
- MSTE 42600 - IC Engines: 3 credit hours
- MSTE 47200 - Vehicle Dynamics: 3 credit hours
- A project course with a Motorsports related project: 3 credit hours

Electrical Engineering Technology (EET) Emphasis:

- MATH 159 - Algebra & Trigonometry or MATH 15300/15400 Algebra & Trigonometry I & II: 5 credit hours
- ECET 10700 - Circuits: 4 credit hours
- MSTE 27200 - Intro to Motorsports: 3 credit hours
- ECET 15700 - Electronic Circuit Analysis: 4 credit hours
- PHYS 21800 - Physics: 4 credit hours
- MSTE 33000 - Data Acquisition for Motorsports: 3 credit hours
- MSTE 47200 - Vehicle Dynamics: 3 credit hours
- A project course with a Motorsports related project: 3 credit hours

Architectural and Interior Design Graphics Certificate

Architectural and Interior Design Graphics Certificate

The fields of architecture and interior design are extremely interrelated. Both require practitioners to sustain specific skill sets relative to computer-aided drafting, BIM and graphics for the purpose of communicating design ideas to the public. In an age of progressive technology, it is difficult for design professionals to stay abreast of the modern techniques and software programs which are needed to compete in a market flooded with fresh talent. This certificate will offer entry level training to out of date design professionals, or any individual wishing to augment their existing skill sets with the latest design related software applications.

Upon completion of the Certificate in Architectural and Interior Design Graphics, students will be able to:

- Use Computer-Aided Drawing software to communicate 2 dimensional design ideas.
- Use Computer-Aided Drawing software to communicate 3 dimensional design ideas.
- Understand color theory, surface rendering and light control in relation to technical illustration.
- Electronically model furniture, interiors and architecture for a built environment
- Create photo-realistic renderings to communicate design ideas.

- Effectively communicate graphic skill sets through a design portfolio.

The 15 credit hour curriculum:

- ART 11700 - Introduction to Construction Drafting with AutoCAD: 3 credit hours
- ART 29900 - Introduction to Revit: 3 credit hours
- CGT 21100 - Raster Imaging for Computer Graphics (Photoshop): 3 credit hours
- CGT 22100 - Graphical Representation in Architectural Documents (Sketchup Modeling): 3 credit hours
- CGT 32100 - Advanced Digital Pictorial Illustration (Sketchup Rendering): 3 credit hours

Candidates for this certificate are required to be formally admitted by the IUPUI Office of Admissions, but are not required to be a student in the Purdue School of Engineering and Technology. Each student must meet with an INTR Advisor to declare their intent to pursue the certificate and complete the Application forms. A history of some practical experience or familiarity with the fields of interior design or architecture is recommended, but not required.

Courses will be offered in formats that are conducive to a professional's busy schedule. Evening, condensed intensive, or hybrid formats are possible.

Lean Six Sigma

Lean Six Sigma

The Lean Six Sigma belt certification program is based on the existing Quality Assurance Certificate (QAC) course structure. Therefore, a student is able to progress from a Green Belt to Black Belt, and Quality Certification depending on the number of classes the student chooses to take.

Lean Six Sigma (LSS) is the combination of two proven methodologies for improving total organization performance through systematic and continuous process improvement. LSS has become the de facto process improvement methodology of choice in the manufacturing, healthcare, insurance and military sectors. Training is based around a graduated belt system dependent on number of training hours and project completion.

Students must complete the following:

Curriculum (9 credit hours)

- IET 36400 - Total Quality Control: 3 credit hours
- IET 45400 - Statistical Quality Control: 3 credit horus
- Undergraduate or Graduate Directed Project (approved and supervised by LSS faculty: 3 credit hours

Quality Assurance Certificate Program

Quality Assurance Certificate Program

Developed in conjunction with the Northeast Indiana Section of the American Society for Quality Control, this certificate program provides training and instruction in the use of measuring instruments and techniques of statistical quality control. The course work provides a basis for putting these techniques to work in the quality control system of an industrial organization. The program includes an investigation of the concept of quality control and the impact of quality costs, determination of customer needs, and follow-up on field performance and feedback. A certificate will be presented to those who successfully complete all course work and the transcript noted.

A total of 20 credit hours and cumulative grade point average of 2.0 on a 4.0 scale is required to receive the certificate.

All students must complete the following courses:

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

Curriculum (23 credit hours)

- MATH 15100 or MATH 15300/15400 Algebra and Trigonometry: 5 credit hours
- MET 10500 Intro to Engineering Technology: 3 credit hours
- IET 30000 Metrology for Quality Assurance: 3 credit hours
- IET 15000 Quantitative Methods for Technology: 3 credit hours
- IET 36400 Total Quality Control: 3 credit hours
- IET 37400 Nondestructive Testing or
- IET 47400 Quality Improvement of Products and Processes: 3 credit hours
- IET 45400 Statistical Quality Control: 3 credit hours

Sustainable Technologies Certificate

Sustainable Technologies Certificate

Purpose

In the United States, sustainability has gained importance in business, industry, government, government agencies, higher education, and in the general public's consciousness. The goal of meeting today's needs without harming future generations' ability to realize their potential is a hallmark of sustainable practices, and there is widespread interest from many disciplines and sectors in developing, enhancing, and integrating sustainability into aspects of products, services, and solutions. Thus, the need to equip students with the knowledge, skills, and perspectives to make contributions to sustainability initiatives has never been greater. Green jobs are rapidly being created as the economy begins embracing sustainable, energy efficiency, and low-carbon practices.

The driving forces behind the development of green jobs are businesses wishing to maintain cutting edge technology, become more energy efficient, while lowering their carbon footprint, or becoming entirely carbon neutral.

The governments of the world, the U.S. being one of them, support these developments through initiatives including: federal funding, subsidies, tax reform, and carbon markets.

This certificate is designed to address a growing need for professionals who can contribute to the green global workforce with knowledge in sustainable practices in current technologies. The Sustainable Technologies

Certificate will be beneficial to students who want to acquire knowledge in areas of renewable energies, green building, and sustainable design, and who may want to pursue a career in a sustainable technology. All of the Sustainable Technologies Certificate courses will be offered online.

Admission

Candidates for this certificate are required to be formally admitted by the IUPUI Office of Admissions, but not required to be a student in the Purdue School of Engineering Technology. To earn the Sustainable Technologies Certificate, or any other certificates, students must contact the department to complete paperwork to add the certificate to their program plan of study before they enroll in the last semester or sooner. Applications for graduation must be completed one semester prior to completion of the required curriculum.

Curriculum (18 credit hours)

Students are required to successfully complete a total of 6 courses (18 credit hours) to earn the certificate. No more than 6.0 units of transfer credit can be applied towards this certificate. All students must successfully complete all of the following required core courses:

- TECH 20100 - Introduction to Sustainable Principles and Practices - 3 credit hours
- TECH 30100 - Renewable Energy Technologies* - 3 credit hours
- TECH 30200 - Introduction to Green Building Technologies*[1] or
  - TECH 30400 - Green Building: Information Modeling[1] - 3 credit hours
- TECH 30300 - Energy Efficiency and Auditing - 3 credit hours
- TECH 40100 - Leadership and Economic Aspects of Sustainability - 3 credit hours
- TECH 40200 - Emerging Green Technologies* - 3 credit hours

[1] For the certificate students choose just one of these courses.

Music and Arts Technology (MAT)

Music & Arts Technology (MAT)

Chair: Debra Burns, Professor of Music & Arts Technology

The Department of Music and Arts Technology reflects urban culture, contemporary and digital arts. Special courses on American popular music, contemporary music performance styles, music technology and music therapy are delivered by innovative instructional technology. The department's technology facilities have captured national attention.

The Department of Music and Arts Technology is committed to delivering quality music instruction to the undergraduate and graduate students at the nation's premiere urban institution. Most undergraduate courses carry no prerequisites and are open to all students. Performance ensembles are open to students, staff, faculty, and community members.

Ensemble groups include the IUPUI Jazz Ensemble, IUPUI Jazz Combos, Pep Band, University Choir, IUPUI Percussion Ensemble, Guitar Ensemble, Steel DrumEnsemble, Afro-Cuban Percussion Ensemble, Chamber Ensemble, Telematic Performing Ensemble, Electro-Acoustic Ensemble, Electronic Music Ensemble, and Laptop Orchestra.

This department awards degrees from Indiana University.

For more information, call or write: Department of Music and Arts Technology, IUPUI, 535 W. Michigan Street, Indianapolis, IN 46202, (317) 274-4000.

Web: music.iupui.edu

Undergraduate Programs

Music Minor

The Department of Music and Arts Technology welcomes students whose majors are outside the department, but who wish to minor in music. There is no audition required to minor in music, but students must declare music as their minor at the appropriate time in their undergraduate studies.

Music minors should participate in music ensembles within the Department of Music and Arts Technology and should register (or audition when required) for these ensembles during undergraduate orientation or the first week of class. The IUPUI Flute Choir, Jazz Ensemble, Pep Band, University Choir, Guitar Ensemble, and Urban Drum Experience are open to all students.

Music Minor in Musical Theatre

The Music Minor in Musical Theatre program (M.M.M.T.) is designed for students seeking to immerse themselves in the art of musical theatre.

This program provides opportunity in the creative process as well as becoming more in tune with the human experience.

Emphasis will be placed on performance that includes singing, acting (character development) and staging.

This course of study includes an annual performance open to family and friends.

Bachelor of Science in Music Technology

The Bachelor of Science in Music Technology degree is designed to provide professional training for students seeking careers that employ music technology. The program builds skills and knowledge common to the music industry and professional fields. The program is broad in scope and enables students to function effectively in the changing, contemporary musical world.

It fosters leadership skills in the areas of creativity, entrepreneurship, self-reliance, and resourcefulness.

The BSMT graduate will be able to adapt knowledge gained from this program to related disciplines beyond traditional music specializations. It will serve as a platform for students seeking the IUPUI Master of Science in Music Technology degree and will prepare graduates for advanced musical and technical study.

Overview

One hundred and twenty (120) hours of course work are required for this IU Degree. Students are engaged in making music with technology, performing, composing and producing digital music formatted materials. Students study musicianship during the first two years of the degree program, which combines music theory, history, keyboard and aural training. They participate in music ensembles and applied music lessons each semester of this four-year course of study.

Students also develop an outside concentration related to the degree. Examples might be in Business, Computer Technology, Informatics, Communication Studies, Mathematics, or Languages.

Admission Requirements

- High School Diploma
- SAT Scores
- Admittance into IUPUI: Bachelor's degree admission requirements
- TOEFL: a provisional minimum of 61+ (internet-based version/iBT), 173+ (computer-based version/ CBT), or 500+ (paper-based version/PBT) http://www.toefl.org. You must request that official score reports be sent to IUPUI. Use school code 1325.
- Completed BSMT Application send to Department of Music and Arts Technology
- Audition
- Interview
- Basic Musical Skills Test
- Additional information may be requested to document musical skills or experience with technology.

Music Therapy Equivalency Program

The music therapy equivalency program is designed to assist students who already have an undergraduate degree in music in obtaining the needed competencies to become board-certified music therapists.

Admission Requirements

- Bachelor's degree in music from NASM-approved school
- Minimum grade point average of 3.0 (4.0 scale)
- Submission of a university and a department application
- Official transcripts of all college course work
- Evidence of musicianship through performance videotape, audio cassette, CD/DVD, or live audition
- Three letters of recommendation required to support the admission application
- In-person or telephone admission interview with the music therapy faculty
- Non-native speakers must demonstrate English language proficiency with a minimum TOEFL score of 600/97. International students will also need to meet the application requirements of the IUPUI Office of International Affairs.

Admission Categories

Upon receipt of the completed application, letters of recommendation, transcript, evidence of musicianship, and the interview, the Graduate Admissions Committee of the IU Department of Music and Arts Technology at IUPUI may grant regular admission, grant admission on probation, or reject the application.

Admission on Probation

Students who do not have an undergraduate average of 3.0 or higher may be admitted on probation in exceptional cases. The probationary status continues until 9 credit hours of course work have been successfully completed. Students who are admitted on probation and incur academic probation during their first semester of study are subject to dismissal.

Program Requirements

Program requirements vary depending on the student's background and educational needs. The American Music Therapy Association and the Certification Board for Music Therapists have identified minimum competencies needed to become board certified as a music therapist. The faculty and student will determine which competencies have not been addressed during previous course work, this needs and strength analysis will determine the courses needed to meet the standards.

Minimum Grade Point Average

- 3.0 average to continue
- No grades lower than C in music therapy core courses are counted toward equivalency

Music Therapy Equivalency Curriculum

There are 22 credit hours of music therapy core courses and 7 credit hours of practicum courses (including internship) required for the equivalency program. In addition, courses in clinical (psychology and anatomy) and musical foundations may be required, depending on the student's previous educational background.

M.S. in Music Technology

M.S. in Music Technology
On-Campus Program

The Master of Science in Music Technology provides graduate students an academic background in digital music production, instructional design, and multimedia development. Current graduates of this master's program have found employment in a wide range of business and educational settings. Participants develop skills in designing software, using authoring tools and languages, applying multimedia concepts, and managing technology facilities and projects. This degree is offered as an on-campus or online program.

Admission Requirements

1. Bachelor's degree (with demonstrated musicalskills)
2. Minimum grade point average of 3.0 (4.0 scale)
3. Submission of a university and a department application
4. Official transcripts of all undergraduate and graduate study
5. Evidence of musicianship through performance videotape, audio cassette, CD/DVD, or live audition
6. Three letters of recommendation required tosupport the admission application
7. In-person or telephone admission interview withthe Head of Graduate Studies

8. Non-native speakers must demonstrate English language proficiency with a minimum TOEFL score of 550/79 International students will also need to meet the application requirements of theIUPUI Office of International Affairs

Admission Categories
Upon receipt of the completed application, letters of recommendation, transcript, evidence of musicianship, and the interview, the Graduate Admissions Committee of the IU Department of Music and Arts Technology at IUPUI may grant regular admission, grant admission on probation, or reject the application.

Admission on Probation
Students who do not have an undergraduate and graduate grade point average of 3.0 or higher may be admitted on probation in exceptional cases. The probationary status continues until 9 credit hours of course work have been successfully completed. At this time student admission requests are re-evaluated. Students who are admitted on probation and incur academic probation during their first semester of study are subject to dismissal.

Degree Requirements
- 30 credit hours (18 credit hours at the 500 level or above)
- 6 credit hours in cognate courses (at the 400 level or above) to be selected from music, business, communications, computer science, education, fine arts, or law
- 6 credit hours of approved courses (at the 400 level or above) from the cognate field or other fields with the approval of the Head of Graduate Studies

Minimum Grade Point Average
- 3.0 average to continue
- No grades lower than B in core courses arecounted toward the degree
- No grades lower than C are counted toward thedegree

Residency Requirements (for on-campus students only)
- Three consecutive summers, two contiguous academic terms

Core Courses
The following courses, totaling 18 credit hours, are required of all students enrolled in the Master of Science in Music Technology program:

Class/Credit Hours

- N512 Foundations of Music Production - 3 cr.
- N513 Principles of Multimedia Technology - 3 cr.
- N514 Music Technology Methods - 3 cr.
- N515 Multimedia Design Applications in the Arts - 3 cr.
- N516 Advanced Interactive Design Applications in the Arts - 3 cr.
- N517 Internship in Arts Technology or N518 Arts Technology Major Project - 3 cr.

Total Credit Hours - 18

Cognate Field Courses
Six (6) credit hours are required in an approved cognate field within or outside the Department of Music and Arts Technology. Students may choose to complete the remaining 6 credit hours with emphasis in one of the following areas: music, business, communications, computer science, education, fine arts, law, or others with the approval of the department. The cognate field may become a minor if at least 12 credit hours are taken in one field.

Internship or Technology Project
Students may elect to enroll in an internship (N517) or develop a multimedia project (N518) as the summative experience in the program. Either option is supervised by the student's academic advisor and requires a full report. (These courses are part of the core courses listed previously.) Students participating in the internship are placed in an academic technology setting or an industry setting for one semester of experience working with technology and multimedia experts. No thesis is required for the degree.

Online Program: Master of Science in Music Technology
The IUPUI Department of Music and Arts Technology offers the entire M.S.M.T. Program "live," using streaming video, videoconferencing and audio through the Internet. All course and degree requirements are the same as the on-campus program.

Admission Requirements
- Bachelor's degree (with demonstrated musical skills)
- Minimum grade point average of 3.0 (4.0 scale)
- Submission of a university and a department application
- Official transcripts of all undergraduate and graduate study
- Evidence of musicianship through performance videotape, audio cassette, or CD/DVD
- Three letters of recommendation are required tosupport the admission application
- In-person or telephone admission interview withthe Head of Graduate Studies
- Non-native speakers must demonstrate English language proficiency with a minimum TOEFL score of 550/79 International students will also need to meet the application requirements of theIUPUI Office of International Affairs

Admission Categories
Upon receipt of the completed application, letters of recommendation, transcript, evidence of musicianship, and the interview, the Graduate Admissions Committee of the IU Department of Music and Arts Technology at IUPUI may grant regular admission, grant admission on probation, or reject the application.

Admission on Probation
Students who do not have an undergraduate and graduate grade point average of 3.0 or higher may be admitted on probation in exceptional cases. The probationary status continues until 9 credit hours of course work have been successfully completed. At this time student admission requests are re-evaluated. Students who are admitted

on probation and incur academic problems during their semesters of study are subject to dismissal.

Degree Requirements

- 30 credit hours (18 hours at the 500 level orabove)
- 6 credit hours in cognate courses (at the 400 level or above) to be selected from music, business, communications, computer science, education, fine arts, or law
- 6 credit hours of approved courses (at the 400 level or above) from the cognate field or other fields with the approval of the Head of Graduate Studies

Minimum Grade Point Average

- 3.0 average to continue
- No grades lower than B in core courses arecounted toward the degree
- No grades lower than C are counted toward thedegree

Virtual Residency Requirement

Course enrollment during three consecutive summers, or one summer and a contiguous academic term.

Core Courses

The following courses, 18 credit hours, are required of all students enrolled in the M.S.M.T. program:

Class/Credit Hours

- N512 Foundations of Music Production - 3 cr.
- N513 Principles of Multimedia Technology - 3 cr.
- N514 Music Technology Methods - 3 cr.
- N515 Multimedia Design Applications in the Arts - 3 cr.
- N516 Advanced Interactive Design Applications in the Arts - 3 cr.
- N518 Arts Technology Major Project - 3 cr.

Total Credit Hours - 18

Cognate Field Courses

Six (6) credit hours are required in an approved cognate field within or outside the Department of Music and Arts Technology. Students may choose to complete the remaining 6 credit hours with emphasis in one of the following areas: music, business, communications, computer science, education, fine arts, law, or others with the approval of the department. The cognate field may become a minor if at least 12 credit hours are taken in one field.

Technology Project

Students develop a multimedia project (N518) as the summative experience in the program. This project is supervised by the student's academic advisor and requires a full report. (This course is part of the core courses listed previously.) No thesis is required for the degree.

M.S. in Music Therapy

M.S. in Music Therapy

The Master of Science in Music Therapy program is designed to provide professional music therapists with advanced research skills and clinical practice in music therapy, and to teach music therapists how to utilize the array of tools available in music technology for such purposes. This degree is offered on campus and online.

Admission Requirements

1. Bachelor's degree in music therapy or its equivalent
2. Board certified by the Certification Board for Music Therapists
3. Minimum grade point average of 3.0 (4.0 scale)
4. Submission of a university and adepartment application
5. Official transcripts of all undergraduate and graduate study
6. Three letters of recommendation
7. In-person or telephone admission interview withmusic therapy faculty
8. Videotaped music therapy session (with accompanying documentation, the function oftherecording is equivalent to a music audition;it will not be an actual session)
9. Non-native speakers must demonstrate English language proficiency with a minimum TOEFL score of 600/97. International students will also need to meet the application requirements of theIUPUI Office of International Affairs.

Admission Categories

Upon receipt of the completed application, letters of recommendation, transcript, evidence of musicianship, and the interview, the Graduate Admissions Committee of the IU Department of Music and Arts Technology at IUPUI may grant regular admission, grant admission on probation, or reject the application.

Admission on Probation

Students who do not have an undergraduate and graduate grade point average of 3.0 or higher may be admitted on probation in exceptional cases. The probationary status continues until 9 credit hours of course work have been successfully completed. At this time student admission requests are re-evaluated. Students who are admitted on probation and incur academic probation during their first semester of study are subject to dismissal.

Degree Requirements

- A total of thirty (30) credit hours are required for completion of the degree, including:
- 12 credit hours in music therapy (at the 500 level or above);
- 9 credit hours in core music technology courses (at the 500 level or above);
- 6 credit hours of cognates (at the 500 level or above);
- 3 credit hours of thesis

Minimum Grade Point Average

- Minimum 3.0 average to continue
- No grades lower than B in core courses arecounted toward the degree
- No grades lower than C are counted toward thedegree

Core Courses

The following courses are required of all students enrolled in the Master of Science in Music Therapy program:

Class/Credit Hours

- N512 Foundations of Music Production - 3 cr.

- N513 Principles of Multimedia Technology - 3 cr.
- N514 Music Technology Methods - 3 cr.
- N521 Research Methods in Arts and Music Technology - 3 cr.
- N530 Philosophy and Theory in Music Therapy - 3 cr.
- N531 Music Therapy Quantitative and Qualitative Research - 3 cr.
- N532 Music in Medicine - 3 cr.
- N533 Advanced Clinical Techniques in Music Therapy - 3 cr.
- N600 Music Therapy Thesis
-

Music Therapy Thesis

The thesis is the final academic requirement for the degree. The thesis proposal must be approved by a faculty committee before enrollment in the thesis will be permitted.

Other Information

IUPUI Music Academy

The IUPUI Music Academy is a non-profit community music school committed to providing high quality, professional music instruction to area residents of all ages and levels of ability. The academy serves over 500 people each year, ages 18 months through adulthood, by offering music classes for children and adults, ensembles, and private lessons. The academy is a member of the National Guild of Community Schools of the Arts.

Music at the Center for Young Children

Children attending the IUPUI Center for Young Children (CYC) can participate in preschool music classes during the weekday. Classes are held at the CYC after lunch, so students do not miss any instruction time from the CYC program.

For more information, contact:

E.J. Choe, Director
IUPUI Music Academy
535 W. Michigan Street, Room 378
Indianapolis, IN 46202

musacad@iupui.edu
Phone: (317) 278-4139
Fax: (317) 278-2590
Web: www.musicacademy.iupui.edu

International Music Technology Conference and Workshop

The Annual International Music Technology Conference and Workshop is hosted in Indianapolis during the latter part of June. Participants may register for graduate credit. During the International Computer Music Technology Conference, they will be able to see and experiment with the latest technology. There is a technology facility and three labs to which they may have access.

The IUPUI Computer Music Technology Facility includes two fully-networked computer music technology laboratories with video-streaming equipment for Internet-based participants. Eachworkstation is equipped with a multimedia computer and an Axiom 61keyboard. The Digital Keyboard Lab is equipped with 16Roland keyboards, a Roland controller audio system, Dell XPS-one computers, and a Teacher Station.

The Graduate Multimedia Lab has full production capabilities, including a digital flatbedscanner, video and photographic digital cameras, sound- and video-editing software, multimedia authoring tools and CD/DVD-ROM burner hardware and software. Both PC and Macintosh computers are available.

The Digital Sound Design Lab provides capabilities for all aspects of digital audio and MIDI-based production for sound tracks, multimedia design, sound sampling, sound design, and collaborative composition over the Internet.

Participants have the opportunity to work with both Macintosh and Windows applications. Topics include the following:

- Multimedia applications
- CD/DVD technology
- Music notation, sequencing and sampling
- Internet resources and Web design
- Computer-based music instruction
- Music workstation design and construction
- Grant writing and fundraising for technology support
- Computer-based music curriculum design
- Special topics (e.g., podcasting, wikis, distance learning, new music software products)

Organizational Leadership and Supervision

Organizational Leadership and Supervision

Associate Professors S. Hundley, C. Feldhaus, T. Egan
Clinical Professors P. Fox, T. Diemer
Senior Lecturer R. Wolter
Visiting Lecturer J. Little-Wiles, R. Markoff
Program Advisor E. Wager

Organizational Leadership and Supervision (OLS) offers a broad based education for those students who desire leadership roles in business, government, technology and industry. A guiding vision of the department is to close the gap between theory and practice. In addition to a Bachelor of Science (B.S.) degree, OLS offers certificates in Human Resource Management, International Leadership, and Leadership Studies. The Certificate in Leadership Studies offers non-majors an opportunity to better understand leadership in today's complex organizations.

All OLS programs are flexible to meet the needs of both traditional and nontraditional students. As part of a relevant and practical field of study, OLS programs integrate a series of core courses with a choice of electives that permit students to earn multiple degrees, certificates, or minors. Core OLS 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 or related field. Students who have successfully completed an A.S. or A.S.S. degree from Ivy Tech, Vincennes University, or another regionally accredited 2-year or 4-year institution can apply up to 64.0 credit hours of transfer credit towards completion of the IUPUI General Education Core, 24.0 credit hour

related area of study outside of OLS, and other elective areas. Students who have not completed a 2-year degree program are encouraged to complete a minor, certificate, or dual baccalaureate degree through the completion of their related area of study.

Program Learning Outcomes

Students who graduate with the B.S. in Organizational Leadership and Supervision will know:

- process and roles of leadership,
- effective traits of leadership,
- how leadership behavior and power influences people and organizations,
- how to apply situational approaches to leadership, and
- strategies for leading during times of uncertainty, turbulence, and change.

Students who graduate with the B.S. in Organizational Leadership and Supervision will be able to:

- design and conduct organizational research, as well as analyze and interpret data,
- reflect and evaluate personal leadership style and effectiveness,
- reflect and evaluate an organization's effectiveness and sustainability,
- reflect and evaluate an organization's social and environmental impact,
- provide leadership for processes and functions within and organization such that it will meet or exceeds desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, and sustainability,
- function on diverse teams,
- identify, formulate, and recommend solutions for organizational problems,
- understand professional and ethical responsibility,
- communicate effectively verbally and nonverbally to variety of audiences and contexts,
- understand the impact of leadership and supervision in a global, economic, environmental and societal context, and
- apply techniques, skills, tools and concepts necessary for effective strategic planning.

Transfer Students

Where applicable, the OLS Department accepts credit hours earned at Ivy Tech, Vincennes University or other similarly accredited colleges and universities to satisfy up to 64.0 credit hours of general education core and selective B.S. degree requirements.

For more information or to make an advising appointment, call (317) 278-1313 or email tlcgroup@iupui.edu.

Bachelor of Science in Organizational Leadership & Supervision

The B.S. degree in Organizational Leadership and Supervision requires a total of 120 credit hours of department approved coursework. Students will complete the required 30.0 credit hours IUPUI General Education Core, 46.0 credit hours of OLS-specific courses including the 25.0 credit hour OLS Core Curriculum (10000, 25200, 26300, 27400, 32700, 37100, 39000, 48700, and 49000), and additional 21.0 credit hours of OLS electives, a minimum of 24.0 credit hours towards a minor, certificate or applied technology area of study, TCM 25000, TCM 32000, Quality/Economics Elective, and 13.0 credits of other approved electives. To be direct admitted to the OLS B.S. degree program, student must complete ENG-W 131 (English Composition), COMM-R 110 (Speech Communication), 3.0 credit hours of approved mathematics, OLS 10000 and/or OLS 25200. Click here to view the OLS B.S. 4-year degree Map and begin planning a career in organizational leadership.

OLS Certificate Programs

To enroll in certificate programs, students must be formally admitted by the Office of Admissions on the IUPUI campus.Students must notify the department of intent to pursue each certificate or minor and sign paperwork for program admission and graduation. 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. To fulfill residency requirements, students must complete a minimum of 50% of coursework in OLS at IUPUI.

Human Resource Management Certificate Program

Although all resources are essential for success, people are an organization's principal resource.How skillfully an organization develops, allocates, and supervises its human resource governs its success or failure. This certificate provides a thorough explanation of the human resource manager's role in helping individuals, work groups, and organizations succeed. The focus of the courses is practical, and each course emphasizes the application of vital concepts so that students will acquire a comprehensive understanding of the subject matter. This Certificate is useful to students who seek careers in human resource management or in other disciplines.

Upon completion of the certificate in Human Resource Management, students should be able to:

- Describe, use, and evaluate tactical and strategic Human resource management principles.
- Develop, implement and provide a safe and effective work environment.
- Comply with local, state, and federal employment law and related public policies.
- Promote training and development of individuals, work teams, and organizations.
- Assess, design, develop, implement, and evaluate learning solutions in various organizational contexts.
- Promote positive, productive employer-employee relationships.
- Create, negotiate, and manage regulations concerning collective bargaining, grievance, and arbitration procedures.
- Leverage compensation, benefits, rewards, and recognition to attract, motivate, and retain talent.
- Develop policy, practice, and procedure to select talent aligned with the strategic direction of the organization.

A certificate will be presented to those who complete graduation paperwork and successfully complete all requirements.

Admission

Candidates for this certificate are required to be formally admitted by the IUPUI Office of Admissions, but are not required to be students in the Purdue School of Engineering and Technology. Each student must meet with an OLS Advisor to declare their intent to pursue the certificate and complete the Application forms.

Leadership Studies Certificate Program

The Certificate in Leadership Studies equips students with the knowledge, skills, experiences, attitudes, perspectives, and tools necessary to understand the broad-based concepts associated with leadership in a variety of individual, organizational, and community settings in an ever changing, pluralistic, global society. A unique feature of this certificate is its ability to attract a diverse group of students from across the myriad of disciplines taught at IUPUI. Such a strong mixture of interdisciplinary perspectives augments the richness of learning that occurs in certificate courses.

Students who complete the certificate in Leadership Studies will be able to:

- Define and defend their personal philosophy of leadership and ethical behavior.
- Describe behavior in organizational settings at the individual, team/group, and macro-organization levels.
- Identify the stages of team development that occurs within organizations.
- Make leadership-oriented decisions that are ethically, legally, morally, and strategically sound.
- Apply concepts of supervisory management, team building, personnel selection and development, decision-making, resource allocation, conflict resolution, and strategic planning to the solving of individual, team/group, and organizational problems.
- Explain the importance of attracting, managing, and motivating a globally-diverse workforce.
- Improve individual and organizational performance by applying the appropriate leadership theories and processes in practice.
- Evaluate the appropriateness of leadership behaviors in given situations, and make suggestions for improving those behaviors.

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 andTechnology. Credit will be given for applicable courses taken at other colleges and universities. Credits earned while completing this certificate may be subsequently applied toward the B.S. degree in Organizational Leadership and Supervision (OLS). Each student must meet with an OLS Advisor to declare their intent to pursue the certificate and complete the necessary forms; however, students with a declared major in OLS are not eligible to earn the leadership studies certificate, due to curricular redundancy.

International Leadership Certificate

The interdisciplinary International Leadership Certificate is designed to provide the knowledge, skills, abilities, perceptions, and experiential learning opportunities appropriate for any student interested in supervising or leading individuals from different countries or preparing for international work assignments. Students who complete the International Leadership Certificate will develop the tools necessary to understand the broad-based concepts associated with leadership in a variety of individual, organizational, and community settings in an ever changing, pluralistic, global society.

Students who complete the Certificate in International Leadership will be able to:

- Demonstrate techniques to analyze and solve intercultural problems that typically occur within diverse organizations.
- Use knowledge and techniques to devise strategies for successfully managing diversity within an international organization.
- Apply knowledge and techniques to devise strategies for successfully leading a diverse workforce within an international organization.
- Demonstrate substantial knowledge of at least one foreign country, or region, (or distinct subculture within the USA), including demographic profile, economic status, political climate, commerce, history, language, and cultural norms as a result of intensive experience and/or study.

Admission

Candidates for this certificate are required to be formally admitted by the IUPUI Office of Admissions, but are not required to be students in the Purdue School of Engineering and Technology. Credit will be given for applicable courses taken at other colleges and universities. Credits earned while completing this certificate may be subsequently applied toward the B.S. degree in Organizational Leadership and Supervision (OLS). Each student must meet with an OLS Advisor to declare their intent to pursue the certificate and complete the necessary forms.

The International Leadership Certificate requires participation in an International Experience. Students may select and enroll in any IU/IUPUI or other departmentally approved Study Abroad, International Service Learning Course, or Internship working in a bi-lingual setting (non-English or native language).

Honors Minor in Leadership

The Honors Minor in Leadership consists of five Honors courses (15 credit hours), providing high-potential IUPUI undergraduates admitted to the new IUPUI Honors College or other degree programs exposure to current theory and practice designed to prepare students for future leadership roles and/or advanced degrees. Each of the Interdisciplinary Leadership Principles in the Honors

Minor in Leadership directly relates to the IUPUI Principles of Undergraduate Learning. Students admitted to the Honors Minor in Leadership must take a sequence of five courses exploring topics covering a wide range of leadership principles including:

1. 1. Foundations of Leadership (3 credit hours of **honors BUS-Z 174, OLS 25200**, BUS-Z 304, or SPEA-V 366)
   2. Ethical, Social, and Political Components to Leadership (3 credit hours of **honors OLS 26300**, BUS-W 494, SPEA-V 412, SPEA-V 473, or other approved courses)
   3. Diversity, Global, and Community Leadership (3 credit hours of **honors OLS 32700**, SPEA-V 382, POLS-Y 219, or ANTH-A 361)
   4. Theoretical and Practical Aspects of Leadership (3 credit hours of **honors OLS 39000**, BUS-J 402, or SPEA-V 362)
   5. Honors RISE Experience in Leadership (3 credit hours of approved honors Research, International, Service, or Experiential Learning coursework)

At least two Honors courses (6.0 credit hours) must be taken outside of the student's primary discipline (*recommended) and students must complete paperwork to declare their intent to pursue the minor and complete a formal Application for Graduation (ET 309: Organizational Leadership and Supervision) to ensure this credential is properly recorded on their official transcripts. Students not enrolling in a designated Honors section must complete the Honors Contract to ensure credit is properly denoted on transcript.

For more information, contact OLS at 317-278-0286 or the IUPUI Honors College at 317-274-7193.

Technology, Leadership & Communication (TLC)

Technology Leadership & Communication (TLC)

Chair: S. Hundley
Associate Chair: M. Hovde, Associate Professor of Technical Communication

TLC equips today's students with the leadership and communication knowledge, skills, and perspectives in order to augment their technical expertise to make effective contributions in a variety of organizational settings. Our undergraduate degrees and certificates in Organizational Leadership and supervision (OLS) and Technical Communication (TCM) offer students a well-rounded education that connects theory with practice. The M.S. in Technology provides an interdisciplinary credential to students interested in honing their leadership skills while drawing on a technical foundation.

TLC's faculty and staff are committed to student success. We provide for our students:

- Learner-centered classes that prepare students to be competitive in the global workplace
- Professors who are experts in their field
- Courses taught in a variety of ways, times, and places, including online, blended, and intensive formats
- One-on-one advising to explore personal, academic, and professional goals and objectives
- Relationships with industry partners who provide input into shaping the curriculum
- Research, international, service, and experiential learning opportunities for students
- Flexible plans-of-study to accommodate individualized student interests
- Opportunities to get involved in student organizations, network with industry professionals, and gain valuable experience through a wide variety of internships and study abroad programs

Explore our website to learn more about the many degree and certificate options offered through the Department of Technology Leadership and Communication at IUPUI!

Technical Communication

Technical Communication

Assistant Professor: C. Renguette (Director)
Associate Professor: M. Hovde, W. Worley

Rapidly advancing technology increases the need to communicate complex technical information effectively to a variety of audiences and users. Technical communicators use technology to create necessary resources such as user manuals, online help, websites, training materials, and specifications, among many other technical communication products.

The B.S. degree in Technical Communication requires 120 credit hours. All courses that count toward the major must be completed with a grade of C or better. Students will take courses from four core areas. These courses prepare students for professional practice in technical communication and related careers.

Technical Communication Bachelor of Science Degree Four Core Area

1. Technical Communication - 53 hours
   - 32 required hours, 21 elective hours (from list*)
   - Note: 6 of these hours are General Education Common Core required courses (ENG-W 131 and COMM-R 110).
2. Science, Technology, Engineering, Mathematics (STEM) - 34 hours
   - 13 required hours, 21 elective hours (from list*)
   - Note: 12 of these hours are General Education Common Core required courses (3 hours of Math, 3 hours of other analytical reasoning, and 6 hours of Life and Physical Sciences).
3. Organizational & Cultural Dynamics - 12 hours
   - 3 required hours, 9 elective hours (from list*)
4. Other Electives - 21 hours
   - Note: 12 of these 21 hours must come from the General Education Common Core electives (3 from Cultural Understanding, 3 from Arts and Humanities, 3 from Social Sciences, and 3 other Arts and Humanities or Social Sciences).

In addition, 6 hours must be at the 300-level or above.

*See the Technical Communication Program website at: http://engr.iupui.edu/departments/tlc/about/programs/tcm for course lists and more information.

Certificate in Technical Communication

The Certificate in Technical Communication requires 19 credit hours. Students will complete 13 hours of required courses and 6 hours of selected courses.

Required Courses: 13 credits

- *Choose either* - TCM 23000 Principles and Practices of Technical Communication or TCM 22000 Technical Report Writing - 3 credit hours
- TCM 24000 - Tools for Technical Communication - 3 credit hours
- TCM 31000 - Technical and Scientific Editing - 3 credit hours
- *Choose either* - TCM 25000Career Planning in Engineering and Technology or TCM 43500 Portfolio Preparation - 1 credit hour
- One technical or scientific course at or above the 200 level - 3 credit hours

Selected Courses: 6 credits

Choose 2 courses from this list:

- TCM 32000 - Written Communication in Science and Industry - 3 credit hours
- TCM 35000 - Visual Technical Communication - 3 credit hours
- TCM 38000 - Technical Communication in the Healthcare Professions - 3 credit hours
- TCM 39500 - Independent Study - 3 credit hours
- TCM 42000 - Field Experience - 3 credit hours
- TCM 42500 - Managing Document Quality - 3 credit hours
- TCM 45000 - Research Approaches for Technical & Professional Communication - 3 credit hours
- One relevant, approved course from another department - 3 credit hours

Policies & Procedures

Undergraduate Policies

Academic Warning

A student whose semester grade point average (GPA) falls below a 2.0, but whose cumulative GPA is a 2.0 or higher, will be placed on academic warning. Students on academic warning will be required to meet with their academic advisor before being able to register for classes.

A student will be advised of academic warning status by the Office of the Associate Dean for Academic Affairs and Undergraduate Programs.

Academic Probation

A student whose cumulative grade point average (GPA) falls below a 2.0 will be placed on probation. Students on academic probation will be required to meet with their academic advisor before being able to register for classes. The student may continue studies provided the student achieves a semester GPA of at least 2.0 for each semester while on probation. Once the cumulative GPA is at least 2.0, the student will be removed from probationary status. A student will be advised of probationary status and the possibility of dismissal by the Office of the Associate Dean for Academic Affairs and Undergraduate Programs.

Dismissal

A student on probation who has completed a minimum of 12 IUPUI grade point average (GPA) hours is subject to dismissal from the School if the student fails to attain a GPA of at least 2.0 in any two consecutive IUPUI semester (fall and spring), including the semester that the student was first placed on probation.

A student can also be dismissed from the School when, in the opinion of the Associate Dean for Academic Affairs and Undergraduate Programs in consultation with the student's major department, the student has ceased making progress in the degree program. Examples of lack of progress may include, but are not limited to, average GPA in courses in the major below 2.0, multiple semesters with semester GPA below 2.0, and repeated failures in core courses in the curriculum. Students in danger of dismissal due to failure to make academic progress will be required to meet with their academic advisor.

A student will be notified of dismissal by the Office of the Associate Dean for Academic Affairs and Undergraduate Programs.

Readmission

A student dismissed for the first time from the Purdue School of Engineering and Technology or another Purdue School must remain out of school at least one regular (fall or spring) semester. During the semester out of school, the student may petition the School of Engineering and Technology for readmission. A student dismissed for the second time must remain out of school at least two regular semesters (fall and spring), but may petition for readmission during the second semester out of school. Readmission after a second dismissal is extremely rare.

A student readmitted will be informed by the Office of the Associate Dean for Academic Affairs and Undergraduate Programs. The notification will specify any conditions and restrictions affecting readmission and continuance in the degree program. Readmitted students will be placed on probation. Readmitted students must earn a GPA of at least 2.0 each semester whil on probation or they will be dismissed again. Readmitted student will be removed from probation when their cumulative GPA is raised to 2.0.

Students may contact Kelly Keelen at (317) 274-2761 or keelen@iupui.edu for a Petition for Readmission. Deadlines for submitting the petition is June 1 for fall and October 1 for spring.

Acceptance of Grade Replacement & Repeating Courses

Repeated Courses (Grade Replacement Policy)

Students enrolled in the School of Engineering and Technology are permitted to apply only the provisions of the IUPUI Grade Replacement Policy that pertain to repeating a course in order to achieve a higher grade. This replacement will affect a student's academic record only at the Purdue School of Engineering and Technology at IUPUI. If the student subsequently transfers to another academic unit at IUPUI or another campus, different

interpretations of the grade replacement policy may be in place.

An undergraduate student who retakes any course may elect to have only the final grade counted in computation of the cumulative semester index, in accordance with the limitations listed below. After retaking the course, the enrollment and original grade will be removed from calculations used to determine the student's cumulative GPA. The student's transcript, however, will continue to show the original enrollment in the course and all grades earned for each subsequent enrollment.

This policy is subject to the following limitations:

- Students may exercise the grade replacement option for no more than 15 credit hours, including any courses in which the former FX option was used for their 1st undergraduate degree.
- A grade may be replaced only by another grade for the same class.
- A student may exercise the Grade Replacement Policy a maximum of two times for a single course.
- The request to remove a grade from the cumulative GPA calculation by this method is irreversible.
- The second enrollment for any course covered by this policy must have occurred during fall semester 1996 or later.

Students who plan to use the grade replacement option must complete and submit the grade replacement form to the Recorder in the Office of Academic Programs for processing after retaking the course.

Academic Regulations

E&T Course Drop Policy (Effective 3/27/2012)
Undergraduate students admitted to the School of Engineering and Technology in fall 2012 and beyond may not drop more than one course per semester. Furthermore, these students are limited to a total of eight withdrawals over the course of their academic career after admission to the School of Engineering and Technology.
If extenuating circumstances warrant an exception to this policy, the exception must be approved both by the student's academic advisor and by the Associate Dean for Academic Affairs and Undergraduate Programs.

If due to extenuating circumstances a student must withdraw from school (drop every class) during an in-progress semester, the withdrawals in that semester will count as only a single withdrawal toward the career maximum of eight.

This policy does not apply to course adjustments made during the Add/Drop (100% refund) period. For first-year students (those with less than 26 total credit hours, both beginners and transfers) served by the New Student Academic Advising Center, courses from which a student has been administratively withdrawn will not be counted toward the one-drop-per-semester limit.

For the purposes of this policy, linked lecture-lab courses taught under two different numbers are considered a single course. Likewise, the dropping all courses that make up a themed learning community will count as a single drop.

Grades and Grade Reports

Students are responsible for completing all required work in each of their courses by the last scheduled class meeting, unless course assignments have been properly cancelled. Students receive a grade in each course in which they are enrolled at the close of the session. Grades indicate what a student has achieved with respect to the objectives of the course, and instructors are required, by action of the Faculty Senate, to record the grade a student has earned in a course. Grades that have been officially recorded will be changed only in cases of instructor error or subsequent finding of student academic dishonesty.

Basis of Grades
The School of Engineering and Technology uses a grading system that may include plus and minus grades as well as straight letter grades for all undergraduate and graduate courses. These grades and their grade point values are indicated below.

For credit courses:

A or A+	4.0
A–	3.7
B+	3.3
B	3.0
B–	2.7
C+	2.3
C	2.0
C–	1.7
D+	1.3
D	1.0
D–	0.7
F	0.0 (no credit)

For credit courses taken under the Pass/Fail option:

P: Pass: equivalent to grade A through D– (no grade point value assigned).
F: Failure: failure to achieve minimal objectives of the course. The student must repeat the course satisfactorily in order to obtain credit for it. The F is factored into the student's grade point average.

For noncredit courses, including thesis research:

S: Satisfactory: meets course objectives (no grade point value assigned).
F: Unsatisfactory: does not meet course objectives (is factored into grade point average).
Note that no separate grades are given for course laboratory sections that have been given separate course designations for scheduling purposes.

Incomplete, Deferred, or Withdrawal grades for credit or noncredit courses (no grade point value assigned):

I: Incomplete, no grade: policies and procedures for I and IX grades for Engineering and Technology students (GRAD and UGRD) passed by Faculty Senate December 11, 2012.

The grade of incomplete "I" may be assigned only when:

- A student has successfully completed at least 75% of the work in a course.
- Extenuating circumstances prevent the student from completing the work within the time limits of the course.

- Faculty should conform to the Incomplete Policy before giving a student an incomplete "I."
- Faculty must fill out the Incomplete Grade Report and have the student sign. It must show what is needed to remove the "I." Faculty must submit these completed and signed forms to the department Secretary or department PA.
- Deadline for work must be listed on Incomplete Grade Report. Although a year is allowed by the campus, students should be encouraged to finish the work as soon as possible.
- Incomplete grades will not be converted to "IX" unless there is documented extended illness or military service. This documentation must be presented to the instructor and Recorder prior to requesting the "IX." An appropriate end date for "IX" grades must be identified at the time of issue.
- GRAD students cannot be given an "IX" per Graduate Office.
- Incomplete grades will NOT be changed to "W" (withdrawal).
- All "I" and "IX" grades should be documented in Advising Record for future reference.

R: Deferred; a grade given for those courses that normally require more than one academic session to complete, such as project, thesis, and research courses. The grade indicates that work is in progress and that the final report has not been submitted for evaluation.

W: Withdrawal; a grade of W is recorded on the final grade report.

Withdrawing from Classes
During the first half of a semester or session, students may officially withdraw from classes without penalty if they obtain the approval of their advisor. During the third quarter of a semester or session, students may withdraw from classes if they obtain the approval of their advisor and the appropriate instructors; during the last quarter of the semester, students will be allowed to withdraw from classes only under extenuating circumstances. At that time they must obtain the approval of the appropriate instructors, their advisor, and the dean, and must also present a written justification from a doctor, member of the clergy, advisor, or similar person of authority. The fact that a student merely stops attending a class will not entitle the student to a grade of W.

Uses of the Pass/Fail Option
To provide students with the opportunity to broaden their education with less worry about the grades they may earn, an alternate grading system, the Pass/Fail option, is permitted for a limited portion of the required credit hours. The following general rules are currently applicable; individual departments may impose further restrictions.

- Subject to the regulations of divisions or departments, students may choose this option in any course that does not already appear on their academic record and that they are otherwise eligible to take for credit with a letter grade. Students may use this option for not more than 20 percent of the total credit hours required for graduation.
- Students taking a course under this option have the same obligations as those taking the course for credit with a letter grade. When instructors report final grades in the course, any student who would have earned a grade of A through D– will receive a P, and any student who has not passed will receive an F. The registrar will note either result on the student's academic records, but will not use the course in computing the grade point average unless the student receives an F.
- This option is not available to students on probation.
- This option is available for a maximum of two courses in any one semester and one course during a summer session.
- Students receiving the grade of Pass in a course taken under the Pass/Fail option may not retake the same course for a letter grade.
- Courses taken under Pass/Fail option and courses taken by correspondence may not be used to fulfill graduation requirements for engineering students. Whether the courses are accepted for technology students is up to each major department.

These rules are general or minimum guidelines for those electing this option. There are certain specific limitations on registration for the Pass/Fail option. This option may be elected only during continuing student registration, late registration, and the drop/ add period at the beginning of a semester or session. Changes from letter grade to Pass/ Fail and vice versa may not be made after the second week of classes during the regular semester or after the first week of classes during the summer sessions.

Absence from Campus
Students who interrupt their course of study for more than one calendar year may be required to meet all departmental curriculum requirements for the program offered at the time of their return.

Scholastic Indexes

The scholarship standing of all undergraduate degree regular students is determined by two scholastic indexes: the semester index and the graduation index.

Semester Index
The semester index (semester grade point average) is an average determined by weighting each grade received (4.0 for an A, 3.7 for an A–, etc.) during a given semester and multiplying it by the number of credit hours in the course, adding up all the figures, and then dividing the sum by the total number of course credit hours obtained during that semester. Grades of P and S are not included in the computation; grades of F are included. The cumulative semester index is the weighted average of all courses taken by a student, except those to which the FX policy is applied. See "Repeated Courses (FX Policy)" above in this section of the bulletin.

Graduation Index
The graduation index (degree grade point average) is the weighted average of grades in only those courses that are used to meet the graduation requirements for the program in which the student is enrolled. When a student retakes a course with the advisor's approval or later substitutes an equivalent course for one previously taken, only the most recent course grade is used by the school in calculating the graduation index. Since certain courses previously completed by the student may on occasion be omitted from a program of study, the graduation index and the cumulative semester index may differ.

Graduation Index Requirements

For all bachelor's degrees in the School of Engineering and Technology, a minimum graduation index of 2.0 is required for graduation. Candidates for graduation from engineering programs must also have an index of 2.0 for all required engineering courses.
For the Associate of Science degree, a minimum graduation index of 2.0 is required for graduation.

Good Standing

For purposes of reports and communications to other institutions and agencies and in the absence of any further qualification of the term, students are considered in good standing unless they have been dismissed, suspended, or dropped from the university and have not been readmitted.

Graduate and Professional Policies

Academic Probation and Academic Dismissal

Academic standards for probation (warning status) and dismissal are established by the faculty for each specific academic program. Therefore, a student is subject to the regulations applicable to all students enrolled in a particular program at the time of registration. If students are experiencing academic difficulty, they are urged to consult their academic advisor as soon as possible.

Students will be notified by IUPUI e-mail from the Office of the Associate Dean for Academic Programs, School of Engineering and Technology, when they are placed on academic probation. The e-mail will also inform the student of the conditions that must be met for removal from academic probation. Students who are dismissed for academic reasons will also be notified by letter from the Office of the Associate Dean for Academic Programs.

The following standards are currently applicable for students enrolled in the School of Engineering and Technology.

Academic Probation

Graduate degree-seeking students are placed on academic warning and probation when either the cumulative index or the semester index is below 3.00 (B). Graduate students must maintain a semester and cumulative grade point average of at least 3.00 each semester to be in good standing. Academic probation will be removed when students achieve a semester and cumulative grade point average of 3.00. The minimum grade acceptable for a graduate-level course is C (2.00).

Full-time undergraduate students are automatically on academic probation when either the cumulative semester index or the semester index is below 2.0 (C). Part-time students are automatically on academic probation when either the cumulative semester index or the grade point average for the last 12 credit hours of consecutive enrollment is below 2.0 (C). All students on probation are automatically placed on academic checklist. Students on checklist must obtain the signature of a departmental advisor in order to register.
Students who, in subsequent enrollments, do not improve significantly may receive a letter stating that they will be subject to dismissal if an index of 2.0 (C) or higher is not earned in the current enrollment period. Such students may register only after their grades have been posted and their departmental checklist clearance form has been approved by the dean.

Removal from Probation

Students are removed from academic probation when they complete 12 credit hours of consecutive enrollment with a minimum grade point average of 2.0, provided their overall grade point average is also at or above 2.0.

Academic Dismissal

Full-time students may be dismissed when they fail to attain a 2.0 semester grade point average in any two consecutive semesters or when their cumulative semester index has remained below 2.0 (C) for any two consecutive semesters. Part-time students may be dismissed when their cumulative semester index or grade point average for the last 18 credit hours of consecutive enrollment is below 2.0 (C).

Readmission

A student who has been dropped due to scholastic deficiency may petition the Faculty Committee on Readmission for readmission. If readmitted, the student will be placed on probation. Students may contact the particular department for specific rules and regulations.

Acceptance of Grade Replacement & Repeating Courses

Students enrolled in the School of Engineering and Technology are permitted to apply only the provisions of the IUPUI Grade Replacement Policy that pertain to repeating a course in order to achieve a higher grade. This replacement will affect a student's academic record only at the Purdue School of Engineering and Technology at IUPUI. If the student subsequently transfers to another academic unit at IUPUI or another campus, different interpretations of the grade replacement policy may be in place.

An undergraduate student who retakes any course may elect to have only the final grade counted in computation of the cumulative semester index, in accordance with the limitations listed below. After retaking the course, the enrollment and original grade will be removed from calculations used to determine the student's cumulative GPA. The student's transcript, however, will continue to show the original enrollment in the course and all grades earned for each subsequent enrollment.

This policy is subject to the following limitations:

- Students may exercise the grade replacement option for no more than 15 credit hours, including any courses in which the former FX option was used.
- A grade may be replaced only by another grade for the same class.
- A student may exercise the Grade Replacement Policy a maximum of two times for a single course.
- The request to remove a grade from the cumulative GPA calculation by this method is irreversible.
- The second enrollment for any course covered by this policy must have occurred during fall semester 1996 or later.

Students who plan to use the grade replacement option must inform the engineering and technology recorder after they have retaken a course and wish to apply the policy.

Academic Regulations

Grades and Grade Reports

Students are responsible for completing all required work in each of their courses by the last scheduled class meeting, unless course assignments have been properly cancelled. Students receive a grade in each course in which they are enrolled at the close of the session. Grades indicate what a student has achieved with respect to the objectives of the course, and instructors are required, by action of the Faculty Senate, to record the grade a student has earned in a course. Grades that have been officially recorded will be changed only in cases of instructor error or subsequent finding of student academic dishonesty.

Basis of Grades

The School of Engineering and Technology uses a grading system that may include plus and minus grades as well as straight letter grades for all undergraduate and graduate courses. These grades and their grade point values are indicated below.

For credit courses:

A or A+	4.0
A–	3.7
B+	3.3
B	3.0
B–	2.7
C+	2.3
C	2.0
C–	1.7
D+	1.3
D	1.0
D–	0.7
F	0.0 (no credit)

For credit courses taken under the Pass/Fail option:

P: Pass; equivalent to grade A through D– (no grade point value assigned).F: Failure; failure to achieve minimal objectives of the course. The student must repeat the course satisfactorily in order to obtain credit for it. The F is factored into the student's grade point average.

For noncredit courses, including thesis research:

S: Satisfactory; meets course objectives (no grade point value assigned).
F: Unsatisfactory; does not meet course objectives (is factored into grade point average).
Note that no separate grades are given for course laboratory sections that have been given separate course designations for scheduling purposes.

Incomplete, Deferred, or Withdrawal grades for credit or noncredit courses (no grade point value assigned):

I: Incomplete, no grade; a temporary record indicating that the work is satisfactory as of the end of the semester but has not been completed. The grade of Incomplete may be assigned only when a student has successfully completed at least three-fourths of the work in a course and unusual circumstances prevent the student from completing the work within the time limits previously set. An instructor may require the student to secure the recommendation of the dean that the circumstances warrant a grade of Incomplete. When an Incomplete is given, the instructor will specify the academic work to be completed and may establish a deadline of up to one year. If the student has not completed the required work by the end of the following year, the registrar will automatically change the I to an F.
R: Deferred; a grade given for those courses that normally require more than one academic session to complete, such as project, thesis, and research courses. The grade indicates that work is in progress and that the final report has not been submitted for evaluation.
W: Withdrawal; a grade of W is recorded on the final grade report.

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- This option is not available to students on probation.
- This option is available for a maximum of two courses in any one semester and one course during a summer session.
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Good Standing

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Student Organizations & Services

Organizations & Services
Engineering and technology students have the opportunity to participate in the activities of the following student societies or chapters:

- American Society of Engineering Education (ASEE)
- American Society of Mechanical Engineers (ASME)
- Associated General Contractors of America (AGC)
- Biomedical Engineering Society
- Engineering and Technology Student Council
- Engineers Without Borders
- Formula SAE
- Global Design Students
- IEEE
- Motorsports Club
- National Society of Black Engineers (NSBE)
- NET
- Pi Tau Sigma Honor Society
- SIGGRAPH
- Society of Hispanic Professional Engineers
- Society of Human Resource Management (SHRM)
- Society of Student Constructors (SSC)
- Society of Women Engineers (SWE)
- Student Design Organization (SDO)
- Tau Alpha Pi Honor Society
- Tau Beta Zeta

Minority Engineering Advancement Program (MEAP)

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, approximately 100 students participate each summer in the program.

MEAP also provides support services to minority undergraduates enrolled in the School of Engineering and Technology. In addition, some scholarships are available to American Indian, African American, and Hispanic students, people from groups that have been historically underrepresented in engineering and technology. 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; http://et.engr.iupui.edu/infofor/community/summer-camps/meap.php; phone (317) 274-2943.

Opportunities to Study Abroad

Opportunities to Study Abroad
The School of Engineering and Technology International Engineering Program 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.

Individual departments also offer short- and long-term study abroad opportunities. Check with the department you're interested in to learn more about its study abroad programs.

Faculty

Administrative Officers

- **David Russomanno**, Dean
- **Wanda L. Worley**, Associate Dean for Academic Affairs and Undergraduate Programs
- **M. Razi Nalim**, Associate Dean for Graduate Programs and Research
- **Sherri Alexander**, Assistant Dean for Finance and Administration
- **Terri Talbert-Hatch**, Assistant Dean for Student Services
- **Eugenia Fernandez**, Chair of the Department of Computer Information and Graphics Technology
- **Yaobin Chen**, Chair of the Department of Electrical and Computer Engineering
- **Elaine Cooney**, Chair of the Department of Engineering Technology
- **Jie Chen**, Chair of the Department of Mechanical Engineering
- **Stephen Hundley,** Chair of the Department of Technology Leadership and Communication Technology
- **Edward Berbari**, Chair of the Department of Biomedical Engineering
- **Corinne Renguette**, Director of Technical Communication
- **Tim Diemer**, Director of International Services
- **Joe Abella**, Director of Industry Relations
- **Danny King**, Director of New Student Academic Advising Center
- **Marilyn Mangin**, Director of Student Recruitment
- **Jennifer Williams**, Director of Career Services and Professional Development

Faculty Emeriti

Faculty Emeriti

Akay, Hasan U., Chancellor's *Professor Emeritus of Mechanical Engineering (1981); B.S. Civil Engineering, 1967, Middle East Technical University, Turkey; M.S. Civil Engineering, 1969, Ph.D. Civil Engineering, 1974, University of Texas at Austin*

Ansty, William T., *Associate Professor Emeritus of Organizational Leadership and Supervision (1973); B.S. Foreign Service, 1955, Georgetown University; M.B.A. Business Administration, 1957, Harvard University*

Arffa, Gerald L., *Professor Emeritus of 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., *Associate Professor Emeritus of 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, *Professor Emeritus of 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 (Deceased)*

Bluestein, Maurice*, Professor Emeritus 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*

Bowman, Michael S., *Associate Professor Emeritus of Mechanical Engineering Technology (1964); B.S. Mechanical Engineering, 1959, Purdue University; M.B.A. 1961, Indiana University*

Close, Sam, *Professor Emeritus of Mechanical Engineering Technology (1966); B.M.E. Mechanical Engineering, 1947, Cleveland State University; P.E., Indiana, Ohio (Deceased)*

Conrad, William*, Professor Emeritus 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*

Crozier, Robert G., *Professor Emeritus of Computer Technology (1972); B.S. Forestry, 1961, University of Missouri; M.S. Forestry, 1962, Ph.D. Entomology, 1966, Purdue University*

Dault, Raymond A., *Professor Emeritus of Restaurant, Hotel, Institutional, and Tourism Management (1950); B.A. Hotel Administration, 1950, Michigan State University; M.B.A. Management, 1969, Indiana University (Deceased)*

Dunipace, Kenneth R., *Professor Emeritus of Electrical Engineering (1977); B.S. Secondary Education, 1951, The Ohio State University; B.S. Mechanical Engineering, 1956, Massachusetts Institute of Technology; M.E. Electrical Engineering, 1965, University of Florida; Ph.D.*

Electrical Engineering, 1968, Clemson University; P.E., Massachusetts, Missouri

Ecer, Akin, *Professor Emeritus 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*

Eberhart, Russell*, Professor Emeritus of Electrical and Computer Engineering; B.S. Electrical Engineering, 1965, M.S. electrical Engineering, 1969, Ph.D. Electrical Engineering, 1972, Kansas State University*

Ebling, Daniel W., *Associate Professor Emeritus of Organizational Leadership and Supervision (1967); B.S. Economics, 1955, Albright College; M.B.A. General Business, 1956, Indiana University*

Fleenor, Edgar, *Professor Emeritus and Chair of Construction Technology (1997); B.S. Industrial Education, 1955, M.A. Education, 1960, Indiana State University; Ph.D. Education, 1974, The Ohio State University (Deceased)*

Gersting, John*, Computer and Engineering Science (1970), B.S. Engineering Science, Purdue University (1962); M.S. Engineering Science, Arizona State University (1964); Ph.D., Engineering Science, Arizona State University (1970)*

Goodwin, Clifford*, Associate Professor of Organizational Leadersyp 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 Emeritus of Computer and Information Technology (1999), Emertius, B.S. Computer Science, 1970, M.S. Computer Science, 1971, Ph.D. Computer Science, 1974, Purdue University*

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

Max, Abraham M., *Mechanical Engineering (1968); B.S., 1934, M.S., 1935, Ph.D., 1937, University of Wisconsin*

Maxwell, Michael P., *Associate Professor Emeritus in Construction Technology (1977); B.A.E. Architectural Engineering, 1955, University of Detroit; Reg. Architect, Indiana, Illinois*

Moll, Richard E., *Associate Professor Emeritus of Mechanical Engineering Technology (1958); B.S. Industrial Education, 1955, M.S. Industrial Education, 1963, Purdue University*

Naghdi, Amir K.,*Professor Emeritus of 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 Emeritus 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., *Associate Professor Emerita of 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., *Professor Emeritus of 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*

Orr, Robert H., *Professor Emeritus of Computer Technology (1985); B.S. Engineering Sciences, 1964, United States Military Academy; M.S. Information and Computer Science, 1973, Georgia Institute of Technology*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*

Peale, Robert*, Professor Emeritus of Mechanical Engineering Technology (1963), B.A. Mechanical Engineering, 1952;M.S. Industrial Engineering, 1953, Purdue University; P.E. Indiana; C.Mfg.E.*

Pfile, Richard E., *Professor of Electrical and Computer Engineering Technology (1983); B.S. Chemistry, 1974, B.S. Electrical Engineering, 1976, University of Louisville; M.S.E. Computer, Information, and Control Engineering, 1980, University of Michigan*

Renda, R. Bruce*, Dean Emeritus and Professor Emeritus of Mechanical Engineering(1974); B.S. Mechanical Engineering, 1952; M.S. Mechanical Engineering, 1957; Ph.D. Mechanical Engineering, 1959, Purdue University*

Sener, Erdogan, *Professor of Construction Engineering Management Technology (1987); B.S. Civil Engineering, 1968, Middle East Technical University, Turkey; M.S. Civil and Structural Engineering, 1969, Michigan State University; Professional Engineer License, Indiana*

Sharp, P. Kent, *Professor Emeritus of Electrical Engineering Technology (1966); B.S. Electrical Engineering, 1957, Rose-Hulman Institute of Technology; M.S. Electrical Engineering, 1964, University of Colorado; P.E., Indiana*

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

Sinha, Akhouri S. C., *Professor Emeritus 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., *Associate Professor Emeritus of Computer Technology (1973); B.S. Engineering, 1960, Cleveland State University; M.S. Engineering Administration, 1964, Case Western Reserve University*

Tharp, Robert E., *Associate Professor Emeritus 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., *Professor Emeritus of Mechanical Engineering Technology (1981); B.S. Industrial Education, 1979, Purdue University; M.S.Ed. Vocational Education, 1981, Indiana University (Deceased)*

Wilkins, Harriet A., *Associate Professor Emerita of Technical Communication (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*

Yokomoto, Charles F., *Professor Emeritus of Electrical and Computer Engineering (1970); B.S. Electrical Engineering, 1964, M.S. Electrical Engineering, 1966, Ph.D. Electrical Engineering, 1970, Purdue University*

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

Zecher, John E.*, Professor of Mechanical Engineering Technology, Director of Mechanical Engineering Technology (1983); B.S. Industrial Technology, 1971, Miami University; M.S. Mechanical Engineering Technology, 1972, Western Michigan University; Professional Engineer License, Indiana*

Resident Faculty

Resident Faculty

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

Albright, Bruce Randall, *Lecturer of Music; B.A., 1992, Indiana University Bloomington; M.S.M.T., 2002, Indiana University-Purdue University Indianapolis*

Alfrey, Karen, *Lecturer of Biomedical Engineering, Director of the Undergraduate Program in Biomedical Engineering, B.S.E.E. 1993 Cornell University; M.S. 1997 Rice University; Ph.D. 2000 Rice University*

Alvarado, John*, Lecturer of Music; B.M. in Classical Guitar Performance, 1998, DePaul University; M.M. in Performance, 2000, Arizona State University*

Anwar, Sohel, *Associate Professor of Mechanical Engineering (2004); B.S. in Mechanical Engineering, Bangladesh University of Engineering & Tech, 1986, M.Sc.Eng. in Mechanical Engineering, Bangladesh University of Engineering, 1988, M.S. in Mechanical Engineering, Florida State University, 1990, Ph.D. in Mechanical Engineering, The University of Arizona, 1995, Professional Engineer (P.E), Michigan, 2004*

Bailey, Darrell*, Professor of Music; B.M. in Organ Performance, 1974, B.A. in Music, 1975, M.M.T., 1976, Oberlin College; D.M.E. University of Illinois at Urbana-Champaign*

Baldwin, Daniel, *Clinical Assistant Professor of Computer Graphics Technology (2006), B.F.A, Painting, 1996, Indiana University; M.F.A, Illustration, 2000, Savannah College of Art and Design*

Bannatyne, Mark*, Associate Professor of Computer Graphics Technology (2004), B.S., Trade & Technical Education, 1988, Utah State University; M.S., Technology Education, 1992, Utah State University; Ph.D., Curriculum and Instruction, 1997, Purdue University*

Berbari, Edward, *Chancellor's Professor of Biomedical 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*

Burns, Debra, *Professor of Music and Chair, Department of Music and Arts Technology; B.A. in Music Education, 1987, Glenville State College; M.M. in Music Therapy, Illinois State University; Ph.D. in Music Education and Music Therapy, 1999, University of Kansas*

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

Chen, Jie, *Professor of Mechanical Engineering, Chair of the Department of Mechanical Engineering, 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, Rongrong, *Associate Professor of Mechanical Engineering Technology (2008), B.S. Physical Chemistry, 1983, Xiamen University, Ph.D. Electrochemistry, 1993, Case Western Reserve University*

Chen, Yaobin, *Professor of Electrical and Computer Engineering, Chair of the Department of Electrical and Computer Engineering (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*

Choe, E.J., *Assistant Professor of Music and Director, IUPUI Music Academy; B.M. in Piano Performance, 1987, M.A. in Piano Performance and Pedagogy, 1990, The University of Colorado at Boulder; D.M. in Piano Pedagogy and Literature, 2008, Indiana University Bloomington*

Christe, Barbara, *Associate Professor*, *Program Director of Healthcare Engineering Technology Management Program (1998); B.S. Engineering, 1984, Marquette University; M.S. Clinical Engineering, 1986, Rensselaer at Hartford; PhD, Higher Education Administration, 2013, University of Phoenix University*

Christopher, Lauren, *Assistant Professor of Electrical and Computer Engineering (2008); B.S. Electrical Engineering, 1982, Massachusetts Institute of Technology; M.S. Electrical Engineering, 1982, Massachusetts Institute of Technology; Ph.D. Electrical Engineering, 2003, Purdue University*

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 and Information Technology (1999); B.S. Computer Technology, 1992, IUPUI; M.S. Management 1996, Indiana Wesleyan University*

Cooney, Elaine, *Professor of Electrical and Computer Engineering Technology (2005), Chair of Engineering Technology (2009); Bachelor of Electrical Engineering, 1984, General Motors Institute; M.S.E.E. 1986, Purdue University*

Cowan, David J., *Associate Professor of Architectural Technology (2009); B.A. Visual Arts, 1973, University of Saskatchewan, Canada; B.Ed. Secondary, 1976, University of Regina, Canada; M.E.Des(Arch.) Architecture, 1986, University of Calgary, Canada; Ph.D. Architecture 2006, University of Calgary, Canada*

Cox, Robin, *Assistant Professor of Music Technology (2013); B.M. University of Texas at Austin, 1989; M.M. Music Composition, University of Michigan, 1991; D.M.A. Music Composition, University of Miami, 1994*

Deal, W. Scott, *Professor of Music; B.A., 1980, Cameron University; M.M. in Percussion Performance, 1982, University of Cincinnati-College-Conservatory of Music; D.M.A., 1994, University of Miami*

Diemer, Timothy, *Assistant Professor of Organizational Leadership & Supervision; Director of International Services; Bachelor of Science (cum laude), 1973, The Ohio State University, College of Education; Master of International Administration, 1983, School for International Training, Brattleboro, Vermont*

dos Santos, Jr, Euzeli C., *Assistant Professor of Electrical and Computer engineering (2012); B.S. Electrical Engineering, 2004; M.S. in Electrical Engineering, 2005; Ph.D. in Electrical Engineering, 2007; Federal University of Campina Grande, Campina Grande - PB, Brazil*

Drews, Michael, *Assistant Professor of Music; B.A., 1994, Kent State University; M.A. in Composition, 1998, Cleveland State University; D.M.A., 2006, University of Illinois at Urbana-Champaign*

Durkin, Robert, *Lecturer of Mechanical Engineering Technology (2011); Bachelor of Electrical Engineering, 1975, Indiana Institute of Technology; MBA, 2000, University of Notre Dame*

Egan, Toby, *Associate Professor of Organizational Leadership and Supervision (2012); B.S. Communication, University of Wisconsin-Milwaukee, 1990; M.Ed. Training and Organizational Development, University of Minnesota, 1992; Ph.D. Human Resource Development, University of Minnesota, 2002*

Elliott, Robert, *Lecturer of Computer and Information Technology (2009); B.S. Computer and Information Technology, 2000, Purdue University, Indianapolis; M.S. Human Computer Interaction, 2009, Indiana University, Indianapolis*

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*

Evans, Nancy, *Lecturer of Computer and Information Technology (2009); B.S. Accounting, 1993, Butler University; M.S. Secondary Education, 2003, Ball State University; Ph.D. Educational Studies, 2012, Ball State University*

Feldhaus, Charles, *Associate Professor of Organizational Leadership and Supervision and Chair of M.S. Technology (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 and Information Technology (1996) and Chair of the Department of Computer Information and Graphics Technology (2009); 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., *Clinical Assistant Professor of Organizational Leadership and Supervision and Associate Chair of Computer, Information, and Leadership Technology, (1983); B.S. Accounting, Indiana University, 1980; M.B.A., 1985, Butler University*

Frank, Mary Ann, *Senior Lecturer in Interior Design, B.S., Systems Science and Math, 1982, Washington University; M.S. , Adult Education, 2009, Indiana University*

Fu, Yongzhu, *Assistant Professor of Mechanical Engineering (2014), B.S. Polymer Materials and Chemical Engineering, 2000, Tsinghua University, China; M.S. Chemical Engineering, 2003, Dalian Institute of Chemical Physics, China; Ph.D. Materials Science and Engineering, 2007, The Univeristy of Texas at Austin*

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

Goodman, David, *Assistant Professor of Electrical Engineering Technology (2009), B.S. Electrical Engineering, 1995, Purdue University, M.S. Mechanical Engineering Technology, 2005, Purdue University, Ph.D. Engineering Technology 2009, Purdue University*

Guy, Jason, *Lecturer of Computer Graphics Technology (2013); A.S. Commercial Art, 1998, Vincennes University;*

B.S. Media Arts & Science, 2004, Indiana University; M.S. Technology, 2012, Purdue University

Hovde, Marjorie Rush, *Associate Professor of Technical Communication, Adjunct Associate 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*

Huffman, Beth, *Lecturer of Interior Design Technology (2013), M.S. Architecture with a specialization in Sustainable New Cities from Illinois Institute of Technology, 2010; B.S. of Architecture from Ball State University, 2002*

Hundley, Stephen P., *Associate Professor of Organizational Leadership and Supervision (1997) and Chair of the Department of Technology Leadership and Communication (2012); 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, *Associate Professor of Mechanical Engineering Technology, Adjunct Associate Professor of Motorsports Engineering (2004); B.S. Mechanical Engineering, 1979, Rose-Hulman Institute of Technology; M.S. Mechanical Engineering, 1983, Purdue University; M.S. Applied Mathematics, 2007, IUPUI; Ed.D. Education Doctorate, Grand Canyon University, 2013*

Iseley, Tom, Clinical *Professor of Construction Engineering Management Technology; B.S.C.E. 1973, University of Alabama in Birmingham; M.B.A.,1976, University of Alabama in Birmingham, Ph.D., Civil Engineering, 1988, Purdue University, PE License, AL IN, MS, LA, NC, and SC*

Izadian, Afshin, *Assistant Professor Electrical Engineering Technology (2009); B.S. Electrical Engineering, 1998, South Tehran University; MSc in Electrical Engineering, 2001, Iran University of Science and Technology; Ph.D. Electrical Engineering, 2008, West Virginia University*

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

Ji, Julie, *Assistant Professor of Biomedical Engineering (2007); B.S. Chemical Engineering, 1999, Massachusetts Institute of Technology; Ph.D. Bioengineering, 2004, University of Pennsylvania*

Jones, Alan S., *Associate Professor of Mechanical Engineering (2007); B.S. in Mechanical Engineering, Bradley University, 1994, M.S. in Mechanical Engineering, The University of Michigan, 1995, Ph.D. in Mechanical Engineering, The University of Michigan, 2003*

Justice, Connie, *Clinical Assistant Professor of Computer and Information Technology (2000); B.S. Electrical Engineering, 1997, Purdue University, Indianapolis; M.S. Information Science, 2004, Indiana University*

Kassab, Ghassan S., *Professor of Biomedical Engineering; Professor of Surgery, Cellular and Integrative Physiology; Thomas J Linnemeier Guidant Chair, B.S. Chemical Engineering 1986 UCSD: M.S. Engineering Sciences 1987 UCSD; Ph.D. Bioengineering 1990 UCSD*

Katona, Thomas R., *Associate Professor of Mechanical Engineering, School of Engineering and Technology, 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*

Kelceoglu, Bekir, *Assistant Professor of Architectural Technology and Interior Design (2009); B.A. Interior Architecture, 2000, Anadolu University, Turkey; M.F.A, Design Development, 2006, The Ohio State University*

Kim, Dongsoo (Stephen), *Associate 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, Computer Science and Engineering, University of Minnesota*

Kim, Youngsik, *Assistant Professor of Mechanical Engineering (2010), B.Sc. Material Engineering, 2000, SungKyunKwan University, South Korea; M.Sc., Materials Science & Engineering, 2003, Ph.D., Materials Science & Engineering, 2006, Iowa State University, Iowa*

King, Brian, *Associate 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*

Koo, Dan, *Assistant Professor of Construction Engineering Management Technology (2010); B.S. Civil Engineering, 1999, Kwandong University; M.S. Construction Management, 2003, Ph.D. Civil and Environmental Engineering, 2007, Arizona State University; PE License, AZ*

Koskie, Sarah, *Associate Professor of Electrical and Computer Engineering (2003); S.B. Mechanical Engineering, 1983, S.M. Mechanical Engineering, 1986, Massachusetts Institute of Technology,; M.S. Mathematics, Rutgers Univeristy, 1999; Ph.D., Control Theory, Rutgers University, 2003*

Lamm, Nancy, *Assistant Professor of Engineering, part-time, and Academic Advisor in the New Student Academic Advising Center (1987); A.B. Microbiology, 1969, Indiana University; B.S.E. Bioengineering, 1983, M.S.E. Interdisciplinary Engineering, 1989, Purdue University*

Laranja, Ricardo, *Lecturer in Music, B.M., 2000, Acquinas College; M.S. Media Arts and Science, 2003, IUPUI*

Lee, John, *Associate Professor of Electrical and Computer Engineering (2005); B.S. Electrical Engineering, 1986, Kyungpook National University, South Korea; M.S. Electrical and Computer Engineering, 2003, Ph.D. Electrical and Computer Engineering, 2004, Georgia Institute of Technology*

Li, Feng, *Assistant Professor of Computer and Information Technology (2009); B.S. Mechanical Engineering, 2002, M.S. Computer Science, 2005, Southeast University, China; Ph.D. Computer Science, 2009, Florida Atlantic University*

Li, Lingxi, *Assistant Professor of Electrical and Computer Engineering (2008); B.E. Automation, 2000, Tsinghua University, China; M.S. Automation, 2003, Chinese Academy of Sciences, China; Ph.D. Electrical and Computer Engineering, 2008, University of Illinois, Urbana*

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Lin, William, *Associate Clinical 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*

Liu, Hongbo*, Assistant Professor of Computer Information Technology (2013); B.S., Communication Engineering, 2005, University of Electronic Science and Technology of China; M.S., Optical Engineering, 2008, University of Electronic Science and Technology of China; Ph.D., Electrical Engineering, 2013, Stevens Institute of Technology*

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McRobbie, Michael A., *Professor of Computer and Information Technology and President of Indiana University 2007; B.A. 1975, University of Queensland, Australia; Ph.D. 1979, The Australian National University, Australia*

Meng, Chuiyuan, *Lecturer of Music; Bachelor of Literature in Musicology and Music Education, 2006, Capital Normal University, China; M.S.M.T., 2008, Indiana University-Purdue University Indianapolis*

Munson, Jordan, *Lecturer of Music; B.M. in Music Performance, 2007, University of Kentucky; M.S.M.T., 2008, Indiana University-Purdue University Indianapolis*

Na, Sungsoo, *Assistant Professor of Biomedical Engineering (2009); B.S. Mechanical Engineering, 1993, Pukyong National University; M.S. Mechanical Engineering, 2000, Pusan National University, South Korea; Ph.D. Biomedical Engineering, 2006, Texas A&M University*

Nalim, M. Razi, *Professor of Mechanical Engineering (1997), Associate Dean for Graduate Programs and Research (2011); B.Tech. Mechanical Engineering, 1983, Indian Institute of Technology, India; M.S. Mechanical Engineering, 1985, Ph.D. Aerospace Engineering, 1994, Cornell University*

Nickolich, David, *Clinical Assistant Professor of STEM Workforce Education, Department of Computer, Information and Leadership Technology (2011) and Director of STEM Initiatives, School of Engineering and Technology (2009); A.A.S. Computer Technology, (1975), Purdue University; B.S. Computer Technology, (1977), Purdue University; M.B.A. Business Administration, (1983), Kelley School of business, Indiana University; M.A. Adult and Community Education, (1992), Ball State University; M.A.E. Educational Administration and supervision, (1993), Ball State University; Ed.D. Adult, Higher, and Community Education, (2005), Ball State University*

Nickolson, Darrell, *Clinical Assistant Professor of Architectural Technology and Interior Design (2009); B.S. Interior Design, 1999; M.S., Gerontology, 2008, University of Indianapolis*

Orono, Peter, *Senior Lecturer of Freshman Engineering and Mechanical Engineering (2000); B.S. Mechanical Engineering, 1979, Makerere University, Kampala, Uganda; M.S. Mechanical Engineering, 1985, Texas Tech University; Ph.D. Mechanical Engineering, 1991, Wayne State University*

Paydar, Nasser H., *Professor of Mechanical Engineering (1985), Executive Vice Chancellor and Chief Academic Officer (2012); B.S. Mechanical Engineering, 1979; M.S. Mechanical Engineering, 1981; Ph.D. Mechanical Engineering, 1985, Syracuse University*

Peters, G. David, *Professor of Music, Director of Graduate Studies; B.M.E., 1964, University of Evansville; M.S. in Music Education, 1965, Ed.D. in Music Education, 1974, University of Illinois at Urbana-Champaign*

Razban, Ali, *Senior Lecturer (2010); B.S., Mechanical Engineering, Purdue University; M.S.E., Mechanical Engineering and Applied Mechanics, University of Michigan; Ph.D., Mechanical Engineering, Imperial College London, UK; M.B.A. Purdue University*

Rees, Fred J., *Professor of Music; B.M., Performer's Certificate in Double Bass, 1971, SUNY Potsdam; D.M.A. in Music Education, 1977, University of Southern California*

Renguette, Corinne*, Assistant Professor of Technical Communication (2013), Director of Technical Communication (2013); B.A. English, Indiana University, 2002; M.A. English, Indiana University, 2004; Ph.D. Applied Linguistics, 2011, Ball State University*

Rennels, Kenneth E., *Associate Professor of Computer Integrated Manufacturing Technology, B.S. Industrial Engineering, 1975, Purdue University; M.S.B.A. Management and Administrative Studies, 1979, Indiana University; M.S. Industrial Engineering, 2000, Purdue University; Professional Engineer License., Indiana*

Rizkalla, Maher E., *Professor of Electrical and Computer Engineering (1986); B.S. Electrical Engineering, 1975, Assiut University, Egypt; M.S. Electrical Engineering, 1980, Cairo University, Egypt; Ph.D. Electrical Engineering, 1985, Case Western Reserve University*

Rogers, Christian*, Assistant Professor of Computer Graphics Technology (2013); B.S. Visual Communication Technology, 2004, Bowling Green State University; M.S. Career & Technology Education, 2006, Bowling Green State University; Ph.D. Curriculum & Instruction, 2013, University of Toledo*

Rovnyak, Steven, *Associate Professor of Electrical and Computer Engineering (2003); B.S. Electrical Engineering; A.B. Mathematics, 1988; M.S. Electrical Engineering,*

1990, Ph.D. Electrical Engineering, 1994, Cornell University

Russomanno, David J*, Professor of Electrical and Computer Engineering and Dean of Purdue School of Engineering and Technology (2010); B.E.E. (Electrical Engineering), 1986, Auburn University; M.E. (Electrical and Computer Engineering), 1989; Ph.D. (Computer Engineering), 1993, University of South Carolina*

Ryu, Jong Eun, *Assistant Professor of Mechanical Engineering (2013); B.S., Mechanical and Aerospace Engineering, 2004, KAIST, South Korea; M.S., Mechanical and Aerospace Engineering, 2006, KAIST, South Korea; Ph.D., Mechanical and Aerospace Engineering, 2009, UCLA*

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

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*

Schubert, Peter J.*, Professor of Electrical and Computer Engineering and Director of the Richard G. Lugar Center for Renewable Energy (2011), B.A., Physics, 1982, Washington University (St. Louis, MO); M.S. Electrical Engineering, 1984, University of Cincinnati; Ph.D., 1990, Electrical Engineering, Purdue University*

Shayesteh, Seemein*, Lecturer of Electrical and Computer Engineering (2012), B.S., Electrical Engineering, 1984, University of Wisconsin-Madison; M.S., Electrical Engineering, 1988, The University of Toledo*

Smith, Ben, Assistant Professor of Music Technology (2013); B.A. Music Composition, Ithaca College, 2002; M.A. Music Composition, University of Illinois at Urbana Champaign, 2007; D.M. Music Composition, University of Illinois at Urban-Champaign, 2011

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

Tabas, Joe, *Lecturer of Biomedical Engineering Technology (2010); B.S. Biomedical Engineering Technology, 2008, M.S. Technology, 2010, Purdue University - Indianapolis*

Tovar, Andres, *Assistant Professor of Mechanical Engineering (2011); B.S., Mechanical Engineering, National University of Colombia (1995); M.S., Industrial Automation, National University of Colombia (2000), Mechanical Engineering, University of Notre Dame (2004); Ph.D., Aerospace and Mechanical Engineering, University of Notre Dame (2005)*

Varahramyan, Kody, *Professor of Electrical and Computer Engineering, Vice Chancellor for Research (2008); B.S. Electrical Engineering, 1977, University of Illinois, Urbana Champaign; M.S. Electrical Engineering, 1979, Ph.D. Electrical Engineering, 1983, Rensselaer Polytechnic Institute*

Wallacce, Joseph*, Assistant Professor of Biomedical Engineering, B.S.A.E. 2002 Georgia Institute of Technology; M.S.E. 2004 University of Michigan; Ph.D. 2007 University of Michigan*

Wasfy, Tamer, *Associate Professor of Mechanical Engineering (2009); B.S. in Mechanical Engineering, American University in Cairo, Egypt, 1989, M.S. in Mechanical/Materials Engineering, American University in Cairo, Egypt, 1990, M.Phil. in Mechanical Engineering, Columbia University, New York, NY 1993, Ph.D. in Mechanical Engineering, Columbia University, New York, NY 1994*

White, James William, *Lecturer of Construction Engineering Management Technology (2008); Bachelor of Arts, Journalism/Sociology, 1979, Indiana University; B.S. Environmental Design, Bachelor of Architecture, 1984, Ball State University; M.S. Technology, 2007, Purdue University, Registered Architect, Indiana*

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Worley, Wanda L., *Associate Dean for Academic Affairs and Undergraduate Programs (2012) and Associate Professor of Technical Communication (2003); B.S. English, 1969, Indiana University; M.A.T. English, 1973, Indiana University; Ph.D. Adult Education, 1999, University of Wisconsin-Madison*

Wu, Huanmei, *Associate Professor of Computer and Information Technology (2005); B.S. Chemistry, 1996, Tsinghua University, Beijing, China; M.S. Computer and Information Science, 2003, Ph.D. Computer and Information Science, 2005, Northeastern University, Boston, MA*

Xie, Dong, *Associate Professor of Biomedical Engineering, Associate Professor, Department of Surgery, School of Medicine (2004); B.S. Biochemical Engineering, 1982, East China University of Science and Technology; M.S. Polymer Chemistry, 1987, Hubei Research Institute of Chemistry; M.S. Dental Materials, 1993, The Ohio State University; Ph.D. Polymeric Biomaterials/Oral Biology, 1998, The Ohio State University; Postdoctoral, Polymers in Biomedical Applications, 1999, University of Alabama at Birmingham*

Xie, Jian, *Associate, Professor of Mechanical Engineering (2007); B.S. in Chemical Engineering, Tianjin University, China, 1982, M.S. in Electrochemistry, University of South Dakota, Vermillion, South Dakota, 1996, Ph.D. in Electrochemistry, Miami University, Oxford, Ohio, 1999*

Yearling, Paul, *Assistant Clinical Professor of Mechanical Engineering Technology (2011); Bachelor of Engineering, 1989, University of Plymouth, UK; M.S. Mechanical Engineering, 1992, Ph.D. Mechanical Engineering, Minor Applied Mathematics, 1995, North Carolina University; PE License, VA*

Yokota, Hiroki, *Professor of Biomedical Engineering and Anatomy-Cell Biology, Professor of Mechanical*

Engineering (1998); B.S. Aeronautics and Astronautics, 1978; M.S. Astronautics, 1980; Ph.D. Engineering, Astronautics, 1983, Tokyo University, Japan; Ph.D. Biology, 1993, Indiana University

Yoshida, Ken, *Associate Professor of Biomedical Engineering (2006), Adjunct Associate Professor of Electrical and Computer Engineering (2008); B.S. Engineering - Biocybernetics (Biomedical Engineering), U.C.L.A., 1989; Ph.D. Bioengineering, 1994, University of Utah*

Yu, Huidan (Whitney), *Assistant Professor of Mechanical Engineering (2011); B.S., Physics, Zhejiang Normal University, China (1984); Ph.D., Physics, Peking University, China (2001), Aerospace Engineering, Texas A&M University (2004)*

Zhang, Jing, *Assistant Professor of Mechanical Engineering (2011); B.S., Metal Forming, University of Science and Technology, Beijing, China (1996); M.S., Manufacturing Engineering, Beijing University of Aeronautics and Astronautics (1999); Ph.D., Materials Science and Engineering, Drexel University (2004)*

Zhu, Likun, *Assistant Professor of Mechanical Engineering (2009); B.S. in Precision Instruments and Mechanology, Tsinghua University, Beijing, China, 1998, M.S. in Precision Instruments and Mechanics, Tsinghua University, Beijing, China, 2001, Ph.D. in Mechanical Engineering, University of Maryland, College Park, Maryland, 2006*

Courses

Key to Course Descriptions

The courses listed in this section will, for the most part, be offered during the 2014–16 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.

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

Architectural Technology

ART 11700 Construction Drafting and CAD (3 cr.) Class 3, Lab 3.This course is intended to introduce students to AutoCAD drafting fundamentals with an emphasis on construction graphics and drawing methods used in Interior Design and Architectural Technology. This is usually the first AutoCAD class for students and aims for students to master the basic commands. In addition understanding of the visualization needed to draw and create 2-dimensional objects, introduction to creating (construction documents) is emphasized.

ART 12000 Architectural Presentation (3 cr.) Class 3, Lab 3. Students will learn and develop techniques for producing architectural/interior presentation drawings (2D, 3D) and to practice methods of rendering interior and exterior spaces utilizing different media (pencil, markers, digital, etc.). The focus is presentation methods that prepare the student for "real-world" scenarios.

ART 15500 Residential Construction (3 cr.) P: ART 11700 Class 3, Lab 3. This course is designed to introduce students to the technical design of residential buildings using BIM software. Topics include, but are not limited to: understanding the use of materials, codes, graphic terminology/conventions and construction methods used within residential buildings and the application of this understanding to a set of architectural design and working drawings.

ART 21000 History of Architecture I (3 cr.) Class 3. An introduction to the history of architecture of the Western World from the Stone Age to skyscrapers based on lectures and readings from the required texts. Lectures and readings cover the historical development of architecture in the following topics: Stone Age, Egyptian & Mesopotamian, Greek, Roman, Early Christian, Islamic, Romanesque, Gothic, Renaissance, Baroque, and the Modern Era to the present.

ART 22200 Commercial Construction (3 cr.) P: ART 15500 Class 3, Lab 3. To introduce the student to the process of designing and drawing commercial buildings using BIM software. Topics include, but are not limited to: understanding the use of materials, codes, graphic terminology/conventions and construction methods used within commercial construction and the application of this understanding to a partial set of architectural working drawings.

ART 29900 Architectural Technology (3 cr.) Independent Study.

ART 29900 International Design Charrette (1-4 cr.) P: By Permission
Introduction to project-management tools and techniques; practical use of tools and techniques to plan, analyze, lead and monitor a project in collaborative international design. Course content is integrated into a collaborative-design project offered in connection with partner universities in Thailand. Other sections of this course may be offered in other locations where an approved study-abroad program is active. Students participating in domestic service-learning projects may be eligible. Please note that this is a variable credit course and those seeking transfer credit for OLS 37100 must sign up for 3 credit hours. This will involve pre-departure orientation sessions, course assignments while in country as well as assignments and a paper due upon completion of the course (post-travel). Students signing up for fewer credits (1-2) will be required to attend pre-departure orientation sessions and will be required to complete a visual diary while in country. Students seeking 4 credit hours will need to complete course work over and above those seeking credit for OLS 37100.

ART 49900 Senior Project Proposal (1 cr.) P: Senior Standing Class 1 This course prepares the student for their capstone senior project. The focus is upon project proposal creation, with attention being given to the development of the project's objectives, goals, concept statement, required resources as well as precedents, best practices and inspirations.

ART 49900 Senior Project Delivery (3 cr.) P: Senior Standing Class 3 The focus of this course is upon the development of the student's senior project. Building upon the project proposal developed in the previous term, the student works on the preliminary design, design development, documentation and presentation of a building project. This project must showcase the student's expertise in both building technology and computer graphics. Projects can be renovation/retrofit based or new construction of mid-sized buildings.

ART 49900 Special Topics in ART (Variable Titles) (3 cr.)
The following are the variable titles and course descriptions for ART 49900.

A**rchitectural Technology (3 credits)** Independent Study

Architectural Detailing (3 credits) P: ART 22200 Class 3. A course devoted to the examination of frame (wood, timber and light gage steel) construction. It explores, through a series of practical exercises, the ways in which buildings are constructed using these materials as the superstructure. Design solutions will be developed using a variety of manual and computer aided techniques.

Codes and Specifications (3 credits) P: ART 22200 Class 3. This course is designed to be a survey of the typical building code applications that one designing build environments will encounter. Students will be exposed to common scenarios around commercial and residential design as it relates to occupant safety, building and occupancy classification, etc. Students will also do assignments connecting construction documents to written specifications for projects.

Internship (3 credits) P: Junior Standing Class 3. An Internship is a 1-3 credit hour supervised pre-professional learning experience that allows students to apply their skills and knowledge in a professional setting. These experiences are designed to enhance the student's preparedness for an intended career with a business, industry, or government agency. Internships can range from 15-40 hours per week but must last the furcation of at least 10 weeks.

Biomedical Engineering

BME 22200 Biomeasurements (4 cr.) P: PHYS 25100 and ENGR 29700 C: MATH 26600 The foundations of circuit theory are developed. Electrical circuits are used in the context of biomedical applications including transducers, electrodes and the amplification and filtering of clinically relevant bioelectric signals. Laboratory exercises develop technical skills in the design and analysis of analog Electrical circuits, signal processing and digital data acquisition and their safe use for biomeasurements.

BME 24100 Fundamentals of Biomechanics (4 cr.) P: PHYS 15200 and MATH 16600 This course combines didactic lecture and laboratory experiments to introduce the student to the principles of mechanics and how these concepts apply to musculoskeletal tissues.

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

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

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

BME 35200 Cell/Tissue Behavior and Properties (3 cr.) P: BIOL-K 101 and CHEM-C 106. C: BIOL-K 324 This course will introduce the students to the biological principles of cellular/tissue behaviors and properties. Topics include: fundamental concepts of cellular structure and tissue organization, biomolecular elements and their properties, cell shape, cell adhesion and migration, mechanotransduction, pattern formation in embryos, and stem cell and tissue regeneration.

BME 35400 Problems in Cell/Tissue Behavior and Properties (1 cr.) P: BME 24100 C: BME 35200 This course develops quantitative biomechanical methods to analyze cell/tissue behavior and properties and to solve biomechanical engineering problems. Topics include: molecular and cellular basis for mechanotransduction, mechanobiology in skeletal and cardiovascular tissues, and molecular/cellular experiments. Students will solve problems appropriate for the class materials, and conduct experiments in the area of molecular/cellular engineering.

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

BME 38300 Problems in Implantable Materials and Biological Response (1 cr.) P: BME 24100 and CHEM-C 106. C: BME 38100. This course supplements the basic science of BME 38100 with quantitative, analytical examples and problems related to fundamental engineering principles in implantable materials. Topics include: microstructure, phase transformation, processing and design issues related to major engineering materials used for implantation purposes.

BME 395 Selected Topice in Biomedical Engineering (3 cr.) Selected topics in BME at the junior level.

BME 40200 BME Seminar (1 cr.) P: Junior standing in BME or consent of instructor. This course explores career and professional topics in Biomedical Engineering. Topics include resume writing, interviewing, and professional conduct; post-graduate education and life-long learning; and industrial, clinical, and research opportunities in Biomedical Engineering.

BME 41100 Quantitative Physiology (3 cr.) P: BME 33100. This course is an introductory course in physiological systems and an introductory course in classical feedback control theory for biomedical engineers. It aims to apply systems theory and classical feedforward and feedback control in the context of physiological systems. Approximately a third of the course will be devoted to physiological systems, a third to classical control theory and a third to the application of classical control and systems theory to physiological systems.

BME 44200 Biofluid Mechanics (3 cr.) P: BME 35400 and BME 35200 This course explores fluid mechanics in the context of the human circulatory system. Principal equations are derived from differential analysis of fluid flow, and models of characteristic flow conditions are fully analyzed. Biofluid mechanics, vessel biomechanics, and hemodynamic analysis of the circulation system will also be discussed.

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

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

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

BME 49500 Selected Topice in Biomedical Engineering (1-6 cr.) Selected topics in BME at the junior level.

BME 49600 Biomedical Engineering Design Projdects (1-6 cr.) P: Permission of Department Independent project overseen by a faculty mentor.

BME 49700 Directed Readings - Biomedical Engineering (1-6 cr.) P: Permission of department. Independent study on a specified topic with a faculty mentor.

BME 59500 Selected Topics in Biomedical Engineering (1-3 cr.) P: Permission of instructor required. This course is designed primarily for specialized topic areas for which there is no specific course, workshop, or individual study plan, but having enough student interest to justify the formalized teaching of a course.

BME 69600 Advanced Biomedical Engineering Projects (1-6 cr.) P: Permission of instructor required. Individual research projects to be approved by the supervising faculty member before registering for the course. An approved written report is required.

BME 69700 Directed Reading in Biomedical Engineering (1-3 cr.) P: Permission of instructor required. Individualized reading course supervised by an appropriate faculty member. Approval for each reading course must be obtained from the department prior to registration.

BME 69800 Research MS Thesis (1-9 cr.) P: Permission of instructor required. Research M.S. thesis.

Biomedical Engineering Technology

BMET 10500 Introduction to HETM (1 cr.) Class 1. Students will explore the discipline of healthcare engineering technology management (HETM) and the professional practice of technicians in the field. Certification, codes of ethics, and potential career paths will be explored. A visit to a clinical HETM department will be included in the experience.

BMET 20900 Microprocessor Applications (2 cr.) P: ECET 10900 This course will explore fundamental microprocessor theory and applications in health care technology. Hardware and software in specific equipment will be discussed.

BMET 21900 PC & Microprocessors for HETM (3 cr.) P: ECET 10900 This course explores fundamental computer and microprocessor components and theory including applications in health care technology. Hardware and software in specific clinical equipment will be discussed.

BMET 22000 Applied Human Biology for HETM (3 cr.) P: ENG-W 131 or equivalent Class 3. This course presents the human biology, anatomy, physiology, and medical terminology essential for biomedical equipment technicians and the devices involved in patient care. Focus is on the vocabulary necessary for effective medical communication skills in the hospital environment as part of the health care team.

BMET 24000 The Technology of Patient Care (3 cr.) P: BMET 22000 and ECET 10700 Class 3. An overview of medical equipment used in the hospital and other medical environments to diagnose and treat patients. Sensors and physiological signals will be explained. Equipment found in various hospital departments and medical specialties will also be discussed. Patient safety and regulations will be emphasized.

BMET 29000 Biomedical Equipment Technician Practicum (4 cr.) P: BMET 32000 or C: BMET 32000. Class 3. Practice working in industry as a BMET. Students work on a variety of medical equipment and job tasks. Students receive some training in the form of in service and orientation programs. An employer evaluation, student report and a minimum of 180 work hours are required.

Students may need to successfully complete a criminal background check.

BMET 29500 HETM Internship (1 cr.) P: Completion of BMET 24000 with a grade of C or better, overall GPA of 2.0 or higher. C: P or C: BMET 32500. Students experience an internship in the clinical setting exploring the professional practice of healthcare technology and the support of patient care. Students receive training through in-service and orientation programs. A minimum of 180 work hours are required. Students may be required to pass a physical exam, TB test, background check or proof of immunizations including Rubella.

BMET 29900 Biomedical Engineering Technology (1-3 cr.) Hours and subject matter to be arranged by staff.

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

BMET 31500 Introduction to Imaging Modalities (3 cr.) P: BMET 24000 The fundamentals of diagnostic imaging equipment will be explored. The principles of x-ray-based systems will be explored. Components and features of MRI, ultrasound, PET, and nuclear medicine will be discussed. Image storage and communication protocols will be presented.

BMET 32000 Biomedical Equipment Systems (4 cr.) P: C or better required for BMET 24000 and ECET 15700. Class 3, Lab 2. 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 32500 Healthcare Devices and Systems (3 cr.) P: BMET 24000 C or better and ECET 15700. Hands-on exploration of the professional practice of the support of technology involved in patient care. Topics will include patient monitoring equipment, IV and PCA pumps, surgical equipment, infection control and safety, life support equipment, and an overview of imaging modalities.

BMET 39900 Biomedical Engineering Technology (1-3 cr.) Hours and subject matter to be arranged by staff.

BMET 40100 Clinical Applications of RFID (3 cr.) P: BMET 21900 Radio frequency identification technology fundamentals will be explored as well as applications within the clinical setting. Current technologies, vendors, and trends will be discussed.

BMET 40200 Networking for Healthcare Systems (3 cr.) P: CIT 40200 and BMET 32500 Students explore the clinical applications of computer networks, integrated medical devices, interoperability, and electronic medical records. Special emphasis will be on security and HIPAA compliance associated with physiological data. Hands-on learning will be involve campus-area hospitals.

BMET 42000 Technology and Special Populations (3 cr.) P: BMET 32500 or equivalent. Class 3. This course focuses on special patient populations in the clinical environment and the equipment that supplements their care. Groups would include neonates, cardiac intensive care patients, surgical patients and trauma. Emphasis is placed on medical needs and the related technologies.

BMET 44000 Codes, Regulation & Patient Safety (3 cr.) P: BMET 32500 or equivalent. Class 3. This course explores applicable NFPA 99, JCAHO, CLIA and other regulatory agencies and their regulations governing medical equipment in the clinical environment. Case studies will be used to provide examples of interpretation and application.

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

BMET 49000 Project Planning and Design (3 cr.) P: Three BMET 30000 or 40000 level courses and BMET 29500 Students are expected to prepare an individual design in collaboration with industry and or the clinical setting. This course will introduce the applications of project management to the student's design. Topics include project scope, scheduling, resource limitations, stakeholder interactions, delivery and quality assurance.

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

BMET 49200 Capstone Project (1 cr.) P: BMET 49000 Extensive individual design and/or evaluation performed in collaboration with faculty and health care team members. Project is performed under the supervision of health care team members. Relation to the clinical environment required. Written and oral presentations of results are required.

BMET 49300 HETM Ethics and Professionalism (1 cr.) P: BMET 29500 and Senior Standing in Program. Students will explore ethical, social, political, legal and ecological issues that practicing BMETs may encounter. Particular emphasis will be placed on patient safety and privacy issues.

BMET 49900 Biomedical Engineering Technology (1-3 cr.) Hours and subject matter to be arranged by staff.

Candidate

CAND 99100 Candidate (0 cr.)

Computer Graphics Technology

CGT 10100 Introduction to Computer Graphics Technology (3 cr.) Class 1. This course provides an introduction to and a survey of the discipline of computer graphics. The topics include a survey of the applications of computer graphics, the knowledge base and history of computer graphics, an examination of computer graphics technologies and careers as well as an overview of available resources for study and research in computer graphics.

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

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

CGT 11600 Geometric Modeling for Visualization and Communication (3 cr.) Class 2, Lab 2. Core introductory 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.

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

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

CGT 22100 Graphic Representation of Architectural Documents (3 cr.) Class 1, Lab 4. This course will study graphic solutions to problems conditioned by traditional and emerging construction document standards. The principles of construction graphics are applied to the visualization, communication, and graphical analysis of problems. Included is an overview of materials and methods of residential structure construction documentation creation.

CGT 24100 Introduction toComputer Animation (3 cr.) P: CGT 11600 and have a solid understanding and ability to construct 3D surface and solid models, and understand raster imaging C: CGT 21100. Class 2, Lab 2. 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 mechanics of 3D geometric formats, spline-based modeling with polygon mesh & NURBS, procedural mapping of raster images, simplified polygon modeling, rendering methods, hierarchical linking, and kinematic fundamentals.

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

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

CGT 29900 Select Topics in Computer Graphics (1-3 cr.) Class 0-3, Lab 0-9. This course has been designed to introduce students to the standard practices used in business and industry to identify potential employees in graphics related positions. Lectures will cover professional conduct when searching for employment and graphics standards expected in a professionally developed portfolio. Hours and subject matter to be arranged by staff. Course may be repeated for up to 9 credit hours.

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

CGT 34000 Digital Lighting and Rendering for Computer Animation (3 cr.) P: CGT 29900 and have a good working knowledge of 3D modeling and basic animation techniques. Class 2, Lab 2. The development of a working knowledge of perspective display of three-dimensional models and the resulting effects of projected light sources on shade, shadow, color, texture, and atmospheric effects in architecture, product illustration, and animation. Emphasis will be placed on lighting design, analysis, and photorealistic simulation for commercial graphic applications.

CGT 34100 Motion for Computer Animation (3 cr.) P: CGT 29900. Class 2, Lab 2. An applied course covering three-dimensional computer graphic animation for graphics specialists and professionals involved in the use of technical design, time and motion study, surface texture mapping, digital lighting, color, and the technology required to produce computer animations for commercial applications in manufacturing design, marketing, and training.

CGT 34600 Digital Video and Audio (3 cr.) P: CGT 29900 and have experience in 3D modeling and animation techniques. Class 2, Lab 2. Covers the use of digital technologies for video and audio in multimedia, hypermedia, and animation products. Students examine the methods for creating, sampling, and storing digital

video and digital audio and the constraints placed on these media assets when used for media-based products. Emphasis is placed upon the technology of digital video and audio including formats, data rates, compressors, and the advantages and disadvantages of the different technologies.

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

CGT 35600 Programming, Development, and Data Integration (3 cr.) P: (CIT 14100 or CGT 21500) and CGT 25100 or Consent of Instructor. Class 2, Lab 2. A course focusing on the development of modern websites through the usage of CSS/HTML and PHP programming languages. The course stresses development strategies for managing the rapidly changing information of corporations and organizations for just-in-time distribution, using authoring programs to create websites that utilize Content Management Systems. Significant time is spent on intermediate to advanced programming and scripting.

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

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

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

CGT 44200 Production for Computer Animation (3 cr.) P: CGT 34100. Class 2, Lab 2. 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 graphics technology will be included.

CGT 44400 The History and Technique of Visual Effects in Film (3 cr.) P: CGT 34100. Class 2, Lab 2. This lecture-based course presents the history and technique of special or visual effects in film from the 19th Century (George Melies) to the current digital age of visual effects. Emphasis is placed on the use of effects in fantasy, science fiction, and horror genres. These effects can range from the recreation of historical venues, to fictional characters and to worlds not yet seen. This course serves not only to address this facet of the history of film and cinema, but also the techniques and technology of visual effects including practical effects, miniatures, stop-motion, makeup, mechanical effects, optical effects, motion control, and the digital realm.

CGT 44600 Technical Animation Production and Direction (3 cr.) P: CGT 34100. Class 3; or Class 2, Lab 2. A variety of commercial applications of technical animation and spatial graphics are analyzed and produced with special emphasis upon client development, design, organization, scripting, storyboarding, technical production, management, and evaluation.

CGT 45100 Multimedia Application Development (3 cr.) P: CGT 35100 Class 2, Lab 2. A continuation of 35100, this course builds on the basic principles of interactive multimedia and builds towards intermediate methods in interactive media. Interactive multimedia is the uses of content forms that includes a combination of text, audio, still images, animation, video, and interactivity content forms sometimes called "rich media" or interactive multimedia that describes as electronic media devices used to store and experience multimedia content. Examples of interactive multimedia are DVD menu's, Online Applications, Presentations, kiosks, ATM's, DVR Menus, Information Screens (Airports, Restaurants, etc), Computer Games, and many other forms of communication.

CGT 45600 Advanced Web Programming, Development and Data Integration (3 cr.) P: CGT 35600 Class 3; or Class 2, Lab 2. A continuation of CGT 35600 this course builds on the basic principles of web design and builds towards intermediate methods in web design and development. A course focusing on the development of modern websites through the usage of CSS/HTML and PHP programming languages. This course builds on the basic foundation that was established in CGT 35600 and extends those principles to the intermediate level. The course stresses development strategies for managing the rapidly changing information of corporations and organizations for just-in-time distribution, using authoring programs to create websites that utilize Content Management Systems. Significant time is spent on intermediate to advanced programming and scripting.

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

Computer and Information Technology

CIT 10600 Using a Personal Computer (3 cr.) Class 2, Lab 2; or Class 3. This course provides an introduction to word processing, spreadsheet, and presentation software. It also includes instruction in basic computer concepts,

Windows operating systems, the Internet, collaborative tools and database concepts. Applications are taught through the use of problem solving assignments, projects, and exams.

CIT 11200 Information Technology Fundamentals (3 cr.) Class 3. This course provides students with a working knowledge of the terminology, processes, and components associated with information technology. Students will receive experience with the Internet, World Wide Web, current versions of hardware and software, networking, security, maintenance, information systems, and the application development process.

CIT 12000 Quantitative Analysis I (3 cr.) P: MATH 11100 or higher placement. Class 3. 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 14000 Programming Constructs Laboratory (3 cr.) P: (CIT 10600 and CIT 12000) or MATH 15900 or MATH 15400 or ECET 10900 Class 3. This course is an introduction to problem-solving techniques, program design and development, programming logic, and object-oriented terminology and concepts.

CIT 17600 Information Technology Architectures (3 cr.) P: CIT 11200 Class 3. A conceptual and technological survey of information technology architectures inclusive of operating systems, network operating systems, distributed systems architectures, and distributed application architectures. Interoperability between these architectural components is explored. Current technology and trends in each architectural element are reviewed.

CIT 20200 Networking Fundamentals (3 cr.) P: CIT 20700 or CIT 30700. Students will gain hands-on experience installing and configuring local area networks, troubleshooting hardware and software issues, and creating network documentation. Students will explore topics including network performance, network management, and network security.

CIT 20300 Information Security Fundamentals (3 cr.) P: CIT 20700 or CIT 30700 or ECET 28400. 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. In addition, students will participate in a semester project to re-enforce key concepts such as policy development and business contingency planning.

CIT 20600 Advanced Computer Applications (3 cr.) P: CIT 10600. This course will cover the advanced topics of office applications in Word, Excel, and PowerPoint as well as establishing desktop publishing skills using Microsoft Publisher. Topics include web-driven applications, forms and documents, macros, financial functions, worksheet queries, web spreadsheets, web data bases, interactive OLS, VBA, brochures, newsletters, and business forms.

CIT 20700 Data Communications (3 cr.) P: CIT 17600. 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 21200 Web Site Design (3 cr.) P: CIT 11200 or computer literacy. Class 3. This course is designed to give students an introduction to web site design and site creation. The course involves learning current standard XHTML fundamentals, CSS and design concepts. The proper design approach for constructing Web sites and related techniques will also be covered.

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

CIT 21400 Introduction to Data Management (3 cr.) P: CIT 11200 or CIT 12000 or MATH-M118 or MATH 15400 or MATH 15900 or ECET 10900. Class 3. Introduction to basic database development concepts. Extensive exploration of data manipulation using a relational DBMS and SQL. Students develop database applications using the most current database technologies.

CIT 21500 Web Programming (3 cr.) P: CIT 21200 and P or C: CIT 21400 Class 3. 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.

CIT 22000 Quantitative Analysis II (3 cr.) P: CIT 12000 or ECET 10900 or MATH 15300 or MATH-M11800 Class 3. A continued investigation into the problem solving tools and techniques that focus on both hardware systems and quantitative data analysis. The course is designed for CIT majors in their second full year of study.

CIT 24200 Introduction to ASP.Net Programming (3 cr.) P: (CIT 14000 or CIT 21500) and CIT 21200 and CIT 21400. Class 2, Lab 2; or Class 3. This course will provide students with the tools and techniques to build dynamic Web sites using the ASP.Net programming environment. Students gain hands-on experience building a database-driven Web site.

CIT 27000 Java Programming (3 cr.) P: (CIT 14000 or CIT 21500) and CIT 21400. Class 3. 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 29000 Computer Project (1-4 cr.) Independent study for sophomore students wanting to execute a complete computer-oriented project. Course may be repeated for up to 6 credit hours.

CIT 29900 Computer Technology (1-4 cr.) Hours, credit, and subject matter to be arrange by staff.

CIT 30100 Digital Technologies for the Consumer (3 cr.) P: Consent of Instructor. This course acquaints users with computer, digital, and telecommunications technologies necessary for personal and professional productivity. Students will learn the importance of protecting computers in cyberspace, how to apply security in homes and small businesses, and how to make cost-effective choices among hardware, software, and service alternatives in today's marketplace. For non-majors only.

CIT 30400 Database Programming (3 cr.) P: CIT 21400 and CIT 200 level programming course. This course explores advanced database programming techniques for enterprise-wide databases and their implementation using programmatic extensions to Structured Query language (SQL). Topics include advanced data manipulation, stored procedures, triggers, and query optimization.

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

CIT 31200 Advanced Web Site Design (3 cr.) P: CIT 21200 and CIT 200 level programming course. Class 2, Lab 2; or Class 3. This course covers the tools and techniques necessary to maximize the effectiveness of deploying e-commerce Web applications and address both client and server side strategies with a focus on optimal Web design strategies. Strategies focus on internal design issues such as security, reusability, usability, accessibility and architecture and external design issues such as user interfaces, load times and multimedia.

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

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

CIT 32700 Wireless Communication (3 cr.) P: CIT 20700 or CIT 30700. Students will learn about the growing range of wireless technologies and their applications. The course will explore the fundamentals of each wireless technology from basic signaling properties to current and future market uses. Students will have the opportunity to gain hands-on experience with various wireless technologies.

CIT 32900 Java Server Pages (3 cr.) P: CIT 21200 and CIT 27000. Class 2, Lab 2; or Class 3. This course will cover the programming of Java Server Pages (JSP) and Java Servlets in an E-Commerce environment. Students will develop reusable E-Commerce software using server-side Java components.

CIT 34400 Database Security (3 cr.) P: CIT 20300 and CIT 30400. This course will cover fundamentals of database security, data auditing, basic security models, and best practices. Topics may include security architecture, access control policies, auditing and monitoring. The course combines lectures with hands-on activities through lab sessions and an application oriented project using a database system such as Oracle or SQL Server.

CIT 34600 Desktop Publishing Applications (3 cr.) P: CIT 10600 or equivalent. Interdisciplinary introduction to desktop publishing technology integrating application and hardware. Students will learn desktop publishing theory and techniques to produce flyers, newsletters, brochures, business forms, web forms, and publications with database inter-connectivity. Service learning includes a complete DTP solution for a small business or not-for-profit agency. This course meets the IUPUI RISE challenge in Service Learning.

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

CIT 35600 Network Operating Systems Administration (3 cr.) P or C: CIT 20200 (Network Fundamentals). 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.

CIT 37300 Visual Design for Software (3 cr.) P: CIT 14000 and CIT 21200. P or C: CIT 21300. Examination of best practices in software interface development for a variety of platforms. A study of the integration of visual elements into the systems analysis and design process, based on business and technical requirements. Topics include study of common design patterns, a review of prototyping tools, multi-modal design concepts, navigation strategies, and user acceptance testing.

CIT 37400 Systems and Database Analysis (3 cr.) P: CIT 21300. Class 2, Lab 4. Intensive exploration of application and database analysis in a synergistic environment. Students engage in collaborative, project-based activities to learn about project management, requirement analysis, modeling, and prototyping employing problem solving and team-building skills. Object-oriented and data modeling tools are used to apply class concepts.

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

CIT 38800 Topics in Programming Languages (variable title) (3 cr.) Class 3; or Class 2, Lab 2. P: one CIT 200-level programming language course. Varies with course content (prerequisites will be included in the semester class schedule). Since various languages may

be offered under this title, this course may be repeated for a maximum of 9 hours of credit.

CIT 40200 Design and Implementation of Local Area Networks (3 cr.) P: CIT 20200 (Network Fundamentals). Class 2, Lab 2; or Class 3. The design, implementation, and configuration of local area networks. Students install the necessary hardware and software to set up a LAN server with several clients. Students will explore topics including "internetworking", network management, network performance, and security.

CIT 40600 Advanced Network Security (3 cr.) P: CIT 20300 or CIT 30300. This course provides students with in-depth study and practice of advanced concepts in applied systems and networking security, including security policies, access controls, IP security, authentication mechanisms, and intrusion detection and protection.

CIT 41200 XML-Based Web Applications (3 cr.) P: CIT 21200 and CIT 200 level programming course. Class 2, Lab 2; or Class 3. This course covers how to build Web applications using XML. Students will learn how to create and validate data in XML documents and how to display XML documents using Cascading Style Sheets (CSS), XSL Transformations (XSLT), and the Document Object Model (DOM).

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

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

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

CIT 43600 Advanced E-Commerce Development (3 cr.) P: CIT 31200 and (CIT 31300 or CIT 32900 or CIT 34700). Class 2, Lab 2; or Class 3. This course will allow students the opportunity to develop a data-driven e-commerce site for a small- to medium-size company.

CIT 44000 Communication Network Design (3 cr.) P: CIT 40200. Class 2, Lab 2; or Class 3. An introduction to wide area networking (WAN), which is a technology used to extend telecommunications connectivity for information distribution over large geographic regions. Topics include architecture, design, and implementation, as well as the influence of the state and federal regulatory environments.

CIT 44400 Advanced Database Design (3 cr.) P: CIT 21400. This course addresses enterprise data management and logical database design concepts with an emphasis on needs determination and data modeling skills from an organizational perspective. Students will create data models and apply forward and reverse engineering techniques.

CIT 45100 IT Security Risk Assessment (3 cr.) P: CIT 40600. Class 2, Lab 2; or Class 3. Students will learn the basic tools of security risk assessment and risk management. Students will be able to identify and assess security risk, conduct information asset valuation, and apply risk control strategies. Other topics discussed will be: security policies, NIST Security Models, and training education and awareness. At the end of the course students will be able to assess vulnerabilities and document them according to a published assessment standard.

CIT 46000 Wireless Security (3 cr.) P: CIT 40600. Focuses on the risks and benefits associated with wireless local area network communications as well as how the networking industry defines a secure wireless network. In addition, students gain the skills needed to properly create, configure and maintain and a secure wireless network.

CIT 47900 Database Implementation and Administration (3 cr.) P: CIT 34400. Class 2, Lab 2; or Class 3. Extends knowledge of database concepts. Topics include physical database design, client/server implementation and database administration. Given logical database design, students develop physical database structures and implement a database application. Students carry out database design, construction, administration, and programming activities using client/server technology.

CIT 48500 Living Lab (1-6 cr.) P: Consent of Instructor. The Living Lab allows students to apply networking, security, database, website, and application development concepts and techniques learned from prior CIT courses to internal and/or external projects. The Living Lab emulates an industry IT department in which students work on one or more projects as part of an IT team. This course meets the IUPUI RISE challenge in Experiential Learning.

CIT 49000 Senior Project (1-4 cr.) Independent study for seniors wanting to execute a complete computer-oriented project. Course may be repeated for up to 7 credit hours. This course meets the IUPUI RISE challenge in Experiential Learning.

CIT 49900 Computer Technology (1-4 cr.) Hours, credit, and subject matter to be arranged by staff.

CIT 52800 Information Security Risk Management (3 cr.) P: Graduate Status. This course examines the field of security risk assessment and management. Topics include steps in performing information security risk assessment; threats to information security; technical, managerial and operational vulnerabilities; methods for analyzing controls, impact of information security breach, and determining risk. Emphasizes the development and utilization of security metrics in the risk assessment process. Students will apply security risk assessment

principles by conducting a risk assessment in a real world setting.

CIT 55000 Organizational Impact of Information Technology (3 cr.) P: Graduate Status. An enterprise view of the organizational impact of information technology as the most effective means for achieving "better, faster, cheaper operations" in today's highly competitive business environment. Examines how information technology has enabled new organizational forms and changes in business processes, products, markets, delivery systems, ways of working, and people management issues and challenges.

CIT 56500 Teaching Computer Programming, Applications, Communication and Design (3 cr.) P: Graduate Status. In this course, participants will explore best practices for teaching high school students computer programming and computer applications. Participants will learn the best methods for teaching various programming languages and applications to high school students. Additionally, participants will integrate other subject matters with computer programming and applications to create meaningful and interactive lesson plans.

CIT-E 123 Internet Skills (3 cr.) This course is designed to provide students with the skills needed to successfully use the Internet and to increase an individual's competency in the global communication environment. For non-majors only.

Construction Engineering Management Technology

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

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

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

CEMT 12000 Construction Materials and Systems (3 cr.) Class 2 + Lab 2. Introduction to common construction terminology, materials, methodologies, and structural systems as they relate to buildings, industrial facilities, and infrastructure. Selection of construction materials (wood, steel, concrete, and masonry) and methods for diverse applications. Site visits for experiential learning.

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

CEMT 16000 Statics (3 cr.) P: MATH 15400 or MATH 15900. P or C: PHYS 21800. Class 3. Forces acting on bodies at rest, including coplanar, concurrent, and nonconcurrent systems. Includes centroids, moments of inertia, and friction.

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

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

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

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

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

CEMT 30200 Construction Law and Ethics (3 cr.) P: CEMT 28000. Class 3. Practical focus on key legal and ethical issues applicable to the construction industry and how to manage them. Laws related to construction work, contractual relationships and strategies, torts, liabilities, bonding, insurance, risk management, dispute avoidance and resolution, liens, partnering, and ethics are among topics covered.

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

CEMT 33000 Construction Field Operations (3 cr.) P: CEMT 34100 Class 3. Study of types and uses of

construction equipment and machinery in relation to diverse field operations. Analysis of equipment productivity and costs.

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

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

CEMT 34700 Construction Contract Administration and Specifications (3 cr.) P: CEMT 30200 Class 2, Lab 2. Relationship between all parties involved in the construction process. Analysis of contracts, the general and special conditions of the contract, specifications and their purpose/intent, standard specifications, adaptation of selected provisions from standard specifications, and delineation of special supplemental conditions.

CEMT 35000 Construction Project Cost and Production Control (3 cr.) P: CEMT 33000 and CEMT 45200 Class 3: A study of the contractor's record-keeping procedures and forms from estimate breakdown to completion of the project, with a review of current methods of production control.

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

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

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

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

CEMT 45500 Construction Safety and Inspection (3 cr.) P: PHYS 21800 Class 3. A study of safety and inspection requirements for construction sites and projects. Accident record keeping, reporting; requirements of the OSHA code; inspection for safety and hazards, environmental issues, and quality; risk control; and management issues related to these. Development and implementation of company safety and hazard communication and inspection programs.

CEMT 48400 Wood, Timber, and Formwork Design (3 cr.) P: CEMT 26000 , CEMT 26700. Class 3. Fundamentals of wood and timber design, including wall, beams, columns, slabs, and forms for special shapes.

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

CEMT 49100 Innovation in Construction (3 cr.) Innovation in Construction considers the role of innovation within the construction industry. The course reviews the general concept of innovation, how it's defined and who's likely to adopt it. A variety of construction technologies, processes, and materials offering the potential of significantly improving the construction industry are also presented.

CEMT 49200 Sustainability in Construction (3 cr.) This course focuses on the unique role the general contractor can play in reducing the amount of energy, material and environmental resources that are expended during the construction process. The course reviews the genreal contractor's pivotal role on projects seeking LEED certification.

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

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

Electrical and Computer Engineering

ECE 20100 Linear Circuit Analysis I (3 cr.) P: or C: MATH 26100 and PHYS 25100. C: ECE 20700. Class 3. Volt-ampere characteristics for circuit elements; independent and dependent sources; Kirchhoff's laws and circuit equations. Source transformations; Thevenin's and Norton's theorems; superposition. Transient response of resistor capacitor (RC), resistor inductor (RL), and resistor inductor capacitor (RLC) circuits; sinusoidal steady-state and impedance. Instantaneous and average power.

ECE 20200 Linear Circuit Analysis II (3 cr.) P: ECE 20100. P or C: MATH 26600. Class 3. Continuation of ECE 20100. Use of computer-aided design programs. Complex frequency plane, resonance, scaling, and coupled circuits. Two-port network parameters. Laplace transform methods. Use of general loop and nodal equations, matrix formulations.

ECE 20400 Introduction to Electrical and Electronic Circuits (4 cr.) P: or C: PHYS 25100 and MATH 26100

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

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

ECE 20800 Electronic Devices and Design Laboratory (1 cr.) P: ECE 20700. C: ECE 25500. Lab 3. Laboratory experiments in the measurement of electronic device characteristics. Design of biasing networks, small signal amplifiers and switching circuits.

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

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

ECE 26100 Engineering Programming Lab (1 cr.) P: Completion of a pre-calculus course or equivalent; completion of 12 credit hours. C: ECE 26300. Lab 3. Introduction to problem solving using software tools, in particular the C programming language.

ECE 26300 Introduction to Computing in Electrical Engineering (3 cr.) P: Completion of a pre-calculus course or equivalent; completion of 12 credit hours. C: ECE 26100. Class 3. An introductory course in computing programming with an emphasis on program decomposition and program structure. The objective of the course is to introduce the student to problem solving using high-level languages. The students are also introduced to number concepts fundamental in electrical engineering. Programming will be in "C" in order to develop a structured approach to problem solving. Problems drawn from the field of electrical engineering will require no prior engineering knowledge.

ECE 26400 Advanced C Programming (3 cr.) Class 3. Continuation of a first programming course. Topics include files, structures, pointers, and the proper use of dynamic data structures. 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.

ECE 27000 Digital Logic Design (4 cr.) P: or C: ECE 20100 and knowledge of electrical circuits. Class 3, Lab 3. 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; hardware description language; 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 CMOS integrated circuits for combination of logic and sequential circuits.

ECE 28200 UNIX Programming for Engineers (1 cr.) P: ECE 26100 and ECE 26300. Lab 2. Introduction to the UNIX operating system, including the UNIX file system, as well as UNIX tools and utilities. Introduction to Shell Programming. The emphasis will be on how these tools/utilities are utilized in the Computing Engineering field.

ECE 30100 Signals and Systems (3 cr.) P: ECE 20200 and MATH 26600. Class 3. Signal and system representation. Fourier series and transforms, sampling and discrete Fourier transforms. Discrete-time systems, difference equation, Z-transforms. State equations, stability, characteristic values and vectors. Continuous-time systems, time and frequency domain analysis. Continuous systems with sampled inputs.

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

ECE 30500 Semiconductor Devices (3 cr.) P: ECE 25500, MATH 26600, and PHYS 25100. Class 3. Materials- and phenomena-based examination of devices, emphasizing the how and why of solid-state device operation.

ECE 31100 Electric and Magnetic Fields (3 cr.) P: MATH 26600 and PHYS 25100. Class 3. Continued study of vector calculus, electrostatics, and magnetostatics. Maxwell's equations, introduction to electromagnetic waves, transmission lines, and radiation from antennas. Students may not receive credit for both 311 and PHYS 330.

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

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

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

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

ECE 35900 Data Structures (3 cr.) P: ECE 26300. Class 3. An introductory course in computer engineering, with emphasis on data structure and program design using the C language. The classical concepts of structured programming such as stack, queue, linked list, tree, recursion, sorting, and searching. Applications of structured programming in engineering.

ECE 36200 Microprocessor Systems and Interfacing (4 cr.) P: ECE 27000 and ECE 26300. Class 3, Lab 3. 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 6812); assembly language programming techniques; system control signals and I/O port design and handshaking protocols; interrupt control systems; LSI parallel and serial interfaces; analog data and control interfaces.

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

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

ECE 38200 Feedback System Analysis and Design (3 cr.) P: ECE 30100. Class 3. Classical concepts of feedback system analysis and associated compensation techniques. In particular, the root locus, Bode diagram, and Nyquist criterion are used as determinants of stability.

ECE 40100 Engineering Ethics and Professionalism (1 cr.) P: Senior Standing. Class 1. Some ethical, social, political, legal, and ecological issues that practicing engineers may encounter.

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

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

ECE 41700 Multimedia Applications (3 cr.) P: ECE30100 and ECE 36200. Class 3. An introductory treatment of multimedia algorithms and implementation using high-speed multimedia processors. Detailed discussion of architecture, addressing modes and instruction set of multimedia processors, entropy coding, transform coding, speech compression, image compression, and video compression.

ECE 42100 Advanced Digital System Design (3 cr.) P: ECE 27000 and ECE 26300. Class 3. Advanced topics in digital design. Boolean logic. Logic optimization, VLSI and ASIC design basics. Design. Simulation. Placement and routing. Logic synthesis. FPGA structure. FPGA implementation. FPGA design flow. Verilog and VHDL coding.

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

ECE 42700 Power Electronics (3 cr.) P: ECE 25500. Class 3. Introduction to the fundamental operating principles of power conditioning circuits that are currently being used to effect power flow from ac to dc and vice versa. Emphasis is on the relationship between form and

function of these circuits. Circuits discussed will include ac/dc line-commutated converters, dc/dc converters, dc/ variable frequency converters, resonant converters and ac/ac converts. Computer simulations will be used as part of the course work.

ECE 43200 Elementary Power Systems Engineering (3 cr.) P: ECE 32100. Class 3. Fundamental concepts of power system analysis, transmission line parameters, basic system models, steady state performance, network calculations, power flow solutions, fault studies, symmetrical components, operating strategies and control.

ECE 44000 Transmission of Information (4 cr.) P: ECE 30100 and ECE 30200. Class 3, Lab 3. 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 46100 Software Engineering (3 cr.) P: CSCI 24000. Class: 3. Introduction to software engineering principles with special emphasis on the process, methods, and tools needed to develop and test quality software products and systems.

ECE 46300 Introduction to Computer Communication Networks (3 cr.) P: ECE 26300 and ECE 26100. Class 3. An introduction to the design and implementation of computer communication networks. The focus is on the concepts and the fundamental design principles that have contributed to the global Internet's success. Topics include: digital transmission, switching and multiplexing, protocols, MAC layer design (Ethernet/802.11), LAN interconnects and switching, congestion/flow/error control, routing, addressing, performance evaluation, internetworking (Internet) including TCP/IP, HTTP, DSN, etc. This course will include one or more project.

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

ECE 47100 Embedded Microcontroller, Microprocessor, and DSP-Based Systems (3 cr.) P: ECE 36200 and ECE 26300. Class 3. A structured approach to the development and integration of embedded microcontroller/microprocessor/DSP-based systems. The course provides students with design experience of embedded systems. The course covers the microprocessor selection, the configuration of peripheral components, and the hardware abstraction techniques. The course also covers the C programming techniques for embedded systems and using a fixed point microprocessor for floating point calculations.

ECE 48300 Digital Control System Analysis and Design (3 cr.) P: ECE 38200. Class 3. 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.

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

ECE 48800 Senior Design II (2 cr.) P: ECE 48700. A real-life experience in engineering problem solving in a group setting from identification, planning and execution to professional-quality written and oral presentations. This is the second semester of a two semester course sequence.

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

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

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

ECE 51000 Introduction to Biometrics (3 cr.) P: ECE 30200 or graduate standing. Class 3. Basic concepts of biometrics, biometrics systems, and fundamental theories in biometrics; help student learn how to design and develop a biometric system for multi-level security applications. Topics include introduction to biometrics, face recognition, iris recognition, fingerprint recognition, speaker recognition, other biometrics, multimodal biometrics, issues and concerns in biometrics, and future biometrics.

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

ECE 53200 Computational Methods for Power System Analysis (3 cr.) P: ECE 43200 or Graduate Standing. System modeling of three-phase power networks. Computational methods and problem formulation related to load flow and fault studies, and economic dispatch of electric power systems. Assigned projects will involve implementing some of the methods and conducting simple studies.

ECE 53600 Introduction to Computational Intelligence (3 cr.) P: C Programming skills; graduate standing or permission of instructor. Class 3. Basic concepts in theory and paradigms for neural networks, evolutionary

computation, and fuzzy logic; algorithms and applications for hybrids of these tools known as computational intelligence are explored. Topics include artificial neural networks, fuzzy systems, and evolutionary computation. Implementations of a number of paradigms are presented, including particle swarm optimization. Applications to various areas such as biomedical engineering and non-linear control are examined.

ECE 53700 Multimedia Applications (3 cr.) P: ECE 30100 and ECE 36200, or Graduate Standing. Class 3. Treatment of multimedia algorithms and their hardware and software implementations using FPGA and ASIC. Detailed discussion of entropy coding, transform coding, speech compression, image compression, and video compression.

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

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

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

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

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

ECE 56300 Programming Parallel Machines (3 cr.) P: ECE 26300 and ECE 46300 or Graduate Standing. Class 3. Examines how to program parallel processing systems. Various parallel algorithms are presented to demonstrate different techniques for mapping tasks onto parallel machines. Parallel architectures to be considered are: SIMD (synchronous), MIMD (asynchronous), and mixed-mode (SIMD/MIMD hybrid). Machines that represent these classes to be used in the course are the MasPar MP-1 (SIMD); nCUBE 2 (MIMD); and PASM (mixed-mode). There will be three programming projects, one on each machine. The similarities and differences among the machines and their languages will be discussed.

ECE 56500 Computer Architecture (3 cr.) P: ECE 36500 or Graduate Standing. Class 3. An introduction to problems of designing and analyzing current machine architectures. Major topics include performance and cost analysis, pipeline processing, instruction level parallelism, GPU architecture and programming, memory hierarchy, and multiprocessor architectures.

ECE 56600 Microprocessor System Design (3 cr.) P: ECE 36500 or Graduate Standing. Class 3. An overview of advanced-architecture CISC microprocessors and their associated support components, with emphasis on incorporating these devices into both general-purpose and embedded board-level designs for multi-microprocessor systems utilizing open-architecture system buses. Survey of 32-bit CISC microprocessor, memory management, floating point support, advanced peripherals, PLD-base “glue logic” design, performance evaluation, IECEE-standard open-architecture system buses, and various pertinent interface and networking standards. Design experience is gained through a comprehensive, semester-long project.

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

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

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

ECE 58000 Optimization Methods for Systems and Control (3 cr.) P: Consent of Instructor or graduate

standing. Class 3. Introduction to optimization theory and methods, with applications in systems and control. Nonlinear unconstrained optimization, linear programming, nonlinear constrained optimization, various algorithms and search methods for optimizations, and their analysis. Examples from various engineering applications are given.

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

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

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

ECE 60200 Lumped System Theory (3 cr.) P: MATH 511 or consent of instructor. Class 3. 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 60400 Electromagnetic Field Theory (3 cr.) P: Graduate Standing. Class 3. 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 60600 Solid State Devices (3 cr.) P: Graduate Standing. Class 3. 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 capicator, and the MOSFET.

ECE 60800 Computational Models and Methods (3 cr.) P: Graduate Standing. Class 3. 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 61000 Energy Conversion (3 cr.) P: Graduate Standing. Class 3. Electromechanical energy conversion, reference frame theory, induction machines, wound-rotor synchronous machines, permanent magnet synchronous machines, dc-to-ac conversion, brushless dc motor drives, induction motor drives.

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

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

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

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

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

ECE 66800 Introduction to Artificial Intelligence (3 cr.) P: ECE 60000 or Consent of Instructor. Class 3. This course consists of four parts: the first part deals with heuristic search and shows how problems involving search can be solved more efficiently by the use of heuristics; how in some cases it is possible to discover heuristics automatically; knowledge representation and deduction, with emphasis on predicate calculus and

associated concepts such as resolution and unification. The last part of the course will deal with the design of a small-scale reasoning framework using the paradigm of logic programming.

ECE 68000 Modern Automatic Control (3 cr.) P: ECE 60200 or Consent of Instructor. Class 3. Theoretical methods in optimal control theory. Topics include the calculus of variations and the Pontryagin minimum principle with applications to minimum fuel and 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 68400 Linear Multivariable Control (3 cr.) P: ECE 60200 or equivalent. Class 3. A state space investigation of multi-input multi-output control design problems from the geometric perspective. The course will detail the theory and design algorithms needed for a solution to the state feedback eigenvalue assignment problem, the disturbance decoupling problem with and without internal stability, the output stabilization problem, and the tracking (or regulator) problem with internal stability.

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

ECE 69500 Advanced Topics in Electrical & Computer Engineering (VAR cr.)

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

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

Electrical and Computer Engineering Technology

ECET 10700 Introduction to Circuit Analysis (4 cr.) Class 3, Lab 2. P Math 602 placement test of 45 or above. A study of voltage, current, power, and resistance; and Ohm's law, Kirchhoff's circuit laws, and network theorems. Circuit studies cover electronic devices: diodes, transistors, and operational amplifiers. Physical features of capacitance and inductance and their effects in transient circuits and in a-c circuits are covered. The laboratory provides experience with electronic instrumentation and circuit simulation.

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

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

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

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

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

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

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

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

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

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

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

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

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

ECET 35100 Instrumentation Applications for Technology (3 or 4 cr.) P: Math 22100 and ECET 11600 or ECET 10700. Class 2 or 3, Lab 2. Introduction to the basic concepts and terminology of instruments. This course covers the procedures and techniques essential to measurement of physical quantities (such as pressure, flow, temperature, and level measurement) and analysis of that data. Students will use data acquisition systems and computer control software to complete laboratory exercises.

ECET 35700 Real-Time Digital Signal Processing (4 cr.) Class 3, Lab 2. P: 20900 and Math 22100 and P or C: Math 22200. 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 37100 Automation, Instrumentation, and Process Control (3 or 4 cr.) P: ECET 16400 and ECET 23100 Class 0 or 2, Lab 4 or 6. A project-oriented course combining key areas of automation, instrumentation, and process control. The course covers automatic testing, computer interfacing, data collection, robotic controls, programmable logic controllers, and graphical process control software. A final project is an integrated system.

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

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

ECET 43400 PC Systems II (4 cr.) Class 3, Lab 2. P: ECET 20900 and: 16400 or CIT 27000, or CIT 26200. Real-time, PC-based operating systems. Programming Graphical User Interfaces for control applications using an object-oriented language. Embedded PC hardware, busses, and peripheral programming. Writing device drivers.

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

ECET 48404 Emerging Information, Communication and Technologies (4 cr.) P: ECET 28400 Class 3, Lab 2. an advanced course in the Computer Engineering Technology program that introduces and evaluates emerging systems, services and applications in information, communication, and technologies (ICT) areas. In the laboratory, students use utilities to evaluate and analyze various emerging subjects so that certain level of mastery of the subjects can be demonstrated.

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

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

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

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

Technology

EEN 22000 Fundamentals of Electrochemical Materials & Energy Engineering (3 cr.) P: CHEM C105. C: ME 20000. Class 2. Lab 1. This course examines the chemistry and structure of materials and their correlation with various electrochemical properties including their suitability for use in conversion and storage of electrochemical energy, energy related materials, and chemical and renewable energy sources.

EEN 24000 Basic Engineering Mechanics (4 cr.) P: PHYS 15200 and MATH 26100. C: MATH 26600. This course is an introductory mechanics course in energy engineering, covers force systems and couples, equilibrium, centroids, friction, Kinematics, kinetics of particles & rigid body, Newton's second law, energy, and momentum methods; equations of motions, and application to machine elements.

EEN 26000 Sustainable Energy (3 cr.) P: PHYS 15200, CHEM-C 10500 and MATH 16600. C: PHYS 25100 and ME 20000. The objective of this course is to familiarize the students with various forms of available energy. The concept of these energies in terms of efficiency, raw material, safety, economy and environmental impact will be introduced.

EEN 26200 Engineering Design, Ethics, and Entrepreneurship (3 cr.) P: ENGR 19600. C: ENGR 29700 and ME 27000.. Class 2. Lab 2. Basic concepts of the design process. Innovative engineering design of real life application. Engineering ethics topics. Fundamentals of Entrepreneurship. Design projects focus on open-ended problems. Design modeling, simulation, documentation and communication. Implementation and use of modern computer tools in solving design problems and completing team design projects in the area of Energy Engineering.

EEN 29700 Selected Topics in Energy Engineering (0-6 cr.) P: Sophomore standing and/or consent of instrucotr. Topics of contemporary importance or of special interest in Energy Engineering.

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

EEN 34500 Renewable Energy System and Design (3 cr.) P: ME 20000, EEN 26000 (required for EEN majors) or Consent of Instructor. This course is designed to introduce the system and design of energy conversion and storage devices for renewable energy sources. Students will first learn about energy sources available on earth including kinetic, solar, and chemical. Next, the course will provide students with a review of the thermodynamic concepts behind energy constant and energy transfer via an energy conversion device. Finally, this course will tie together concepts of renewable energy sources and thermodynamics teaching students about design elements for energy conversion and storage devices, in which renewable energy sources are converted and stored.

EEN 39700 Selected Topics in Energy Engineering (0-6 cr.) P: Junior Standing and/or consent of instructor. Topics of contemporary importance or of special interest in Energy Engineering.

EEN 39700 Selected Topics in Energy Engineering (Variable Title) (3 cr.)
The following are the variable titles and course descriptions for EEN 39700.

EEN 41000 Clean Power Generation (3 cr.) P: ME 20000. Thermodynamic cycle analysis Biofuels, fossil fuels, waste fuels. Thermal power generators, steam and gas turbines, boilers, condensers, fans, pumps, cooling towers. Solar photovoltaic, fuel cells, thermo-electric power. Solar and low-temperature thermal power generation. Hydro-kinetic power generators, wind turbines, hydro power, wave energy.

EEN 46200 Capstone Design (3 cr.) P: Senior Standing. C: ME/EEN 48200. Class 3. Concurrent engineering design concept is introduced and practiced. Application of the design is emphasized. Design problems from all areas of energy engineering are considered. Contemporary issues pertaining to energy engineering career will be discussed.

EEN 49700 Selected Topics in Energy Engineering (0-6 cr.) P: Junior standing and/or consent of insturctor. Topics of contemporary importance or of special interest in Energy Engineering.

EEN 49700 Selected Topics in Energy Engineering (Variable Title) (3 cr.)
The following are the variable titles and courses descriptions for EEN 49700.

Freshman Engineering

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

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

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

ENGR 19000 Elementary Engineering Design (3 cr.)

ENGR 19500 Selected Topics in Engineering (Variable Titles) (0-3 cr.)
The following are the variable titles and course descriptions for ENGR 19500.

Selected Topics in Engineering I (0-3 credits) Selected topics in general or interdisciplinary engineering

First Year Engineering Projects (1-2 credit)

Introduction to the engineering Profession (1 credit) Class 1 P: none. This course introduces students to the engineering profession and to campus resources. The course is designed to help students develop essential communication and thinking skills along with the study

and time-management skills needed for success in studying engineering. Collaborative techniques used in engineering practice are utilized.

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

ENGR 19700 Introduction to Programming Concepts (3 cr.) C: MATH 16500. Class 1, Lab 2. Basic concepts and applications of software programming for solving engineering problems. Topics include techniques for developing structured algorithms, data input and output, conditional statements, loops, recursion, functions, arrays, and elementary concepts in mathematical programming. Examples, homework, and applications of programming concepts make extensive use of the C programming language.

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

Industrial Engineering Technology

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

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

IET 20400 Maintaining Quality (3 cr.) Class 2, Lab 2. P: MATH 15300 and MATH 15400, or MATH 15900. An analysis of the basic principles of quality control. Includes statistical aspects of tolerances; basic concept of probabilities; frequency distribution; X and R charts; and uses of mechanical, electronic, air, and light devices for checking and measuring levels of quality acceptance.

IET 24000 Quality Techniques for Electronics Manufacturing (3 cr.) P: 15000. Survey of contemporary quality concepts and techniques. Topics include total quality management philosophy, process improvement, vendor certification, quality systems, ISO 9000 documentation, electronics industry quality applications, SPC, introduction to design experiments, basic reliability concepts, testing, and related topics. Team approaches to quality improvement and the application of the basic quality tools to improve processes are covered.

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

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

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

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

IET 36400 Quality Control (3 cr.) Class 3. The course is aimed at determining customer needs and wants, interpreting these into a design during production, follow-up on field performance, and feeding back quality information to further improve the quality system.

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

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

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

Interior Design Technology

INTR 10300 Introduction to Interior Design (3 cr.) Class 2, Lab 2. An overview of the field of interior design, its

history, and theory. An application of the principles and elements of interior design. design process, basic hand drafting, lettering, finish and color board construction/ layout is included. This course is for those who are seeking or considering a degree in Interior Design.

INTR 11000 Interior Design for Non-Majors (3 cr.)

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

INTR 12500 Color and Lighting of Interiors (3 cr.) P: INTR 10300 and HER-E 109. 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 15100 Textiles for Interiors (3 cr.) P: INTR 10300 and HER E109. Class 3. An extensive study of textiles: fiber types, yarn production, fabric construction, finishing, coloring, and printing. Focus on application of textiles for use in residential and commercial interiors.

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

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

INTR 22400 Residential I, Kitchen and Bath (3 cr.) P: INTR 12400, INTR 20200, and ART 12000. Class 2, Lab 2. This studio class emphasizes the design of kitchen and bath spaces, including the development of floor plans, mechanical plans, elevations, and working drawings. NKBA guidelines will be heavily explored. Manual drafting/ drawing.

INTR 22500 Three-Dimensional Interior Design Studio (3 cr.) P: INTR 12400, INTR 12500, and ART 15500. Class 2, Lab 2. This studio class examines the fundamentals of three-dimensional design, detailing and documentation along with 3D thinking and visualization of design solutions sensitive to functional, ergonomic and aesthetic objectives.

INTR 22600 Commercial Systems I (3 cr.) P: INTR 12400, INTR 12500, INTR 20200, and ART 15500. Class 2, Lab 2. This studio course emphasizes the elements used in development of non-residential space. Studies include technological and building requirements, programming, ADA guidelines, material selection and presentation, building and life-safety codes, square footage and space planning standards.

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

INTR 32400 Residential Interior Design Studio II (3 cr.) P: INTR 22400, INTR 22500, and MATH 15400. Class 2, Lab 2. The studio class will emphasize the design of residential space, recognizing design development as a process. Programming and space planning, schematic and design development, working drawings, plans, decorative elements, finish and material selection, budget and client presentations will also be covered.

INTR 32500 Environmental Lighting and Design (3 cr.) P: INTR 22600 and MATH 15400. Class 2, Lab 2, The study and practice of interior lighting fundamentals with an emphasis on environmentally efficient lighting systems and energy economy. Through the design process and execution of luminaire layouts, students will examine the visual process, lamp and luminaire selection, calculation methods, lighting controls and evaluation of effective solutions.

INTR 32600 Commercial Interior Design Studio II (3 cr.) P: INTR 22600 and MATH 15400. Class 2, Lab 2, This studio course emphasizes the elements used in development of nonresidential space. Studies include technological and building requirements; building and life-safety codes, ADA guidelines, square footage and space planning standards, and material selection. Heavy emphasis on the planning of systems furniture.

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

INTR 42800 Interior Design Capstone Design Project (3 cr.) C: INTR 48000. Class 2, Lab 2 In this B.S. Capstone course the designer tackles a semester long advanced design problem by applying the design process from project obtainment through construction documents. This class must be taken in conjunction with INTR 480.

INTR 45200 Interior Building Systems (3 cr.) P: ART 22200. Class 2, Lab 2 A survey course of building systems that covers the design implications of heating, air-conditioning, plumbing, security and electrical systems of primarily commercial buildings.

INTR 45300 Business Practices - Interior Design (3 cr.) P: Senior Standing Class 3 This course discusses professional skills, such as developing your resume/ portfolio and interviewing for an interior design/ architectural technology position, and emphasizes the tools and processes required to succeed in professional practice. This course is delivered entirely online.

INTR 48000 Senior Thesis Project (3 cr.) C: INTR 42800. An instructor mentored research methods and application project relative to the Interior Design Technology major. This class must be taken in conjunction with INTR 42800.

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

Freshman Engineering

ENGR 20000 Cooperative Education Practice I (1 cr.) Semester of external career related experiences designed to enhance the student's preparedness for entering an initial or second career.

*A minimum of 10 weeks and 200 hours are required for credit.

ENGR 20000 Career Enrichment Internship I (1 cr.) Semester of external career related experiences designed to enhance the student's preparedness for entering an initial or second career.

*A minimum of 10 weeks and 200 hours are required for credit.

ENGR 25000 Cooperative Education Practice II (1 cr.) Semester of external career related experiences designed to enhance the student's preparedness for entering an initial or second career.

*A minimum of 10 weeks and 200 hours are required for credit.

ENGR 25010 Career Enrichment Internship II (1 cr.) Semester of external career related experiences designed to enhance the student's preparedness for entering an initial or second career.

*A minimum of 10 weeks and 200 hours are required for credit.

ENGR 30000 Cooperative Education Practice III (1 cr.) Semester of External career related experiences designed to enhance the student's preparedness for entering an initial or second career. *A minimum of 10 weeks and 200 hours are required for credit.

ENGR 30010 Career Enrichment Internship III (1 cr.) Semester of External career related experiences designed to enhance the student's preparedness for entering an initial or second career. *A minimum of 10 weeks and 200 hours are required for credit.

ENGR 35000 Cooperatice Education Practice IV (1 cr.) Semester of External career related experiences designed to enhance the student's preparedness for entering an initial or second career. *A minimum of 10 weeks and 200 hours are required for credit.

ENGR 40000 Cooperatice Education Practice V (1 cr.) Semester of External career related experiences designed to enhance the student's preparedness for entering an initial or second career. *A minimum of 10 weeks and 200 hours are required for credit.

TECH 20000 Cooperative Education Practice I (1-3 cr.) Semester of External career related experiences designed to enhance the student's preparedness for entering an initial or second career.

*A minimum of 10 weeks and 200 hours are required for credit.

TECH 20010 Career Enrichment Internship I (1-3 cr.) Semester of External career related experiences designed to enhance the student's preparedness for entering an initial or second career.

*A minimum of 10 weeks and 200 hours are required for credit.

TECH 25000 Cooperative Education Practice II (1-3 cr.) Semester of External career related experiences designed to enhance the student's preparedness for entering an initial or second career.

*A minimum of 10 weeks and 200 hours are required for credit.

TECH 25010 Career Enrichment Internship II (1-3 cr.) Semester of external career related experiences designed to enhance the student's preparedness for entering an initial or second career.

*A minimum of 10 weeks and 200 hours are required for credit.

TECH 30000 Cooperative Education Practice III (1-3 cr.) Semester of External career related experiences designed to enhance the student's preparedness for entering an initial or second career.

*A minimum of 10 weeks and 200 hours are required for credit.

TECH 30010 Career Enrichment Internship III (1-3 cr.) Semester of external career related experiences designed to enhance the student's preparedness for entering an initial or second career.

*A minimum of 10 weeks and 200 hours are required for credit.

TECH 35000 Cooperative Education Practice IV (1-3 cr.) Semester of External career related experiences designed to enhance the student's preparedness for entering an initial or second career.

*A minimum of 10 weeks and 200 hours are required for credit.

TECH 45000 Cooperative Education Practice V (1-3 cr.) Semester of External career related experiences designed to enhance the student's preparedness for entering an initial or second career.

*A minimum of 10 weeks and 200 hours are required for credit.

Mechanical Engineering

ME 20000 Thermodynamics I (3 cr.) Class 3. P: PHYS 15200. P or C: MATH 26100. First and second laws,

entropy, reversible and irreversible processes, properties of pure substances. Application to engineering problems.

ME 26200 Engineering Design, Ethics and Entrepreneurship (3 cr.) P: ENGR 19600, P or C: ENGR 29700 and ME 27000. Class 2, Lab 2. Basic concepts of the design process. Innovative engineering design of real life applications. Engineering ethics topics. Fundamentals of Entrepreneurship. Design projects focus on open-ended problems. Design modeling, simulation, documentation and communication. Implementation and use of modern computer tools in solving design problems and completing team design projects in the area of Mechanical Engineering.

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

ME 27200 Mechanics of Materials (3 cr.) P: ME 27000. Class 3. 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.

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

ME 29500 Engineering Topics (1-5 cr.) Topics of contemporary importance or of special interest that are outside the scope of the standard undergraduate curriculum can be offered temporarily under the selected topics category until the course receives a permanent number.

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

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

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

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

ME 33000 Modeling and Analysis of Dynamic Systems (3 cr.) Class 3. P: ECE 20400 and MATH 26200 P or C:34000.Introduction to dynamic engineering systems; electrical, mechanical, fluid, and thermal components; linear system response; Fourier series and Laplace transform.

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

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

ME 37200 Design of Mechanisms (3 cr.) P: ME 26200, ME 27200, and ME 27400. Class 3 This course presents fundamental concepts on kinematics and dynamic analysis of linkages and mechanical systems; analytical and graphical approaches to analysis; vector loop and relative velocity/acceleration solutions; design and analysis of cams and gears.

ME 39700 Selected Topics in Mechanical Engineering (0-6 cr.) P: Junior Standing and/or Consent of Instructor. Topics of contemporary importance or of special interest in Mechanical Engineering.

ME 39700 Special Topics in Mechanical Engineering (1 cr.) C: ME 34400 and ME 37200.
The following are the variable titles and Course descriptions for ME 39700.

ME 39700 Mechanical Engineering Lab (1 cr.) This laboratory course provide students with a hands on experience in investigating characteristics of engineering materials and their behavior under different loading conditions as well as design of mechanical components and system.

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

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

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

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

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

ME 43300 Principles of Turbomachinery (3 cr.) Class 3. P: ME 20000 and 31000. Unified treatment of principles underlying fluid mechanic design of hydraulic pumps, turbines, and gas compressors. Similarity and scaling laws. Cavitation. Analysis of radial and axial flow machines. Blade element performance. Radial equilibrium theory. Centrifugal pump design. Axial compressor design.

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

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

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

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

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

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

ME 48200 Control System Analysis and Design (3 cr.) Class 3. P: ME 34000 or equivalent. Classical feedback concepts, root locus, Bode and Nyquist techniques, state-space formulation, stability, design applications. Students may not receive credit for both 48200 and ECE 38200.

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

ME 49700 Selected Topics in Mechanical Engineering (1-6 cr.) Topics of contemporary importance or of special interest that are outside the scope of the standard undergraduate curriculum can be offered temporarily under the selected topics category until the course receives a permenant number.

ME 49700 Machine Design (3 cr.) P: ME 26200, ME 27200, ME 27400. This course prepares the student to: apply basic mechanics (statics and dynamics), mechanics of materials, and probably and statistics to the analysis and design of machines and machine component; design for strength of various machine components; study of stress/strain and force/deflection relations in machine components; understand fundamental approaches to stress and fatigue analysis and failure prevention; incorporate design methods for machine components such as shafts, bearings, springs, gears, clutches, breaks, chains, belts, and bolted and welded joints; and solve open-ended machine design problems involving structural analysis, life prediction, cost, reliability and analysis and technical communication.

ME 50000 Advanced Thermodynamics (3 cr.) Class 3. P: ME 31000. The empirical, physical basis of the laws of thermodynamics. Availability concepts and applications. Properties and relations between properties in homogeneous and heterogeneous systems. The criteria

of equilibrium. Application to a variety of systems and problems including phase and reaction equilibrium.

ME 50101 Energy Assessment of Industrial Processes (3 cr.) P: Graduate Standing or Instructor Consent. The course provides and analyzes methodologies for improving energy efficiency in the manufacturing sector. The manufacturing equipment and processes will be analyzed in terms of energy consumption and optimization. It provides the technical and analytical foundation for students on assessing industrial processes to evaluate measures for optimizing energy efficiency in industrial, electrical, motor drive, compressed air, process heating, process cooling, lighting, space conditioning, combined heat and power systems. This course is designed for students who are interested in energy efficiency.

ME 50102 Energy Management Principles (3 cr.) P: Graduate Standing or Instructor Consent. This course provides energy management principles for industrial applications. Various energy management methods, commitments, and strategies for continuous improvement as well as international standards will be analyzed and integrated. This course emphasizes real world applications including: critiquing utility rates structure and assessing costs; characterizing and quantifying energy saving opportunities at industrial facilities; determining investment payback scenarios and considerations.

ME 50103 Industrial Energy Assessment: Tools and Applications (3 cr.) P: Graduate Standing or Instructor Consent. This course synthesizes advanced energy efficiency, energy auditing, and energy assessment methods and practices. Several types of industrial audits will be analyzed with respect to the methods, tools (hand and software), and industrial applications. Topics include: the audit process for energy, industrial productivity, and waste stream audits; audit components: energy bill analysis and economic analysis; audit system mechanics related to building envelop, electrical system, HVAC system, waste heat recovery, lighting, cogeneration, and other prevalent industrial systems; and measurement instrumentation issues for each industrial system. Students will enhance learning from a class project, which requires completion of an industrial scale energy audit.

ME 50400 Automotive Control (3 cr.) Class 3. P: ECE 38200 or ME 48200 or equivalent, and familiarity with MATLAB. Concepts of automotive control. Electro-mechanical systems that are controlled by electronic control modules via an appropriate algorithm (such as fuel injection timing control, emission control, transmission clutch control, anti-lock brake control, traction control, stability control, etc.). In-depth coverage on modeling and control of these automotive systems. MATLAB/SIMULINK modeling and simulation.

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

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

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

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

ME 54200 Introduction to Renewable Energy (3 cr.) P: ME 31000 Class 3. This is an introductory course on renewable energy. The students will learn the fundamental principles of the various renewable energy options and their applications and costs. After taking this course, the students will be familiar with the economic and societal impact of renewable energy systems, and be able to participate in the design or selection of renewable energy systems.

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

ME 55000 Advanced Stress Analysis (3 cr.) Class 3. P: ME 27200 and MATH 26600. Studies of stresses and strains in three-dimensional problems. Failure theories and yield criteria. Stress function approach to two-dimensional problems. Bending of nonhomogeneous asymmetric curved beams. Torsion of bars with noncircular cross sections. Energy methods. Elastic stability. Introduction to plates. Students may not receive credit for both ME 47200 and ME 55000.

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

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

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

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

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

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

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

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

ME 59700 Selected Topics in Mechanical Engineering (0-6 cr.) Topics of contemporary importance or of special interest that are outside the scope of the standard graduate curriculum can be offered temporarily under the selected topics category until the course receives a permanent number.

ME 59700 Selected Topics in Mechanical Engineering (Variable Title) (3 cr.)
The following are the variable titles and course descriptions for ME 59700.

Design Optimization Methods (3 credit hours) Class 3 P: MATH 26200 and MATH 26100. In this course, the general theory of optimization, concepts and problem statement are presented. Methods for minimization of a function of one or n variables with and without constraints are discussed. Response surface methods and design of experiments are shown to significantly reduce analysis time. Applications using a commercial software package to solve typical engineering design optimization problems are demonstrated. Uncertainty in the design process is introduced. In addition to engineering, the methods studied can be applied to a variety of diverse disciplines such as finance, investment portfolio management, and life sciences.

Fuel Cell Science & Engineering (3 credit hours) P: CHEM-C 106, PHYS 251 or ECE 20200 or ECE 20400; ME 20000 or Professors permission. Fundamental principles of fuel cell science and engineering (fuel cell reactions, charge and mass transport in fuel cells, water transport management, and materials development in the fuel cells, fuel cell system designs and integrations), current state-of-the-art fuel cell technology and the current technical challenges on the development of fuel cells, codes and standards for safe handling of fuel cells.

Nanosystems Principles (3 credit hours) This is the introductory course in the nanosystems area. It introduces students to the principles and applications of nanosystems. The course begins with an introduction to the nanometer scale phenomena. It then introduces students to the basic elements resulting in nanosystems: nanoscale materials, processes, and devices. It also provides students with a basic understanding of the tools and approaches that are used for the measurement and characterization of nanosystems, and their modeling and simulation. Moreover, the course covers the applications of nanosystems in a wide range of industries, including information technology, energy, medicine, and consumer goods. The course concludes with a discussion of the societal and economical significance of these applications, including benefits and potential risks.

Topology Optimization (3 credit hours) P: ME 48200 or equivalent, and any high-level programming languages. This graduate-level course focuses on theoretical and practical aspects of numerical methods utilized in the solution of structural optimization with emphasis on topology optimization problems. This course presents fundamental aspects of finite element analysis and mathematical programming methods with applications on discrete and continuum topology optimization problems. Applications include designing lightweight structures, compliant mechanisms, heat transfer, and energy harvesting systems.

ME 60101 Fundamentals of Turbulence and Modeling (3 cr.) P: ME 50900 or consent of instructor. Class 3. This course consists of three parts: (i) fundamentals

of turbulence including turbulence concepts, statistical description, and Kolmogorov hypothesis. (ii) major modeling concepts and formulations such as direct numerical simulations (DNS), large eddy numerical simulation (LES), and Reynolds averaged Navier-stokes simulation (RANS). Team projects related to turbulence modeling and computation with applications in environment, industry, biomechanics for visualizing and experiencing turbulence.

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

ME 69700 Mechanical Engineering Projects II (1-6 cr.) P: Graduate Standing Individual advanced study in various fields of mechanical engineering. May be repeated for up to 6 credit hours.

ME 69700 Selected Topics in Mechanical Engineering (Variable Title) (3 cr.)
The following are the variable titles and coruse descriptions for ME 69700.

Fundamentals of Turbulence and Modeling (3 cr.) P: ME 50900 or equivalent via consent of instructor. This course consists of three parts: (i) fundamentals of turbulence including turbulence concepts, statistical description, and Kolmogorov hypothesis. (ii) major modeling concepts and formulations such as direct numerical simulations (DNS), large eddy numerical simulation (LES), and Reynolds averaged Navier-stokes simulation (RANS). Team projects releated to turbulence modeling and computation with applications in environment, industry, biomechanics for visualizing and experiencing turbulence.

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

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

Mechanical Engineering Technology

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

MET 20400 Production Drawing (3 cr.) Class: 2, Lab: 2. P:TECH 10400 or CGT 11000, TECH 10500 or MET 10500 (Or Instructors Consent). The design, evaluation, and documentation of engineering specifications required for manufacturability and assembly are introduced. Emphasis is on CAD-based details, assemblies, design layouts, equipment installations and related industrial practices.

MET 20500 Production Drawing and CAD II (3 cr.) Class: 2, Lab: 2. P: TECH 10400 or CGT 11000 (Or Instructors Consent). Application of 3D modeling referenced from engineering drawings (assembly and detail drawings). Topics include: 3D solid modeling, solids editing, lighting and rendering.

MET 20900 Three-Dimensional NURBS Modeling (3 cr.) Class: 2, Lab: 2. P: TECH 10400 or CGT 11000 (Or Instructors Consent). Introduction to 3D geometric modeling using NURBS-based CAD modeling. Emphasis on creating, editing, manipulating and presenting 3D conceptual and production models. Efficient modeling strategies, data exchange and an overview of down-stream applications is included.

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

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

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

MET 22000 Heat and Power (3 cr.) P: PHYS 21800 Class 2, Lab 2 Heat/Power 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. Typically offered Fall/Spring.

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

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

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

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

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

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

MET 32000 Applied Thermodynamics (3 cr.) P: MET 22000 and MATH 22100 Class 2, Lab 2 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 32800 CAD/CAM for Mechanical Design (3 cr.) Class: 2, Lab: 2 plus 1 arranged. P: TECH 10400 or CGT 11000, TECH10500 or MET 10500 (Or Instructor's Consent). Basic operations of mechanical design-drafting. A PC CAD (2D and 3D) laboratory-centered course introducing the basic steps involved in the geometric design of mechanical parts. This class provides an overview and continues into a detailed investigation of parametric modeling. Parametric modeling concepts will be applied to problems using standard industrial practices. Students must possess a solid background in engineering or technical graphics.

MET 32900 Applied Heat Transfer (3 cr.) P: MET 22000 Class: 3, An applied approach to the introduction of basic vocabulary and concepts related to the steady state transfer (i.e., conduction, convection, radiation) will be covered. Additional topics will include heat exchangers, boilers and solar energy.

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

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

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

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

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

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

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

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

MET 42800 Advanced CAD for Mechanical Design and Drafting (3 cr.) Class 2, Lab 3. P: 32800 or equivalent. Mechanical and geometric modeling of complex surfaces, with manufacturing emphasis using wire-frame and shaded imaging techniques.

MET 47200 Vehicle Dynamics (3 cr.) Class 3. P: MET 21300, MSTE 21000 or ME 27400 or equivalent or permission of instructor. The course provides a study of vehicle chassis, suspension, and aerodynamic systems with a focus on high performance.

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

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

MET-E 198 Employment Enrichment Experience I (1 cr.) P: Sophomore standing, a minimum GPA of 2.3,and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's preparedness for entering an initial or second career. A comprehensive written report on the internship experience is required.

MET-E 298 Employment Enrichment Experience II (1 cr.) P: Sophomore standing, a minimum GPA of 2.3,and program advisor approval. A semester or summer

of external, full-time, related career experiences designed to enhance the student's preparedness for entering an initial or second career. A comprehensive written report on the internship experience is required.

MET-I 198 Career Enrichment Internship I (1 cr.) P: Sophomore standing, a minimum GPA of 2.7, and program advisor (1 cr.) P: Sophomore standing, a minimum GPA of 2.3,and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's preparedness for entering an initial or second career. A comprehensive written report on the internship experience is required.

MET-I 298 Career Enrichment Internship II (1 cr.) P: Sophomore standing, a minimum GPA of 2.3,and program advisor approval. A semester or summer of external, full-time, related career experiences designed to enhance the student's preparedness for entering an initial or second career. A comprehensive written report on the internship experience is required.

Motorsports Engineering

MSTE 21000 Statics and Dynamics (4 cr.) P: MATH 16600 and PHYS 15200 or Permission of Instructor. Class 4. This course studies the analysis of systems in static equilibrium, systems in dynamic equilibrium, simple vibratory systems and provides for the study of either vehicle dynamics or vibrations.

MSTE 21700 Motorsports Practicum I (1 cr.) P: None. This course engages students in a hands-on experiential learning opportunity in which they participate in the design, fabrication, assembly, and preparation of a race vehicle just as they might when engaged with a race team in the motorsports industry. Students will be expected to show mastery of at least 4 of 12 key skills for success in motorsports.

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

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

MSTE 29800 Programming & Computer Modeling for Motorsports (2 cr.) P: MSTE 27200 Introductory course detailing methods for creating virtual models of objects and systems for design, analysis, and optimization of motorsports components. Virtualization methods include object-oriented programming techniques for creating mathematical models, and solid modeling techniques for visualizing objects as three-dimensional representations. The methods intriduced through this course lay the foundation for advanced courses in vehicle design, simulation, and analysis.

MSTE 29900 Motorsports Engineering Directed Study (1-3 cr.) P: Permission of Insstructor. This is a directed study course for students wishing to pursue additional motorsports studies under the direction of a faculty advisor.

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

MSTE 31100 Business of Motorsports II (3 cr.) Class 3. P: MSTE 31000. This course studies complex business, public relations, and management relationships including case studies from the unique environment of the Motorsports Industry.

MSTE 31200 Business of Motorsports (4 cr.) P: MSTE 27200 and ENG W131 This course will introduce students to the concept of a team organizational structure and business management as well as the important aspects of marketing and sponsorships in the motorsports industry through an examination of literature and guest speakers. Topics will include team structure, budgeting and finances, risk management, marketing, public relations, and sponsorships with the emphasis on motorsports. Students will also have the opportunity to learn about networking and marketing themselves in the Motorsports industry.

MSTE 31700 Motorsports Practicum II (1 cr.) P: MSTE 21700 This course engages students in a hands-on experiential learning opportunity in which they participate in the design, fabrication, assembly, and preparation of a race vehicle just as they might when engaged with a race team in the motorsports industry. Students will be expected to show mastery of at least 8 of 12 key skills for success in motorsports.

MSTE 32000 Motorsports Design I (3 cr.) Class 3. P: MSTE 31000 and MSTE 21000 and MSTE 29700 or permission of instructor. This course explores the design concepts and approaches of the Motorsports Industry, creating connectivity between the courses of the first two years of the Motorsports Engineering BS Program and preparing students for internships in industry. A student project is required.

MSTE 33000 Data Acquisition in Motorsports (3 cr.) P: ECE 20400 C: MSTE 47200 Class 3. This course explores instrumentation, data acquisition, data reduction, and data analysis within the Motorsports Industry.

MSTE 33100 Data Acquisition in Motorsports II (3 cr.) P: MSTE 33000 and MSTE 47200 This course provides an in-depth discussion to instrumentation, data acquisition, data reduction, and data analysis within the Motorsports Industry featuring case studies. Requires a student project.

MSTE 34000 Dynamic Systems and Signals (3 cr.) P: MATH 26600 and MSTE 47200 Introduction to dynamic engineering systems and continuous-time and discrete-time signals, mechanical electromechanical components, linear system response, Fourier and Laplace Transforms. The course is designed to teach the student the basic concept for modeling the behavior of dynamic systems.

MSTE 35000 Computer Aided Design & Manufacturing (3 cr.) P: MSTE 29800 and MSTE 21000. This course provides the basis for the computer aided engineering and analysis skills needed in the Motorsports Industry.

The ability to visualize and conceptualize a real part in the physical world and produce graphical respresentations of it in 2D and 3D in Solidworks or an equivalent is a primary objective. Further skills to be developed include the ability to produce large assemblies of such parts with appropriate tolerancing, free form surfacing, casting shapes and casting machining, 2D drawings for use in 3D sheet metal fabrication including shrink and stretch, use of 3D models to facilitate Finite Element Analysis, Conversion of CAD model to programming of CAM machining.

MSTE 41400 Motorsports Design II (3 cr.) P: MSTE 31200 and MSTE 32000 This is the culminating course in the Motorsports Engineering Plan of Study, typing together concepts from all the other courses in the curriculum, and requires a capstone design project representative of a real world project within the Motorsports Industry.

MSTE 41700 Motorsports Practicum III (1 cr.) P: MSTE 31700 This course engages students in a hands-on experiential learning opportunity in which they participate in the design, fabrication, assemsbly, and preparation of a race vehicle just as they might when engaged with a race team in the motorsports industry. Students will be expected to show mastery of 12 of the 12 skills outlined in the Course Objectives.

MSTE 41800 Advanced Motorsports Practicum (1 cr.) P: MSTE 41700 This course engages students in a hands-on experiential learning opportunity in which they participate in the design, fabrication, assembly, and preparation of a race vehicle just as they might when engaged with a race team in the motorsports industry. Students will be expected to show mastery beyond the 12 skills outlined in the Course Objectives.

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

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

MSTE 48200 Motorsports Aerodynamics (3 cr.) P: MSTE 35000 and ME 31000 Study of fluid flow and aerodynamics as applied to race car design and Computational Fluid Dynamic (CFD) Analysis.

MSTE 49000 Motorsports Engineering Independent Study (1-3 cr.) P: Permission of Instructor. This is an independent study course for students wishing to pursue advanced studies under the direction of a faculty advisor.

MSTE 49700 Motorsports Design Project (3 cr.) P: MSTE 31100, MSTE 33100, MSTE 35000 and MSTE 32000. This is an independent study version of the MSTE 41400 culminating course in the Motorsports Engineering Plan of Study, tying together concepts from all the other courses in the curriculum, and requires a capstone design project representative of a real world project within the Motorsports Industy.

MSTE 49900 Motorsports Engineering Special Topics (1-3 cr.) P: Permission of Instructor. This is a special topics course for students wishing to pursue advanced studies under the direction of a faculty advisor.

MSTE-I 41000 Motorsports Internship (1-3 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.

Music and Arts Technology

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

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

MUS-A 210 Advanced Musicianship and Technology I (6 cr.) Musicianship and Technology III is the continuation of the four-semester sequence in comprehensive musicianship. Concepts introduced in Musicianship and Technology I-II shall be explored with greater depth and sophisticated application. Several new topics, such as counterpoint, mode mixture, and enharmonic transformation, shall be included. All topics shall be explored from an analytical, historical, and hands-on perspective. Course material shall incorporate an array of styles, genres, and cultural influences. For music majors only. Prerequisites: Basic Musicianship and Technology I and II (A110 and A120) and/or consent of instructor.

MUS-A 220 Advanced Musicianship and Technology II (6 cr.) Musicianship and Technology IV is the conclusion of the four-semester sequence in comprehensive musicianship. Concepts introduced in Musicianship and Technology I-III shall be explored with greater depth and sophisticated application. Several new topics, such as composition and cellular organization shall be included. All topics shall be explored from an analytical, historical, and hands-on perspective. Course material shall incorporate an array of styles, genres, and cultural influences. Music majors only. Prerequisites: Basic Musicianship and Technology I and II (A110 and A120) and Advanced Musicianship and Technology I (A210) and/or consent of instructor.

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

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

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

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

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

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

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

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

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

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

MUS-E 536 Workshop: Social Network Web 2.0 and Beyond (3 cr.)
Departmental consent required.

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

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

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

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

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

MUS-E 536 Workshop: Musical Theatre Forum (3 cr.)
This course touches on theatre production. Consent of instructor.

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

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

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

MUS-E 536 Workshop: Website Design for Musicians (3 cr.)

Individuals will learn the techniques of creating their own music website. Departmental consent required.

MUS-E 536 Advanced Website Design for Musicians (3 cr.)
Individuals will learn advanced techniques of creating music website. Departmental consent required. Call (317) 278-3264 for more information.

MUS-F 400 Chamber Music Ensemble (2 cr.) For non-majors. 2 credit hours. This is a performance class, designed to further skills on each individual instrument, learn diverse styles of music, and work in a group setting. Private coaching will be offered and a performance will be scheduled for the end of the semester. Acceptance is by audition only and requires a minimum of an intermediate level of proficiency. Advanced musicians are also encouraged. The following instruments may be included in this course: Flute, oboe, bassoon, clarinet, strings, guitar, piano, French horn, and voice. Performance at the end of the semester is required. Audition and authorization are required for this class.

MUS-F 420 Topics in Performance Study/ Undergraduate (1 cr.)

MUS-F 451 Chamber Ensemble (1 cr.) For majors. 1 credit hour. This is a performance class, designed to further skills on each individual instrument, learn diverse styles of music, and work in a group setting. Private coaching will be offered and a performance will be scheduled for the end of the semester. Advanced musicians are encouraged. The following instruments may be included in this course: Flute, oboe, bassoon, clarinet, strings, guitar, piano, French horn, and voice. Performance at the end of the semester is required. Only 1 credit per semester will count towards BMST degree.

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

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

MUS-L 102 Intermediate Guitar Class (2 cr.) P: L101 and/or ability to read music and play chord structures proficiently. Builds on knowledge learned in L10100; ability to reach chord notation, rhythms, and music notation necessary; acoustic guitar required for class and practice.

MUS-L 103 Advanced Guitar Class (2 cr.) P: L101 or permission of instructor. Study of advanced techniques, including open tunings and slide guitar. A section for classical guitar is also available under this number.

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

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

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

MUS-L 254 Music Therapy Practicum I (1 cr.) P: X298 Students provide services to individual client in campus clinic or at local agency. Emphasis on acquiring skill in conducting music therapy assessments. Two or more hours per week and attendance at weekly seminar. May be repeated. Liability insurance required.

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

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

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

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

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

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

MUS-L 420 Clinical Processes in Music Therapy (3 cr.) P: L15300 or consent of instructor. Overview of the influence of music on behavior and the use of music in treatment plans with clients. Includes principles of behavior therapies as they apply to the music therapy clinical treatment process.

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

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

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

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

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

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

MUS-N 310 Music Technology I (3 cr.) P: MUS-A 210 and consent of the instructor. This course is the foundation course to the music technology sequence. it is intended to provide the student with conceptual understanding of basic hardware and software tools for creating, editing, and recording music. It will also acquaint the student with the nomenclature and techniques of music production.

MUS-N 320 Music Technology II (3 cr.) P: MUS-N 310 and consent of the instructor. This course is an overview to the digital world behind music hardware and software. Major scripting languages taught during this course are intended to provide a knowledge and appreciation of the board genre of computer music, as well as a practical understanding of the fundamental techniques used in digital signal processing.

MUS-N 410 Music Technology III (3 cr.) P: MUS-N 320 and consent of the instructor. This course addresses the domains of creativity, music business/ organizational administration, product development and studio production.

MUS-N 420 Concentration Capstone (3 cr.) P: MUS-A 110, A210, A120, A220, N310, N320 and consent of instructor. Capstone project based on courses taken for concentration.

MUS-N 450 Concentration Capstone (3 cr.) P: MUS-A110, A 210, A120, A220, N310, N320, N410, N420 and consent of instructor. BSMT final capstone project.

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

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

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

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

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

schedules for intrinsic motivation of students and trainees are examined.

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

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

MUS-N 519 Digital Sound Design for Multimedia I (3 cr.) P: M110, N514, or consent of instructor. Digital sound design and multimedia applications result in use of advanced Digital Audio Workstations and advanced software systems. Digital software-based sampling, synthesis, and multitrack recording systems will be mastered, including Pro-Tools, CuBase, and experimental music systems. Lab time in Digital Sound Design Studio required.

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

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

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

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

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

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

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

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

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

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

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

MUS-P 200 Piano (1-2 cr.) For majors. 1-2 credit hours. Class consists of individual lessons for Piano, 30-50 minutes each week. Additional applied fee. Time scheduled with instructor. Only 1 credit per semester will count towards BSMT degree.

MUS-R 241 Introduction to Musical Theatre (2 cr.)

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

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

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

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

MUS-S 230 Cello (1-2 cr.) Private cello lessons, 30-50 minutes each week. Additional applied fee. Time scheduled with instructor. Students must provide instrument. Only 1 credit per semester will count towards BSMT degree.

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

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

MUS-U 410 Creative Arts, Health & Wellness (3 cr.)

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

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

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

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

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

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

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

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

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

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

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

MUS-X 040 University Instrumental Ensembles (1 cr.) Electro-acoustic Ensemble.

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

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

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

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

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

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

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

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

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

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

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

MUS-Z 301 History of Rock Music—'70s and '80s (3 cr.) Survey of trends and styles in rock music of the

’70s and ’80s. Focuses on the artists and groups who have shaped the music of yesterday, today, and tomorrow.

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

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

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

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

MUS-Z 320 Special Topics in Music (Variable Title) (3 cr.)
The following are the variable titles and course descriptions for MUS-Z 320

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

Music of Elvis Presley (3 cr.) The music of Elvis Presley involves discussion of Elvis Presley's music, including influences and innovations. Also discussed is the impact of Elvis Presley on modern popular music.

Foundations of Music Production (3 cr.) This class examines foundations and principles of music production. Consent of instructor. Call (317) 278-3264 for more information.

Global Music Journey (3 cr.) Explore the diversity of musical traditions found throughout the world by studying the various means of transmission, musical instruments, musical meaning, musical sound, as well as the rituals and myths commonly associated with an assortment of music cultures. Previous musical training is not required. Pre-requisite M174. WEB

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

Jazz Improv I (3 cr.) Introduction to Jazz Improvisation including Jazz theory, chord recognition and Jazz vocabulary. Consent of instructor. Call (317) 278-3264 for more information.

Women Musicians (3 cr.) This class studies the lives and music of representative women composers and performers from Medieval Period to the 21S Century.

Music of Jimi Hendrix (3 cr.) The music of Jimi Hendrix involves discussion of Hendrix's music, including influences and innovations. Also discussed is the impact of Jimi Hendrix on modern popular music.

History of American Pop Music (3 cr.) This is a variable topics class in popular music. A general description includes, but is not limited to, the following: This class examines the cultural content of music by defining "popular" and by examining various decades of music in America from the 1600 to the present day.

History of Electronic Music (3 cr.) This course will give the student an understanding of the history of electronic and experimental music and how it relates to the music of today. Students will learn the most significant works realized through computers and other electronic devices from the middle of this century through the present. The purpose of this course is to give an introduction to the history, styles, techniques, and composers of the genre. Topics will include musique concrete, MIDI, tape compositions, synthesizers, waveforms, electronic musical instruments and devices, electronic musical genres, and computer music.

Website Design for Musicians (3 cr.) Individuals will learn advanced techniques of creating music websites. Departmental consent required. Call (317) 278-3264 for more information.

Digital Sound Design for Multimedia (3 cr.) Digital sound design and multimedia applications result in use of advanced Digital Audio Workstations and advanced software systems. Consent of instructor. Call (317) 278-3264 for more information.

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

Steel Pan Techniques (3 cr.) The objective of the IUPUI Steel Band Techniques class is to give the students the opportunity to explore the instrumentation, styles, excitement, and techniques of island music through performance. The group's repertoire will include calypso, reggae, jazz, pop, and classical selections. Call (317) 278-3264 for more information.

Hip Hop Music and Culture (3 cr.) This course examines the cultural and musical phenomenon that is hip hop. Discussions will include the influences and history of

early hip-hop, controversies, creativity and innovation, and the appropriation of hip-hop into the music industry.

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

MUS-Z 373 The American Musical: Context and Development (3 cr.) The origins of the American musical: its societal impact and its development from vaudeville and European operetta to the rock musicals of today.

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

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

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

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

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

MUS-Z 403 The Music of Jimi Hendrix (3 cr.)

Organizational Leadership and Supervision

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

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

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

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

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

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

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

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

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

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

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

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

OLS 38300 Human Resource Management (3 cr.) This course teaches an overview of the human resource function in organizations today. Case studies are used to explore applications of human resource principles.

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

OLS 39900 Special Topics in OLS (Variable Topics) (3 cr.)
The following are the variable titles and course descriptions for OLS 39900.

Special Topics (3 credit) 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.

Introduction to Sustainable Principles and Practices (3 credits) Introduction to Sustainable Principles and Practices course will introduce students to sustainability. It will look at how and why sustainability became important in the world today. We will look at the history of sustainability, the definitions of sustainability, and sustainable Development. By applying the principles of sustainability to design, buildings, and energy there can be enormous savings in natural resources. How these sustainable practices are put into play with regards to design, building and energy in the United States and other parts of the world will be discussed as well.

Leadership and Economic Aspects of sustainable Technologies (3 credits) This course will examine what it takes to be an environmental leader. It will look at the standards, implicit or explicit, that you must meet to be green. How you communicate what your sustainable technologies business is doing right and what it is doing wrong. How your sustainable technology company can be heard amid the "green noise" in the market place and what are the new opportunities emerging for companies in the green economy.

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

OLS 42300 Go Green (3 cr.) This is an interdisciplinary course emphasizing sustainability, globalization, and an international culture experience. In this context, sustainability refers to design, engineering, manufacturing, technology and leadership processes implemented and maintained in industry and business for the purpose of being environmentally responsible, energy efficient, cost effective, and socially responsible.

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

OLS 47400 Conference Leadership Training (3 cr.) This is an applications oriented course that provides students with the necessary skills to present technical information, conduct problem solving and decision making meetings, plan and lead interactive conferences for many organizational purposes. Special emphasis is placed on leading, facilitating, and structuring information in various types of meetings.

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

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

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

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

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

OLS 58100 Workshop in OLS (1-6 cr.)

OLS 58200 Leadership & Organizational Change (3 cr.)

Technical Communication

TCM 19900 Selected Topics: Technical Communication (1-3 cr.) Topics of current and specialized interest for technical communication. Hours and subject matter to be arranged by faculty.

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

TCM 23000 Principles and Practices of Technical Communication (3 cr.) Class 3. This course serves as a gateway into the technical communication B.S. degree. It introduces the basic principles and practices of technical communication in the workplace. This course explores

the range of abilities that technical communicators need and includes applied projects that will begin to develop these abilities. The course also serves as a foundation for higher-level courses within the major of technical communication.

TCM 24000 Tools for Technical Communication (3 cr.) Class 3. This course teaches students the basics of understanding, using, and evaluating software that is commonly used to create, distribute, and manage technical communication. Note: This course is being offered as TCM 29900 during spring 2014.

TCM 25000 Career Planning in Engineering and Technology (1 cr.) Class 3 P: ENG-W 131 or Equivalent A systematic, hands-on approach to making career-releated decisions. Course equips students with the necessary tools to find and acquire an internship, co-op, or job now and in the future.

TCM 29900 Selected Topics: Technical Communication (1-3 cr.) Topics of current and specialized interest for technical communication. Hours and subject matter to be arranged by faculty.

TCM 31000 Technical and Scientific Editing (3 cr.) Class 3. TCM 31000 focuses on techniques for editing functional technical and scientific products in academic and professional settings.

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

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

TCM 35000 Visual Technical Communication (3 cr.) P: TCM 22000 or consent of instructor. Class 3. Topics covered in this class include methods and principles of creating visual technical communication, basics of visual design, visualization of technical data, usability of visual technical communication products, the role of technical communicators in the workplace, and modern technology available to technical communicators.

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

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

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

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

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

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

TCM 42500 Managing Document Quality (3 cr.) Examines and applies principles of creating technical publications with a focus on quality management of the process. Students will create effective publications by identifying and intervening at crucial points in the documentation cycle - planning, researching, designing, drafting, reviewing, testing, and revising.

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

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

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

TCM 49900 Selected Topics: Technical Communication (1-3 cr.) Topics of current and

specialized interest for technical communication. Hours and subject matter to be arranged by faculty. May be repeated for up to 6 credit hours.

Technology

TECH 30100 Renewable Energy Systems (3 cr.) Course provides the students with an introduction to renewable energy sources. Topics include photovoltaic, solar thermal systems, fuel-cells, hydrogen, wind power, waste heat, bio-fuels, wave/tidal power, geothermal power and hydroelectric. Analysis of technical, economic, environment, politics, and social policy are integral components of the course.

TECH 30200 Introduction to Green Building Technology (3 cr.) This course examines, discusses and analyzes buildings. In particular, it delves into an introduction into green building science and technology. Building systems and assemblies (both residential and commercial) will be discussed and will include topics such as the principles of: thermal efficiency and comfort, climate, shading, site design, daylighting, efficient building envelopes and mechanical equipment. An emphasis will be placed upon interpreting, designing, assessing and applying green solutions and details for building construction purposes.

TECH 30300 Energy Efficiency and Auditing (3 cr.) Course discusses fundamentals of energy efficiency and energy auditing. Students will analyze audit data, research energy improvement measures, and prepare recommendations. Topics include energy audit process, energy audit reports, energy bill analysis, economic analysis, audit instrumentation, and will include a subset of the following: building envelope, electrical system, HVAC system, waste heat recover, lighting, cogeneration, and other prevalent commercial/industrial systems.

TECH 30400 Green Building Information Modeling (3 cr.) This course examines the BIM or Building Information Modeling approach to the design and construction of buildings. Topics include, but are not limited to: parametric modeling, interoperability, clash detection and BIM implications for architects, engineers, interior designers, managers and contractors. An emphasis will be placed upon interpreting, designing, and assessing how sustainable technologies (e.g., energy efficiency) can be assessed using BIM tools and modeling techniques.

TECH 40200 Emerging Green Technologies (3 cr.) This course will allow for examination of the very latest emergent green technologies in renewable energy, green buildings, and sustainable design, as well as, other green technology emerging in the marketplace or in development stages. Students will be immersed in the study of technology that is on the "bleeding edge" of technological development worldwide.

TECH 50400 Motorsports Project Management (3 cr.) This course focuses on engineering and organizational project management aspects specific to the technical operation of a race team or other closely related business in the extremely fast moving world of motorsports.

TECH 50700 Measurement and Evaluation in Industry and Technology (3 cr.) An introduction to measurement strategies in industrial, technical, and human resource development environments. The evaluation of measurement outcomes will be the primary focus of the course.

TECH 52100 Practicum in Motorsports Design and Application (4 cr.) This course comprises a study conducted while the student is working with a race team or associated motorsports industry organization. The student's experience will be overseen and monitored by IUPUI faculty. A project relevant to the student's individual situation will be determined by mutual agreement between the student, supervising faculty member, and industrial supervisor. The project will integrate and synthesize the various aspects of the motorsports industry in which the student has been imbedded. An industry quality technical presentation and technical report will be required.

TECH 53100 Motorsports Topics Seminar (2 cr.) This course features a variety of special topics and guest speakers tying together the concepts of design, modeling, and testing which were studied in an undergraduate program in motorsports engineering or elated field.

TECH 56300 History, Trends and Limitations of Technology (3 cr.) Students learn the fundamental concepts in engineering and technology education. This includes knowledge of information and communication systems, constructions, manufacturing processes, energy/power/transportation technologies, and the overall impact of individuals on the environment within the context of society. This course develops the philosophy and nature of technology as an education discipline. It covers an overview of the importance of technology in history. Students also learn the limitations and scope that impacts the field of engineering technology.

TECH 58100 Workshop in Technology (1-3 cr.) Advanced study of technical and professional topics. Emphasis is on new developments relating to technical, operational, and training aspects of industry and technology education.

TECH 58200 Motorsports Special Topics (3 cr.) This course involves an independent or directed study conducted under the guidance of a motorsports department faculty member.

TECH 64600 Analysis of Research in Industry and Technology (3 cr.) P: Master's student standing. Analysis of research and evaluation of research reports. Emphasis on understanding the application of fundamental statistical methods in design and interpretation of research findings in industrial, technical, and human resource development environments.