

# Illinois Institute of Technology Bulletin

**Undergraduate Programs**

**Issued April 1998**

# Degrees offered at IIT

The table below lists the programs offered by IIT. Specific information concerning the degrees offered in each program can be found in this bulletin on the page indicated in the table. Advanced degrees are described in the *Bulletin of Graduate Programs*.

Field	Page	Bachelor's	Master's	Doctorate
Architecture	33	Yes	Yes	Yes
Engineering				
Aerospace	85	Yes	Yes	Yes
Architectural	65	Yes	No	No
Chemical	52	Yes	Yes	Yes
Civil	61	Yes	Yes	Yes
Computer	80	Yes	Yes	Yes
Electrical	76	Yes	Yes	Yes
Environmental	58	Yes	Yes	Yes
Mechanical	85	Yes	Yes	Yes
Metallurgical and Materials	85	Yes	Yes	Yes
Science				
Applied Math	73	Yes	No	No
Biology	39	Yes	Yes	Yes
Chemistry	43	Yes	Yes	Yes
Computer	69	Yes	Yes	Yes
Physics	47	Yes	Yes	Yes
Social Science				
Political Science	107	Yes	No	No
Psychology	91	Yes	Yes	Yes
Technology				
Manufacturing	83	Yes	Yes	No
<b>Post-Baccalaureate Only</b>				
Business Administration		No	Yes	No
Design		No	Yes	Yes
Environmental Management		No	Yes	No
Financial Markets and Trading		No	Yes	No
Food Process Engineering		No	Yes	No
Food Safety and Technology		No	Yes	No
Law		No	Yes	Yes
Management Science		No	No	Yes
Manufacturing Engineering		No	Yes	No
Marketing Communications		No	Yes	No
Operations and Technology Management		No	Yes	No
Personnel and Human Resources Development		No	Yes	No
Public Administration		No	Yes	No
Public Works		No	Yes	No
Rehabilitation Counseling		No	Yes	No
Technical Communication and Information Design		No	Yes	No
Telecommunications and Software Engineering		No	Yes	No

## Foreword for IIT the Undergraduate 1998-1999 Bulletin

### Purpose of the IIT Undergraduate Bulletin

This bulletin describes the academic programs and resources, policies, procedures, and student services in effect at the time of publication. It is a primary source of information for undergraduate students, the faculty and administration.

General information regarding the history of the university, the setting of the campus and campus life is also included. These sections can be used by prospective students and others to gain an understanding of the university as a whole.

The programs described in this bulletin are applicable to those students who entered IIT in the academic years 1998-99 and 1999-2000. Students follow the programs described in the bulletin in effect at the time of their first registration.

Changes in programs and policies often occur before a new bulletin is published. A faculty adviser from the student's major department is the best source for current curriculum information. The Undergraduate Dean's Office can refer students to the appropriate administrative office for current policies and procedures.

It is the intention of Illinois Institute of Technology to act in accordance with all regulations of the federal, state, and local governments with respect to providing equality of opportunity in employment and in education, insofar as those regulations may pertain to IIT. IIT prohibits and will act to eliminate discrimination on the basis of race, color, religion, national origin, sex, age, handicap or veteran status.

Any student, applicant or employee of Illinois Institute of Technology who believes that he or she has received inequitable treatment because of discrimination violating IIT's stated policy of equal opportunity in employment and in education should communicate, either in writing or in person, with the affirmative action officer, Room 224, Perlstein Hall, Illinois Institute of Technology.

For descriptions of graduate programs and courses, see the ***IIT Bulletin: Graduate Programs***. For descriptions of law programs and courses see the ***Chicago-Kent College of Law Bulletin***

Note: The information in this bulletin is subject to change without notice.

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# Calendar

## IIT Academic Calendar for Fall

	<b>Fall 1998</b>	<b>Fall 1999</b>	<b>Fall 2000</b>	<b>Fall 2001</b>
Last day for reinstatement	Aug 4	Aug 10	Aug 8	Aug 7
Registration & orientation period	Aug 17 - 20	Aug 23 - 26	Aug 21- 24	Aug 20 - 24
Class begins	Aug 24	Aug 30	Aug 28	Aug 27
Labor Day holiday	Sept 7	Sept 6	Sept 4	Sept 3
Last day to submit appl. for grad.	Sept 4	Sept 10	Sept 8	Sept 7
Last day to remove "I" grades	Oct 2	Oct 8	Oct 6	Oct 5
Last day for official withdrawal	Oct 30	Nov 5	Nov 3	Nov 2
Adv. registration and advising	Nov 9-20	Nov 8-19	Nov 6 - 17	Nov 5 - 16
Thanksgiving Day holiday	Nov 26 - 28	Nov 25 - 27	Nov 23 - 25	Nov 22 - 24
Classes end	Dec 5	Dec 11	Dec 9	Dec 8
Final exam period	Dec 7 - 12	Dec 13 - 18	Dec 11-16	Dec 10 - 15
Semester ends	Dec 12	Dec 18	Dec 16	Dec 15
Commencement*	Dec 12	Dec 18	Dec 16	Dec 15

## IIT Academic Calendar for Spring

	<b>Spring 1999</b>	<b>Spring 2000</b>	<b>Spring 2001</b>	<b>Spring 2002</b>
Last day for reinstatement	Dec 28, 1998	Dec 27, 1999	Dec 27, 2000	Dec 31, 2001
Registration & orientation period	Jan 11 - 14	Jan 10 - 13	Jan 8- 11	Jan 14 - 17
MLK, Jr. holiday	Jan 18	Jan 17	Jan 15	Jan 21
Class begins	Jan 19	Jan 18	Jan 16	Jan 22
Last day to submit appl. for grad.	Jan 29	Jan 28	Jan 26	Feb 1
Last day to remove "I" grades	Feb 26	Feb 25	Feb 23	Mar 1
Spring vacation	Mar 15-20	Mar 13 - 18	Mar 12 - 16	Mar 18-23
Last day for official withdrawal	Apr 2	Mar 31	Mar 30	Apr 5
Adv. registration and advising	Apr 12 - 23	Apr 10 - 21	Apr 9 - 20	Apr 15 - 26
Classes end	May 8	May 6	May 5	May 11
Final exam period	May 10 - 15	May 8 - 13	May 7 - 12	May 13 - 18
Semester ends	May 15	May 13	May 12	May 18
Commencement*	May 15	May 13	May 12	May 18

## IIT Academic Calendar for Summer

	<b>Summer 1999</b>	<b>Summer 2000</b>	<b>Summer 2001</b>	<b>Summer 2002</b>
Last day for reinstatement	May 19	May 17	May 16	May 15
Registration period	June 2-3	May 31-June 1	May 30-31	May 29 - 30
Class begins	June 7	June 5	June 4	June 3
Last day to submit appl. for grad.	June 11	June 9	June 8	June 7
Independence Day holiday	July 3 - 5	July 4	July 4	July 4
Last day for official withdrawal	July 16	July 14	July 13	July 12
End of 8-week session	July 31	July 29	July 28	July 27

\* tentative

## Objective of Education at IIT

IIT's mission is to educate individual for complex professional roles in a changing world and to advance knowledge through research and scholarship. The guiding principle of the university is that a modern, innovative education for students expecting to enter complex professional roles is only possible with a faculty that both maintains close ties to the technical professions and has an outstanding reputation in academic research. The university is committed to the educational ideal of small undergraduate classes and individual mentoring. Our unique Introduction to the Professions

program brings students and senior faculty members together each week in small groups, where students interact with their advisers as both teachers and mentors. Throughout the curricula, the IIT interprofessional projects provide a learning environment in which interdisciplinary teams of students apply theoretical knowledge gained in the classroom and laboratory to real-world projects sponsored by industry and government. IIT seeks to offer an educational experience that is second to none.

## The Colleges of Illinois Institute of Technology

IIT was founded in 1940 with the merger of the Armour Institute of Technology (established in 1890) and Lewis Institute (established in 1896). The Institute of Design joined the university in 1949, and Chicago-Kent College of Law became part of IIT in 1969. The Midwest College of

Engineering (established in 1967) joined the university in 1986, forming the nucleus for IIT's west suburban Rice Campus. Today, IIT offers degree programs through eight colleges, institutes and schools, with classes taught on five campuses in the Chicago area.

### College of Architecture

The program in architecture was established at Armour Institute of Technology, one of IIT's predecessors, in 1895. In 1938, the program came under the directorship of the world-renowned architect and educator Ludwig Mies van der Rohe. The college is housed in S.R Crown Hall, one of

Mies' most significant buildings and a major contribution to Chicago's rich architectural heritage. The college emphasizes applied Studio work under the tutelage of a faculty of practicing architects, the study of architectural theory, interdisciplinary learning and foreign study,

### Armour College

Armour College is named for IIT's predecessor, Armour Institute of Technology, which was established on the site of the present IIT Main Campus in 1892. The following departments comprise Armour College: Biological, Chemical and Physical Sciences; Chemical and Environmental Engineering; Civil and Architectural Engineering; Computer Science and

Applied Mathematics; Electrical and Computer Engineering; the Lewis Department of Humanities; Mechanical, Materials and Aerospace Engineering; and Social Sciences. The college is also home to the Pritzker Institute of Medical Engineering and the Manufacturing Productivity Center.

### Chicago-Kent College of Law

The Chicago-Kent College of Law is the second oldest law college in Illinois. When it joined the university in 1969, IIT became the first major institute of technology to include law among its disciplines. Chicago-Kent College offers programs leading to the degrees of Juris Doctor, Master of Law and

Master of American Law. Although the college does not offer an undergraduate degree, it offers a specialized minor to undergraduates in double-degree programs. The Chicago-Kent Library is open to IIT students conducting research in relevant fields.

### Institute of Design

The Institute of Design, founded by Laszlo Moholy-Nagy in 1937 and named the "New Bauhaus" after Germany's International School of Design, merged with IIT in 1949.

The Institute of Design is the first U.S. school to offer a Ph.D. in design; its program also includes a Master of Science in Design and a Master of Design.

# **IIT Profile**

## **Institute of Psychology**

Established in 1995, the Institute of Psychology was created from the Department of Psychology, previously housed within IIT's Lewis College of Liberal Arts. It is noted for its applied graduate programs in clinical, industrial/organiza-

tional and rehabilitation psychology. It offers an undergraduate program that is focused on psychology as a science linked to the professions.

## **Stuart School of Business**

The Stuart School of Business was established in 1970 with a gift from the estate of IIT alumnus and Chicago financier Harold Leonard Stuart. Although its primary educational focus is master's - and doctoral-level education, the Stuart School offers courses in economics and management

for undergraduates. The school houses the Center for Research on Industrial Strategy and Policy, the Center for Research on the Impact of Information Systems and the Center for Research in Financial Markets & Trading.

## **The Undergraduate College**

The Undergraduate College coordinates the programs of the undergraduate curriculum offered by the departments and colleges of the university. The college sets minimum standards for all undergraduate students, represents the university in national forums for undergraduate education and serves as an advocate for undergraduate education across the university. The dean of the Undergraduate College chairs the Undergraduate Studies Committee. The Interprofessional

Project initiative (IPRO) and the Reserve Officer Training Corps for Navy and Marines, Air Force, and Army report to the dean. Academic support services including the Career Development Office, the Center for Multicultural Programs, the Educational Technology Center, the Office of Educational Services, the Women's Educational Development Center and the Writing Center report to the Dean of the Undergraduate College.

## **The Graduate College**

The Graduate College coordinates the programs of advanced study offered by the departments and colleges of the university. The dean of the Graduate College chairs the Graduate Studies Committee and Research Council, sets

minimum standards for all graduate students, represents the university in national forums for graduate education and serves as an advocate for promoting graduate education across the university.

## IIT Campuses

IIT's 120-acre Main Campus is located on the Near South Side of Chicago. The master plan of the Main Campus and many of its 50 buildings were developed by Ludwig Mies van der Rohe, one of the 20th Century's most influential architects. IIT Research Institute (IITRI) has its headquarters on the IIT Main Campus and operates facilities at 16 sites throughout the country. The VanderCook College of Music, an independent institution, is also located on the Main Campus. The Main Campus is easily accessible by public transportation and a shuttle bus provides transportation between the Main and Downtown campuses.

The Chicago-Kent College of Law, Stuart School of Business programs and the Department of Social Sciences Master of Public Administration program are housed in the Downtown Campus in the West Loop business district, a short walk from the Northwestern Train Station. The Institute of Design is located in the North Loop business district of Chicago, near the Merchandise Mart and a short walk from the River North art gallery district. IIT's Daniel F and Ada L. Rice Campus, located in west suburban Wheaton, offers evening and Saturday classes leading to selected undergraduate and graduate degrees.

The university's fifth site is IIT's Moffett Campus, which houses the National Center for Food Safety and Technology, a multidisciplinary food safety research facility in southwest suburban Bedford Park. The Moffett Campus, created by a gift from CPC International Inc., has enabled the university to develop academic programs in food safety and technology. A master's degree and a certificate program in food safety and technology are offered at this facility.

Students also may take classes through the William F Finkl Interactive Instructional Network (IITV), which links classroom studios on campus with remote TV receiving sites. IITV's talk-back feature permits students in remote classrooms to participate in class discussions. IITV has arrangements with the Chicago Medical School, Oakton Community College, the IIT Rice Campus, William Rainey Harper College, South Cook Educational Service Center #7 and the IIT Moffett Campus. In addition, over 20 companies offer IITV courses to their employees at their places of employment.

## Accreditation

IIT is accredited by the North Central Association of Colleges and Secondary Schools (30 N. LaSalle #2400, Chicago, IL 60602-2504.) Specific professional curricula are accredited by their respective professional associations and accrediting

agencies. The professional accreditation of specific degree programs is noted with the description of the degree requirements.

## A Snapshot of the IIT Community

### Enrollment (Fall 1997)

Graduate	3,062 students
Law	1,266 students
Undergraduate	1,959 students
<b>Total</b>	<b>6,287 students</b>

### Student Demographics

Male . . . . .	70%
Female . . . . .	30%
Minority . . . . .	26%
(includes African American, Asian American, Hispanic American, and Native American)	

International . . . . .	15%
Countries of Origin . . . . .	80+
Student/Faculty Ratio . . . . .	11:1

### Degrees Awarded 1995-96

Bachelors	402
Masters and Professional	658
<b>Law</b>	<b>410</b>
Ph.D.	82
<b>Total</b>	<b>1,552</b>



## Admission, Financial Aid and Expenses

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## Undergraduate Admission

### Classification of Students

Undergraduate admission to IIT is processed in three separate offices, based on a student's classification. Be sure to contact the correct office for application materials.

All full-time, degree-seeking, domestic Freshmen or transfer students should contact:

Office of Undergraduate Admission  
10 W 33rd Street  
Perlstein Hall 101  
Chicago, IL 60616  
Telephone: 312.567.3025  
Outside Chicago: 1.800.448.2329  
Fax: 312.567.6939  
E-mail: [admission@vax1.ais.iit.edu](mailto:admission@vax1.ais.iit.edu)  
On-line application: <http://www.iit.edu/admission/undergrad>

All international students should contact:

International Center Office  
3300 S. Michigan Avenue  
Farr Hall 408  
Chicago, IL 60616  
Telephone: 312.808.7105  
Fax: 312.808.7133  
E-mail: [ia-misquita@vax1.ais.iit.edu](mailto:ia-misquita@vax1.ais.iit.edu)  
On-line application: <http://www.iit.edu/admission/international>

AU part-time degree and non-degree students, special status students, summer school students and all re-admit applicants should contact:

Office of Educational Services  
3300 S. Federal Street  
Main Building 101  
Chicago, IL 60616  
Telephone: 312.567.3300  
Fax: 312.567.3302  
E-mail: [edsvcs@vax1.ais.iit.edu](mailto:edsvcs@vax1.ais.iit.edu)  
Online application: <http://lledserve.iit.edu>

## Full-Time Freshman Admission for Domestic Students

Office of Undergraduate Admission  
10 W. 33rd Street  
Perlstein Hall 101  
Chicago, IL 60616  
Telephone: 312.567.3025  
Outside Chicago: 1.800.448.2329  
Fax: 312.567.6939  
E-mail: [admission@vax1.ais.iit.edu](mailto:admission@vax1.ais.iit.edu)  
On-line application: <http://www.iit.edu/admission/undergrad>

The Office of Undergraduate Admission is responsible for admission decisions for all first year (freshmen and transfer), full-time, domestic, degree-seeking undergraduates. To be full-time, a student must register for 12 or more credit hours each semester.

### Application as a Freshman

IIT admits freshmen students on a rolling basis beginning in September, with most admission decisions having been made by mid-March. Students will be admitted after March if there are spaces available.

Some honors programs and some scholarships have January deadlines. Students need to adhere to those deadlines stated in the admission or scholarship applications. Students have until May 1 (National Candidates' Reply Date) to accept IIT's offer of admission. Students admitted after May 1 will have two weeks from the receipt of their admission and/or financial aid award letters to respond to IIT's offer.

# Undergraduate Admission

## Obtaining Freshman Application

Freshman applicants must submit a completed application, application fee or fee waiver, transcripts of all high schools attended, transcripts from all colleges attended (when applicable), standardized test scores and a letter of recommendation. The freshman application may be obtained by contacting the Office of Undergraduate Admission with a request, or from the following on-line sources:

IIT on-line application = [www.iir.ais.edu/admission/undergrad](http://www.iir.ais.edu/admission/undergrad)  
College Link = [www.collegelink.com](http://www.collegelink.com)  
APPLY NOW! = [www.weapply.com](http://www.weapply.com)  
Peterson's Polaris = [www.applytocollege.com](http://www.applytocollege.com)

IIT also accepts the Common Application.

## Standardized Test Scores for Freshman Applicants

All students are required to submit scores from either the College Entrance Examination Board's Scholastic Aptitude Test (SAT) or The American College Test (ACT). The tests may be taken at any time, but preferably by the December testing date in the high school senior year. Applicants for

admission to the spring semester must have taken the SAT1 or ACT by the preceding November. IIT recommends SAT2 tests in math and science, but does not require SAT2 test scores for admission or scholarship applications.

## High School Requirements for Freshman Applicants

Graduates from an accredited high school applying for admission must present evidence that they have completed a minimum of 16 units of high school work. Most admitted students exceed this minimum. A unit may be defined broadly as the study of a major subject for one academic year in high school.

	Required	Recommended
English	4 years	
Mathematics	4 years *	calculus
Laboratory Science	2 years **	3 years

\* Material should include depth in algebra, geometry, trigonometry, analytic geometry and pre-calculus skills.

\*\* Should include physics.

## Transferring College-Level Credit for Freshman Applicants

IIT recognizes the CEEB Advanced Placement Program and encourages student to take AP examinations and have the scores sent to the IIT Office of Undergraduate Admission.

Acceptable credit and placement varies by subject. IIT will accept scores of 4 and 5, and in some cases scores of 3.

## International Baccalaureate Program

Students holding an International Baccalaureate (IB) diploma or who have successfully completed IB examinations may be awarded credit according to the following policies. Credit is awarded for higher level (HL) work only. No credit is given to standard level (SL) work. Scores of 4 (passing) through

7 (highest) on the HL test will be considered for credit. A maximum of 10 hours of credit in each area of HL work will be considered. Scores should be sent to the Office of Undergraduate Admission.

## College Course Work

IIT will accept college coursework, taken while still in high school from other accredited universities and colleges, provided the courses are comparable in nature, content and level to those offered at IIT. Grades must be equivalent to a "C" or higher.

Grades of "C-" are not acceptable for transfer credit. Transcripts of all college work are required to be submitted as part of the application for admission to the Office of Undergraduate Admission, regardless of the transferability of credits.

## Undergraduate Admission

### New Student Financial Aid

Financial aid for all admitted freshmen and new transfer students is processed in the Office of Undergraduate Admission. Continuing student financial aid is processed by the IIT Office of Financial Aid. IIT offers both need-based and merit-based aid. To be considered for need-based

aid and merit scholarships at IIT, students must submit a Free Application for Federal Student Aid (FAFSA) to the Department of Education. Financial aid and scholarship deadlines are described in the IIT application for admission.

### Decision to Matriculate

To accept IIT's offer of admission, students need to return the Enrollment Confirmation Form and a non-refundable \$100 matriculation deposit. The deposit is credited to the student's account and will go toward the cost of attendance. The Enrollment Confirmation Form is sent to every admit-

ted student and may be returned at any time, but students have until May 1 to submit their confirmation form and deposit. Students admitted after May 1 will have two weeks from the time they are notified of their admission and/or financial aid award to respond to IIT's offer.

### Immunization Requirement

In accordance with Illinois law, all students born on or after January 1, 1957 and enrolling at IIT for the first time after July 1, 1989 must supply health provider documented evidence of vaccination for diphtheria, tetanus, measles, rubella and mumps. Transfer students are considered first-time enrolled students. Students enrolling for the first time during a summer session may be permitted to enroll in the subsequent fall term before providing proof of immunization. Students who wish to enroll only in one class per semester or via IITV

at corporate sites may file a written request for an exemption. Exemption from one or more of the specific requirements may also be granted based on documented medical or religious reasons. A student who fails to provide acceptable evidence of immunization shall be prevented from registering for classes in the next semester. Questions regarding the immunization policy should be directed to IIT's Counseling and Health Service at 312.808.7199.

## Full-Time Transfer Admission for Domestic Students

### Application as a Transfer Student

The Office of Undergraduate Admission is responsible for admission decisions for full-time, domestic, transfer students. Full-time status requires that students enroll in a minimum of 12 credit hours each semester. Transfer students may apply for the fall or spring term in all majors except architecture,

which is a fall entry program only. IIT admits transfer students on a rolling basis. The deadline to apply for the fall term (beginning late August) is July 1; for the spring term (beginning mid-January), the deadline is November 1.

### Definition of a Transfer Student

Students who have graduated from high school and have taken a minimum of 15 semester hours or one full-time semester equivalent of transferable courses at an college or

university are considered transfer students. Students who take college-level work while enrolled in high school are not considered transfer students.

### Obtaining an Application

The transfer application may be obtained by contacting the Office of Undergraduate Admission with a request, or by visiting the on-line application:  
[www.iit.edu/admission/undergrad](http://www.iit.edu/admission/undergrad)

Students must submit the IIT Transfer Application, application fee or fee waiver, transcripts from all colleges and universities attended, a personal statement and a letter of recommendation to the IIT Office of Undergraduate Admission.

# Undergraduate Admission

## Requirements for Transfer

Transfer applicants must be in good academic standing at their previous college to be considered for admission to IIT. Admission is based upon a cumulative GPA and individual grades in all classes that apply to the major selected. A minimum cumulative GPA of 3.0 is required for transfer consideration. Students on academic probation or who have been dismissed for academic or other reasons will not

be considered for transfer. Students must also be in good financial standing at all previous colleges attended.

Transfer applicants with less than 30 hours of transferable graded college course work must submit high school transcripts and SAT1 or ACT scores as part of their application.

## Transfer Credit

Official credit evaluations are completed only after a student is admitted to IIT.

Courses may be acceptable for transfer from accredited colleges and universities provided they are comparable in nature, content and level to those offered at IIT. Credit may also be accepted, based on appropriate documentation, test scores and agency recommendations for CLEP (see page 174), Dantes and military experience. IIT, however, does not grant credit for vocational courses or life/work experience. In addition, technology courses will not be accepted in any engineering program.

A maximum of 68 applicable semester hours of transfer credit is permitted from a two-year college. There is no maximum number of hours of transfer credit from a four-year college; however, the final 45 semester hours must be completed at IIT (See page 177.)

Transfer credit will be accepted for courses completed with the equivalent of a grade "C" or better. A grade of "C-" is not acceptable for transfer credit.

Transfer articulation agreements that list course equivalents are available for most two-year colleges in the Chicago area from the Office of Undergraduate Admission, the Office of Educational Services or on-line: [www.iit.edu/admission/undergrad](http://www.iit.edu/admission/undergrad)

## Transfer Student Financial Aid

Financial aid for all admitted freshmen and new transfer students is processed in the Office of Undergraduate Admission. Continuing student financial aid is processed by the IIT Office of Financial Aid. IIT offers both need-based and merit-based aid. To be considered for need-based aid and merit

scholarships at IIT, students must submit a Free Application for Federal Student Aid (FAFSA) to the Department of Education. Financial aid and scholarship information is included with the IIT application for admission.

## Decision to Matriculate

To accept IIT's offer of admission, students need to return the Enrollment Confirmation Form and a non-refundable \$100 matriculation deposit. The deposit is credited to

the student's account and will go toward the cost of attendance. The Enrollment Confirmation Form is sent to every admitted student.

## Immunization Requirement

In accordance with Illinois law, all students born on or after January 1, 1957 and enrolling at IIT for the first time after July 1, 1989 must supply health provider documented evidence of vaccination for diphtheria, tetanus, measles, rubella and mumps. Transfer students are considered first-time enrolled students. Students enrolling for the first time during a summer session may be permitted to enroll in the subsequent fall term before providing proof of immunization. Students who wish to enroll in one class per semester

or via IITV at corporate sites may file a written request for an exemption. Exemption from one or more of the specific requirements may also be granted based on documented medical or religious reasons. A student who fails to provide acceptable evidence of immunization shall be prevented from registering for classes in the next semester. Questions regarding the immunization policy should be directed to IIT's Counseling and Health Service at 312.808.7199.

## International Student Admission

International Center Office  
3300 S. Michigan Avenue  
Farr Hall 408  
Chicago, IL 60616  
Telephone: 312.808.7105  
Fax: 312.808.7133  
E-mail: [ia\\_misquita@vaxl.ais.iit.edu](mailto:ia_misquita@vaxl.ais.iit.edu)  
On-line application: <http://www.iit.edu/admission/international>

Students who are neither citizens nor permanent residents of the United States submit the International Undergraduate Application for Full-time Admission, which may be obtained from the International Center Office, or on-line: [www.iit.edu/admission/international](http://www.iit.edu/admission/international)

Though the required admission documents can vary depending upon individual circumstances, all international applicants must submit a completed application for admission, a certified copy in English translation of all upper secondary school grades or marks, SAT1 or ACT scores, TOEFL scores and an affidavit of financial support.

Prospective applicants should read carefully the description of requirements included with the printed application for admission or on the IIT website that provides the on-line application.

## Part-Time Admission

Office of Educational Services  
3300 S. Federal Street  
Main Building 101  
Chicago, IL 60616  
Telephone: 312.567.3300  
Fax: 312.567.3302  
E-mail: [edsvcs@vaxl.ais.iit.edu](mailto:edsvcs@vaxl.ais.iit.edu)  
Online application: <http://ledserve.iit.edu>

## Part-Time Degree-Seeking Students

Students who wish to enroll in less than 12 credit hours per semester are classified as part-time students. All undergraduate programs, except architecture, can be completed on a part-time basis with both day and evening courses being offered. However, only the following degree programs can be completed in their entirety through evening classes:

Chemical engineering  
Computer engineering  
Computer science  
Electrical engineering  
Manufacturing technology  
Mechanical engineering

The graduation requirements for full-time and part-time students are identical.

## Application as a Degree-Seeking Part-time Student

Part-time students must meet the same admission requirements as full-time students. Students with previous college work will be evaluated by the same criteria used for full-time undergraduate transfer admission. (See page 16.) Students who have less than 30 hours of transferable college course work may be required to submit high school transcripts and standardized test scores. Students who have not attended

college must meet the high school requirements listed on page 14, and must submit high school transcripts and standardized test scores.

Prospective students submit the completed application, application fee or fee waiver, and official transcripts of all course work to the Office of Educational Services.

## Undergraduate Admission

### Application as a Non-Degree-Seeking Student

Applicants who are taking courses for the following reasons will be limited to part-time enrollment:

- taking courses for professional development,
- taking courses prior to being admitted to a graduate program, or
- taking courses to transfer to another institution.

A non-degree status student must be admitted to IIT.

Admission is based on prerequisite course work or other preparation necessary for the intended course. Non-degree seeking students follow the same application procedures as part-time degree-seeking students.

### Campus Locations for Part-time Students

Part-time students can take courses at either the Main Campus or the Daniel E and Ada L. Rice Campus in Wheaton, a Chicago suburb. The Main Campus has the most extensive offering of day and evening classes. The Rice campus offers evening classes, most of which start at 6:25 p.m. The majority of courses taught at the Rice campus are 300- and 400-level mechanical or electrical engineering courses, manufacturing

technology courses, as well as 400-level computer science courses.

IITV, a live talk-back system that links classroom studios with remote TV receiving sites, is another option for the part-time student. For more information about IITV, see the *IIT Bulletin Schedule of Classes*.

### Summer School Admission

Students who attend another college or university and who wish to enroll for summer courses at IIT with the intention of transferring the credits to their home institution must submit to the Office of Educational Services:

- a Summer School Application
- a \$30 application fee

- a transcript and/or a letter of good standing, indicating that he/she has the prerequisites for the requested courses at IIT.

Additionally, students should check with their home institutions to determine equivalencies for specific courses and the policies and procedures required to transfer \*IIT summer courses.

### Reinstatement of Undergraduate Students

Former IIT students who wish to re-enter IIT as full-time or part-time undergraduate students must contact the Office of Educational Services for an "Application for Undergraduate Reinstatement." No fee is required. The application and all supporting documents must be submitted no later than two weeks prior to the week of registration for the semester of intended enrollment. Students who have attended other

schools since their last attendance at IIT must submit official transcripts from all colleges or universities attended.

International students with a student visa requesting reinstatement must contact the International Center Office in addition to submitting the application for reinstatement.

## Financial Aid

### Comprehensive Financial Aid Program

IIT administers a comprehensive financial aid program for full-time undergraduate students that includes federal, state and institutional funds. Federal programs include grants, loans and salaries for employment. State programs include grant funds. All federal and state funds are based on demonstrated financial need. Institutional funds include both

need-based grants, loans and merit scholarships based on academic, athletic and service achievements. IIT uses the formula established by the U.S. Congress to determine financial need for assistance. IIT offers limited academic scholarship assistance to international students.

### Determining Financial Need for Assistance

Financial need is the difference between a student's total annual cost of attending IIT and the amount the student and his or her family is expected to contribute toward that cost of education. The total cost of attendance at IIT includes tuition and mandatory fees, room and board, books and supplies, transportation and personal expenses. The amount the student and family is expected to contribute is called the expected family contribution (EFC). The U.S. Congress has established

the formula that is used to calculate the EFC. The EFC is subtracted from the cost of education, and what is left over is considered to be the demonstrated need for financial assistance. One of the principles of need-based assistance is that students and their families are expected to help pay some of the cost of education.

### Student Eligibility Requirements to Receive Financial Assistance

Students must be U.S. citizens or eligible non-citizens and be enrolled in a degree-seeking program at least one-half time (6 credit hours or more per semester).

### Application Process

All students applying for financial assistance need to complete the Free Application for Federal Student Aid (FAFSA). This application is available after January 1 and should be filed by the student as soon as possible after January 1 of the academic year in which the student is attending college. (The IIT Title IV School Code is **001691**.) The priority date for financial aid consideration at IIT is March 16. All finan-

cial assistance is awarded on an annual basis. Students should be aware that a FAFSA must be filed each academic year. The amount of financial aid a student receives each year depends on demonstrated financial need and the availability of funds. Students applying for financial aid will be required to submit tax information upon request.

### New Freshman Students

The Free Application for Federal Student Aid (FAFSA) for freshmen entering IIT is available from high schools, IIT's Office of Undergraduate Admission, the IIT Student Services Center or on-line: [www.fafsa.ed.gov](http://www.fafsa.ed.gov)

The priority date for financial aid consideration is March 16; therefore, new students should NOT wait for a final admission decision before filing the FAFSA.

### New Transfer Students

All new transfer students will file either a renewal or an original FAFSA. The priority date for financial aid consideration is March 16; therefore, new transfer students should

NOT wait for a final admission decision before filing the FAFSA.



# Financial Aid

## Continuing Students

All continuing students must submit either a renewal or original FAFSA to the Department of Education by March 16.

The priority date for financial aid consideration is March 16. FAFSAs are available at the Student Services Center.

## Federal Financial Aid Programs

### Federal Pell Grant

A Federal Pell Grant is a federal grant that does not have to be repaid. Pell Grants are awarded only to undergraduate students who have not earned a bachelor's or professional degree. Pell Grants are awarded based on demonstrated financial need. Students apply for a Pell Grant by filing the FAFSA. All students who file the FAFSA receive a Student Aid Report

(SAR). If a student does not qualify for a Pell Grant, he or she may still be eligible for other forms of financial aid. The Pell Grant levels for this academic year have not yet been set, but the maximum Pell Grant award for the 1997-98 academic year was \$2,700 for a full-time student attending for a full year. Students can designate IIT as a SAR recipient by using the code 001691 in section H of the FAFSA.

### Federal Supplemental Opportunity Grant (FSEOG)

A FSEOG is a federal grant that does not have to be repaid. This grant is for undergraduate students who demonstrate

exceptional financial need. Students apply for the FSEOG by filing the FAFSA.

### Federal Perkins Loan

A Federal Perkins Loan is a low interest (5 percent) federal loan for both undergraduate and graduate students with exceptional financial need. IIT is the lender and the loan is made with government funds. There is no interest charged while the student is attending school. When a student leaves

school or drops below one-half time attendance, there is a nine-month, interest-free grace period before the student begins repayment. All repayments are made to IIT on a quarterly basis. Students apply for a Perkins Loan by filing the FAFSA.

### Federal Work Study Program (FWSP)

The FWSP provides salaries for jobs for undergraduate and graduate students with demonstrated financial need. Students awarded FWSP funds can earn money to help pay education expenses. Students can work either on- or off-campus. Off-campus jobs will be with private, non-profit organizations or public agencies that encourage community service work. Students awarded FWS are paid at least the current federal

minimum wage or higher depending on the type of work performed. Students are paid by the hour and receive a paycheck. FWS students are not permitted to work more than 20 hours per week during the academic year and may not work during their scheduled class times. Students apply for FWS by filing the FAFSA.

### Federal Family Education Loan Program (FFELP).

The FFELP loan program includes the Stafford subsidized and unsubsidized loan program for undergraduate and graduate students, and the Parent Loan for Undergraduate Students (PLUS) Program. The Stafford Loan Program provides low interest loans to assist students with paying educational costs. The interest rate for new loans is set on July 1 and will vary annually. The maximum rate is 8.25 percent. These loans must be repaid over a period of time, after a student leaves school. The funds for these loans come from banks, credit unions or other participating lenders.

The Subsidized Stafford loan is awarded based on demonstrated financial need, and students do not pay interest on the

principal while they are in school. The Unsubsidized Stafford loan is NOT awarded based on demonstrated financial need; however, interest IS charged from the time the loan funds are disbursed to the student. Students have the option of paying the interest or having the interest added onto the principal. Fees of up to 4 percent are charged on each loan and these fees are deducted before a student receives the loan funds.

PLUS loans enable parents with a good credit history to borrow money to help pay education expenses for their dependent, undergraduate student. The interest rate is set on July 1 and will vary annually. The maximum rate is 9 percent. Students apply for all FFELP loans by filing the FAFSA.

## Illinois Student Assistance Commission (ISAC) Financial Aid Programs

### Monetary Award Program (MAP)

This program is for undergraduate Illinois residents and provides state grants that do not have to be repaid. To receive a MAP grant, students must demonstrate financial need, be a resident of Illinois and be enrolled at an Illinois institution. The maximum grant for 1997-98 was \$4,120 for a full-time

student attending a full academic year. The MAP grant can only be applied toward tuition and mandatory fees. Students can receive 10 semesters of the MAP grant. Students apply for the MAP grant by filing the FAFSA. The ISAC notifies students of their award.

### Merit Recognition Scholarship (MRS)

The MRS program provides a one-time, \$1,000 state grant to qualified Illinois high school students who rank in the top 5 percent of their class at the end of the 7th semester in high school. Demonstrated financial need is not a factor in determining MRS recipients. The top 5 percent of seniors

from all Illinois high schools are automatically considered for the MRS program. Once ISAC selects all eligible recipients, an MRS application is sent to the student. The student completes the application and gives it to the IIT Office of Undergraduate Admission.

### Illinois Incentive for Access Program (IIAI)

The IIA Program provides a one-time state grant of up to \$500 for freshmen who have an expected family contribution (EFC) of zero, which is determined by filing the FAFSA.

Students must be enrolled at least half-time in an Illinois institution, be an Illinois resident and have not received a bachelor's degree.

## IIT-Funded Financial Aid Programs

More than 90 percent of IIT students receive some form of financial assistance. All students who submit a FAFSA are considered for all federal, state, and institutional financial aid for which they qualify. IIT grants and loans are funded by

the university and are awarded on the basis of demonstrated financial need. In addition, each year a number of talented students receive IIT scholarships that are based on talent and/or merit.

### Transfer Student Scholarships

Merit scholarships up to one-half tuition are awarded to transfer students who have strong college records.

Awards are renewable based on grade point average at IIT and reasonable academic progress. All admitted students are reviewed for eligibility.

### Athletic Scholarships

As an National Association of Intercollegiate Athletics (N:A.I.A.) member, IIT awards athletic scholarships based solely on athletic ability, regardless of need. In compliance with N.A.I.A. rules, athletic scholarships are officially made

by financial aid officers, upon recommendation of the athletic director. Students with demonstrated financial need will be reviewed for federal, state and other IIT financial aid for which they are eligible.

### IIT Endowed Scholarships

These scholarships are made possible through donations to IIT by individuals, corporations and foundations. First-year IIT students will be reviewed by the Office of Undergraduate

Admission for scholarship eligibility. Continuing students will be reviewed by the Office of Financial Aid.

# Financial Aid

## IIT Loans

Loans are available to undergraduate students demonstrating financial need and will be listed on a student's financial aid award notification letter.

## Part-time Employment

Part-time employment for students who are not awarded Federal Work Study (FWS) is available on-campus and off-campus in the greater Chicago area. On-campus jobs are usually advertised on department bulletin boards (electronic

and otherwise) and at the IIT Career Development Center. Off-campus jobs are advertised by the Career Development Center. This office also assists students in finding summer employment and permanent jobs after graduation.

## ROTC Programs

IIT offers scholarship supplements to admitted students who have been awarded U.S. Air Force, Army or Naval ROTC scholarships. In combination, the ROTC scholarships and the IIT supplemental scholarship often cover the entire cost of tuition and room and board. To be considered,

students must send a copy of their ROTC Scholarship Award letter to the Office of Undergraduate Admission and to the Army, Air Force or Naval ROTC office on IIT's campus.

## Veterans' Educational Benefits

The Office of Student Records and Registration, Room 104, Main Building 3 12.567.33 10, helps students complete forms

certifying enrollment so that eligible students can receive their veterans' benefits to attend IIT.

## Continued Eligibility for Financial Assistance

All students receiving any federal and/or state financial aid funds must demonstrate reasonable academic progress toward graduation from IIT. Reasonable academic progress includes both a satisfactory cumulative and major grade point average, and sufficient credit hours earned each semester toward the

completion of a degree program. IIT has established a Reasonable Academic Progress Policy in compliance with federal and state regulations. Failure to comply with IIT's Reasonable Academic Progress Policy will lead to the student's losing eligibility for financial assistance.

## Additional Information

All financial aid awards and scholarships for entering freshmen and transfer students are processed by the Office of Undergraduate Admission. These students should submit all information regarding financial assistance to: IIT Office of Undergraduate Admission, 10 West 33rd Street, Chicago, Illinois 60616; phone 312.567.3025. Outside of Chicago: 1.800.448.2329. Fax: 312.567.6939.

All financial aid awards for continuing undergraduates, and all graduate students (excluding law students) are processed by the Financial Aid Office. Students should submit all information regarding financial assistance to: Office of Financial Aid, 3300 South Federal Street, Chicago, Illinois 60616, Telephone 312.567.7219. The office is open Monday through Friday, 8:30 a.m. to 5 p.m.

## Expenses

All expenses listed herein are for the 1998-99 academic year and are subject to change without notice. The university regrets that continually rising costs do not permit it to guar-

antee that published charges will not change. Students and parents are cautioned to anticipate periodic increases in the years ahead.

### Admission Application Fee

All applications for admission from U.S. citizens must be accompanied by a non-refundable fee of \$30 or a fee waiver. For international students the fee is \$40.

### Undergraduate Tuition

Tuition for full-time undergraduates is \$17,000 for the 1998-99 academic year. Part-time undergraduate students

(those taking fewer than 12 credit hours) will be charged at the rate of \$535 per credit hour.

### Enrollment Deposit

Each student admitted as a degree-seeking undergraduate is required to make a \$100 non-refundable enrollment deposit, which is credited toward the student's cost of

attendance and holds his or her place in class for the initial semester of enrollment.

### Student Health Insurance

All students are required to purchase the basic student health insurance policy or to submit proof of equivalent insurance. This requirement applies to students who are:

- registered for 12 or more credit hours or
- participants in the co-op program or
- considered lifetime by their departments or
- research or teaching assistants or
- occupants of IIT residence halls

A charge for the basic insurance program will be added to a student's tuition and fees by the third billing cycle (usually eight to nine weeks into the semester) unless he or she submits a valid declination to the plan's underwriters by the dates listed in the Insurance Brochure issued at registration. Once a student declines the insurance, he or she does not have to decline it again in subsequent, continuously enrolled years. Other students, spouses and dependents of students may participate in the student health program. Consult Counseling and Health Service in Farr Hall, 312.808.7101, for further details.

### Student Activity Fee

A fee of \$50 for full-time students and \$2.50 per credit hour for part-time students will be charged each semester. This applies only to students at the Main Campus.

The student activity fee provides funding to registered student organizations in support of co-curricular activities. The fund is administered by the Student Leadership Committee.

### Parking Fee

All students parking on campus must register their cars with the Public Safety Department and pay a parking fee. Students

pay \$50 for the full academic year. Students authorized to park at IIT will receive windshield decals and gate-control cards.

## Expenses

### Special Fees

These are fees for special services and are charged only if incurred:

Late registration	\$ 50.00
Budget payment plan fee	25.00
Deferred payment plan fee	50.00

Graduation fee	50.00
Proficiency examination (per credit hour)	100.00
Returned check fee	25.00
Student insurance	442.00

### Books and Supplies

Books and other supplies are available at Follett's Commons Bookstore. Their costs differ widely, depending upon the field of study. Most students can expect to spend approximately \$600 per year for books and supplies (exclusive of

drafting equipment and similar one-time purchases). Students in the College of Architecture may spend less on books but substantially more on supplies; a 35mm camera is required for architecture majors.

## Payments and Refunds

### Payments and Refunds

Students must pay their balance due for each semester before classes begin. Students may pay using one of the IIT-approved payment plans described in the ***Bulletin: Schedule of Classes***, by credit card (Visa, Master Card or Discover) or by check or

money order. Payment may be made in person at the IIT Cashier's Office in Main Building or by mail to: Office of the Bursar, Illinois Institute of Technology, PO. Box 95152, Chicago, IL 60694.

### Institutional Refund Policy

Withdrawal during the first week of classes-eligible for 100 percent refund of tuition

Withdrawal during the second week of classes-eligible for 50 percent refund of tuition

Withdrawal during the third week of classes-eligible for 25 percent refund of tuition

Withdrawal after the third week of classes - no refund

### Refunds of Tuition

No tuition will be charged and full refund will be made on any amounts paid, upon application supported by proof as necessary, under the following circumstances:

- If a course for which the student is registered is canceled by the university.
- If a student's serious injury causing incapacity or death occurs.

Under other exceptional circumstances, such as withdrawal for involuntary military service, serious illness or action by the university, consideration may be given for a refund or credit for unused tuition upon written request to the bursar.

## Living Expenses

### Living Expenses

#### Unmarried Students

The university's residence halls provide facilities for room and board for undergraduate and graduate men and women. First-year students not living with their families must live in the residence halls or in fraternity houses. Exceptions to this policy may be granted by the associate vice president for student affairs. Residence hall contracts are made for the full

academic year, from the beginning of orientation in August until commencement in May. The charges for room and board for new students in 1998-99 range from \$5,005 to \$5,090 for an academic year. When a student applies for housing accommodations, an itemized list of available housing facilities and rates will be furnished.

#### Meals

Students living in residence halls contract for a variety of meal plans. Meal plans and meals on a cash basis are available to non-residents.

#### Housing Deposit Fee

A \$50 security deposit is required at the time a room application is submitted. An initial \$150 nonrefundable payment, which applies in full to charges for room and board, must be submitted to the director of housing by July 1 for fall

semester applicants or December 1 for spring semester applicants. One-half of the room and board charge for the academic year is payable each semester.

#### Commuting Students

A student living at home and commuting will spend an estimated average of \$1,200 on living costs at home and for meals on campus and approximately \$500 for travel.

#### Miscellaneous Expenses

Miscellaneous personal and recreational expenses are estimated at \$650 for the academic year. These figures are used in computing the official financial aid budget.

#### Married Students

There are 356 living units in four high-rise apartment buildings on campus. These units range from efficiency to three-bedroom apartments. Leases typically are signed on married students and single full-time graduate students if space is available. Rentals, including all utilities except telephone, range from approximately \$445 to \$900 per month,

unfurnished. Furnished apartments also are available. Applications for campus housing should be submitted to the director of housing well in advance. A \$35 application fee is required when applying for an apartment.

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## Undergraduate Curricula at IIT

IIT combines excellence in academic preparation for professional careers with opportunities for practical experience in the major branches of engineering, the sciences, mathematics, architecture, computer science and liberal arts. This section

lists the general education requirements of the university. Specific degree requirements are described in the departmental listings. Minors are listed on page 108.

### Undeclared Majors

Students who are unsure of their career choices may enter IIT as undeclared or open majors. During the first year of study undeclared majors take required general education courses in science, mathematics, computer science, humanities and social science. These courses provide the foundation for

nearly all of IIT's major programs. Because general education courses apply to all majors, students may wait as late as the sophomore year to declare their major and can still graduate on time.

# Undergraduate Curricula

## General Education Requirements

The general education program is designed to ensure that all IIT graduates have a basic understanding of certain essential areas of knowledge. **The general education program sets minimal requirements.** General education requirements may not be waived, nor will substitutions be permitted, without

the approval of the dean of the Undergraduate College. Approval will be granted only under extraordinary circumstances. Most departments of major study require additional courses in these areas, which are stated under the individual major degree requirements.

### A. Basic Writing Proficiency:

Students must take the IIT English Proficiency Examination before beginning classes at IIT. Within their first year at IIT, students who do not pass the IIT English Proficiency Examination must demonstrate basic writing proficiency by passing an English composition course at IIT. This requirement applies to all students enrolling for an undergraduate degree.

### B. Mathematics: 5 credit hours

The five credit hours must be above MATH 115.

### C. Computer Science: 2 credit hours

All students must take CS 104 or 105, or ARCH 125, or a computer science course at the 200 level or above.

### D. Humanities and Social or Behavioral Sciences: 21 Credit hours, subject to minimum requirements in each area as specified below:

1. Humanities: a minimum of 9 credit hours. Courses that satisfy this requirement are marked with an (H) in this **Bulletin**.

These must be distributed as follows:

- (a) HUM 100-level course.
- (b) At least two courses marked with an (H) at the 300-level or above. Some students may use foreign language courses at the 200-level to fulfill 300-level requirements. Students wishing to use foreign language courses must confirm their eligibility with the dean of the Undergraduate College.

2. Social or Behavioral Sciences: a minimum of 9 credit hours.

Courses that satisfy this requirement are marked with an (S) in this **Bulletin**.

These must be distributed as follows:

- (a) At least two courses on the 300-level, or above.
- (b) Courses must be chosen from at least two different fields.
- (c) At least six credits in a single field.

### E. Natural Science or Engineering: 11 credit hours

This component may be satisfied by courses in engineering, biology, chemistry, physics, or by courses marked with an (N) in psychology. The courses must be distributed as follows:

- (a) Two sequential natural science or engineering courses in a single field. (CHEM 124 with MS 201 satisfies this requirement.)
- (b) At least one natural science or engineering course in a second area.

### F. Interprofessional Projects: 6 credit hours

Students will participate in at least two interprofessional project experiences. These projects develop communication, teamwork and leadership skills and an awareness of economic, marketing, ethical and social issues within the framework of a multidisciplinary team project. The project teams will be integrated across academic programs, and at different levels within programs.

## Special Academic Requirements

There are special requirements that go beyond or modify the basic general education requirements.

### 1. Policy on Writing and Communications

IIT recognizes the importance of critical thinking, writing and oral communication in all academic pursuits and in professional practice. IIT is therefore committed to a campus-wide program that engages students in the practice of written and oral communication in all disciplines. This program includes the following components:

- (a) Students must satisfy the "Basic Writing Proficiency" requirement in the General Education Requirements.
- (b) Students must complete a minimum of 42 credit hours of courses with a significant written and oral communication component, identified with a (C) in the catalog, with a minimum distribution as follows:
  - 15 hours in the major courses
  - 15 hours in non-major courses

Full time students should enroll in two (C)-designated courses and part time students should enroll in one (C)-designated course each academic year.

- (c) Students must seek help from the IIT Writing Center when referred by a course instructor or an academic adviser. The Writing Center provides support for all writing instruction within the curriculum, tutoring for students referred to the center by course instructors or advisers, and individual help on demand to students who wish to improve their writing.

### 2. Engineering and Computer Science Majors

The Bachelor of Science degree programs in engineering and computer science require the following courses, which may be applied to the general education requirements:

- (a) Mathematics: MATH 151 and MATH 152, and at least one course numbered 200 or above.
- (b) Physics: PHYS 123, PHYS 221.

### 3. Non-Applicable Courses

Some courses are marked as not applying to graduation. These courses do affect grade point averages and academic status.

### 4. Introduction to the Profession: 4 credit hours

All engineering and computer science students must complete this seminar in their first year. (Students entering with 30 hours or more of transfer credit are excused.)

## Applied Sciences

### Applied Sciences Program

As technology becomes a pervasive force, no professional can afford to enter the workplace without an understanding of technology and its scientific foundations. For example, a corporate attorney may draw on a background in biology to defend a pharmaceutical patent. A physician may be called upon to make a cost-benefit analysis of a sophisticated medical device. A person trained in psychology may find a rewarding career in such specialties as human resources or rehabilitation counseling. Each of these professionals requires education in more than one discipline.

IIT's Applied Sciences Degree Program offers students this multidisciplinary cross-training. Undergraduates may major in one of eight focused professional disciplines: psychology, political science, biology, chemistry, physics, computer information systems, applied mathematics, or molecular biochemistry and biophysics-linked with an interdisciplinary core of math, sciences, computing, communication, organizational behavior and humanities that will be the basis for every

professional career in the future. Undergraduates from engineering and architecture who plan to pursue graduate or professional study also are invited to participate in the Applied Sciences program.

The flexibility and broad base of the Applied Sciences Degree Program make it an ideal preparation for students planning careers in medicine, dentistry and other graduate health professions; the physical and social sciences; law; psychology; environmental studies; and graduate business. Because graduates of these programs have excellent analytic and communication skills, they are prepared to begin careers in a variety of fields after earning their undergraduate degrees.

Each student's program is highly individualized-integrating courses, projects, research and field work relevant to the student's professional goals as well as his or her undergraduate specialization.

#### Program advisers

T. I. Morrison  
Chair, Biological, Chemical and Physical Sciences  
182 Life Sciences  
Ext. 73381

C. Robert Carbon  
Chair, Computer Science and Applied Mathematics  
237 Stuart Building  
Ext. 75150

M. Ellen Mitchell  
Director, Institute of Psychology  
252 Life Sciences  
Ext. 73500

William J. Grimshaw  
Chair, Social Sciences  
214 Wishnick Hall  
Ext. 75129

#### Legal studies adviser

Scott Peters  
Assistant Professor of Political Science  
221 Wishnick Hall  
Ext. 75130

#### Premedical advisers

Biology, Chemistry, Molecular Biochemistry  
and Biophysics, and Physics for the Professions  
Dean Chapman  
Associate Professor of Physics  
174 Life Sciences  
Ext. 73575

#### Psychology for the Professions

Margaret Huyck  
Professor of Psychology  
252 Life Sciences  
Ext. 73517

## College of Architecture

On this threshold, before the next century, architecture must fill an ever more demanding role in asserting human values in a rapidly changing, technology-driven, increasingly complex global society. The integration of new construction, along with the conservation of the old, brings together current issues of urban housing, commercial development, infrastructure and transportation along with critical concerns for energy and sustainable environment. The resulting cultural values of community development must be adaptable to both domestic and international contexts, and thoughtful to the consequences of what we build.

The College of Architecture at IIT is uniquely positioned to provide the academic challenge of preparing students for this professional responsibility.

The college's roots are firmly embedded in Chicago's architectural history. Creative pioneers like Sullivan, Jenney, Root, Burnham and Wright produced a body of work that established the principles of modern architecture. These

architects were energized by exciting new engineering possibilities, yet they never wavered from the unifying belief in a rich cultural expression of architecture for their time. They also believed in education and in 1895 combined a course of study in drawing and construction at the Art Institute of Chicago with the support courses of history, mathematics, and engineering from the then Armour Institute of Technology. The catalog for this new program was called the Chicago School of Architecture.

Out of these beginnings, the College of Architecture continues this tradition of responding to the leading issues of architectural education and practice. Located in one of the world's greatest cities for the study of architecture, the most outstanding architectural and engineering resources of Chicago provide both faculty and reinforcement of the educational mission. Moreover, S.R. Crown Hall, designed by Mies van der Rohe, is the ultimate space to study architecture. Set within the Mies-designed campus, it has become recognized as one the most significant buildings of the 20th century.

### Faculty

#### Dean

Donna V. Robertson  
S. R. Crown Hall  
Ext. 73230

#### Assistant Dean for Academic Affairs

Lee W. Waldrep  
S. R. Crown Hall  
Ext. 78835

#### Professors

Elnimeiri, Land

#### Associate Professors

Beltemacchi, Hovey, Robertson, Schipporeit, Sharpe, Takeuchi, Thomas

#### Studio Professors

Brown, Conger-Austin, Denison, Gadelha, Horn, Karidis, Krueck, Nicholson, Roesch, Veikos, Werzel

#### Special Lechuer

Caldwell

#### Lectures

Cole, Krawczyk

#### Adjunct Professors

Abdelrazaq, Ahuja, Baker, Bihler, Bowman, Brininstool, Fujikawa, Gang, Gentry, Grimes, Hamill, Hartray, Hillary, Kriegshauser, Linden McAnuhy, Moreno, Nelson, Piotrowski, Ronan, Rubio, Shaver, Sobel, Schmieding, Stein, Waldrep, Yeo

#### Visiting Assistant Professors

Berman, Mitchell, Roy, Witte

#### Faculty Emeriti

Danforth, Hannaford, Utsunomiya

#### Instructors

Felsen, Miller

#### Joint Appointment

Harrington (Humanities)

#### Visiting Critics

Whiting, Wilkinson

# Architecture

## Professional Degrees

The undergraduate professional degree program at IIT has always been a comprehensive five-year, fully accredited Bachelor of Architecture degree. The educational format is based on providing the fundamental body of knowledge required by the profession within a fully coordinated three-year core studio sequence. Each of the three years is team taught to horizontally integrate all courses within each year and vertically sequence learning experiences from year to year. This professional background within the three-year core becomes the preparation for the last two years of electives in design studios focused on topic areas such as spatial awareness, comprehensive building design, and the design of large building complexes.

IIT has also taken a leadership role in addressing the responsibilities of professional education for the next century's global workplace. While technical proficiency will always be necessary, IIT recognizes that colleges must also educate students to work as part of teams; to communicate well; and to understand the economic, social, environmental and international context of their profession. Faculty are encouraged to broaden the upper level studios to become real-world interdisciplinary projects. This new emphasis on holistic learning, when combined with a new global vision

and advanced computer and communication technology, positions IIT and the College of Architecture at the leading edge of higher education.

To clarify the difference in architectural degree programs, it should be noted that most states require that an individual intending to become an architect hold an accredited degree. There are two types of degrees that are accredited by the National Architectural Accrediting Board: (1) The Bachelor of Architecture, which requires a minimum of five years of study, and (2) The Master of Architecture, which requires a minimum of three years of study following an unrelated bachelor's degree or two years following a related pre-professional bachelor's degree. These professional degrees are structured to educate those who aspire to registration and license to practice as architects. The college offers both of these degrees.

The four-year preprofessional degree, where offered, is not accredited by NAAB. The preprofessional degree is useful to those wishing a foundation in the field of architecture as preparation for either continued education in a professional degree program or for employment options in fields related to architecture. (The college does not offer this degree.)

Required Courses	Credit Hours	Required Courses	Credit Hours
<b>Major Courses</b>	83	<b>Art and Architectural History Requirements</b>	6
ARCH 100, 109, 110, 113, 114, 125, 200, 201, 202, 225, 305, 306, 309, 310, 313, 417, 418, 419, 420, 423		AAH 119, 120	
<b>City and Regional Planning Requirements</b>	6	<b>Architecture History Elective</b>	3
CRP 201, 465		<b>Humanities and Social Science Requirements</b>	21
<b>Mathematics Requirements</b>	6	See General Education requirements page 30	
MATH 119, 122		<b>Interprofessional Projects</b>	6
<b>Physics Requirements</b>	6	<b>Architecture elective or specialized minor</b>	15
PHYS 211, 212		<b>Total Credit Hours</b>	<b>168</b>
<b>Civil and Architectural Engineering Requirements</b>	16		
CAE 286, 287, 351, 352, 425			

## Architecture Curriculum

Semester 1				Semester 2			
	Lect	Lab.	Cr.		Lect.	Lab.	Cr.
		Hrs.	Hrs.			Hrs.	Hrs.
ARCH 100 Intro to Architecture	1	0	1	ARCH 200 Intro to Architecture	0	2	1
ARCH 113 Architecture Studio I	0	12	6	ARCH 114 Architecture Studio II	0	12	6
ARCH 109 Freehand Drawing I	0	4	2	ARCH 110 Freehand Drawing II	0	4	2
MATH 119 Geometry for Architects	3	0	3	MATH 122 Introduction to Mathematics II	3	0	3
ARCH 125 Intro to Architectural Computing	2	2	3	PHYS 211 Basic Physics I	3	0	3
Humanities 100-level elective	3	0	3	Humanities/social science elective	3	0	3
Totals	9	18	18	Totals	9	18	18
Semester 3				Semester 4			
ARCH 201 Architecture III: Structures, Building Systems and Assembly	0	10	5	ARCH 202 Architecture IV: Structures, Building Systems and Assembly	0	12	6
AAH 113 History of World Architecture I	3	0	3	AAH 120 History of World Architecture II	3	0	3
CAE 286 Theory and Concept of Structural Mechanics	4	0	4	CAE 287 Structures I, Analysis and Behavior	3	0	3
PHYS 212 Basic Physics II	3	0	3	CRP 201 The Dwelling	3	0	3
ARCH 225 Computer-aided Design in Practice	1	2	3	Social science elective	3	0	3
Totals	12	12	18	Totals	12	12	18
Semester 5				Semester 6			
ARCH 305 Architecture V	0	12	6	ARCH 306 Architecture VI	0	12	6
ARCH 309 Mechanical & Electrical Building Systems for Architects I	3	0	3	ARCH 310 Mechanical & Electrical Building Systems for Architects II	3	0	3
CRP 465 The Ecological Basis of Planning	3	0	3	CAE 352 Structures III: Reinforced Concrete and Masonry Design	3	0	3
CAE 351 Structures II: Steel & Timber Design	3	0	3	ARCH 423 Architectural Programming	3	0	3
ARCH elective/minor	3	0	3	ARCH elective/minor	3	0	3
Totals	12	12	18	Totals	12	12	18
Semester 7				Semester 8			
ARCH 417 Architecture VII	0	12	6	ARCH 418 Architecture VIII	0	12	6
ARCH history elective	3	0	3	CAE 425 Fire Protection and Life Safety in Building Design	3	0	3
ARCH elective/minor	3	0	3	IPro elective	1	6	3
Social science elective	3	0	3	Humanities elective	3	0	3
Totals	9	12	15	Totals	7	18	15
Semester 9				Semester 10			
ARCH 419 Architecture IX	0	12	6	ARCH 420 Architecture X	0	12	6
ARCH 313 Architectural Practice	3	0	3	ARCH elective/minor	3	0	3
ARCH elective/minor	3	0	3	IPro elective	1	6	3
Social science elective	3	0	3	Humanities elective	3	0	3
Totals	9	12	15	Totals	7	18	15

Total Credit Hours 168

# Architecture

## Optional Programs

Architecture students are encouraged to select electives that will provide a sequence of 15 credit hours of learning experiences related to a specific interest that will reinforce the curriculum.

Such topic fields of study should be chosen early in the student's program in consultation with an academic adviser.

### **Bachelor of Architecture/M.B.A. Double Degree Option:**

Qualified students may earn both the Bachelor of Architecture and Master of Business Administration (M.B.A.) degrees in six rather than the normal seven years. Students who are completing their eighth semester, or an equivalent of 124 credit hours in architecture at IIT, may apply for entry into the joint program. They should take preparatory courses

for the M.B.A. prior to entry and the Graduate Management Admission Test during the eighth semester. Students who anticipate entering into the program should seek advising in the Stuart School of Business and the College of Architecture early in their studies at IIT

### **Bachelor of Architecture/M.C.E. Double Degree Option:**

Qualified students regularly enrolled at IIT may earn both the Bachelor of Architecture and the Master of Civil Engineering (M.C.E.). They must complete preparatory courses for the M.C.E. prior to entry into the combined program. Students who anticipate entry into the combined program and who intend to specialize in structural engineering must successfully complete the following courses as part of their undergraduate program in architecture: MATH 151, MATH 152, MATH 251, CAE 303, CAE 304, CAB 307, CAE 310, CAE 431, and CAE 432 in place of MATH 119, MATH 122, CAB 287, CAE 351, CAE 352 and as

technical electives. Students who anticipate entry into the combined program and who intend to specialize in construction engineering and management must successfully complete the following courses as part of the technical electives in their undergraduate program in architecture: CAE 323, CAE 431, CAE 432 and CAB 457.

Students who anticipate entering into the program should seek advising in the Department of Civil and Architectural Engineering and the College of Architecture early in their studies at IIT.



## Biological, Chemical and Physical Sciences

### Biological, Chemical and Physical Sciences

A thorough understanding of the sciences is essential for professional leadership in our increasingly technological society. A modern professional in a technologically oriented career must not only have a mastery of the basic sciences of biology, chemistry, and physics but must also appreciate the context of these sciences in the modern world and how these sciences become increasingly interrelated. Individuals with this background are in demand in a wide variety of professional careers outside of these three major disciplines. Health care, law, business, engineering, physics, biotechnology, and technical management all will become more reliant on strong scientific preparation.

Scientists work with professionals in various disciplines and must apply their knowledge and their judgment to challenging and constantly changing sets of problems. In recognition of the interdisciplinary needs of tomorrow's decision-making professionals, IIT has merged its traditional science departments into a single unit to provide the students with an option for breadth and depth in the sciences that is unparalleled in the history of the school. Flexibility is the key word, and academic rigor is the continuing tradition.

The IIT science major will be exposed to this interdisciplinary approach, gaining a baccalaureate in a specific area and a better understanding of how the sciences relate to each other and how they relate to those professions that have not traditionally required a science background. IIT students will most likely continue their education in a graduate program, either within their specific discipline or in professions, such as law, business, or medicine, in which a science background will place them ahead of their competition.

Biology, chemistry, and physics are the bases for IIT's Applied Sciences for the Professions degree program. They provide a strong interdisciplinary science foundation and specialized preparation for students seeking advanced degrees in medicine, law, business, and graduate level science.

The Bachelor of Science degree program provides a unique educational experience combining interprofessional projects and interdisciplinary studies while allowing the student to develop strength and depth in specific concentration areas such as biology, chemistry and physics. It will prepare the student for graduate studies in a number of professions such as law, medicine, environmental science and engineering, business studies, and scientific research.

BCPS Department Home Page: <http://www.iit.edu/-bcps>

### Faculty

#### Chair

Timothy I. Morrison  
182 Life Science  
Ext. 73480

#### Biology Faculty

##### Professors

D. Cork, Roth, B. Stark, Webster

##### Adjunct Professors

Sedita

##### Associate Professors

Erwin, Howard

##### Adjunct Associate Professors

Gendel, Kilbane, McCormick, Ratajczak, Rubenstein

##### Assistant Professors

Garfinkel, T.C. Irving

##### Faculty Emeriti

Bretz, W.F. Danforth, Grecz, Hayashi, Hoskin,  
Jasper, Koblick, Roush

#### Chemistry Faculty

##### Professors

Eisenberg, P.Y. Johnson, Lykos, Schug

##### Associate Professors

Mandal, Stetter

##### Assistant Professors

Khan, Stagliano

##### Adjunct Assistant Professor

Smotkin

##### Faculty Emeriti

Fanta, Filler, Miller, Wood

## Biological, Chemical and Physical Sciences

### Physics Faculty

#### Pritzker Professor of Science

Lederman

#### Professors

R. Burnstein, Erber\*, P.W. Johnson, Kallend\*\*,  
Rubin, Spector, Zasadzinski

#### Associate Professors

Bunker, Chapman, Coffey, Kaplan, Longworth,  
Morrison, Segre

### Research Associate Professors

Port, Zhang

### Adjunct Associate Professor

Gluskin

### Research Assistant Professor

White

### Visiting Assistant Professor

Karagiannes

### Faculty Emeriti

Colvert, Grossweiner, Hauser, Mahlot, Markham, Zwicker

\*Jointly with CSAM

\*\*Jointly with MMAE

## Biological. Chemical and Physical Sciences

### Biology for the Professions

The department offers an undergraduate program with concentration in biology aimed at those students who intend to enter medical school or other professional post-graduate schools as well as at those students who wish to continue

on to advanced degrees or pursue a career in research. A semester-by-semester outline of the degree program (including credit hours) is presented on the next page.

Required Courses	Credit Hours	Required Courses	Credit Hours
Major Courses BIOL 100, 101, 107, 109, 115, 117, 210, 214, 225, 320, 403, 404, 430, 445, 446, 495	42	Physics Requirements PHYS 123, 221, 223	12
Biology Electives	9	Computer Science Requirements CS 105	2
Interprofessional Projects Any two of the following: IPRO 297,397,497	6	Humanities/Social Science Requirements PSYC 221, 222	6
Mathematics Requirements MATH 151, 152	10	Humanities Elective	9
Chemistry Requirements CHEM 124, 125, 237, 239, 247	18	Social Science Electives	9
		Free Electives	6
		Total Credit Hours	129

# Biological, Chemical and Physical Sciences

## Biology Curriculum

Semester 1				Semester 2			
	Lect.	Hrs.	Cr.		Lect.	Hrs.	Cr.
BIOL 100 Introduction to the Profession I	2	0	2	BIOL 101 Intro to the Profession II	2	0	2
BIOL 107 General Biology Lectures	3	0	3	BIOL 115 Human Biology	3	0	3
BIOL 109 General Biology Laboratory	0	4	2	BIOL 117 Experimental Biology	0	4	2
CHEM 124 Principles of Chemistry I	3	3	4	CHEM 125 Principles of Chemistry II	3	3	4
MATH 151 Calculus I	4	1	5	MATH 152 Calculus II	4	1	5
Totals	12	8	16	Totals	12	8	16
Semester 3				Semester 4			
PHYS 123 Mechanics	3	3	4	CHEM 239 Organic Chemistry II	3	0	3
PSYC 221 Human Behavior, Growth and Learning	3	0	3	PHYS 221 Electricity and Magnetism	3	3	4
BIOL 214 Genetics and Genetic Technology	3	0	3	BIOL 210 Microbiology Lectures	3	0	3
Humanities 100-level course	3	0	3	BIOL 225 Microbiology Laboratory	0	4	2
CHEM 237 Organic Chemistry I	3	4	4	Humanities elective	3	0	3
Totals	15	7	17	Totals	12	7	15
Semester 5				Semester 6			
BIOL 430 Animal Physiology: Lecture	3	0	3	BIOL 403 Biochemistry Lecture	4	0	4
CHEM 247 Analytical Chemistry	2	4	3	BIOL 404 Biochemistry Laboratory	0	6	3
PHYS 223 Thermal and Modern Physics	3	3	4	IPRO 397 Interprofessional Project	1	6	3
CS 105 Introduction to Computer Programming I	2	1	2	PSYC 222 Brain, Mind and Behavior	3	0	3
BIOL 320 Biological Literature	0	4	2	Social science elective	3	0	3
Free elective	3	0	3	Totals	11	12	16
Totals	13	12	17				
Semester 7				Semester 8			
Biology elective	3	0	3	Biology elective	3	0	3
BIOL 445 Cell Biology	3	0	3	Biology elective	3	0	3
BIOL 446 Cell Biology Laboratory	0	6	3	Humanities elective	3	0	3
IPRO 497 Interprofessional Project	1	6	3	Free elective	3	0	3
Social science elective	3	0	3	Social science elective	3	0	3
BIOL 495 Colloquium	1	0	1	BIOL 495 Colloquium	1	0	1
Totals	11	12	16	Totals	16	0	16

Total Credit Hours

129

## Biological, Chemical and Physical Sciences

### Molecular Biochemistry and Biophysics

The Molecular Biochemistry and Biophysics Program provides interdisciplinary training in biology, chemistry, and physics aimed at students who intend to enter medical school or pursue

graduate education in biophysics. A semester-by-semester outline of the program is presented on the next page.

Required Courses	Credit Hours	Required Courses	Credit Hours
<b>Biology</b> BIOL 107, 109, 115, 117, 210, 214, 301, 403, 404, 430, 445, 446, 495	35	<b>Introduction to the Professions</b> BIOL 100, 101	4
<b>Chemistry</b> CHEM 124, 125, 237, 239, 343	18	<b>Interprofessional Projects</b> IPRO 397, 497	6
<b>Physics</b> PHYS 123, 221, 223, 348, 410	19	<b>Computer Science Requirements</b> CS 105	2
<b>Mathematics Requirements</b> MATH 151, 152, 251, 474	17	<b>Humanities and Social Sciences Requirements</b> See General Education requirements, page 30	21
<b>Additional Technical Requirements</b> CHEM 247 or PHYS 300 MATH 252 or PHYS 240	6-7	<b>Biology Elective</b>	3
		<b>Total Credit Hours</b>	<b>131-132</b>

## Biological, Chemical and Physical Sciences

### Molecular Biochemistry and Biophysics Curriculum

Semester 1				Semester 2			
		Lect.	Cr. Hrs.			Lect.	Cr. Hrs.
CHEM 124	Principles of Chemistry I	3	3	CHEM 125	Principles of Chemistry II	3	3
BIOL 107	General Biology Lecture	3	0	BIOL 115	Human Biology	3	0
BIOL 109	General Biology Laboratory	0	4	BIOL 117	Experimental Biology	0	4
MATH 151	Calculus I	4	1	MATH 152	Calculus II	4	1
BIOL 100	Introduction to the Profession I	2	0	BIOL 101	Introduction to the Profession II	2	0
Totals		12	8	Totals		12	8
			16				16
Semester 3				Semester 4			
		Lect.	Cr. Hrs.			Lect.	Cr. Hrs.
PHYS 123	Mechanics	3	3	PHYS 221	Electromagnetism and Optics	3	3
CHEM 237	Organic Chemistry I	3	3	CHEM 239	Organic Chemistry II	3	0
Social science	elective	3	0	CS 105	Introduction to Computer Programming I	2	1
MATH 251	Multivariate and Vector Calculus	4	0	BIOL 210	Microbiology Lecture	3	0
BIOL 214	Genetics and Generic Technology	3	0	Humanities	100-level course	3	0
Totals		16	6	Totals		14	4
			18				15
Semester 5				Semester 6			
		Lect.	Cr. Hrs.			Lect.	Cr. Hrs.
BIOL 430	Animal Physiology Lecture	3	0	BIOL 403	Biochemistry Lecture	4	0
CHEM 247	Analytical Chemistry or	2	4	BIOL 404	Biochemistry Laboratory	0	6
PHYS 300	Instrumentation Laboratory	2	3	Humanities	elective	3	0
Humanities	elective	3	0	Social science	elective	3	0
PHYS 223	Thermal and Modern Physics	3	3	MATH 252	Intro to Differential Equations or	4	0
IPRO 397	Interprofessional Project	1	6	PHYS 240	Computational Science	2	3
Totals		12	12-13	BIOL 301	Lit Survey/MCAT Prep	1	0
			16	Totals		13-15	6-9
							17-18
Semester 7				Semester 8			
		Lect.	Cr. Hrs.			Lect.	Cr. Hrs.
BIOL 445	Cell Biology	3	0	Social science	elective	3	0
BIOL 446	Cell Biology Laboratory	0	6	Social science	elective	3	0
PHYS 348	Modern Physics			Biology	elective	3	0
	for Scientists and Engineers	3	0	MATH 474	Probability and Statistics	3	0
IPRO 497	Interprofessional Project	1	6	PHYS 410	Molecular Biophysics	4	0
CHEM 343	Physical Chemistry I	3	0	BIOL 495	Colloquium	1	0
BIOL 495	Colloquium	1	0	Totals		17	0
Totals		11	12				17
			16				
Total Credit Hours						131-132	

## Biological, Chemical and Physical Sciences

### Chemistry Program

As part of the Applied Sciences for the Professions program the department offers two undergraduate programs of study in chemistry: a Chemistry for the Professions Program aimed at those students who plan to continue on to medical, law school or business school and a Chemistry for Industry/Graduate Study Program for those students who

wish to continue on to advanced degrees or pursue a career in research. A significant overlap exists between the two degree programs, enabling students to transfer from one degree program to the other early in their course of study. Semester-by-semester outlines of both degree programs (including credit hours) are presented on the next page.

### Chemistry for the Professions

Required Courses	Credit Hours	Required Courses	Credit Hours
Major Courses	48	Physics Requirements	12
CHEM 100, 101, 124, 125, 237, 239, 240, 247, 321, 334, 343, 344, 415, 416, 450, 451		PHYS 123, 221, 223	
Interprofessional Projects	6	Computer Science Requirements	2
IPRO 297, 497		CS 105	
Chemistry electives	6	Humanities/Social Science Requirements	6
Mathematics Requirements	14	PSYC 221, 222	
MATH 151, 152, 251		Humanities Electives	9
Biology Requirements	21	Social Science Electives	9
BIOL 107, 109, 115, 214, 403, 404, 430		Total Credit Hours	133

## Biological, Chemical and Physical Sciences

### Chemistry for the Professions Curriculum

Semester 1				Semester 2			
	Lect.	Hrs.	Cr.		Lect.	Hrs.	Cr.
CHEM 124 Principles of Chemistry I	3	3	4	CHEM 125 Principles of Chemistry II	3	3	4
BIOL 107 General Biology Lectures	3	0	3	BIOL 115 Human Biology	3	0	3
BIOL 109 General Biology Laboratory	0	4	2	CHEM 101 Introduction to the Profession II	2	0	2
CHEM 100 Introduction to the Profession I	2	0	2	MATH 152 Calculus II	4	1	5
MATH 151 Calculus I	4	1	5	Humanities 100-level course	3	0	3
Totals	12	8	16	Totals	15	4	17
Semester 3				Semester 4			
PHYS 123 Mechanics	3	3	4	PHYS 221 Electromagnetism and Optics	3	3	4
CHEM 237 Organic Chemistry I	3	4	4	CHEM 239 Organic Chemistry II	3	0	3
MATH 251 Multivariate and Vector Calculus	4	0	4	CHEM 240 Organic Chemistry Laboratory	1	4	2
I PRO 297 Interprofessional Project	1	6	3	CS 105 Introduction to Computer Programming I	2	1	2
BIOL 214 Genetics and Genetic Technology	3	0	3	CHEM 247 Analytical Chemistry	2	4	3
Totals	14	13	18	PSYC 221 Human Behavior, Growth and Learning	3	0	3
				Totals	14	12	17
Semester 5				Semester 6			
CHEM 343 Physical Chemistry I	3	0	3	CHEM 344 Physical Chemistry II	3	4	4
BIOL 430 Animal Physiology Lecture*	3	0	3	BIOL 403 Biochemistry Lecture**	4	0	4
PHYS 223 Thermal and Modern Physics	3	3	4	BIOL 404 Biochemistry Laboratory**	0	6	3
Chemistry elective*	3	0	3	Humanities elective	3	0	3
PSYC 222 Brain, Mind and Behavior	3	0	3	CHEM 451 Modern Techniques in Chemical Literature	2	0	2
Totals	15	3	16	Totals	12	10	16
Semester 7				Semester 8			
CHEM 321 Instrumental Analysis	2	6	4	CHEM 334 Spectroscopic Methods in Identification and Analysis	2	0	2
CHEM 416 Advanced Chemistry Laboratory	1	7	3	CHEM 415 Inorganic Chemistry	3	0	3
I PRO 497 Interprofessional Project	1	6	3	CHEM 450 Introduction to Research	0	8	3
Chemistry elective †	3	0	3	Humanities elective	3	0	3
Social science elective	3	0	3	Social science elective	3	0	3
Totals	10	19	16	Social science elective	3	0	3
				Totals	14	8	17
Total Credit Hours							133

\* Highly recommended but not required.

\*\* Recommended by the American Chemical Society for a Biochemistry Option.

† or PRO 397.



## Biological. Chemical and Physical Sciences

### Chemistry for Industry/Graduate Study Required Courses

Required Courses	Credit Hours	Required Courses	Credit Hours
Major Courses	52	Physics Requirements	12
CHEM 100, 101, 124, 125, 237, 239, 240, 247, 321, 334, 343, 344, 415, 416, 450, 451, 487		PHYS 123, 221, 223	
Chemistry Electives	15	Computer Science Requirements	2
Interprofessional Projects	6	CS 105	
IDRO 297, 497		Humanities/Social Science Requirements	6
Mathematics Requirements	14	PSYC 221, 222	
MATH 151, 152, 251		Humanities Electives	9
Biology Requirements	3	Social Science Electives	9
BIOL 107		Free Elective	3
		Total Credit Hours	131

## Biological, Chemical and Physical Sciences

### Chemistry for Industry/Graduate Study Curriculum

Semester 1				Semester 2			
	Lect.	Lab.	Cr.		Lect.	Lab.	Cr.
		Hrs.	Hrs.			Hrs.	Hrs.
CHEM 124 Principles of Chemistry I	3	3	4	CHEM 125 Principles of Chemistry II	3	3	4
BIOL 107 General Biology Lectures	3	0	3	CS 105 Intro to Computer Programming I	2	1	2
CHEM 100 Introduction to the Profession I	2	0	2	CHEM 101 Introduction to the Profession II	2	0	2
MATH 151 Calculus I	4	1	5	MATH 152 Calculus II	4	1	5
Humanities 100-level course	3	0	3	Humanities elective	3	0	3
Totals	15	4	17	Totals	14	5	16
Semester 3				Semester 4			
PHYS 123 Mechanics	3	3	4	PHYS 221 Electromagnetism and Optics	3	3	4
CHEM 237 Organic Chemistry I	3	4	4	CHEM 239 Organic Chemistry II	3	0	3
CHEM 247 Analytical Chemistry	2	4	3	CHEM 240 Organic Chemistry Laboratory	1	4	2
I PRO 297 Interprofessional Project	1	6	3	PSYC 221 Human Behavior, Growth and Learning	3	0	3
MATH 251 Multivariate and Vector Calculus	4	0	4	Humanities elective	3	0	3
Totals	13	17	18	Totals	13	7	15
Semester 5				Semester 6			
CHEM 321 Instrumental Analysis	2	6	4	CHEM 334 Spectroscopic Methods in Identification and Analysis	2	0	2
CHEM 343 Physical Chemistry I	3	0	3	CHEM 344 Physical Chemistry II	3	3	4
PHYS 223 Thermal and Modern Physics	3	3	4	CHEM 45 1 Chemical Literature	2	0	2
Chemistry elective	3	0	3	Humanities elective	3	0	3
PSYC 222 Brain, Mind and Behavior	3	0	3	Free elective	3	0	3
Totals	14	9	17	CHEM 415 Inorganic Chemistry	3	0	3
Semester 7				Semester 8			
CHEM 416 Advanced Chemistry Laboratory	1	7	3	Chemistry elective (500-level)*	3	0	3
Chemistry elective (500 level)*	3	0	3	Chemistry elective (500-level)*	3	0	3
CHEM 450 Introduction to Research	0	8	3	Chemistry elective	3	0	3
I PRO 497 Interprofessional Project	1	6	3	Social science elective	3	0	3
Social science elective	3	0	3	CHEM 487 Senior Thesis in Chemistry	0	12	4
Totals	8	21	15	Totals	12	12	16
Total Credit Hours						131	

\* Or CHEM 435, 455, 497 or interdisciplinary courses with the department's consent.

## Biological. Chemical and Physical Sciences

### Physics Program

As part of the Applied Sciences for the Professions program, the department offers two undergraduate programs of study in physics: a Physics for the Professions Program aimed at those students who plan to continue on to medical, law or business school and a Physics for Industry/Graduate Study program for those students who wish to continue on

to advanced degrees or pursue a career in research. A significant overlap exists between the two degree programs enabling students to transfer from one degree program to the other early in their course of study. Semester-by-semester outlines of both degree programs (including credit hours) are presented below.

### Physics for the Professions

Required Courses	Credit Hours	Required Courses	Credit Hours
Major Courses PHYS 100, 101, 123, 221, 223, 240, 300, 304, 308, 348, 405, 413, 427	40	Biology Requirements BIOL 107	3
physics Electives	9	Biology Electives	6
Interprofessional Projects IPRO 397, 497	6	Biochemistry Electives	4
Mathemathics Requirements MATH 151, 152, 251, 252	18	Microbiology Electives	3
Mathematics Electives	3	Computer Science Requirements CS 105	2
Chemistry Requirements CHEM 124, 125	8	Humanities/Social Science Requirements PSYC 221, 222	6
Chemistry Electives		Humanities Electives	9
		Social Science Electives	9
		Total Credit Hours	132

# Biological, Chemical and Physical Sciences

## Physics for the Professions Curriculum

Semester 1				Semester 2			
	Lect.	Hrs.	Cr.		Lect.	Hrs.	Cr.
CHEM 124 Principles of Chemistry I	3	3	4	CHEM 125 Principles of Chemistry II	3	3	4
BIOL 107 General Biology Lectures	3	0	3	PHYS 123 Mechanics	3	3	4
PHYS 100 Introduction to the Profession I	2	0	2	PHYS 101 Introduction to the Profession II	2	0	2
MATH 151 Calculus I	4	1	5	MATH 152 Calculus II	4	1	5
Humanities 100-level course	3	0	3	PSYC 221 Human Behavior, Growth and Learning	3	0	3
<b>Totals</b>	<b>15</b>	<b>4</b>	<b>17</b>	<b>Totals</b>	<b>15</b>	<b>7</b>	<b>18</b>
<b>Semester 3</b>				<b>Semester 4</b>			
PHYS 221 Electromagnetism and Optics	3	3	4	PHYS 223 Thermal and Modern Physics	3	3	4
PSYC 222 Brain, Mind and Behavior	3	0	3	CS 105 Introduction to Computer Programming I	2	1	2
MATH 251 Multivariate and Vector Calculus	4	0	4	MATH 252 Intro to Differential Equations	4	0	4
Biology elective*	3	0	3	Biology elective *	3	0	3
Chemistry elective*	3	0	3	Chemistry elective*	3	0	3
<b>Totals</b>	<b>16</b>	<b>3</b>	<b>17</b>	<b>Totals</b>	<b>15</b>	<b>4</b>	<b>16</b>
<b>Semester 5</b>				<b>Semester 6</b>			
PHYS 300 Instrumentation Laboratory	2	3	3	PHYS 240 Computational Science	2	3	3
PHYS 348 Modern Physics for Scientists and Engineers	3	0	3	PHYS 304 Kinetic Theory and Thermodynamics	3	0	3
IPRO 397 Interprofessional Project	1	6	3	Biochemistry elective*	4	0	4
Mathematics elective	3	0	3	Microbiology elective*	3	0	3
Humanities elective	3	0	3	Social science elective	3	0	3
<b>Totals</b>	<b>12</b>	<b>9</b>	<b>15</b>	<b>Totals</b>	<b>15</b>	<b>3</b>	<b>16</b>
<b>Semester 7</b>				<b>Semester 8</b>			
PHYS 427 Advanced Physics Laboratory I	2	3	3	Physics elective	3	0	3
PHYS 308 Classical Mechanics I	3	0	3	PHYS 413 Electromagnetism	3	0	3
IPRO 497 Interprofessional Project	1	1	3	Physics elective	3	0	3
PHYS 405 Fundamentals of Quantum Theory I	3	0	3	Physics elective	3	0	3
Social science elective	3	0	3	Humanities elective	3	0	3
<b>Totals</b>	<b>12</b>	<b>9</b>	<b>15</b>	Social science elective	3	0	3
				<b>Totals</b>	<b>18</b>	<b>0</b>	<b>18</b>
<b>Total Credit Hours</b>						<b>132</b>	

\* Elective course and credit hours for the pre-med program are satisfied by BIOL 107, 109, 115, 117, CHEM 237,239.

Selection of specific electives should be done in consultation with pre-med adviser. For pre-law and pre-business orientations, substitute other courses in business, political science, etc. in consultation with adviser.

## Biological. Chemical and Physical Sciences

### Physics for Industry/Graduate Study

Required Courses	Credit Hours	Required Courses	Credit Hours
Major Courses	46	Biology Requirements	3
PHYS 100, 101, 123, 221, 223, 240, 300, 304, 308, 340, 405, 406, 413, 427, 437		BIOL 107	
Physics Electives	12	Computer Science Requirements	2
Technical Electives	6	C S 105	
I PRO 397, 497		Humanities/Social Science Requirements	6
Interprofessional Projects	6	PSYC 221, 222	
Mathematics Requirements	18	Humanities Electives	9
MATH 151, 152, 251, 252		Social Science Electives	9
Mathematics Electives	3	Free Electives	6
Chemistry Requirements	8	Total Credit Hours	134
CHEM 124, 125			

## Biological, Chemical and Physical Sciences

### Physics for Industry/Graduate Study Curriculum

Semester 1				Semester 2			
	Lect.	Hrs.	Cr.		Lect.	Hrs.	Cr.
CHEM 124 Principles of Chemistry I	3	3	4	CHEM 125 Principles of Chemistry II	3	3	4
BIOL 107 General Biology Lectures	3	0	3	PHYS 123 Mechanics	3	3	4
PHYS 100 Introduction to the Profession I	2	0	2	PHYS 101 Introduction to the Profession II	2	0	2
MATH 151 Calculus I	4	1	5	MATH 152 Calculus II	4	1	5
Humanities 100-level course	3	0	3	PSYC 221 Human Behavior, Growth and Learning	3	0	3
<b>Totals</b>	<b>15</b>	<b>4</b>	<b>17</b>	<b>Totals</b>	<b>15</b>	<b>7</b>	<b>18</b>
Semester 3				Semester 4			
PHYS 221 Electromagnetism and Optics	3	3	4	PHYS 223 Thermal and Modern Physics	3	3	4
PSYC 222 Brain, Mind and Behavior	3	0	3	PHYS 240 Computational Science	2	3	3
MATH 251 Multivariate and Vector Calculus	4	0	4	MATH 252 Intro to Differential Equations	4	0	4
CS 105 Introduction to Computer Programming I	2	1	2	Free elective	3	0	3
Humanities elective	3	0	3	Humanities elective	3	0	3
<b>Totals</b>	<b>15</b>	<b>4</b>	<b>16</b>	<b>Totals</b>	<b>15</b>	<b>6</b>	<b>17</b>
Semester 5				Semester 6			
PHYS 308 Classical Mechanics I	3	0	3	Physics elective	3	0	3
PHYS 300 Instrumentation Laboratory	2	3	3	PHYS 413 Electromagnetism	3	0	3
PHYS 348 Modern Physics for Scientists and Engineers	3	0	3	PHYS 304 Kinetic Theory and Thermodynamics	3	0	3
IPRO 397 Interprofessional Project	1	6	3	TECH elective*	3	0	3
Mathematics elective	3	0	3	Social science elective	3	0	3
<b>Totals</b>	<b>12</b>	<b>9</b>	<b>15</b>	<b>Totals</b>	<b>15</b>	<b>0</b>	<b>15</b>
Semester 7				Semester 8			
PHYS 405 Fundamentals of Quantum Theory I	3	0	3	Physics elective†	3	0	3
Physics elective†	3	0	3	PHYS 437 Solid State Physics	3	0	3
Physics elective†	3	0	3	TECH elective*	3	0	3
PHYS 427 Advanced Physics Laboratory I	2	3	3	Free elective	3	0	3
IPRO 497 Interprofessional Project	1	6	3	Social science elective	3	0	3
Social science elective	3	0	3	PHYS 406 Fundamentals of Quantum Theory II	3	0	3
<b>Totals</b>	<b>18</b>	<b>9</b>	<b>18</b>	<b>Totals</b>	<b>18</b>	<b>0</b>	<b>18</b>
<b>Total Credit Hours</b>						<b>134</b>	

\* Can be physics or any other engineering or scientific discipline.

† PHYS 401, PHYS 402, PHYS 403, PHYS 414, PHYS 440

## Stuart School of Business

### Faculty

#### Dean

M. Zia Hassan  
430C Downtown Campus  
Ext. 66515

#### Adviser, Undergraduate Programs

John R. Twombly  
446 Downtown Campus  
Ext. 66538

#### Professors

Goldhar, Hassan, Knowles, Thomopoulos

#### Associate Professors

Bariff (Coleman-Fannie Mae Candies Foundation Associate Professor), Bilson, Ginn, Hall, Kraft, Prabhaker, Quinn, Tourk

#### Clinical Assistant Professors

Hamilton, Twombly

#### Assistant Professors

Barlow, Caudill (visiting), Imam

#### Senior Lecturer

Gibbons

#### Lecturers

Jabbari, Modica, Rausch

The Stuart School of Business offers graduate degrees and teaches undergraduate courses.

Since employment in many professions often leads to management responsibility, undergraduate students should consider taking a minor in management to help develop their competence as managers. A minor in management would also help those students who seek an M.B.A. after the conclusion of their undergraduate program.

## Chemical and Environmental Engineering

### Chemical and Environmental Engineering

The IIT Department of Chemical and Environmental Engineering offers leading edge research and education programs that prepare engineers for the technological challenges of the 21st century. The department, capitalizing on its unique interdisciplinary focus, provides students with a knowledge of chemical and environmental engineering fundamentals; the capability to design processes that incorporate principles of pollution prevention; and an understanding of economic, environmental, and societal issues that influence intelligent technology choices.

B.S., M.S., professional master, and Ph.D. degree programs are offered in both chemical and environmental engineering. MS. and professional master degree programs are offered in Food Process Engineering. Among the innovative programs also available are a 4½-year double B.S. degree in chemical and environmental engineering and a 5-year B.S. in chemical engineering/master of environmental engineering combination. The department also offers B.S./M.D. programs in engineering and medicine and in the combined Undergraduate/Graduate Law Programs (see pages 112, 113).

### Faculty

#### Chair

Hamid Arastoopour  
Room 127 Perlstein Hall  
Ext. 73040

#### Professors

Arastoopour, Beissinger, B. Bernstein, Cinar (Associate Chair, Chemical Engineering), Gidaspow, Linden (Max McGraw Professor), Moschandreas, Noll, Parulekar, Selman, Wasan

#### Associate Professors

Anderson, Holsen (Associate Chair, Environmental Engineering), Teymour (S.C. Johnson Polymer Associate Professor), Venerus

#### Assistant Professors

Chang, Khalili, Pagilla, Schieber, Smotkin

#### Adjunct Professors

Aderangi, Balasubramaniam, Caracotsios, Fields, Knowlton, Lindahl, Peters, Wang

#### Research Professors

Nikolov, Tulis

#### Part-time Faculty

Abrevaya, Basila, Berry, Butler, Franek, Kelley, Myers, Negiz, Nykiel, Oskouie, Vamos

#### Faculty Emeritus

Swanson

### Special Program Note for the Chemical and Environmental Engineering Programs

#### The Interprofessional Project Experience

Students in the Chemical and Environmental Engineering programs must be enrolled in 6 credits of Interprofessional Projects according to the following format:

IPRO 296 Introduction to IPROs (1 credit)  
IPRO 397 Interprofessional Project (3 credits)  
IPRO 496 Design IPRO (2 credits)

IPRO 397 provides the opportunity to enroll in an IPRO offered by any academic unit. IPRO 296 and 496 make a package to accomplish interdisciplinary team work for process design. All project groups will have students

from chemical and environmental engineering programs. IPRO 496 students attend one lecture weekly on process design and a two-hour meeting with the expanded IPRO group and their project adviser. The expanded IPRO group consists of the IPRO 496 students, IPRO 296 students and students from other academic units who have registered for the relevant IPRO 297/397/497 sections (3 credit hours). IPRO 296 students provide support to the specific design activity through literature survey, data generation and use of design software as appropriate. IPRO 496 students are responsible for developing and designing the process. IPRO 297/397/497 students enrich the project by extending the work in their areas of specialization.



## Chemical and Environmental Engineering

### Chemical Engineering

Chemical engineering is concerned with the design, development, and management of facilities that convert raw materials into useful products. The engineer must assume responsibility for the economical use of the raw materials, preservation of the environment, and profitability of the operation. The

chemical engineering program has been designed to provide both the engineering competence and the professional skills necessary to succeed in this endeavor. In order to achieve this objective, the curriculum incorporates course work in both of these areas throughout the four-year duration of the program.

### Coursework

The chemical engineering curriculum emphasizes basic knowledge and applications of transport processes, thermodynamics and kinetics of processes, automatic control, and design, as well as fundamental sciences, and math and engineering sciences. Design experience is spread across the curriculum, beginning with the Introduction to Profession courses, and is integrated in environmental, economic, and societal issues. Equipment design is emphasized in courses such as Fluid Mechanics and Heat Transfer Operations, Mass Transfer Operations, and Chemical Reaction Engineering. Control system design is practiced in the Process Control

course. Process modeling, simulations, and optimization are discussed and practiced in Transport Phenomena, Process Modeling and System Theory, Numerical and Data Analysis, Statistical Tools for Engineering, and Process Control courses. The capstone design courses (Chemical Process Design and Process Design IPRO) integrate these design concepts and practice process design and optimization. In addition to engineering competence, the program also examines the economic, environmental and societal implications of chemical engineering.

### Professional training

Professional training is stressed equally in the design of the chemical engineering curriculum. Since engineering is largely a team effort, the department develops the individual's ability to work effectively as a team member. Group projects are assigned starting with the Introduction to Profession course. Laboratory course and capstone design course projects are conducted by teams of students. The laboratory work is designed to reinforce the concepts developed in the lectures and to show the application of chemical engineering principles

to the solution of real-world problems. Because individual attention is so important to the student's growth, laboratory sections are small and a high level of personal contact between student and instructors is maintained. Students are encouraged to become involved with state-of-the-art research projects at the undergraduate level. The industry/university co-op program is available to students who would like to use one or more extra semesters any time after their sophomore year to work on an internship in industry.

### Specialized programs

In addition to the core curriculum, special programs exist to accommodate the student who wants to develop more extensive background in related areas. With their exposure to a wide range of industrial applications and problems, students are better equipped to make a decision to explore an area of interest in depth. Professional specializations are available in:

Energy/Environment/Economics (E<sup>3</sup>)  
Environmental Engineering  
Polymer Science and Engineering  
Bioengineering  
Process Design and Operation

These programs are described on the following pages.

Students may also choose the following minors (see page 108):

Air Force Aerospace Studies	Management
Applied Mathematics	Military Science
Fire Protection and Safety Engineering	Naval Science

All students must include in their minor program or as a technical elective CHE 426 (Statistical Tools for Engineers) or at least one three-credit-hour engineering science course. Students who plan to go to graduate school are advised to take CHE 535 (Applications of Mathematics to Chemical Engineering) as a technical elective.

# Chemical and Environmental Engineering

## Undergraduate Program in Chemical Engineering

Required Courses	Credit Hours	Required Courses	Credit Hours
Major Courses			
Chemical Engineering CHE 100, 101, 202, 301,302, 317, 351, 406, 418, 423, 433, 435, 451, 494	40	Electrical and Computer Engineering ECE 383	3
Mathematics MATH 151, 152, 251, 252	18	Humanities and Social Sciences Requirements See General Education requirements, page 30	21
Physics PHYS 123,221	8	Technical Electives	12
Chemistry CHEM 125, 237, 239, 343, 344	21	Interprofessional Projects IPRO 296, 397, 496	6
Computer Science CS 105		Total Credit Hours	131

## Chemical and Environmental Engineering

## Chemical Engineering Curriculum

Semester 1				Semester 2			
		Lab. Cr.				Lab. Cr.	
	Lect.	Hrs.	Hrs.		Lect.	Hrs.	Hrs.
MATH 151 Calculus I	4	2	5	MATH 152 Calculus II	4	2	5
CHEM 125 Principles of Chemistry II*	3	3	4	PHYS 123 Mechanics	3	3	4
CS 105 Introduction to Computer Programming I	2	1	2	Humanities elective	3	0	3
CHE 100 Intro to the Profession I	1	2	2	CHE 101 Introduction to the Profession II	0	4	2
Social sciences elective	3	0	3	Totals	10	9	14
Totals	13	8	16				
Semester 3				Semester 4			
MATH 252 Intro to Differential Equations	4	0	4	MATH 251 Multivariate and Vector Calculus	4	0	4
CHE 202 Material and Energy Balances	2	2	3	IPRO 296 Introduction to IPRO†	0	2	1
CHEM 237 Organic Chemistry I	3	4	4	CHEM 239 Organic Chemistry II	3	0	3
PHYS 221 Electromagnetism and Optics	3	3	4	CHEM 343 Physical Chemistry I	3	0	3
Humanities elective	3	0	3	CHE 301 Fluid Mechanics and Heat Transfer Operations	3	0	3
Totals	15	9	18	Humanities or social science elective	3	0	3
				Totals	16	2	17
Semester 5				Semester 6			
CHE 302 Mass Transfer Operations	2	2	3	CHE 317 Chemical Engineering Laboratory	1	3	2
CHE 351 Chemical Engineering Thermodynamics	3	0	3	CHE 439 Numerical and Data Analysis	3	0	3
CHEM 344 Physical Chemistry	3	4	4	ECE 383 Electric and Electronic Circuits	3	0	3
CHEM 247 Analytical Chemistry	2	4	3	IPRO 397 Interprofessional Project	3	0	3
Humanities elective	3	0	3	CHE 433 Process Modeling and System Theory	2	2	3
Totals	13	10	16	Technical elective	3	0	3
				Totals	15	5	17
Semester 7				Semester 8			
CHE 418 Chemical Engineering Laboratory II	1	3	2	CHE 406 Transport Phenomena	3	0	3
CHE 423 Chemical Reaction Engineering	2	2	3	CHE 451 Chemical Process Thermodynamics	2	0	2
CHE 435 Process Control	2	2	3	IPRO 496 Process Design IPRO†	1	2	2
CHE 494 Chemical Process Design	2	2	3	Technical elective	3	0	3
Technical elective	3	0	3	Technical elective	3	0	3
Social science elective	3	0	3	Social science elective	3	0	3
Totals	13	9	17	Totals	15	2	16

Total Credit Hours 131

\* Initial placement in CHEM 125 requires consent of the BCPS department.

† Satisfies part of the General Education Requirement for Interprofessional Projects. Only CHE and ENVE majors may register for IPRO 296 and IPRO 496.

This curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

# Chemical and Environmental Engineering

## Professional Specializations

Students choosing one of the professional specializations should take a total of four courses in the specialization area.

### 1. Energy/Environment/Economics (E<sup>3</sup>)

Program Adviser: H. Arastoopour

Students selecting the E<sup>3</sup> specialization take a three-credit-hour course in Special Problems or Research in Energy

CHE 492 Senior Problems; or  
MMAE 491 Undergraduate Research,  
MMAE 494 Undergraduate Design Project,  
MMAE 497 Undergraduate Special Topics; or  
ECE 491 Undergraduate Research,  
ECE 497 Undergraduate Special Problems

In addition, they choose three or four courses, at least one course from each of the following three areas. Appropriate substitutions may be made with the approval of E<sup>3</sup> program advisers.

#### Energy Sources and Conversion

CHE 465 Electrochemical Energy Conversion  
CHE 481 Flow Through Porous Media and  
Fundamentals of Reservoir Engineering  
CHE 483 Synthetic Energy  
CHE 582 Interfacial and Colloidal Phenomena  
ECE 319 Fundamentals of Power Engineering  
MMAE 425 Direct Energy Conversion  
CHE 565 Electrochemical Engineering

#### Energy and Power Distribution and Utilization/Environment

CHE 430 Petrochemical Process Operations and Design  
CHE 482 LNG Fundamentals  
CHE 489 Fluidization  
MMAE 423 Air Conditioning and Refrigeration  
MMAE 424 Internal Combustion Engines  
ENVE 404 Water and Wastewater Engineering  
ENVE 463 Introduction to Air Pollution Control  
ENVE 476 Engineering Control of Industrial Hazards  
ENVE 480 Solid Waste Engineering  
ENVE 485 Pollution Prevention  
ECE 411 Power Electronics  
ECE 419 Power Systems Analysis  
ECE 420 Analytical Methods in Power Systems  
ECE 434 Control Systems with Laboratory  
ECE 435 Electrical, Magnetic, and Optical Properties of Materials  
ECE 436 Analysis and Processing of Discrete Signals  
ECE 437 Digital Signal Processing I  
ECE 438 Control Systems

#### Energy Analysis, Economics and Policy

CHE 426 Statistical Tools for Engineers  
CHE 541 The Role of Energy in Industrial Economies  
CHE 543 Energy, Environment, and Economics  
ECON 423 Economic Analysis of Capital Investments  
PS 338 Energy and Environmental Policy

### 2. Environmental Engineering

Program adviser: T. Holsen

Students must take the following three courses:

ENVE 404 Water and Wastewater Engineering  
ENVE 463 Introduction to Air Pollution Control and  
ENVE 481 Hazardous Waste Engineering

In addition they should choose one course from the following:

CHE 426 Statistical Tools for Engineers  
ENVE 401 Introduction to Water Resources Engineering  
ENVE 450 Analysis of Environmental Systems  
ENVE 476 Engineering Control of Industrial Hazards  
ENVE 480 Solid Waste Engineering  
ENVE 485 Pollution Prevention.

Appropriate substitutions may be made with the approval of the program adviser.

### 3. Polymer Science and Engineering

Program adviser: D. Venerus

The program embraces polymer chemistry, characterization, structure, and properties, and the manufacture of polymeric raw materials and their processing into finished products. Four courses (12 credit hours) should be taken as follows.

Students must take one of the following two courses:

CHE 450 Principles of Polymer Science and Engineering  
CHEM 435 Introduction to Polymers

At least two courses (6 credit hours) chosen from:

CHE 455 Polymer Processing  
CHE 492 Senior Problems  
CHE 538 Polymerization Reaction Engineering  
CHE 555 Polymer Processing  
CHE 575 Polymer Rheology  
CHE 581 Processing and Applications of Polymer Composite Materials  
CHEM 535 Advanced Polymer Chemistry  
CHEM 537 Polymer Chemistry Laboratory  
CHEM 542 Characterization of Polymers  
MMAE 467 Fundamental Principles of Polymer Materials  
MMAE 483 Structure/Property Relationship in Polymers  
MMAE 487 Fiber-Reinforced Polymer Composite Materials  
MMAE 579 Characterization of Polymers

## Chemical and Environmental Engineering

MMAE 580 Structure and Property of Polymers  
 MMAE 581 Theory of Mechanical Behavior of Polymers  
 MMAE 583 Characterization of Polymers

And up to one course (3 credit hours) from the following:

CHE 426 Statistical Tools for Engineers  
 CHE 489 Fluidization  
 CHE 582 Interfacial and Colloid Phenomena  
 MMAE 451 Finite Element Methods in Engineering  
 MMAE 485 Manufacturing Processes  
 FPE 541 Principles of Food Packaging

Appropriate substitutions may be made with the approval of the program adviser.

### 4. Bioengineering

Program advisers: R. Beissinger and S. Parulekar

Bioengineering has two career specializations:

**Biomedical Engineering:** The four elective courses (12 credit hours) must be taken, and are allocated as follows:

BIOL 107 General Biology Lectures  
 BIOL 115 Human Biology and  
 CHE 411 Introduction to Bioengineering

One elective is chosen from

BIOL 214 Genetics and Genetics Technology  
 BIOL 403 Biochemistry Lectures  
 BIOL 414 Genetics for Engineering Scientists  
 BIOL 430 Animal Physiology: Lecture  
 BIOL 445 Cell Biology  
 CHE 426 Statistical Tools for Engineers  
 CHE 492 Senior Problems  
 CHE 510 Transport Phenomena in Living Systems

**Biotechnology:**

CHE 411 Introduction to Bioengineering (required)

And three courses chosen from

BIOL 107 General Biology Lectures  
 BIOL 214 Genetics and Genetic Technology  
 BIOL 403 Biochemistry Lectures  
 BIOL 414 Genetics for Engineering Scientists  
 BIOL 423 Microbial Genetics Laboratory  
 BIOL 445 Cell Biology  
 CHE 426 Statistical Tools for Engineers  
 CHE 577 Biochemical Engineering  
 CHE 578 Biochemical Engineering II  
 CHE 579 Enzyme Reactor Engineering

### 5. Process Design and Operation

Program adviser: A. Cinar

For students interested in design, operation, monitoring, optimization, and control of chemical processes.

At least two courses (6 credit hours) must be taken from the following:

CHE 426 Statistical Tools for Engineers  
 CHE 431 Artificial Intelligence Applications in Engineering  
 CHE 437 Discrete Time Systems and Computer Control  
 CHE 507 Computer-Aided Design  
 CHE 508 Process Design Optimization  
 CHE 528 Analysis and Simulation of Chemical Processing;  
 CHE 530 Advanced Process Control  
 CHE 532 Process Modeling  
 CHE 560 Statistical Quality and Process Control

Up to two courses may be selected from the following (only one ENVE course):

CHE 402 Introduction to Microelectronics Fabrication Technology  
 CHE 430 Petrochemical Process Operations and Design  
 CHE 455/555 Polymer Processing  
 CHE 465 Electrochemical Energy Conversion  
 CHE 475 Food Engineering I  
 CHE 476 Food Engineering II  
 CHE 489 Fluidization  
 CHE 492 Senior Problems  
 CHE 571 Food Process Engineering  
 CHE 572 Advanced Food Process Engineering  
 ENVE 450 Analysis of Environmental Systems  
 ENVE 476 Engineering Control of Industrial Hazards  
 ENVE 485 Pollution Prevention  
 FPE 521 Food Process Engineering  
 FPE 522 Advanced Food Process Engineering

# Chemical and Environmental Engineering

## Environmental Engineering

Environmental engineering is a dynamic, multidisciplinary profession that draws on fundamentals from the biological, physical, mathematical, and social sciences, as well as the various engineering disciplines. Environmental engineering can be defined as the science and art of planning, designing, constructing, and managing solutions to environmental problems. These problems are often multimedia, involving contaminant transport through air, water, and solid phases in the environment. Furthermore, the scale of the systems involved is enormous, ranging from global warming to marine pollution, to treatment systems for emissions from a specific industry, to microbial degradation processes. Environmental engineers are involved in resource

development, allocation and management to achieve and maintain sustainable development.

Environmental engineers must be able to analyze existing and potential environmental problems to develop comprehensive solutions. To meet these requirements, the environmental engineering baccalaureate curriculum begins with the mathematical and physical sciences common to all fields of engineering. It also includes courses in the natural and life sciences, which are critical to understanding the impact of development on natural systems. Advanced courses in the program include laboratory classes in sample collection and analysis as well as classes in environmental control systems design.

## Undergraduate Programs in Environmental Engineering

Required Courses	Credit Hours	Required Courses	Credit Hours
<b>Major Courses</b>	<b>29</b>	<b>Engineering Course Requirements</b>	<b>18</b>
ENVE 100, 101, 302, 305, 404, 407, 426, 463, 481, 490, 494		CHE 202, 301, 302, 351, 423, 433	
<b>Mathematics Requirement</b>	<b>18</b>	<b>Humanities and Social Science Requirements</b>	<b>21</b>
MATH 151, 152, 251, 251		See General Education requirements, page 30	
<b>Physics Requirement</b>	<b>8</b>	<b>Technical Electives</b>	<b>6</b>
PHYS 123,221		<b>Interprofessional Projects</b>	<b>6</b>
<b>Chemistry Requirement</b>	<b>18</b>	IPRO 296, 397, 496	
CHEM 125, 237, 247, 343, 344		<b>Total Credit Hours</b>	<b>132</b>
<b>Computer Science Requirement</b>	<b>2</b>		
CS 105			
<b>Biology Requirement</b>	<b>6</b>		
BIOL 107, 210			

## Chemical and Environmental Engineering

## Environmental Engineering Curriculum

Semester 1				Semester 2			
	Lect.	Hrs.	Cr.		Lect.	Hrs.	Cr.
ENVE 100 Intro to the Profession I	0	2	2	ENVE 101 Introduction to the Profession II	0	4	2
MATH 151 Calculus I	4	2	5	MATH 152 Calculus II	4	2	5
CHEM 125 Principles of Chemistry II*	3	3	4	PHYS 123 Mechanics	3	3	4
CS 105 Introduction to Computer Programming I	2	1	2	Humanities elective	3	0	3
BIOL 107 General Biology Lectures	3	0	3	Totals	10	9	14
Totals	12	8	16				
Semester 3				Semester 4			
MATH 252 Intro to Differential Equations	4	0	4	MATH 251 Multivariate and Vector Calculus	4	0	4
CHE 202 Material and Energy Balances	2	2	3	CHE 301 Fluid Mechanics and Heat Transfer Operations	3	0	3
PHYS 221 Electricity and Magnetism	3	3	4	CHEM 343 Physical Chemistry I	3	0	3
CHEM 237 Organic Chemistry I	3	4	4	Social science elective	3	0	3
BIO 210 Microbiology Lectures	3	0	3	Humanities elective	3	0	3
Totals	15	9	18	IPRO 296 Introduction to IPRO**	0	2	1
				Totals	16	2	17
Semester 5				Semester 6			
ENVE 302 Environmental Chemistry	2	3	3	ENVE 305 Geochemical Cycles	3	0	3
CHE 302 Mass Transfer Operations	2	2	3	ENVE 463 Intro to Air Pollution Control	3	0	3
CHE 351 Chemical Process Thermodynamics	3	0	3	ENVE 404 Water and Wastewater Engineering	3	0	3
CHEM 247 Analytical Chemistry	2	4	3	IPRO 397 Interprofessional Project	3	0	3
CHEM 344 Physical Chemistry II	3	4	4	CHE 433 Process Modeling and System Theory	3	0	3
Totals	12	13	16	Humanities or social science elective	3	0	3
				Totals	18	0	18
Semester 7				Semester 8			
CHE 423 Chemical Reaction Engineering	2	2	3	ENVE 490 Environmental Processes Lab	1	3	2
ENVE 426 Statistical Tools for Engineers	3	0	3	ENVE 481 Hazardous Waste Engineering	2	3	3
ENVE 494 Environmental Engineering Design	2	2	3	IPRO 496 Process Design IPRO**	1	2	2
ENVE 407 Environmental Monitoring	1	3	2	Technical elective	3	0	3
Technical elective	3	0	3	Humanities elective	3	0	3
Social science elective	3	0	3	Social science elective	3	0	3
Totals	14	7	17	Totals	13	8	16
Total Credit Hours						132	

\* Initial placement in CHEM 125 requires consent of the BCPS department.

\*\* Satisfies part of the General Education Requirement for Interprofessional Projects. Only CHE and ENVE majors may register for IPRO 296 and IPRO 496.

ROTC students may substitute two technical electives with ROTC required courses.

# Chemical and Environmental Engineering

## Double Degree Option -

## Chemical and Environmental Engineering Curriculum

Semester 1				Semester 2			
	Lect.	Lab.	Cr.		Lect.	Lab.	Cr.
		Hrs.	Hrs.			Hrs.	Hrs.
CHE/ENVE 100 Introduction to Profession	1	2	2	CHE/ENVE 101 Introduction to Profession	0	4	2
MATH 151 Calculus I	4	2	5	MATH 152 Calculus II	4	2	5
CHEM 125 Principles of Chemistry II	3	3	4	PHYS 123 Mechanics	3	3	4
BIOL 107 General Biology Lectures	3	0	3	Humanities elective	3	0	3
CS 105 Intro to Computer Programming	2	1	2	Totals	10	9	14
Totals	13	8	16				
Semester 3				Semester 4			
	Lect.	Lab.	Cr.		Lect.	Lab.	Cr.
		Hrs.	Hrs.			Hrs.	Hrs.
MATH 252 Intro to Differential Equations	4	0	4	I PRO 296 Introduction to I PRO*	0	2	1
CHE 202 Material and Energy Balances	2	2	3	MATH 251 Multivariate and Vector Calculus	4	0	4
PHYS 221 Electromagnetism and Optics	3	3	4	CHE 301 Fluid Mechanics and Heat Transfer Operations	3	0	3
CHEM 237 Organic Chemistry I	3	4	4	CHEM 343 Physical Chemistry I	3	0	3
BIO 210 Microbiology Lectures	3	0	3	CHEM 239 Organic Chemistry II	3	0	3
Totals	15	9	18	Humanities elective	3	0	3
				Totals	16	2	17
Semester 5				Semester 6			
	Lect.	Lab.	Cr.		Lect.	Lab.	Cr.
		Hrs.	Hrs.			Hrs.	Hrs.
ENVE 302 Environmental Chemistry	2	3	3	ENVE 305 Geochemical Cycles	3	0	3
CHE 302 Mass Transfer Operations	2	2	3	CHE 433 Process Modeling & System Theory	2	2	3
CHE 351 Chemical Transfer Thermodynamics	3	0	3	I PRO 397 Interprofessional Project	3	0	3
CHEM 344 Physical Chemistry II	3	4	4	ENVE 404 Water & Wastewater Engineering	3	0	3
Social science elective	3	0	3	CHE 317 Chemical Engineering Laboratory I	1	3	2
Totals	13	9	16	CHE 439 Numerical and Data Analysis	3	0	3
				Totals	15	5	17
Semester 7				Semester 8			
	Lect.	Lab.	Cr.		Lect.	Lab.	Cr.
		Hrs.	Hrs.			Hrs.	Hrs.
CHE 418 Chemical Engineering Laboratory II	1	3	2	ENVE 490 Environmental Processes Laboratory	1	3	2
CHE 423 Chemical Reaction Engineering	2	2	3	ENVE 481 Hazardous Waste Engineering	2	3	3
CHE/ENVE 494 Chemical Process Design /Environmental Engineering Design	2	2	3	ENVE 463 Intro to Air Pollution Control	3	0	3
CHE 435 Process Control	2	2	3	I PRO 496 Process Design I PRO	1	2	2
CHEM 247 Analytical Chemistry	2	4	3	CHE 406 Transport Phenomena	3	0	3
Social science elective	3	0	3	CHE 451 Chemical Process Thermodynamics	2	0	2
Totals	12	13	17	Totals	12	8	15
Semester 9							
	Lect.	Lab.	Cr.				
		Hrs.	Hrs.				
ENVE 407 Environmental Monitoring	1	3	2				
CHE 426 Statistical Tools for Engineers	3	0	3				
ECE 383 Electric and Electronic Circuits	3	0	3				
Social science elective	3	0	3				
Humanities elective	3	0	3				
Humanities or social science elective	3	0	3				
Totals	16	3	17				

ROTC students require 5 years to complete the double degree program.

\* CHE/ENVE 296 and 496 satisfy part of the General Education Requirement for Interprofessional Projects. Only CHE and ENVE majors may register for these courses.

**Total Credit Hours**

**147**



## Civil and Architectural Engineering

### Civil Engineering

Civil engineering is the original of the engineering disciplines. With the increase in population, the growing complexity of industries, and changing urban centers, the civil engineer's task-applying science to the control and utilization of the environment for the total benefit of mankind-represents a challenge unsurpassed in all of engineering.

The civil engineer often is confronted with conditions so variable and complex that they cannot be precisely defined by science and mathematics. Therefore, a knowledge of the arts and social sciences, as well as the physical sciences, is essential. In addition, because civil engineering requires overall planning of very large projects whose components involve many other disciplines, it is also necessary to have knowledge of management techniques. The goal of the civil engineering degree program is to provide an education that enables graduates to make far-reaching decisions that draw not only upon technical knowledge but also on integrity and judgment.

In the professional courses, classroom lectures are supplemented by laboratory practice, including the study of materials, concrete, hydraulics, environmental engineering, geotechnical engineering, and surveying. The principal functional areas that are considered subdivisions of civil engineering are structural engineering, transportation engineering, geotechnical engineering, environmental engineering, water resources engineering, and construction management.

The Department of Civil and Architectural Engineering provides introductory undergraduate education in these six

subdisciplines of civil engineering and provides professional specializations in the areas of structural, geotechnical, transportation, civil-environmental, construction engineering and architectural engineering. The department also offers graduate degree programs and conducts research in the areas of structural engineering, geotechnical engineering, transportation engineering, and construction engineering and management. In addition, the department provides undergraduate service courses to the College of Architecture in the area of structural engineering and through minors in construction management and fire protection and safety engineering.

Students may choose a professional specialization as described on the following pages, or one of the following minors: Air Force Aerospace Studies, Military Science, Naval Science, and Fire Protection and Safety Engineering (see page 108).

Architecture students who plan to pursue a master's degree in structural engineering should take CAE 303, 304, 307, 310, 431 and 432 in place of CAE 287,351 and 352. Consult the *IIT Bulletin: Graduate Programs* for additional details.

All civil engineering students are expected to take the Fundamentals of Engineering (FE) examination during their senior year. The examination is offered by the State of Illinois in October and April. Please contact the Civil and Architectural Engineering Department office for information concerning this examination.

### Faculty

#### Interim Chair

Jamshid Mohammadi  
228 Alumni Memorial  
Ext. 73540

#### Professors

Arditi, Guralnick (Perlstein Distinguished Professor),  
Khisty, Mohammadi

#### Adjunct Professors

Carreira, Gill

#### Associate Professors

Budiman, O'Leary

#### Adjunct Associate Professors

Domel, Paintal

#### Assistant Professors

DeSantiago, Novak (visiting), Shen

#### Adjunct Assistant Professors

Fazio, Frano, Lemming, Jahedi

#### Faculty Emeriti

Chu, Dygdon, Fiesenheiser, Hrachovsky, Loving, Milbradt

# Civil and Architectural Engineering

## Civil Engineering

Required Courses	Credit Hours	Required Courses	Credit Hours
Major Courses	61	Chemistry Requirements	4
CAE 100, 101, 105, 221, 301, 302, 303, 304, 307, 310, 312, 315, 323, 419, 431, 432, 457, 470 and three CAE electives*		CHEM 124	
Technical Electives*	9	Computer Science Requirement	2
Mathematics Requirements	18	CS 105	
MATH 151, 152, 251, 252		Engineering Course Requirements	9
Physics Requirements	11	MMAE 201, 202, 305	
PHYS 123, 221, 224		Humanities and Social Sciences Requirements	21
		See General Education Requirements, page 30	
		Total Credit Hours	135

\* Of the total of six technical electives one must be a junior year IPRO, another must be a senior year IPRO, and three must be CAE courses.

## Civil and Architectural Engineering

## Civil Engineering Curriculum

Semester 1				Semester 2			
	Lect.	Hrs.	Cr.		Lect.	Hrs.	Cr.
MATH 151 Calculus I	4	2	5	MATH 152 Calculus II	4	2	5
CHEM 124 Principles of Chemistry	3	3	4	CS 105 Introduction to Computing	2	1	2
CAE 100 Introduction to the Professions I	1	2	2	CAE 101 Introduction to the Professions II	0	4	2
CAE 105 Geodetic Science	2	3	3	PHYS 123 Mechanics	3	3	4
Humanities or social science elective	3	0	3	Humanities or social science elective	3	0	3
<b>Totals</b>	<b>13</b>	<b>10</b>	<b>17</b>	<b>Totals</b>	<b>12</b>	<b>10</b>	<b>16</b>
Semester 3				Semester 4			
MATH 251 Calculus III	4	0	4	MATH 252 Intro. to Differential Equations	4	0	4
MMAE 201 Mechanics of Solids I	3	0	3	MMAE 305 Dynamics	3	0	3
CAE 221 Engineering Geology	2	2	3	MMAE 202 Mechanics of Solids II	3	0	3
PHYS 221 Electromagnetism and Optics	3	3	4	PHYS 224 General Physics III	3	0	3
Humanities or social science elective	3	0	3	Humanities or social science elective	3	0	3
<b>Totals</b>	<b>15</b>	<b>5</b>	<b>17</b>	<b>Totals</b>	<b>16</b>	<b>0</b>	<b>16</b>
Semester 5				Semester 6			
CAE 301 Hydraulics and Hydrology	2	3	3	CAE 302 Fluid Mechanics and Hydraulics	3	0	3
CAE 303 Structural Design I	2	3	3	CAE 307 Structural Design II	2	3	3
CAE 304 Structural Analysis I	3	0	3	CAE 310 Structural Analysis II	3	0	3
CAE 312 Engineering Systems Analysis	3	0	3	CAE 323 Soil Mechanics	2	3	3
CAE 315 Materials of Construction	2	3	3	Technical elective*	3	0	3
Technical elective*	3	0	3	Humanities or social science elective	3	0	3
<b>Totals</b>	<b>17</b>	<b>9</b>	<b>18</b>	<b>Totals</b>	<b>16</b>	<b>6</b>	<b>18</b>
Semester 7				Semester 8			
CAE 419 Transportation Engineering and Design	3	0	3	CAE 432 Concrete and Foundation Design	3	0	3
CAE 431 Steel and Timber Design	3	0	3	Technical electives*	9	0	9
CAE 457 Geotechnical Foundation Design	3	0	3	Humanities or social science elective	3	0	3
CAE 470 Construction Methods and Cost Estimating	2	3	3	<b>Totals</b>	<b>15</b>	<b>0</b>	<b>15</b>
Technical elective*	3	0	3	<b>Total Credit Hours</b>			
Humanities or social science elective	3	0	3	<b>135</b>			
<b>Totals</b>	<b>16</b>	<b>3</b>	<b>18</b>				

This program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

\* Of the total of six technical electives, one must be a junior year IPRO, another must be a senior year IPRO, and three must be CAE courses.

# Civil and Architectural Engineering

## Professional Specializations in Civil Engineering

Students who select an area of specialization must take a minimum of nine credit hours from the following technical electives listed under the respective area of specialization. Three additional credit hours may be any 400-level CAE course taken with prior approval of the student's adviser and chair.

**Structural Engineering:** CAE 408, Bridge and Structural Design; CAE 420, Introduction to Dynamics of Structures; CAE 430, Probability Concepts in Civil Engineering; CAE 435, Experimental Analysis of Structures; and CAE 442, Finite Elements Methods in Framed Structures.

**Construction Engineering and Management:** CAE 471, Construction Planning and Scheduling; CAE 472, Construction Site Operation; and CAE 473, Construction Project Administration.

**Geotechnical Engineering:** CAE 415, Pavement Design; Construction, and Maintenance; CAE 442, Finite Element Methods in Framed Structures; and CAE 486, Soil and Site Improvement.

**Transportation Engineering:** CAE 412, Traffic Engineering Studies and Design; CAE 415, Pavement Design, Construction, and Maintenance; CAE 416, Facility Design of Transportation Systems; CAE 417, Railroad Engineering Studies and Design; and CAE 430, Probability Concepts in Civil Engineering.

**Civil-Environmental Engineering** ENVE 401, Introduction to Water Resources Engineering; ENVE 480, Solid Waste Engineering; and CAE 482, Hydraulic Design of Open Channel Systems.

**Architectural Engineering** Consult the department for advice on appropriate courses.

## Civil and Architectural Engineering

### Architectural Engineering

Architectural Engineering is a building-oriented discipline that offers students an opportunity to obtain an engineering education specializing in building architecture, building system integration, and structural and computer-aided design.

Professional architectural engineers are concerned with the structural integrity of buildings; the performance of mechanical, acoustic, electrical and sanitation systems; lighting; systems and energy conservation; and the management of construction resources and schedules. Graduates of the architectural engineering program will be well prepared for careers as consulting engineers, building contractors,

construction managers, structural engineers and as knowledgeable specialists in related areas of building design and analysis.

Architectural engineering shares much in common with civil and mechanical engineering, but is distinct in its exclusive concentration on building projects. Architectural engineering students should have an aptitude in and an appreciation of the following areas of knowledge: basic principles of mathematics; physics and chemistry; manual and computer-aided drafting and design; surveying, construction materials; engineering mechanics; structural analysis and design; building system integration; and professional practice and ethics.

### Architectural Engineering

Required Courses	Credit Hours	Required Courses	Credit Hours
<b>Major Courses</b>	<b>61</b>	<b>Computer Science Requirement</b>	<b>2</b>
CAE 100, 101, 105, 303, 304, 307, 310, 312, 315, 323, 401, 402, 457, 470, 471		CS 105	
<b>Architecture Courses</b>	<b>9</b>	<b>Engineering Course Requirements</b>	<b>18</b>
ARCH 226, 309, 310		ECE 383, MMAE 201, 202, 305, 313, 320	
<b>Technical Elective*</b>	<b>12</b>	<b>Humanities Requirement</b>	<b>3</b>
		AAH 119 (3 hrs)	
<b>Mathematics Requirements</b>	<b>18</b>	<b>Humanities and Social Science Electives</b>	<b>18</b>
MATH 151, 152, 251, 252		(18 hrs)	
<b>Physics Requirements</b>	<b>11</b>	<b>Total Credit Hours</b>	<b>135</b>
PHYS 123, 221, 224			
<b>Chemistry Requirement</b>	<b>4</b>		
CHEM 124			

\* Of the total of four technical electives, one must be a junior year IPRO, another must be a senior year IPRO, and one must be a CAE course.

# Civil and Architectural Engineering

## Architectural Engineering Curriculum

Semester 1				Semester 2			
	Lect.	Hrs.	Cr.		Lect.	Hrs.	Cr.
MATH 151 Calculus I	4	2	5	MATH 152 Calculus II	4	2	5
CHEM 124 Principles of Chemistry	3	3	4	CS 105 Introduction to Computing	2	1	2
CAE 100 Introduction to the Profession I	1	2	2	CAE 101 Introduction to the Profession II	0	4	2
CAE 105 Geodetic Science	2	3	3	PHYS 123 Mechanics	3	3	4
Humanities or social science elective	3	0	3	Humanities or social science elective	3	0	3
Totals	13	10	17	Totals	12	10	16
Semester 3				Semester 4			
MATH 251 Multivariate and Vector Calculus	4	0	4	MATH 252 Intro to Differential Equations	4	0	4
AAH 119 History of World Architecture I	3	0	3	MMAE 305 Dynamics	2	3	3
PHYS 221 Electromagnetism and Optics	3	3	4	MMAE 202 Mechanics of Solids II	3	0	3
MMAE 201 Mechanics of Solids I	3	0	3	ARCH 225 Computer Aided Design			
Humanities or social science elective	3	0	3	in Practice	2	2	3
Totals	16	3	17	PHYS 224 Thermal and Modern Physics	3	0	3
				Totals	14	5	16
Semester 5				Semester 6			
MMAE 320 Thermodynamics	3	0	3	CAE 307 Structural Design II	2	3	3
CAE 303 Structural Design I	2	3	3	MMAE 313 Fluid Mechanics	3	0	3
CAE 304 Structural Analysis I	3	0	3	CAE 310 Structural Analysis II	3	0	3
CAE 315 Materials of Construction	2	3	3	CAE 323 Soil Mechanics	2	3	3
ARCH 309 Mechanical & Electrical Building				ARCH 310 Mechanical & Electrical Building			
Systems for Arch. I	3	0	3	Systems for Arch. II	3	0	3
Humanities or social science elective	3	0	3	Technical elective*	3	0	3
Totals	16	6	18	Totals	16	6	18
Semester 7				Semester 6			
CAE 457 Geotechnical Foundation Design	3	0	3	CAE 471 Construction Planning			
CAE 470 Construction Methods				& Scheduling	3	0	3
and Cost Estimating	2	3	3	CAE 402 Building Systems Integration			
CAE 401 Building Systems Integration				Studio II	0	6	2
Studio I	1	3	2	ECE 383 Electric and Electronic Circuits	3	0	3
CAE 312 Engineering Systems Analysis	3	0	3	Technical elective*	3	0	3
Technical elective*	3	0	3	Technical elective*	3	0	3
Humanities or social science elective	3	0	3	Humanities or social science elective	3	0	3
Totals	15	6	17	Totals	15	6	17
Total Credit Hours							136

\* Of the total of four technical electives, one must be a junior year IPRO, another must be a senior year IPRO, and one must be a CAE course.

## Civil and Architectural Engineering

### Engineering Graphics

Engineering graphics is an indispensable communication and design tool which is concerned with the graphical representation of designs and specifications for physical objects and data relationships as used in engineering, science, business, and technical work. The graphic language, with the symbolic and verbal languages, enables those engaged in technology to communicate effectively, making it possible for new ideas,

designs, and developments to be transformed into useful consumer products. With the increase in technological development, the well-trained engineer, scientist, or technician must be able to make correct graphical representations of engineering structures, designs, and data relationships, and possess an ability to express ideas quickly and accurately through the use of the graphic language.

### Optional Programs in Engineering Graphics

#### Certificate Programs

Recognizing the need for drafters and designers with a strong background in special areas of graphics, the Department of Civil and Architectural Engineering offers the following engineering graphics certificate programs. These programs

are designed to prepare specialists in graphics for positions in business and industry. Students completing the specified courses with satisfactory grades will be awarded a Certificate of Completion.

#### Architectural Technology

EG 105 Engineering Graphics and Design (1-2-2)\*  
EG 308 Architectural Drawing I (2-2-3)  
EG 309 Architectural Drawing II (2-2-3)

EG 310 Architectural Drawing III (2-2-3)  
EG 312 Architectural Freehand Drawing (2-2-3)  
EG 313 Architectural Detailing (2-2-3)

#### Engineering Graphics and CAD

EG 105 Engineering Graphics and Design (1-2-2)  
EG 305 Advanced Engineering Graphics and Design (2-2-3)  
EG 306 Engineering Descriptive Geometry (2-2-3)

EG 405 Mechanical Design Graphics (2-2-3)  
EG 406 Technical and Pictorial Illustration (2-2-3)  
EG 419 Computer Graphics in Engineering (2-2-3)

### Professional Specialization in Engineering Graphics

The department offers a comprehensive series of special courses in Engineering Graphics that a student may take

as electives in areas related to his or her professional goals. Consult the department for advice on appropriate courses.

### Graduate Courses

Graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty

adviser. See the current *IIT Bulletin: Graduate Programs* for course descriptions.

\* Numbers in parenthesis indicate lecture hours-laboratory hours-credit hours.

## Computer Science and Applied Mathematics

### Computer Science and Applied Mathematics

Computers have changed what we do and how we do it- in our homes, in our offices, and throughout our world. The discipline of computer science focuses upon the many challenging problems encountered in the development and use of computers and computer software. Areas of study in computer science range from theoretical analyses into the nature of computing and computing algorithms, through the development of advanced computing devices and computer networks, to the design and implementation of sophisticated software systems.

The field of applied mathematics explores those branches of mathematics that form the foundation of science and engineering-probability and statistics, numerical analysis, and mathematical modeling. Collectively, these branches define an emerging field of study called computational science and engineering, which uses techniques drawn from applied mathematics and computer science to solve problems from various science and engineering disciplines.

### Faculty

#### Chair

C. Robert Carlson  
236B Stuart Building  
Extension 75150

#### Professors

Byrne, Campbell, Carlson, Deliyannis, Edelstein, Evens, Frank, Erber (jointly with Physics)

#### Associate Professors

Adler, I. Burnstein, Christopher, Greene, Heller, Korel, Lubin, Roberge, Stueben

#### Assistant Professors

Chang, Dickens, Fasshauer, Hood, Wan

Research Associate Professor  
Elrad

#### Adjunct Associate Professors

Biernat, Chafi, Drakopoulos, Lidinsky, Soneru

#### Adjunct Assistant Professors

Nowicki, Trygstad, Woyna

#### Senior Lecturers

Maslanka, Sitton

#### Instructors

M. Bauer, Bistriceanu, Manov

#### Faculty Emeriti

C. Bauer, Darsow, De Cicco, Pearson, Reingold, Sklar, Wilcox



## Computer Science and Applied Mathematics

### Undergraduate Programs in Computer Science

The department offers two undergraduate programs in computer science: a Bachelor of Science in Computer Science and an Applied Science for the Professions Bachelor of Science in Computer Information Systems. Both programs provide an excellent background in computer science. Both allow for ample study in other areas. Where these programs differ is in the approach they take to computer science. The Bachelor of Science in Computer Science provides an in-depth experience focusing on the theory and practice of computer science while the Bachelor of Science in Computer Information Systems provides a more interdisciplinary experience balancing study in computer science with study in another field. In addition to these programs in computer science, the Department of Computer Science and Applied Mathematics and the Department of Electrical and Computer Engineering jointly offer a Bachelor of Science in Computer Engineering. This program focuses on both the digital electronics hardware used in computer systems and the software that controls this hardware, with an emphasis on the design and implementation of computer-controlled systems. This program is described in detail on page 80.

All three programs begin with a set of introductory courses that work together to provide students with a firm foundation in computer science. These introductory courses include weekly labs in which students use state-of-the-art software development techniques (object-oriented programming in C++, for instance) to create solutions to interesting problems. The department's unique four-phase laboratory model encourages student creativity by providing ample opportunity for constructive feedback on each student's efforts. Having completed the introductory core, a student is prepared

to work independently within a well-structured design framework-in the classroom or on the job.

The last two years of study build upon this foundation. The Bachelor of Science in Computer Science focuses on the concepts and techniques used in the design and development of advanced software systems. Students in this program explore the conceptual underpinnings of computer science-its fundamental algorithms, programming languages, operating systems, and software engineering techniques. In addition, students choose from a rich set of electives-including computer graphics, artificial intelligence, database systems, computer architecture, and computer networks, among others. As with the introductory sequence, these advanced courses stress "hands on" learning by doing. A generous allotment of free electives allows students to combine study in computer science with study in another field-either by taking a well-defined specialized minor in another discipline or by working with an adviser to formulate a program that combines experiences across disciplines.

The Bachelor of Science Program in Computer Information Systems emphasizes the use of computers as sophisticated problem-solving tools. Students in this program pursue an interdisciplinary course of study that combines a solid foundation in computer science with a focus in another discipline. This program is designed for students who seek to blend their computer science abilities with skills specific to another domain to solve problems in that domain. Examples include computing with a business focus (e.g., management information systems) or computing with a natural science focus (e.g., computational physics).

### Bachelor of Science in Computer Science

Required Courses	Credit Hours	Required Courses	Credit Hours
<b>Major Courses</b>	32		
CS 100, 101, 105, 106, 330, 331, 350, 351, 430, 440, 450, 487		<b>Humanities or Social Science Electives</b>	24
<b>Computer Science Electives</b>	15	<b>Non-technical Elective</b>	3
<b>Mathematics Requirements</b>	17	<b>I PRO</b>	6
MATH 151, 152, 251, 474		<b>Free Electives</b>	12
<b>Mathematics Electives</b>	3	<b>Total Credit Hours</b>	129
<b>Science/Engineering Requirements</b>	8		
PHYS 123, 221			
<b>Science/Engineering Elective5</b>	6		
<b>Humanities Requirement</b>			
PHIL 374 or CS 485	3		

# Computer Science and Applied Mathematics

## Computer Science Curriculum

Semester 1				Semester 2			
	Lect.	Hrs.	Cr.		Lect.	Hrs.	Cr.
CS 100 Introduction to the Professions I	1	2	2	CS 101 Introduction to the Professions II	0	4	2
CS 105 Introduction to Computer Programming I	2	1	2	CS 106 Introduction to Computer Programming II	2	1	2
MATH 151 Calculus I	4	1	5	MATH 152 Calculus II	4	1	5
Humanities 100-level course	3	0	3	PHYS 123 Mechanics	3	3	4
Social science elective	3	0	3	Humanities elective	3	0	3
Totals	13	4	15	Totals	12	9	16
Semester 3				Semester 4			
CS 330 Discrete Structures	3	0	3	CS 350 Computer Organization and Assembly Language Programming	2	2	3
CS 331 Data Structures and Algorithms	2	2	3	CS 430 Introduction to Algorithms	3	0	3
MATH 251 Multivariate and Vector Calculus	4	0	4	MATH elective	3	0	3
PHYS 221 Electromagnetism and Optics	3	3	4	Science/engineering elective	3	0	3
Humanities elective	3	0	3	Social science elective	3	0	3
Totals	15	5	17	Totals	14	2	15
Semester 5				Semester 6			
CS 351 Systems Programming	2	2	3	CS 440 Programming Languages and Translators	3	0	3
Computer Science elective	3	0	3	Computer Science elective	3	0	3
Science/engineering elective	3	0	3	MATH 474 Probability and Statistics	3	0	3
Humanities elective	3	0	3	Social science elective	3	0	3
Free elective	3	0	3	IPRO I Interprofessional Project I	1	6	3
Totals	14	2	15	Free elective	3	0	3
				Totals	16	6	18
Semester 7				Semester 8			
IPRO II Interprofessional Project II	1	6	3	Computer Science elective	3	0	3
CS 450 Operating Systems I	3	0	3	Computer Science elective	3	0	3
CS 487 Software Engineering I	3	0	3	PHIL 374 Moral Issues in Computer Science or			
Computer Science elective	3	0	3	CS 485 Computers in Society	3	0	3
Social science elective	3	0	3	Non-technical elective	3	0	3
Free elective	3	0	3	Free elective	3	0	3
Totals	16	6	18	Totals	15	0	15
Total Credit Hours							129

## Computer Science and Applied Mathematics

### Computer Information Systems

Required Courses	Credit Hours	Required Courses	Credit Hours
<b>Specialized Courses</b>		<b>Humanities Requirements</b>	
CS 100, 101, 105, 106, 330, 331, 350, 351	20	Humanities 100-level course	3
CS technical electives*	15	Humanities electives	9
CS electives	6		
		<b>Psychology Requirements</b>	
<b>Mathematics Requirements</b>		PSYCH 121,301	6
MATH 151	5		
Mathematics elective	3	<b>Social Science Requirements</b>	
		PS 200	3
<b>Science Requirements</b>			
BIOL 107 or 115	3	<b>Social Science electives</b>	6
CHEM 124	4		
PHYS 123	4	<b>Interprofessional projects</b>	6
Science elective	3		
		<b>Minor</b>	15
		<b>Free electives</b>	18
		<b>Total Credit Hours</b>	129

\* Computer science technical electives are designated with a (T) in the course descriptions.

# Computer Science and Applied Mathematics

## Computer Information Systems Curriculum

Semester 1			Lab.	Cr.	Semester 2			Lab.	Cr.
		Lect.	Hrs.	Hrs.			Lect.	Hrs.	Hrs.
CS 100	Introduction to the Profession I	1	2	2	CS 101	Introduction to the Profession II	0	4	2
CS 105	Intro to Computer Programming	2	1	2	CS 106	Introduction to Computer			
MATH 151	Calculus I	4	1	5		Programming II	2	1	2
Humanities	100-level course	3	0	3	Mathematics	elective	3	0	3
PSYCH 221	Introduction to Psychology	3	0	3	BIOL 115	Human Biology	3	0	3
Totals		13	4	15	Humanities	elective	3	0	3
					Social science	elective	3	0	3
					Totals		14	5	16
Semester 3					Semester 4				
CS 330	Discrete Structures	3	0	3	CS 350	Computer Organization and			
CS 331	Data Structures and Algorithms	2	2	3		Assembly Language Programming	2	2	3
CHEM 124	Principles of Chemistry I	4	0	4	Computer Science	technical elective	3	0	3
PS 200	American Government	3	0	3	PHYS 123	Mechanics	3	3	4
Humanities	elective	3	0	3	Minor		3	0	3
Totals		1.5	2	16	Computer science	elective	3	0	3
					Totals		14	5	16
Semester 5					Semester 6				
CS 351	Systems Programming	2	2	3	Computer Science	technical elective	3	0	3
Science	elective	3	0	3	PSYCH 301	Industrial Psychology	3	0	3
Minor		3	0	3	Minor		3	0	3
Free elective		3	0	3	IPRO I	Interprofessional Project I	1	6	3
Free elective		3	0	3	Humanities	elective	3	0	3
Totals		14	2	15	Free elective		3	0	3
					Totals		16	6	18
Semester 7					Semester 8				
Computer Science	technical elective	3	0	3	IPRO II	Interprofessional Project II	1	6	3
Computer Science	technical elective	3	0	3	Computer Science	technical elective	3	0	3
Minor		3	0	3	Minor		3	0	3
Social science	elective	3	0	3	Free elective		3	0	3
Computer science	elective	3	0	3	Free elective		3	0	3
Free elective		3	0	3	Totals		13	6	15
Totals		18	0	18					

## Computer Science and Applied Mathematics

### Applied Mathematics

The field of applied mathematics explores those branches of mathematics that form the foundation of science and engineering—probability and statistics, numerical analysis, and mathematical modeling. Collectively, these branches define an emerging field of study called computational science that uses techniques drawn from applied mathematics and computer science to solve problems arising in the sciences, engineering, and business.

The Department of Computer Science and Applied Mathematics offers a Bachelor of Science in Applied Mathematics. Students in this program combine a foundation in mathematics and computer science with a professional concentration in another discipline in which they apply their computational mathematics skills to the modeling and solution of real world problems.

The requirements for the B.S. in Applied Mathematics are summarized below.

### Bachelor of Science in Applied Mathematics

Required Courses	Credit Hours	Required Courses	Credit Hours
<b>Specialization Courses</b>		<b>Humanities Requirements</b>	
MATH 100, 101, 151, 152, 251, 252, 332, 400, 402, 461, 471, 475, 476	43	Humanities 100-level course	3
CS 200, 330, 331, 430	12	Humanities electives	9
Specialization electives	6	<b>Psychology Requirements</b>	
CSAM electives	6	PSYCH 221,301	6
Professional concentration electives	15	<b>Social Science Requirements</b>	
<b>Science Engineering Requirements</b>		PS 200	3
CHEM 124	4	Social science electives	6
BIOL 107 or 115	3	<b>Interprofessional projects</b>	6
PHYS 123	4		
Science elective	3	<b>Total credit hours</b>	<b>129</b>

A sample program of study is given on the next page. Note that the time sequence shown is only a guideline. Each student works closely with an adviser to formulate a program of study

that not only meets the student's goals in terms of content, but that also allows for experiences outside of the classroom—for instance, internships, co-ops and ROTC programs.

# Computer Science and Applied Mathematics

## Applied Mathematics Curriculum

Semester 1				Semester 2			
	Lect.	Hrs.	Cr.		Lect.	Hrs.	Cr.
MATH 100 Introduction to Profession I	1	2	2	MATH 101 Introduction to the Profession II	0	4	2
MATH 151 Calculus I	4	1	5	MATH 152 Calculus II	4	1	5
CS 200 Introduction to C++ Programming	2	2	3	CS 330 Discrete Structures	3	0	3
Humanities 100-level course	3	0	3	PHYS 123 Mechanics	3	3	4
PSYCH 221 Introduction to Psychology	3	0	3	Humanities elective	3	0	3
Totals	13	5	16	Totals	13	8	17

Semester 3				Semester 4			
MATH 251 Multivariate and Vector Calculus	4	0	4	MATH 252 Intro to Differential Equations	4	0	4
MATH 332 Matrices	3	0	3	MATH 471 Numerical Methods 1	3	0	3
CS 331 Data Structures and Algorithms	2	2	3	CSAM elective	3	0	3
CHEM 124 Principles of Chemistry I	3	3	4	BIOL 115 Human Biology	3	0	3
PS 200 American Government	3	0	3	CSAM elective	3	0	3
Totals	15	5	17	Totals	16	0	16

Semester 5				Semester 6			
MATH 400 Analysis I	3	0	3	MATH 461 Fourier Series and Boundary-Value Problems	3	0	3
CS 430 Introduction to Algorithms	3	0	3	Specialization elective	3	0	3
Science elective	3	0	3	PSYCH 301 Industrial Psychology	3	0	3
Social science elective	3	0	3	Humanities elective	3	0	3
Professional concentration elective	3	0	3	Professional concentration elective	3	0	3
Totals	15	0	15	I PRO I Interprofessional Project I	1	6	3
				Totals	16	6	18

Semester 7				Semester 6			
MATH 402 Complex Analysis	3	0	3	MATH 476 Statistics	3	0	3
MATH 475 Probability	3	0	3	Specialization elective	3	0	3
Social science elective	3	0	3	Humanities elective	3	0	3
Professional concentration elective	3	0	3	Professional concentration elective	3	0	3
Professional concentration elective	3	0	3	I PRO II Interprofessional Project II	1	6	3
Totals	15	0	15	Totals	13	6	15

Total Credit Hours 129

## Institute of Design

The Institute of Design no longer offers an undergraduate degree program but encourages students with undergraduate degrees in disciplines other than design to apply to its

master's and Ph.D. programs. For further information, call 312-595-4900.

### Faculty

#### Director

Patrick F. Whitney  
350 N. LaSalle  
312-595-4900

#### Professors

Fahnstrom, Heskett, Whitney

#### Associate Professors

Grimes, Poggenpohl, Prygrocki, Sato

#### Assistant Professors

Bleviss, Wolke

#### Senior Lecturers

K. McCoy, M. McCoy

#### Visiting Faculty

Cain, Conley, Ichikawa, Keeley, Pycha, Sivasankaran, Thaler

## Electrical and Computer Engineering

### Electrical and Computer Engineering

The Department of Electrical and Computer Engineering offers the Bachelor of Science Degree in Electrical Engineering (B.S.E.E.). The department also offers a Bachelor of Science Degree in Computer Engineering (B.S.CP.E.) in conjunction with the Department of Computer Science and Applied Mathematics. Both degree programs are accredited by the Engineering Accreditation Commission of the Accreditation Board of Engineering and Technology (ABET).

The Department also offers the following minors (see page 108).

- Air Force Aerospace Studies
- Applied Solid State Physics
- Energy/Environment/Economics (E<sup>3</sup>)
- Management
- Military Science
- Naval Science
- Pre-Med for E.E. majors
- Telecommunications

The B.S.E.E. curriculum provides a strong foundation in mathematics, physics, chemistry and computer science during the first two years of study. The fundamentals of circuits, electronics, digital and computer systems, electrodynamics, linear systems and energy conversion are introduced in the second and third years. In the senior year, students further explore their specific areas of interest and gain in-depth exposure to engineering design through their choice of electives. The curriculum is described in detail on page 79.

Some students may wish to combine the full breadth of the B.S.E.E. curriculum with a concentration on computer systems. For these students, the department offers a computer systems specialization of the B.S.E.E. degree. The specialization includes the full B.S.E.E. curriculum and specific courses in computer science and electrical engineering.

The B.S.CPE. curriculum concentrates on the design and application of computer hardware and software systems. During the first three years, the curriculum provides students with a strong foundation in mathematics, physics, chemistry, and computer science, followed by the fundamentals of electrical engineering and computer science that form the basis of computer engineering. During the senior year, advanced courses provide students with depth in selected areas and exposure to the practice of engineering design. Elective courses provide the flexibility to take specialized courses in a number of different areas. This curriculum is described in detail on page 81.

The ECE department considers advising of students an important obligation. Each student must meet with his/her faculty adviser during the preregistration period each semester. Students must closely adhere to course prerequisites to maximize academic performance and satisfy requirements for ABET accreditation. Faculty advisers for all E.E. and CPE. degree students are listed on the ECE Department bulletin board.



## Electrical and Computer Engineering

### Faculty

#### Interim Chair

Donald R. Ucci  
127 Siegel Hall  
Ext. 73400

#### Associate Chair

John Nestor  
141 Siegel Hall  
Ext. 73386

#### Professors

Arzbaecher, LoCicero, Saniie, Shahidehpour, H. Stark  
(Carl and Paul Bodine Distinguished Professor), Wong

#### Adjunct Professor

Briley

#### Associate Professors

Atkin, Galatsanos, Nestor, Patterson, Saletta, Troyk,  
Ucci, Weber, Williamson

#### Assistant Professors

Chan (Motorola Assistant Professor), Flueck, Ramesh,  
Wernick, Yang

#### Visiting Assistant Professor

Mills

#### Lecturer

Behera

#### Instructors

Kubik, Tagliavia

#### Faculty Emeriti

Armington, Jones, Martin, Peach, Whitehead

#### CPE Program Faculty

Chang (CSAM), Galatsanos (ECE), Hood (CSAM),  
Korel (CSAM), Nestor (ECE), Ramesh (ECE), Roberge  
(CSAM), Saniie (ECE)

# Electrical and Computer Engineering

## Electrical Engineering

Electrical engineering is concerned with the generation, transmission and utilization of electrical energy and with transmitting and processing information. Electrical engineers are involved in the analysis, design, and production of electric power, radio, radar, television, computing, telecommunication, control, and information systems. These engineers find

solutions to the challenging technical problems that arise in our rapidly changing society. They impact virtually every aspect of day-to-day life, as evidenced by examples such as wireless communications, power distribution, computerized traffic control, noise pollution monitoring and abatement, and medical instrumentation.

Required Courses	Credit Hours	Required Courses	Credit Hours
<b>Major Courses</b>	<b>40</b>	<b>Engineering Course Requirement</b>	<b>3</b>
ECE 100, 101, 211, 212, 213, 214, 218 242, 307, 308, 309, 311, 312, 319		<b>MMAE 320</b>	
<b>Professional Electives</b>	<b>14</b>	<b>Electives</b>	
		Science elective (BIOL 107, MS 201 or CHEM 126)	3
<b>Mathematics Requirements</b>	<b>24</b>	Technical selection	3
MATH 151, 152, 251, 252, 333, and MATH 475 or ECE 475		<b>Interprofessional Projects</b>	<b>6</b>
<b>Physics Requirements</b>	<b>11</b>	<b>Total Credit Hours</b>	<b>131</b>
PHYS 123, 221, 224			
<b>Chemistry Requirement</b>	<b>4</b>		
CHEM 124			
<b>Computer Science Requirement</b>	<b>2</b>		
CS 105			
<b>Humanities and Social Sciences Requirements</b>	<b>21</b>		
See General Education requirements, page 30			

## B.S.E.E. Degree- Professional Specialization in Computer Systems

The following courses must be completed in addition to required courses for B.S.E.E.

CS 106  
CS 331\*  
CS 450  
ECE 441\*\*  
ECE 429 or 446\*V  
ECE 448\*V

\*This course serves as a technical selection

\*\* These courses serve as professional ECE electives

## Electrical and Computer Engineering

## Electrical Engineering Curriculum

Semester 1	Lect.	Lab.	Cr.	Semester 2	Lect.	Lab.	Cr.
	Hrs.	Hrs.			Hrs.	Hrs.	
MATH 151 Calculus I	4	1	5	MATH 152 Calculus II	4	1	5
CHEM 124 Principles of Chemistry I	3	3	4	PHYS 123 Mechanics	3	3	4
CS 105 Introduction to Computer Programming I	2	1	2	Science elective*	3	0	3
ECE 100 Introduction to the Profession I	1	2	2	ECE 101 Introduction to the Profession II	0	4	2
Social science elective	3	0	3	Humanities 100-level course	3	0	3
Totals	13	7	16	Totals	13	8	17
Semester 3				Semester 4			
MATH 252 Intro to Differential Equations	4	0	4	MATH 251 Multivariate and Vector Calculus	4	0	4
PHYS 221 Electromagnetism and Optics	3	3	4	PHYS 224 Thermal and Modern Physics	3	0	3
ECE 211 Circuit Analysis I	3	0	3	ECE 213 Circuit Analysis II	3	0	3
ECE 212 Analog and Digital Laboratory I	0	3	1	ECE 214 Analog and Digital Laboratory II	0	3	1
ECE 218 Digital Systems	3	cl	3	ECE 242 Digital Computers and Computing	3	0	3
Social science elective	3	0	3	Totals	13	3	14
Totals	16	6	18				
Semester 5				Semester 6			
MATH 333 Matrix Algebra and Complex Variables	3	0	3	ECE 308 Signals and Systems	3	0	3
IPRO I ** Interprofessional Project I	1	6	3	ECE 309 Traveling Waves	3	0	3
ECE 307 Electrodynamics	3	3	4	ECE 312 Electronic Circuits	3	3	4
ECE 311 Engineering Electronics	3	3	4	ECE 319 Fundamentals of Power Engineering	3	3	4
Humanities elective	3	0	3	Social science elective	3	0	3
Totals	13	12	17	Totals	15	6	17
Semester 7				Semester 8			
Professional ECE elective †	3	0	3	Professional ECE elective †	3	0	3
Professional ECE elective †	3	3	4	Professional ECE elective †	3	3	4
ECE 475 or MATH 475	3	0	3	Technical selection ††	3	0	3
IPRO II** Interprofessional Project II	1	6	3	MMAE 320 Thermodynamics	3	0	3
Humanities elective	3	0	3	Humanities or social science elective	3	0	3
Totals	13	9	16	Totals	15	3	16

Total Credit Hours

131

This program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

\* Science elective must be BIOL 107, CHEM 126 or MS 201.

\*\* Interprofessional Projects may be taken at any time during the sophomore, junior or senior years (course scheduling must be adjusted accordingly with adviser approval).

† Professional ECE electives may be chosen from any of the 400-level ECE courses identified with (P) in the course descriptions. Courses at the 500-level may be taken with the written consent of the instructor, faculty adviser and the department chair. At least two of the electives must contain laboratories. A maximum of 3 credits of Undergraduate Research (ECE 491) or Special Problems (ECE 497) may be used as professional ECE electives with adviser approval.

†† The technical selection may be chosen from CS 331, MMAE 200, Technical IPRO, or other departmental approved courses.

# Electrical and Computer Engineering

## Computer Engineering

Computer engineering involves the design and application of computer hardware and computer software. Computer hardware consists of the physical components that implement a computer system: processor and memory chips, circuit boards, and peripheral devices. Computer software consists of computer programs that accomplish a specific task using sequences of simple, programmable steps. Computers have become an integral part of many large systems that require

sophisticated control including automobiles, medical instrumentation, telecommunication systems, and factory automation. Computers are a driving force behind many of today's exciting new technologies, including high-definition television (HDTV), interactive multimedia, and high-speed computer networks. Computer engineers must have detailed knowledge of both hardware and software to design, build, and use complex information processing systems for a wide range of applications.

Required Courses	Credit Hours
<b>Mathematics Requirements</b>	
MATH 151, 152, 251, 252, 474	21
Junior Mathematics elective (MATH 333 or 471)	3
<b>Physics Requirements</b>	11
PHYS 123, 221, 224	
<b>Chemistry Requirement</b>	4
CHEM 124	
<b>Engineering Science Requirement</b>	3
MMAE 200 or MMAE 320	
<b>Humanities and Social Sciences Requirements</b>	21
See General Education requirements, page 30	

Required Courses	Credit Hours
<b>Major Courses</b>	
CPE 100, 101	4
CS 105, 106, 330, 331, 350, 351, 450, 470, 487	25
ECE 211, 212, 213, 214, 218, 311, 441	19
<b>Junior CPE Elective</b>	3/4
Either ECE 307, 308, 309, 312, or 319	
<b>Professional Electives</b>	9/10
<b>Interprofessional Projects</b>	6
<b>Total Credit Hours</b>	<b>129/131</b>

## Electrical and Computer Engineering

## Computer Engineering Curriculum

Semester 1					Semester 2				
		Lect.	Hrs.	Cr. Hrs.			Lect.	Hrs.	Cr. Hrs.
MATH 151	Calculus I	4	1	5	MATH 152	Calculus II	4	1	5
CPE 100	Introduction to the Profession I	1	2	2	CPE 101	Introduction to the Profession II	0	4	2
Humanities	100-level course	3	0	3	Social science elective		3	0	3
CHEM 124	Principles of Chemistry I	3	3	4	PHYS 123	Mechanics	3	3	4
CS 105	Introduction to Computer Programming I	2	1	2	CS 106	Introduction to Computer Programming II	2	1	2
Totals		13	7	16	Totals		12	9	16
Semester 3					Semester 4				
MATH 252	Intro to Differential Equations	4	0	4	MATH 251	Multivariate and Vector Calculus	4	0	4
PHYS 221	Electromagnetism and Optics	3	3	4	PHYS 224	Thermal and Modern Physics	3	0	3
ECE 211	Circuit Analysis I	3	0	3	ECE 213	Circuit Analysis II	3	0	3
ECE 212	Analog and Digital Laboratory I	0	3	1	ECE 214	Analog and Digital Laboratory II	0	3	1
ECE 218	Digital Systems	3	0	3	CS 350	Computer Organization and Assembly Language Programming	2	2	3
CS 331	Data Structures and Algorithms	2	2	3	CS 330	Discrete Structures	3	0	3
Totals		15	8	18	Totals		15	5	17
Semester 5					Semester 6				
Engineering science elective*		3	0	3	Junior CPE elective***		3	0/3	3/4
ECE 311	Engineering Electronics	3	3	4	CS 450	Operating Systems I	3	0	3
CS 351	Systems Programming	2	2	3	MATH 474	Probability and Statistics†	3	0	3
Junior mathematics elective**		3	0	3	IPRO I	Interprofessional Project I††	1	6	3
Humanities elective		3	0	3	Social science elective		3	0	3
Totals		14	5	16	Totals		13	6/9	15/16
Semester 7					Semester 8				
ECE 441	Microcomputers	3	3	4	Professional elective†††		3	0/3	3/4
CS 470	Computer Architecture I	2	2	3	Professional elective†††		3	0	3
CS 487	Software Engineering I	3	0	3	IPRO II	Interprofessional Project II††	1	6	3
Professional Elective †††		3	0	3	Humanities elective		3	0	3
Social science or humanities elective		3	0	3	Social science elective		3	0	3
Totals		14	5	16	Totals		13	6/9	15/16
Total Credit Hours							129/131		

This program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

\* Engineering science elective: Choose either MMAE 200 or MMAE 320.

\*\* Junior mathematics elective: Choose either MATH 333 or MATH 471.

\*\*\*Junior CPE elective: Choose one of ECE 307, 308, 309, 312, or 319.

† ECE 475 may be substituted with adviser approval.

†† Interprofessional Projects may be taken at any time during the sophomore, junior, or senior years (course scheduling must be adjusted accordingly with adviser approval).

††† Professional electives may be chosen from the 400-level ECE courses identified with a (P) in the course descriptions except ECE 448, and any 400-level CS courses except CS 460, 461, and 485. At least one professional elective must be CS 471, ECE 429, or ECE 446. A maximum of 3 credits of Undergraduate Research (ECE 491 or CS 491) or Special Problems (ECE 497 or CS 495) may be used as a professional elective with adviser approval.

## Lewis Department of Humanities

### Lewis Department of Humanities

The Lewis Department of Humanities offers courses in writing, literature, history, foreign languages, art and architectural history, and philosophy. The department has four objectives:

1. To offer students the opportunity to pursue their personal interests in the humanities. This objective is achieved through offering a wide range of advanced courses in the many disciplines that comprise the humanities. The department also encourages students to take minors in literature, history and philosophy.
2. To strengthen the ability of all IIT students to formulate and express ideas. In addition to composition courses for both native English and non-native English speakers, the department supports the Writing Center where students receive one-on-one tutoring at their convenience. Undergraduates who qualify may also take advanced courses in technical and business writing. Advanced courses provide further exposure to critical thinking and the communication of ideas.
3. To support the requirements of IIT's professional degree programs. Courses marked with an **(H)** satisfy degree requirements in general education. The department also offers specialized courses (such as architectural history) that meet the educational needs of specific degree programs. The department offers many courses that are of special relevance to students preparing for careers in the law in IIT's preprofessional degree programs.
4. To help all IIT students enrich their professional and personal lives. This goal is achieved through advanced elective courses in the humanities, which provide an appreciation and understanding of human development and the moral foundations of human experience, particularly as reflected in history, literature, and philosophy.

IIT students are encouraged to broaden their educational backgrounds and to discover new interests through the study of humanities.

#### Faculty

##### Chair

John D. Root  
218 Siegel Hall  
Ext. 73465

##### Professors

Davis, Feinberg, Harrington, Ladenson, Root, Schmaus

##### Associate Professors

Barrett, Fox-Good, Misa, Snapper (Associate Chair)

##### Assistant Professors

Amato, Basu, Brande, Coogan, Pulliam, Quiroz

##### Instructor

Dabbert

##### Faculty Emeriti

Applebaum, Irving, Knepler, Sawyer, Zesmer

## Manufacturing Technology

The Bachelor of Manufacturing Technology is a transfer program designed to enable community college AAS graduates who are interested in manufacturing to complete their bachelor's degree while they are working.

Admission to the B.M.T. Program is competitive. It is based on a review of college transcripts, documentation of work experience, and an admission interview. The applicant must hold an associate's (AAS) from an accredited college, or the equivalent.

The degree should be in an appropriate technical field. Only courses in which the student has earned a grade of "C" or better may be accepted for transfer. Students admitted must have previously completed the following requirements or make them up while working on the B.M.T. degree. The degree requires 126 hours including transfer and course work completed at IIT

### Faculty

#### B.M.T. Program Director

Keith E. McKee  
122 Wishnick Hall  
Ext. 73650

#### Program Coordinator

Pamela Houser  
Ext. 73584

#### Outreach Coordinator

Jerry Field  
Ext. 73651

#### Chairman, Academic Overview Committee

Kalpajian

#### Adjunct Professor

Levine

#### Part-time Faculty

Copley, Feldy, Gibson, Maurer, Nemeth, Sud, Thakkar, Vohra

### B.M.T. Admission Requirements

#### Mathematics

6 credit hours of mathematics at the level of college algebra or above.

#### Computer Science

3 credit hours of computer programming.

#### Natural Science

11 credit hours of science or engineering courses. Relevant courses include physics, chemistry, or biology. Up to 6 credit hours may be in graphics/drafting. Course work should

include at least one laboratory science. In some cases, certain technology courses might be applied to this requirement.

#### Humanities

6 credit hours. Relevant studies include literature, philosophy (except logic), and history.

#### Social Sciences

6 credit hours. These typically include anthropology, geography, political science, psychology, sociology, and economics.

# Manufacturing Technology

## Manufacturing Technology Curriculum

A total of 66 credits (22 courses) are required for the degree for a total of 126 credit hours. This includes four senior-level humanities and social science electives. The 18 required

**B.M.T. courses focus on all facets of plant operations including materials, marketing, planning, and budgeting, as well as communications, supervisory skills and software applications**

Semester 1		Lab. Cr.			Semester 2		Lab. Cr.		
		Lect.	Hrs.	Hrs.			Lect.	Hrs.	Hrs.
MT 301	Technical Communications	3	0	3	MT311	Production and Operations	3	0	3
MT 305	Computers in Manufacturing	3	0	3	MT 313	Materials in Manufacturing	3	0	3
MT 300/315	Manufacturing Enterprises	3	0	3	Humanities elective*		3	0	3
Totals		9	0	9	Totals		9	0	9
Semester 3					Semester 4				
MT 321	Computer Integrated Manufacturing	3	0	3	MT 331	Product Design in Manufacturing	3	0	3
MT 323	Manufacturing Management and Planning	3	0	3	MT 333	Manufacturing Management and Planning	3	0	3
Social science elective*		3	0	3	Social science or humanities elective*		3	0	3
Totals		9	0	9	Totals		9	0	9
Semester 5					Semester 6				
MT 404	Sales, Marketing, and Product Introduction in Manufacturing	3	0	3	MT 412	Manufacturing Processes	3	0	3
MT 406	Quality Control in Manufacturing	3	0	3	MT 432	Vendor/Customer Relations	3	0	3
I PRO 397	Interprofessional Project	1	6	3	Totals		6	0	6
Totals		7	6	9					
Semester 7					Semester 8				
MT 414	Topics in Manufacturing	3	0	3	MT 422	Manufacturing Technology	3	0	3
MT 424	Management Information Systems in Manufacturing	3	0	3	MT 434	Manufacturing Futures	3	0	3
MT 426	Decision-Making and Risk Analysis in Manufacturing	3	0	3	Totals		6	0	6
Totals		9	0	9	Total Credit Hours				66

\* 9 credit hours of 300/400 level social science or humanities electives are required.



## Mechanical, Materials and Aerospace Engineering

### Mechanical, Materials and Aerospace Engineering

The MMAE Department at Illinois Institute of Technology offers the Bachelor of Science degree in mechanical engineering (B.S.M.E.), **metallurgical** and materials engineering (B.S.M.M.E.), and aerospace engineering (B.S.A.E.). These degree programs are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

All three programs build upon a strong foundation in mathematics and basic sciences, the humanities and social sciences, and a balance of engineering topics in the respective disciplines; include innovative engineering activities and opportunities for undergraduate students; and are responsive to the changing needs of industry. The aim is to educate individuals for professional careers in engineering and to provide

the basis for life-long learning and advanced study at the graduate level.

In recognition of the changing professional environment in which IIT's graduates will function, the MMAE Department programs place substantial emphasis on the following:

- teaching students to understand the economic, ethical, societal, environmental and international context of their professional activities
- improving oral and written communication skills
- training students to work in multidisciplinary teams
- preparing students for the interprofessional work force of the 21st century
- enhancing students' abilities to link science and engineering principles to key technologies.

### Faculty

#### Chair

Marek Dollar  
243 Engineering 1  
Ext. 73175

#### Department Home Page

<http://mmae.iit.edu>  
(includes faculty e-mail addresses)

#### Professors

Barnett, Corke, Dix, M. Dollar, Higgins, Kallend, Kalpakjian, Nagib (Rettaliata Distinguished Professor), Nair, Nash, Porter, Todd (Associate Chair, Metallurgical and Materials Engineering Program and Iron and Steel Society Professor), Way (Associate Chair, Aerospace Engineering Program), Williams

#### Associate Professors

Aronov, Meade (Associate Chair, Mechanical Engineering Program), Mostovoy, Ruiz, Wark

#### Assistant Professors

A. Dollar, Cassel, Foley (Finkl Assistant Professor), Gosz, Tarabishy (visiting)

#### Research Professors

Broutman, Kumar, Sciammarella

#### Research Assistant Professors

Hites

#### Lecturer

Jennings

#### Adjunct Professors

Copley, Morel, Natarajan, Patwardhan, Routbort, Singh

#### Adjunct Associate Professor

Mansy, Thakkar

#### Faculty Emeriti

Bonthron, Breyer, Donnell, Fejer, Gordon, Graham, Lavan, Morkovin, Rasof, Rettaliata, Tao, Torda, Winston

# Mechanical, Materials and Aerospace Engineering

Students are introduced to the scope of the engineering profession in the first-year courses Introduction to the Profession I and II, and to the ethical, economical, safety, environmental and other responsibilities of being a professional engineer. Strong emphasis is placed on development of oral and written communication skills. Accompanying courses in mathematics and the basic sciences provide the foundation for later studies of engineering sciences relevant to the students' major fields of study. These areas include: energy, and structures and motion for the ME major; materials, structure-property relations, materials processing, service behavior and design for the MME major; and structures and materials, propulsion and aerodynamics for the AE major. Regardless of the students' intended major, all MMAE students have a common curriculum for the first two years.

The second year emphasizes building a foundation for the eventual study of engineering design. The engineering sciences offer a rational approach to solving detailed problems encountered in major-specific courses, including the capstone design courses of the third and fourth years.

In the third year, students begin the transition to professional practice and learn to develop sound engineering judgement by studying open-ended problems and realistic constraints. Students build further on the engineering sciences, and approximately one-third of major-specific course work is devoted to the introduction of tangible engineering design. The student's professional experience is developed by participation in a minimum of two interprofessional projects in the third and fourth years.

The process continues into the fourth year where the three programs culminate in senior year capstone design courses. Mechanical engineering projects involve design of thermal and mechanical systems; metallurgical and materials engineering students develop new or optimized materials, processing routes and selection schemes; and aerospace engineering students produce conceptual designs of aircraft and spacecraft missions.

## Mechanical Engineering

Mechanical engineering is an essential part of most industries and modern technologies, and includes the analysis, design, and development of machines and structures that involve motion. Mechanical engineers are employed in areas such as the design and control of machinery; the development of means of transportation including automobiles, aircraft, space

and marine vehicles, and railroads; computer-aided design and manufacture of products, consumer goods, devices, and industrial equipment; medical technology utilizing mechanical and electromechanical devices; the generation of energy from fossil and nuclear fuels; and the utilization, storage and distribution of alternative energy sources.

## Metallurgical and Materials Engineering

The metallurgical and materials engineering program aims to develop an understanding of the structure, properties, processing and service behavior of engineering materials, including metallic, ceramic, polymeric and composite materials. This understanding fosters both development of new materials and improvement of existing materials in order to optimize manufactured products. Laboratory experience is an important part of the program and emphasizes microstructural characterization

using modern analytical techniques such as optical and electron microscopies and x-ray diffraction, materials processing, determination of the physical and mechanical behavior of materials, and materials and process selection. Graduating students find employment opportunities in a wide range of industries requiring knowledge of materials development and/or optimization, processing and selection.

## Aerospace Engineering

Aerospace engineering explores both the design and manufacture of aircraft, and the design and flight of vehicles beyond the earth's atmosphere. Knowledge of aerodynamics, structures and materials, propulsion systems, and flight mechanics and controls are important to this field. Aerospace engineers are primarily employed in civil aeronautics, the defense industry,

and the space program. However, applications of aerospace technology are also found in related areas such as ground and undersea transportation systems, pollution control, wind power and the effects of wind on structures, and the development and use of advanced materials.

## Mechanical, Materials and Aerospace Engineering

### Advising

The MMAE department considers advising of students an important obligation. Each student must meet with his/her faculty adviser during the pre-registration period each semester. Students must closely adhere to course prerequisites to maximize academic performance and satisfy requirements for ABET accreditation. Faculty advisers for all MMAE students are listed on the departmental bulletin board.

Program requirements may not be waived, nor will substitutions be permitted, without the approval of the appropriate associate chair.

### Minors

Minors available to students who wish to broaden their knowledge can be found beginning on page 108. In the B.S.M.E. and B.S.A.E. programs, two of the required minor courses substitute for the two technical electives. In the B.S.M.M.E. program, these are substituted for the two MME electives. Minors other than those listed below may be undertaken with the approval of the student's faculty adviser and the MMAE Undergraduate Studies Committee. In the event that a required course for a minor is also required for the major, an approved substitution must be made. Application to take a minor is typically made in the student's third or fourth semester. Minors require completion of additional courses.

Among the minors that are available to ME, MME and AE students are:

- Aerospace Engineering (for ME students only)
- Air Force Aerospace Studies
- Applied Solid State Physics (for MME students only)
- Construction Management
- Electromechanical Design and Manufacturing (for ME and AE students only)
- Energy/Environment/Economics (E<sup>3</sup>)
- Environmental Engineering
- Fire Protection and Safety Engineering
- Management
- Materials Engineering (for ME and AE students only)
- Mechanical Engineering (for AE students only)
- Military Science
- Naval Science
- Polymer Science and Engineering
- Premedical Studies
- Software Engineering

# Mechanical. Materials and Aerospace Engineering

## Courses Required for B.S.M.E. B.S.A.E. and B.S.M.M.E. Degrees

Required Courses for the first two years	Credit Hours	Additional Courses Required for the B.S.M.E. Degree in the third and fourth years	Credit Hours
Mathematics MATH 151, 152, 251, 252	18	Mechanical and Aerospace Engineering MMAE 303, 305, 310, 320, 321, 322, 350, 430, 431, 432 or 433, 443, 485	40
Physics PHYS 123, 221, 224	11	Physics PHYS 300	3
Chemistry CHEM 124	4	Interprofessional Projects	6
Computer Science CS 105	2	Technical electives	6
Engineering Graphics EG 105	2	Humanities/social science electives	9
Material Science MS 201	3	Total Credit Hours, B.S.M.E.	131
Mechanical, Materials and Aerospace Engineering MMAE 100, 101, 201, 202, 271	15		
Humanities/social science electives	12		
Additional Courses Required for the B.S.A.E. Degree in the third and fourth years	Credit Hours	Additional Courses Required for the B.S.M.M.E. Degree in the third and fourth years	Credit Hours
Mechanical and Aerospace Engineering MMAE 304, 305, 310, 311, 312, 320, 322, 350, 430, 436, 441, 452	40	Metallurgical and Materials Engineering MMAE 361, 362, 363, 370, 464, 465, 467, 468, 474, 476, 482, 485	36
Physics PHYS 300	3	Physics PHYS 300	3
Interprofessional Projects	6	Interprofessional Projects	6
Technical electives	6	MME electives	6
Humanities/social science electives	9	Humanities/social science electives	9
Total Credit Hours, B.S.A.E.	131	Total Credit Hours, B.S.M.M.E.	127

## Mechanical, Materials and Aerospace Engineering

**B.S.M.E., B.S.A.E. and B.S.M.M.E. Curricula**

Curricula for B.S.M.E., B.S.A.E. and B.S.M.M.E. are the same in the first two years

Semester 1		Lect.	Lab.	Cr.	Semester 2		Lect.	Lab.	Cr.
		Hrs.	Hrs.	Hrs.			Hrs.	Hrs.	Hrs.
MMAE 100 Introduction to the Profession I	1	4	3		MMAE 101 Introduction to the Profession II	1	4	3	
EG 105 Engineering Graphics & Design	1	2	2		CS 105 Introduction to Computing	2	1	2	
CHEM 124 Principles of Chemistry	3	3	4		PHYS 123 Mechanics	3	3	4	
MATH 151 Calculus I	4	2	5		MATH 152 Calculus II	4	2	5	
Humanities or social science elective	3	0	3		Humanities or social science elective	3	0	3	
Totals	12	11	17		Totals	13	10	17	

Semester 3		Lect.	Lab.	Cr.	Semester 4		Lect.	Lab.	Cr.
		Hrs.	Hrs.	Hrs.			Hrs.	Hrs.	Hrs.
MMAE 201 Mechanics of Solids I	3	0	3		MMAE 202 Mechanics of Solids II	3	0	3	
MS 201 Materials Science	3	0	3		PHYS 224 Thermal and Modern Physics	3	0	3	
PHYS 221 Electricity and Magnetism	3	3	4		MATH 252 Intro to Differential Equations	4	0	4	
MATH 251 Multivariate and Vector Calculus	4	0	4		MMAE 271 Engineering Materials & Design	2	3	3	
Humanities or social science elective	3	0	3		Humanities or social science elective	3	0	3	
Totals	16	3	17		Totals	15	3	16	

**Mechanical Engineering: Third and Fourth Years**

Semester 5		Lect.	Lab.	Cr.	Semester 6		Lect.	Lab.	Cr.
		Hrs.	Hrs.	Hrs.			Hrs.	Hrs.	Hrs.
PHYS 300 Instrumentation Laboratory	2	3	3		MMAE 303 Mechanics of Solids III	3	0	3	
MMAE 305 Dynamics	3	0	3		MMAE 321 Applied Thermodynamics	3	0	3	
MMAE 310 Fluid Mechanics	3	3	4		MMAE 322 Heat and Mass Transfer	3	3	4	
MMAE 320 Thermodynamics	3	0	3		I PRO I Interprofessional Project I	1	6	3	
MMAE 350 Computational Mechanics	3	3	4		Humanities or social science elective	3	0	3	
Totals	14	9	17		Totals	13	9	16	

Semester 7		Lect.	Lab.	Cr.	Semester 8		Lect.	Lab.	Cr.
		Hrs.	Hrs.	Hrs.			Hrs.	Hrs.	Hrs.
MMAE 430 Engineering Measurements	2	6	4		MMAE 432 Design of Mechanical Systems or 1	6	3		
MMAE 431 Design of Machine Elements	2	3	3		MMAE 433 Design of Thermal Systems	2	3	3	
MMAE 485 Manufacturing Processes	3	0	3		MMAE 443 System Analysis and Control	3	0	3	
I PRO II Interprofessional Project II	1	6	3		Technical Elective	3	0	3	
Humanities or social science elective	3	0	3		Technical Elective	3	0	3	
Totals	11	15	16		Humanities or social science elective	3	0	3	
					Totals	13/14	6/3	15	

Total Credit Hours 131

# Mechanical, Materials and Aerospace Engineering

## Aerospace Engineering: Third and Fourth Years

Semester 5				Semester 6			
	Lect.	Hrs.	Cr.		Lect.	Hrs.	Cr.
MMAE 305 Dynamics	3	0	3	PHYS 300 Instrumentation Laboratory	2	3	3
MMAE 310 Fluid Mechanics	3	3	4	MMAE 304 Mechanics of Aerostructures	3	0	3
MMAE 320 Thermodynamics	3	0	3	MMAE 311 Compressible Flow	3	0	3
MMAE 350 Computational Mechanics	3	3	4	MMAE 312 Aerodynamics of			
Humanities or social science elective	3	0	3	Aerospace Vehicles	3	0	3
Totals	15	6	17	I PRO I Interprofessional Project I	1	6	3
				Totals	12	9	15
Semester 7				Semester 8			
MMAE 322 Heat/Mass Transfer	3	3	4	MMAE 430 Engineering Measurements	2	6	4
MMAE 441 Aerospace Dynamics	3	0	3	MMAE 436 Design of Aerospace Vehicles	2	3	3
MMAE 452 Aerospace Propulsion	3	0	3	Technical elective	3	0	3
I PRO II Interprofessional Project II	1	6	3	Technical elective	3	0	3
Humanities or social science elective	3	0	3	Humanities or social science elective	3	0	3
Totals	17	9	16	Totals	13	9	16
				Total Credit Hours			
				131			

## Metallurgical and Materials Engineering: Third and Fourth Years

Semester 5				Semester 6			
	Lect.	Hrs.	Cr.		Lect.	Hrs.	Cr.
PHYS 300 Instrumentation Laboratory	2	3	3	MMAE 361 Fund. of Crystalline Solids	3	0	3
MMAE 362 Physics of Solids	3	0	3	MMAE 465 Electrical, Magnetic & Optical			
MMAE 363 Metallurgical and Materials				Properties of Materials	3	0	3
Thermodynamics	3	0	3	Metallurgical and Materials elective	3	0	3
MMAE 370 Materials Laboratory I	1	6	3	I PRO I Interprofessional Project I	1	6	3
Humanities or social science elective	3	0	3	Humanities or social science elective	3	0	3
Totals	12	9	15	Totals	13	6	15
Semester 7				Semester 8			
MMAE 464 Physical Metallurgy	3	0	3	MMAE 474 Metals Processing	2	3	3
MMAE 467 Fund. Prin. of Polymer Materials	3	0	3	MMAE 476 Materials Laboratory II	2	3	3
MMAE 468 Introduction to Ceramic Materials	3	0	3	MMAE 485 Manufacturing Processes	2	3	3
MMAE 482 Composites	3	0	3	Metallurgical and Materials elective	1	6	3
Humanities or social science elective	3	0	3	I PRO II Interprofessional Project II	1	6	3
Totals	15	0	15	Totals	8	21	15
				Total Credit Hours			
				127			

## Graduate Courses

Graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current *IIT Bulletin: Graduate Program* for course descriptions.

## Institute of Psychology

Psychology has as its objective understanding the manner in which organizations, human beings, and animals behave, learn, and interact and the ways in which their behavior can be modified.

The Institute of Psychology offers two distinct psychology programs as well as options for honors premed and law. The first, a traditional Bachelor of Science in Psychology, is detailed below. The second is a unique research-based, human-behavior-oriented B.S. program, blending the strengths of highly successful graduate programs in clinical, industrial/organizational, and rehabilitation psychology. The program incorporates recommendations of the American Psychological Association for undergraduate education in the four basic areas of social, individual differences, physiology, and learning and cognition, as well as Illinois Institute of Technology's focus on interdisciplinary, project-based learning. Designed for highly motivated, career-oriented students, this new program emphasizes the integration of applied research with faculty and practical experience in professional settings in conjunction with traditional classroom activities. The four-year learning experience is highlighted and supported by a faculty mentorship model, individual advising, and both individual

and group activities with faculty graduate, and other undergraduate students. Below is a list of required courses and a sample program of study. Students should also refer to page 32 of this bulletin for additional information on this applied sciences program.

Most psychologists hold advanced degrees, and this innovative program will provide students with excellent preparation for graduate school. Jobs in many fields are open to persons holding only a bachelor's degree in psychology, including new burgeoning areas of geriatrics, health and sports counseling, behavioral medicine, and managed health care, as well as traditional settings such as schools, courts, hospitals, industries, and research laboratories. Many students also will find psychology highly beneficial as a pre-professional major for advanced studies in medicine, dentistry, law, business, or public administration.

In summary, our curriculum encompasses the major changes which have occurred in psychology over the past 25 years and prepares students for the 21st century, whether it be in psychology or another professional field.

## Faculty

### Director

M. Ellen Mitchell  
252 Life Sciences  
Ext. 73500

### Professors

Geist, Huyck, Lam, Raju, Schleser, Wolach

### Associate Professors

Ayman, Hopkins, Merbitz, Mitchell, Young

### Assistant Professors

Hansen, Hilburger, Morris, Sher, Roch, Rokicki

### Visiting Assistant Professor

Paquin

### Faculty Emeritus

Vermillion

# Institute of Psychology

## Applied Sciences Program

### Psychology Specialization

Required Courses	Credit Hours	Required Courses	Credit Hours
<b>Major Courses</b>	33	<b>Interprofessional Projects</b>	6
PSYC 204, 221, 222, 301, 303, 406, 435 or 436, 482, 483, 487, 488		<b>Natural Sciences Requirement</b>	12-13
<b>Introduction to the Profession 100 (2 semesters)</b>	4	CHEM 124, BIOL 107 and/or 115*, PHYS 211	
<b>Psychology Electives</b>	15	<b>Humanities and Social Sciences Requirements</b>	24
<b>Mathematics Requirements</b>	6	See General Education requirements, page 30 (21 hrs)	
MATH 122,221		Social science electives (3 hrs)	
<b>Computer Science Requirements</b>	2	<b>Fourth-year capstone project</b>	3
CS 105		<b>Free electives</b>	21
		<b>Total Credit Hours</b>	<b>126-127</b>

\* In the absence of a lab to accompany BIOL 107 or 115, both courses must be completed.

A sample curriculum follows. Interested students should contact the institute directly to consult with a faculty adviser about the curriculum and its tailor-made opportunities.



**Applied Sciences, Psychology Specialization Curriculum**

Semester 1				Semester 2			
	Lect.	Lab. Hrs.	Cr. Hrs.		Lect.	Lab. Hrs.	Cr. Hrs.
Introduction to the Profession	2	0	2	Introduction to the Profession	2	0	2
100-level humanities elective	3	0	3	BIOL 115 Human Biology	3	0	3
CHEM 124 Principles of Chemistry I	3	3	4	PS 200 American Government	3	0	3
PSYC 221 Human Behavior, Growth and Learning	3	0	3	PSYC 222 Brain, Mind and Behavior	3	0	3
MATH 122 Introduction to Mathematics II	3	0	3	Humanities or social sciences elective	3	0	3
Totals	14	3	15	Totals	14	0	14
Semester 3				Semester 4			
PSYC 303 Abnormal Psychology	3	0	3	Free elective	3	0	3
PSYC 482 Undergraduate Research Seminar I	1	2	3	Psychology elective	3	0	3
PSYC 301 Industrial Psychology	3	0	3	PSYC 483 Undergraduate Research Seminar II	1	2	3
BIOL 107 General Biology Lectures	3	0	3	CS 105 Introduction to Computer Programming I	2	1	2
MATH 221 Basic Probability and Statistics	3	0	3	PHYS 211 Basic Physics I	3	0	3
IPRO Interprofessional project	1	6	3	Humanities or social sciences elective	3	0	3
Totals	14	8	18	Totals	15	3	17
Semester 5				Semester 6			
PSYC 435 Early Development or PSYC 436 Adult Development	3	0	3	Psychology electives	6	0	6
PSYC 204 Experimental Psychology and Research Methods	3	0	3	Humanities or social sciences elective	3	0	3
Free elective*	3	0	3	Humanities or social sciences elective	3	0	3
Free elective *	3	0	3	Free electives *	6	0	6
Humanities or social sciences elective	3	0	3	Totals	18	0	18
Totals	15	0	15				
Semester 7				Semester 8			
IPRO Interprofessional Project	1	6	3	Psychology Honors Project	3	0	3
PSYC 487 Integrative Psychology Seminar I	3	0	3	PSYC 488 Integrative Psychology Seminar II	3	0	3
PSYC 406 History and Systems of Psychology	3	0	3	Psychology elective	3	0	3
Psychology elective	3	0	3	Humanities or social sciences elective	3	0	3
Free elective*	3	0	3	Free elective*	3	0	3
Totals	13	6	15	Totals	15	0	15
Total Credit Hours						127	

\* Students may select a minor sequence in place of free electives.

# Institute of Psychology

## Psychology (Traditional)

Required Courses	Credit Hours	Required Courses	Credit Hours
<b>Major Courses</b>	30	<b>Biology Requirements</b>	6
PSYC 204, 221, 222, 303, 310, 406, 423, 435 or 436, 452, 487		BIOL 107, 115	
<b>Psychology Electives</b>	6	<b>Humanities and Social Sciences Requirements</b>	21
		See General Education requirements, page 30	
<b>Mathematics Requirements</b>	13	<b>Electives</b>	
MATH 151, 152, 221		Individualized minor courses	15
<b>Physics Requirements</b>	6	Free electives	6
PHYS 211,212		IPRO Interprofessional Projects	6
<b>Chemistry Requirements</b>	7	<b>Total Credit Hours</b>	<b>128</b>
CHEM 124, 126			
<b>Computer Science Requirements</b>	8		
CS 105, 200, 460			

**Psychology (Traditional) Curriculum**

Semester 1				Semester 2			
		Lect.	Cr.			Lect.	Cr.
		Hrs.	Hrs.			Hrs.	Hrs.
PSYC 100 Introduction to Professions	2	0	2	PSYC 101 Introduction to Professions	2	0	2
PSYC 221 Human Behavior, Growth and Learning	3	0	3	PSYC 222 Brain, Mind and Behavior	2	2	3
100-level Humanities	3	0	3	PSYC 303 Abnormal Psychology	3	0	3
MATH 151* Calculus I	4	2	5	MATH 152* Calculus II	4	2	5
Humanities or social science elective	3	0	3	Humanities or social science elective	3	0	3
Totals	13	4	16	CS 105 Introduction to Computer Programming I	2	1	2
				Totals	16	5	18
Semester 3				Semester 4			
PSYC 310 Social Psychology	3	0	3	PSYC 204 Experimental Psychology and Research Methods	3	0	3
BIOL 107 General Biology Lectures	3	0	3	PHYS 211 Basic Physics I	3	0	3
CS 200 Intro to C++ Programming	2	2	3	BIOL 115 Human Biology	3	0	3
Social science elective	3	0	3	IPRO Interprofessional Project	1	6	3
Humanities elective	3	0	3	Individualized minor**	3	0	3
Totals	14	2	15	Totals	13	6	15
Semester 5				Semester 6			
PHYS 212 Basic Physics II	3	0	3	PSYC 435 Early Development or 436	3	0	3
MATH 221 Basic Probability and Statistics	3	0	3	CHEM 126 Principles of Chemistry II	3	0	3
CHEM 124 Principles of Chemistry I	3	3	4	Humanities or social science elective	3	0	3
CS 460 Fundamentals of Multimedia	2	2	3	Individualized minor**	3	0	3
Individualized minor**	3	0	3	Free elective	3	0	3
Totals	14	5	16	IPRO Interprofessional Project	1	6	3
				Totals	16	6	18
Semester 7				Semester 8			
PSYC 452 Personality Theory	3	0	3	PSYC 487 Integrative Psychology Seminar I	3	0	3
PSYC 406 History and Systems of Psychology	3	0	3	PSYC 423 Learning Theory	3	0	3
Humanities or Social science elective	3	0	3	Individualized minor**	3	0	3
Individualized minor**	3	0	3	Free electives	6	0	6
Psychology elective	3	0	3	Totals	15	0	15
Totals	15	0	15				
Total Credit Hours						128	

\* Depending on their level of preparation, students may be placed in another mathematics sequence.

\*\* Students must plan a specialized minor in consultation with their departmental adviser. The minor will be designed to complement their professional studies.

# Institute of Psychology

## Optional Programs

### Combined Degree Programs

A specialization in psychology may be used as the basis for the combined undergraduate-graduate professional degree programs in law (B.S./J.D.), business (B.S./M.B.A.), public administration (B.S./M.P.A.), personnel and human resource development, or rehabilitation counseling (B.S./M.S.) offered by IIT. Students wishing to participate in the accelerated B.S./J.D. option must indicate this as early as possible. With the consent of the Institute director, undergraduate psychology

students may enroll in some graduate-level psychology courses. Applications for admission to graduate programs at IIT (leading to the degrees of master of science in psychology, master of science in rehabilitation counseling, master of science in personnel and human resource development, and doctor of philosophy in psychology in rehabilitation and industrial/organizational psychology) are encouraged from students earning undergraduate degrees from IIT.

## ROTC: Air Force Aerospace Studies

### ROTC: Air Force Aerospace Studies

Air Force ROTC is conducted at approximately 600 colleges and universities throughout the United States in order to select and train men and women to become commissioned officers in the U.S. Air Force. Most graduates who enter the Air Force through Air Force ROTC are assigned to positions consistent with their academic major. Others, who

wish to do so, may qualify to become pilots and navigators. Men and women who complete graduation requirements and the Professional Officer Course receive commissions and enter active duty as second lieutenants. Officers who qualify may take graduate training prior to beginning their military duties.

### Faculty

#### Chair

Lt. Col. Greg Hayman  
208 Stuart Building  
Ext. 73525

#### Professor

Hayman

#### Assistant Professors

Chancy, Duhon, Musselman, Larson

# ROTC: Air Force Aerospace Studies

## Financial Aid

Scholarships are available to qualified graduate and undergraduate students in both the four-year and two-year programs. These pay up to full tuition and fees, textbook allowance, and a monthly subsistence allowance. All members receive a subsistence allowance of \$150 per month in their final two academic years. Scholarships are available for four-, three-,

and two-year periods depending on the student's academic major. Qualified students desiring operational, technical/scientific, nontechnical (business), nursing, or health-related (medicine, optometry) options should contact the Department of Air Force Aerospace Studies.

## Courses

The General Military Course (AS 101, 102, 201, 202) examines the role of U.S. Military forces in the contemporary world, with particular attention to the United States Air Force and its organization and mission.

The Professional Officer Course (AS 301, 302, 401, 402) provides an examination of the broad range of U.S. civil-military

relations, the environmental context in which U.S. defense policy is formulated and implemented, and the principles and practices of leadership and Total Quality Management as they relate to the U.S. Air Force.

A student may take any of these courses without entering the AFROTC program.

## Four-Year Program

The Air Force ROTC offers both the four-year and two-year commissioning programs for men and women IIT students. The four-year program consists of the four-semester General Military Course (GMC) and the four-semester Professional Officer Course (POC). Students normally start this program as freshmen but may begin as sophomores by enrolling in both the freshman- and sophomore-year classes. Students not on scholarship may withdraw from the GMC at any time.

Participants in the POC are selected from qualified volunteer applicants. An Air Force ROTC-paid, four-week field training encampment, held at an Air Force base, is required for POC students. This requirement is normally completed during the summer between the sophomore and junior years. The major areas of study during field training include junior officer training, aircraft and air-crew orientation, career orientation, survival training, base functions, and the Air Force environment.

## Two-Year Program

The two-year program consists of a paid six-week summer field training encampment and the four-semester Professional Officer Course. Participants in this program are selected from qualified volunteer applicants. This program is designed for undergraduate and graduate students with less than three but at least two years remaining at IIT. The six-week field training is held at an Air Force base and is a prerequisite

for the POC. The major areas of study at field training are the same as in the four-year program with the addition of the GMC academic curriculum. Upon successful completion of the six-week program, which includes the GMC academic curriculum, transfer credit of three semester hours will be applied toward the completion of the AFROTC minor.

## Minor

Students may select a minor in Air Force Aerospace Studies. See page 108 for course requirements.

## ROTC: Air Force Aerospace Studies

### ROTC Air Force Aerospace Studies Curriculum

Semester 1		Lab. Cr.			Semester 2		Lab. Cr.		
		Lect.	Hrs.	Hrs.			Lect.	Hrs.	Hrs.
AS 101	Air Force Today I	1	2	1	AS 102	Air Force Today II	1	2	1
Semester 3					Semester 4				
AS 201	Air Force Way I	1	2	1	AS 202	Air Force Way II	1	2	1
Semester 5					Semester 6				
AS 301	Air Force Leadership and Management I	3	2	3	AS 302	Air Force Leadership and Management II	3	2	3
Semester 7					Semester 8				
AS 401	Preparation for Active Duty I	3	2	3	AS 402	Preparation for Active Duty II	3	2	3
					Totals		16	16	16

GMC courses AS 101, 102, 201, and 202 academic curricula are included in the two-year program's six-week field training.

## ROTC: Military Science

### ROTC: Military Science

The principal objective of the college-level Reserve Officer's Training Corps (ROTC) program is to develop commissioned officers for the Active Army, the Army National Guard, and U.S. Army Reserve. Each course is designed to develop essential qualities and traits of leadership required for success in either a civilian or a military career.

Instruction is offered through either a four-year or two-year program. The four-year program consists of the Basic Course (freshman and sophomore years) and the Advanced Course (junior and senior years). The two-year Advanced Course is open to students eligible for advanced placement through a variety of options. Both programs include attendance at Camp Adventure (a six-week advanced summer camp) just prior to commissioning.

### Faculty

#### Chair

LTC Patrick D. Flanagan  
University of Illinois at Chicago  
312-996-3451

#### IIT Program Director

Cpt. David Chovancek  
103 SB  
Ext. 77148

#### Professor

Flanagan

#### Assistant Professors

Chovancek, Gardiner, Henson

#### Instructors

Alton, Barstow, LaRoche



## ROTC: Military Science

### Basic Course

The basic course is an introduction to Military Science and carries no military obligation. Completion is a prerequisite to enrollment in the Advanced Course. Prior service, com-

pletion of basic combat training through the National Guard or Reserve, or completion of Camp Challenge may be substituted for the Basic Course.

### Advanced Course

All cadets who successfully complete the Basic Course, meet the physical and academic requirements, and pass an officer-qualification test and a physical examination are eligible for selection by the Professor of Military Science for the Advanced Course. A tax-free subsistence allowance of \$150 per month is paid to each cadet in the Advanced Course except during

attendance at summer camp, when pay is approximately \$100 per week. Upon graduation and successful completion of the Advanced Course and the Professional Military Education Requirements (PMEs), cadets are commissioned as second lieutenants in the Active Army, the Army Reserve, or the National Guard.

### Summer Camp

Cadets are paid approximately \$700 during both Camp Challenge (the Basic Camp), and Camp Adventure (the Advanced Camp). Travel to and from camp is at government

expense. Meals, housing, medical care, uniforms, and equipment are furnished.

### Professional Military Education Requirements (PMEs)

In order to receive a well-rounded education, cadets are required to complete courses in the following areas: advanced

written communications, human behavior, military history, computer literacy, and math reasoning.

### Simultaneous Membership Program (SMP)

Membership in the Army National Guard or United States Army Reserve offers cadets additional experience as officer trainees, and these individuals will receive both the ROTC

subsistence allowance and drill pay. They may also receive additional money while attending school.

### Financial Assistance

In addition to a monthly subsistence of \$150, the program offers two, three and four-year federal Army ROTC scholarships, up to \$16,000 per year to qualified students. IIT offers

an excellent incentive package to scholarship winners. For further information, call 312.567.7553 or visit the Military Science Office.

## ROTC: Military Science

### ROTC: Military Science Curriculum

Semester 1				Semester 2			
	Lect.	Hrs.	Cr.		Lect.	Hrs.	Cr.
MILS 010	1	0	1	MILS 102	1	2	1
MILS 101	1	2	1	MILS 148*	0	3	2
MILS 147*	0	3	2	Totals	1	5	3
Totals	2	5	4				
Semester 3				Semester 4			
MILS 201	2	2	2	MILS 202	2	2	2
MILS 247*	0	3	2	MILS 248*	0	3	2
Totals	2	5	4	Totals	2	5	4
Semester 5				Semester 6			
MILS 301	3	2	3	MILS 302	3	2	3
MILS 347**	0	3	2	MILS 348**	0	3	2
Totals	3	5	5	Totals	3	5	5
Semester 7				Semester 8			
MILS 401	3	2	3	MILS 402	3	2	3
MILS 447**	0	3	2	MILS 448**	0	3	2
Totals	3	5	5	Totals	3	5	5

\* MILS 147-48/247-48 (Aerobic Conditioning) are required for all scholarship cadets in the Basic Program.

\*\* MILS 347-48/447-48 (Aerobic Conditioning) are required for all Advanced Course cadets.

## ROTC: Naval Science

The Naval Reserve Officers Training Corps (NROTC) offers an opportunity for young men and women to qualify for a commission in the U.S. Navy or U.S. Marine Corps while attending college. While pursuing their academic studies, midshipmen of the NROTC unit receive a professional education and the necessary specialized training to qualify them to become commissioned Navy or Marine Corps officers.

As commissioned officers in the United States Navy, graduates may serve in one of the various components of the U.S. Fleet, such as surface ships, the aviation community, or nuclear power submarines. Of particular interest is the

opportunity to serve as an operating engineer aboard a nuclear or conventionally powered ship. The theoretical knowledge obtained at IIT is combined with practical knowledge and early responsibility in the operation and management of the latest in missile, aircraft, and high-performance ship propulsion systems.

Students may request the option to become officers in the U.S. Marine Corps. A commission in the Marine Corps may lead to a specialization in aviation, infantry, engineering, armor, communications, or supply.

## Faculty

### Chair

Capt. Michael D. Besancon  
217 Stuart Bldg.  
Ext. 73530

### Professor

Besancon

### Associate Professor

Yaple

### Assistant Professors

Buch, Carroll, Crawford, Mahaley

## ROTC: Naval Science

### ROTC: Naval Science Undergraduate Study

The objective of the program in Naval Science is to supplement the student's academic study with specialized education in naval subjects and practical training and experience so that upon commissioning the future officer can become a productive member of the naval community. Active duty naval officers are assigned as instructors in the NROTC unit. It is their responsibility to assist the students in translating the theoretical knowledge they receive into the practical skills and knowledge they will require after commissioning and to provide both professional and personal counseling.

Classroom experience is principally directed toward providing education in those technical areas that are peculiar to the

naval environment, for example, navigation. Knowledge of customs and traditions of the service is provided through seminars and contact with Navy personnel. During the summer, students are assigned to naval ships and stations where their education as future naval officers is enhanced by on-the-job training. Scholarship NROTC students receive about four weeks of summer training each year; College Program students attend training during the summer preceding their last academic year. Between their third and fourth years, Marine Corps NROTC students will attend a summer training program at the Marine Corps Development and Education Command in Quantico, Virginia.

### Scholarship Program

NROTC scholarship students are selected by nationwide competition. The NROTC Scholarship pays for tuition, books, and fees and provides a tax-free stipend each month

for four years. Graduates are commissioned as naval officers and incur an obligation of four years of active duty.

### College Program

Admission to the College Program is controlled by the Professor of Naval Science. Students incur no obligation to the naval services for participation in this program until their junior year. Qualified students enrolled in this program may be recommended for scholarships by the Professor of Naval

Science. In addition to uniforms and some naval science books issued to students enrolled in this program, the Navy provides a tax-free stipend each month during the junior and senior years. Graduates are commissioned as Reserve naval officers and incur an obligation of three years of active duty.

### Two-Year Programs

The Navy/Marine Corps offer two two-year programs; one of these is a Scholarship Program, the other is a two-year College Program. Students are selected before April 1 of their sophomore year and attend a six-week Naval Science institute

in the summer before entering their junior year. Scholarship benefits for the junior and senior year are identical to those received by students in the four-year program during their junior and senior years.

### Academic Requirements

Scholarship program students are encouraged to pursue majors in engineering and applied sciences to meet the technological demands of the modern Navy. Most other fields of study leading to a baccalaureate degree are permitted with the approval of the Professor of Naval Science. All Navy option scholarship program students are required to complete one year each of calculus and physics.

College program students and students enrolled in the Marine Corps option are encouraged to take courses in calculus and

physics or pursue a science or engineering major. In addition to the prescribed naval professional academic courses, the naval faculty conducts laboratories all four academic years to give students experience in practical leadership.

All scholarship students are required to complete a course in American Military Affairs or National Security Policy. Naval Science courses are not offered on a pass-fail basis.

### Optional Program

Students may select a minor in Naval Science. See page 109 for course requirements.

# ROTC: Naval Science

## ROTC: Naval Science Curriculum

Semester 1			Lab. Cr.			Semester 2			Lab. Cr.		
			Lect.	Hrs.	Hrs.				Lect.	Hrs.	hrs.
NS 101	Introduction to Naval Science	2	2	2		NS 202	Seapower and Maritime Affairs	3	2	3	
Semester 3						Semester 4					
NS 102	Naval Ships Systems	3	2	3		NS 201	Naval Weapons Systems	3	2	3	
Semester 5						Semester 6					
NS 301	Navigation & Naval Operations I	3	2	3		NS 302	Navigation & Naval Operations II	3	2	3	
Semester 7						Semester 8					
NS 401	Leadership and Management	2	2	2		NS 402	Naval Leadership and Ethics	2	2	2	
Marine Option											
Semester 5						Semester 6					
NS 310	Evolution of Warfare or	3	2	3		No Required Courses					
NS 410	Amphibious Warfare	3	2	3							
Semester 7						Semester 8					
NS 401	Leadership and Management	2	2	2		NS 402	Naval Leadership and Ethics	2	2	2	
						NS 410	Evolution of Warfare	3	2	3	

## Social Sciences

### Social Sciences

The Department of Social Sciences, which encompasses the disciplines of political science, sociology, and public administration, offers course work and awards degrees at both the undergraduate and graduate levels. The faculty has special strengths in the fields of urban government and politics, organization and management, policy analysis, and science and technology studies, and concentrates many of its courses in these fields of specialization.

An undergraduate program is offered leading to a Bachelor of Science with a concentration in political science, as are minors in political science, sociology and public administration. The department participates with other IIT

departments in offering interdisciplinary minors in Legal Studies, Law and Society, Technology and Human Affairs, and Urban Studies.

At the graduate level, the Department offers the masters degree in public administration (M.P.A.). Combined undergraduate B.S./M.P.A. degrees are offered combining several different undergraduate degrees with a master's degree in public administration. These combined degrees can usually be completed in five years. The department cooperates with the University's law school (Chicago-Kent College of Law) in offering a program leading to a bachelor's degree and law degree in six years instead of the usual seven years.

### Faculty

#### Chair

William J. Grimshaw  
214 Wishnick Hall  
Ext. 75129

#### Professor Grimshaw

Associate Professors  
Beam, DeForest, Segerstrale

#### Assistant Professors

Nippert-Eng, Peters

#### Adjunct Professors

Cohen, Gillio, Kuner, Maloney, Marcus, Markle,  
Pounian, Risley, Stafford

#### Faculty Emeritus

Goldman, Stover

## Political Science

Political science emphasizes making connections between the theory and practice of politics. Concerns range from perennial philosophical issues regarding justice, equality and freedom to practical political matters such as conflict resolution, collective decision making and public policy. Opportunities are provided to consider how theoretical understandings of politics can inform political action and how participation in politics offers the basis for understanding it.

Since the ancient Greeks, knowledge of the affairs of state has always been deemed essential for all educated citizens. A knowledge of political science is central to any occupation or profession that needs an understanding of human behavior and the relations between people and governments or the analysis and communication of information about public problems. A background in political science is virtually indispensable to people in politics and government, whether at the state, local or national level. A political science undergraduate degree is common for the following types of professionals: lawyers, journalists, policy analysts, planners,

scientists, business managers, politicians, or medical people. Such professionals are in constant need for information on and understanding of the political, legal, governmental, and public implications of their fields.

At IIT, most political science students emphasize American government, urban affairs, or public administration. A number of faculty also teach courses involving political and social issues relating to science and technology and to the workplace.

Students seeking a major in political science are required to complete 33 credits in political science. With department approval, up to 18 hours of course work in related fields may be applied toward this requirement. Majors are also required to complete an approved course in statistics and a course in research methods. Students seeking a minor in political science are required to complete 15 credits in political science. Additional courses may be required to prepare students for professional training and for entrance in their chosen professional field such as law or medicine.

## Sociology

Sociology may be defined as the study of societies, communities, organizations, and groups. It examines the structure and process of society and of the social groups that compose it. The focus is often on how people coordinate their activities to reach individual and collective goals in a wide range of settings including work, educational, religious, familial, and political settings.

Sociological analysis explores social situations from the standpoint of the roles, meanings, and norms that make behavior predictable and organized. It investigates how such patterns of interdependent activity arise and what sustains them; why

they take one shape instead of another; how some change more rapidly than others; how they are related to each other, and how people justify and explain their organizations and activities. Thus the field provides an understanding of the crucial problems facing our rapidly changing society.

Sociology provides intellectual and research skills as well as a body of concepts and information useful to those entering numerous professions, including architecture, engineering, design, government, planning, social work, law, and medicine. Students completing a minor in sociology are required to take five 3-hour courses offered in the discipline.

## Minors

## Minors

Minors generally consist of five courses and are optional and frequently cross-disciplinary. Because they provide a coherent set of ideas, concepts, and educational experiences in a variety of areas, a student may find that they enhance his or her potential for professional development. A student who wishes to pursue a minor must consult with an adviser in his or her major department.

**NOTE:** Not all specialized minors are applicable to all majors. Some may require more than a normal course load to satisfy requirements.

Following are some sample minors.

**Aerospace Engineering** (ME majors only): MMAE 311, MMAE 312, MMAE 436, MMAE 441, MMAE 443, MMAE 452.

**Air Force Aerospace Studies:** AS 101, AS 102, AS 201, AS 202, AS 301, AS 302, AS 401, AS 402. Attendance at a 6-week field training camp may be substituted for AS 101, AS 102, AS 201 and AS 202.

**Applied Solid State Physics:** PHYS 348, PHYS 412, PHYS 415, and at least two of the following courses: PHYS 300, PHYS 405, PHYS 418, PHYS 427, PHYS 428, PHYS 437.

**Architectural Technology:** EG 105, EG 308, EG 309, EG 310, EG 312, EG 313.

**Architecture** (non-architecture majors only): ARCH 100, ARCH 109, either ARCH 113 or ARCH 400, either AAH 119 or AAH 120, and one of the following courses: ARCH 114, ARCH 200, ARCH 225, ARCH 309, ARCH 313 and ARCH 319. Those students preparing for competitive application to graduate programs in architecture are encouraged to select ARCH 114.

**Artificial Intelligence:** CS 200, CS 330, CS 331, CS 430, CS 480.

**Biochemistry:** BIOL 210, BIOL 225, BIOL 403, BIOL 404, BIOL 445, and either BIOL 515 or CHEM 538.

**Bioengineering:**

- **Biomedical specialization**-BIOL 107, CHE 411, and at least three of the following courses: BIOL 210, BIOL 214, BIOL 403, BIOL 414, BIOL 430, BIOL 445, CHE 492 and CHE 510.
- **Biochemical specialization**-BIOL 107, CHE 411, and at least three of the following courses: BIOL 210, BIOL 214, BIOL 403, BIOL 414, BIOL 445, CHE 492, CHE 577 and CHE 579.

**Biology:** BIOL 107, BIOL 109, and four additional courses in biology.

**Chemistry:** At least 15 credit hours must be completed from the following courses: CHEM 247; one of the sequences: CHEM 237, 239 or CHEM 343, 344; and electives chosen from: CHEM 321, CHEM 334, CHEM 335, CHEM 455.

**Circuits and Systems** (non-EE, non-CPE majors only): ECE 211, ECE 213, ECE 218 and one of the following sequences: ECE 308 and ECE 403, or ECE 308 and ECE 438, or ECE 309 and ECE 420.

**Computational Structures:** CS 200, CS 330, CS 331, CS 430, MATH 471.

**Computer Architecture:** At least 15 hours must be completed from the following courses: CS 200, ECE 218, CS 331, CS 350, CS 470, CS 471.

**Computer Networking:** CS 200, CS 331, CS 350, CS 450, CS 455.

**Construction Management:** CAE 470, CAE 471, CAE 472, CAE 473, ECON 423.

**Database Management:** CS 200, CS 325, CS 331, CS 425, CS 445.

**Electromechanical Design and Manufacturing** (AE and ME majors only):

- **AE majors:** MMAE 445, MMAE 485, MSC 312, ECE 218, ECE 242, ECE 441 (replaces PHYS 300).
- **ME majors:** MMAE 444, MMAE 485, MSC 312, ECE 218, ECE 242, ECE 441 (replaces PHYS 300).

**Energy/Environmental/Economics (E<sup>3</sup>):** Three or six credit hours in Special Problems, Projects, or Research in Energy. In addition, at least one course from each of the following three areas:

- **Energy Sources and Conversion:** CHE 465, CHE 481, CHE 483, CHE 565, CHE 566, CHE 582, MMAE 425 and ECE 319.
- **Energy and Power Distribution and Utilization/Environment:** CHE 430, CHE 482, CHE 489, MMAE 424, ENVE 404, ENVE 463, ENVE 476, ENVE 480, ENVE 485, ECE 411, ECE 419, ECE 420, ECE 434, ECE 435, ECE 436, ECE 437, ECE 438.
- **Energy Analysis, Economics, and Policy:** CHE 426, CHE 541, CHE 543, ECON 423, LAW 330, PS 338, CS 480. Appropriate course substitutions may be made with the approval of the energy technology program advisers.



**Engineering Analysis:** MATH 332, MATH 402, MATH 461, MATH 471, MATH 488.

**Engineering Graphics and CAD:** EG 105, EG 305, EG 306, EG 405, EG 406, EG 419.

**Environmental Engineering:** ENVE 404, ENVE 463, ENVE 481 and two courses from the following: ENVE 401, EMVE 426 or CHE 426, ENVE 450, ENVE 476, ENVE 480, ENVE 485, ENVE 501, ENVE 506.

**Fire Protection and Safety Engineering:** CAE 421, CAE 422, CAE 424, CAE 425, CAE 426.

**Graphics and CAD for Non-Engineers:** EG 225, EG 325, EG 329, EG 425, EG 429.

**Health Care and American Society:** SOC 201, SOC 348, PS 351, PS 332 or SOC 301.

**History:** At least 15 credit hours must be completed, including at least 6 hours in European and 6 hours in American history on the 300 level or above.

**Law and Society:** At least 15 credit hours must be completed, including the following: PS 256, PS 318, SOC 348, PHIL 362.

**Literature:** At least 15 credit hours in 300-level English courses must be completed, including ENGL 337 or ENGL 338.

**Logic and Philosophy of Science:** At least 15 credit hours must be completed, including: PHIL 340, PHIL 341, and at least three of the following courses: PHIL 326, PHIL 335, PHIL 342, PHIL 343, PHIL 345, PHIL 350.

**Management:** ACCT 151, ECON 211, MGT 351 and two of the following three courses: ECON 423, MKT 371, and OM 312. Chemical engineering majors should also take CHE 426 or another engineering science course.

**Materials Engineering:**

- **ME majors only:** MMAE 361, MMAE 464, MMAE 474, MMAE 476 and one of the following courses: MMAE 467, MMAE 468, MMAE 482, MMAE 483, MMAE 486, or an approved IPRO.
- **AE majors only:** MMAE 361, MMAE 464, MMAE 474, MMAE 485 and one of the following courses: MMAE 467, MMAE 468, MMAE 482, MMAE 483, MMAE 486, or an approved IPRO.

**Mechanical Engineering** (AE majors only): MMAE 406, MMAE 431, MMAE 432, MMAE 433, MMAE 443, MMAE 485.

**Military Science:** MILS 101, MILS 102, MILS 201, MILS 107 or MILS 202 (these courses will at times be interchanged) or attendance at military training; MILS 301, MILS 302, MILS 401, MILS 402.

**Naval Science:** NS 101, NS 102, NS 201, NS 202 (attendance at the Naval Science Institute may be substituted for these courses), NS 301, NS 302, NS 401, NS 402.

**Marine Option:** MGT 351, NS 101, NS 202, NS 310, **NS 402, NS 410.**

**Music:** 15 credits in music theory or practice taken at VanderCook College of Music. Students should contact Educational Services concerning applicability of course toward graduation.

**Operating Systems:** CS 200, CS 331, CS 350, CS 351, CS 450.

**Organizational Psychology** PSYC 221, PSYC 301, PSYC 303, PSYC 310 or SOC 201, PSYC 409.

**Philosophy:** At least 15 credit hours of philosophy courses numbered 300 or above.

**Political Science:** At least 15 credit hours in political science must be completed, including at least nine hours above the 200 level.

**Polymer Science and Engineering:** CHE 450 or CHEM 435 and at least three courses from the following: CHE 492, CHE 538, CHE 555, CHE 575, CHE 581, CHEM 535, CHEM 537, CHEM 542, MMAE 467, MMAE 483, MMAE 487, MMAE 580; and at least one course from the following: CHE 426, CHE 489, CHEM 582, MMAE 451, MMAE 485, FPE 541.

**Premedical Studies** (engineering and computer science majors): This specialized minor is intended for those students who plan to apply to a medical school, and must be approved by the Premedical Advisory Committee.

- **Chemical Engineering:** BIOL 107, BIOL 109, BIOL 115, BIOL 117
- **Environmental Engineering:** BIOL 109, BIOL 115, BIOL 117, CHEM 239
- **Electrical Engineering:** BIOL 107, BIOL 109, BIOL 115, BIOL 117, CHEM 125, CHEM 237, CHEM 239
- **Materials Engineering:** BIOL 107, BIOL 109, BIOL 115, BIOL 117, CHEM 237, CHEM 239
- **Mechanical Engineering:** BIOL 107, BIOL 109, BIOL 115, BIOL 117, CHEM 125, CHEM 237, CHEM 239
- **Computer Science:** BIOL 107, BIOL 109, BIOL 115, BIOL 117, CHEM 124, CHEM 125, CHEM 237, CHEM 239, PHYS 223

## Minors

**Process Design and Operation:** At least three courses from the following: CHE 426, CHE 431, CHE 437, CHE 507, CHE 508, CHE 528, CHE 530, CHE 532, CHE 560; and at least two courses from the following (only one of the ENVE offerings): CHE 402, CHE 430, CHE 455 or CHE 555, CHE 465, CHE 475, CHE 476, CHE 489, CHE 492, CHE 571, CHE 572, CHE 577, ENVE 404, ENVE 450, ENVE 476, ENVE 485.

**Programming Languages:** CS 200, CS 331, **CS 350**, CS 351, CS 440.

**Psychology:** At least 15 credit hours must be completed, including the following two required courses: MATH 221, PSYC 221.

**Public Administration:** PS 200 or PS 201 and PS 351, PS 452, PS 462, SOC 311.

**Rehabilitation Services:** PSYC 410, PSYC 411, PSYC 412, PSYC 583, PSYC 584.

**Sociology:** SOC 200 or SOC 201, plus an additional 12 credits chosen in consultation with the Sociology faculty.

**Software Engineering:** CS 200, CS 331, CS 350, CS 351, CS 487.

**Statistics:** MATH 332, MATH 475, MATH 474, MATH 483, and either MATH 482 or MATH 487.

**Technical and Professional Communications:** ENGL 421, ENGL 423 and nine more credits of communication coursework in consultation with the director of the Program in Technical Communication and Information Design.

**Technology and Human Affairs:** At least 15 credit hours must be completed from the following: HIST 383, PHIL 370, PHIL 374, PS 332, PS 338, PS 339, SOC 303, **SOC 362**.

**Telecommunications:** CS 106, ECE 403,436, and two telecommunications electives chosen from CS 331, **CS 450**, ECE 448, or ECE 449.

**Urban Studies:** Four of the following courses: HIST 350, HIST 352, PS 315, PS 317, SOC 350 or SOC 411.

## Special Programs

### Double Undergraduate Degree Options

Depending upon their interest, capabilities, and goals, and with the permission of their advisers and department chairs,

students may design their own double undergraduate degree programs or select one of the options listed below.

### B.S. Chemical Engineering/B.S. Environmental Engineering

This &-year program is designed to train students to be knowledgeable in the fundamental principles of chemical engineering science and design and to have a clear understanding

of environmental issues and their assessment. For a full description of the program see page 60 in the departmental curricula section of this bulletin.

### B.S. Mechanical Engineering/B.S. Aerospace Engineering

Students interested in this program should consult an adviser from the Mechanical, Materials, and Aerospace Engineering Department.

### Bachelor Degree/Master Degree Options

IIT's double degree options allow students to earn two degrees in as few as five years. The university has created bachelor degree/master degree options in fields that are in demand in professions where graduate training is essential.

Students may enter some undergraduate/graduate double degree programs either through the Honors Track or the Standard Track. Through the Honors Track, exceptional students may be admitted simultaneously into both the undergraduate and graduate schools when they apply to IIT

Admission will be based on their high school records, including grades, test scores, and faculty/employer recommendation, and other documentation. Through the Standard Track, students are admitted into the undergraduate department offering the bachelor's portion of the program.

Depending upon their interests, capabilities, and goals, and with the permission of their advisers and department chairs, students may design their own combined degree programs or select one of the following options.

### Bachelor/Master of Business Administration

One of the most appealing career preparations is the combination of a bachelor's degree with the Master of Business Administration (M.B.A.) degree. IIT students who complete the necessary undergraduate management courses may earn both the bachelor's degree and the M.B.A. degree in about five rather than the usual six years. An exception exists in the case of architecture, where qualified students may earn a bachelor's degree and the M.B.A. degree in about six rather than the usual seven years. The undergraduate courses listed below, when included as part of the bachelor program, replace graduate courses which are part of the M.B.A. program. This allows students to complete the M.B.A. with as few as 16 courses.

Take as undergraduate:	Advanced standing in graduate school for:
ACCT 151	MBA 510
MGT 351	MBA 520
OM 312	MBA 570
MKT 371	MBA 560

Students who are considering the bachelor/M.B.A. program should consult with the Stuart School of Business Undergraduate Programs adviser as early as possible in their academic career in order to plan a program enabling them to receive the maximum number of advanced standing credits toward their M.B.A. Formal application to the M.B.A. program, which includes a GMAT score, should be submitted prior to the completion of the seventh semester of the bachelor's program.

# Special Programs

## Bachelor of Architecture/Master of Business Administration

Qualified students may earn both the Bachelor of Architecture and Master of Business Administration degrees in about six rather than the usual seven years. Students who are completing their eighth semester or an equivalent of 124 credit hours in architecture at IIT may apply for entry into the joint program. They should take preparatory courses for the M.B.A.

prior to entry and the Graduate Management Admission Test during the eighth semester. Students who anticipate entering the program should seek advising in the Stuart School of Business and the College of Architecture early in their studies at IIT.

## Bachelor of Architecture/Master of Civil Engineering

Qualified students regularly enrolled at IIT may earn both the Bachelor of Architecture and Master of Civil Engineering (M.C.E.). They must complete preparatory courses for the M.C.E. prior to entry into the combined program. Students who anticipate entry into the combined program and who intend to specialize in structural engineering must successfully complete the following courses as part of their undergraduate program in architecture: MATH 151, MATH 152, MATH 251, CAE 303, CAE 304, CAE 307, CAE 310, CAE 437, and CAE 438 in place of MATH 119, MATH 122, CAE 287, CAE 351, CAE 352, and as

technical electives. Students who anticipate entry into the combined program and who intend to specialize in construction engineering and management must successfully complete the following courses as part of the technical electives in their undergraduate program in architecture: CAE 323, CAE 437, CAE 438, and CAE 457.

Students who anticipate entering into the program should seek advising in the Department of Civil and Architectural Engineering and the College of Architecture early in their studies at IIT.

## Bachelor of Science/Master of Public Administration

The requirements for the B.S. in political science and Master of Public Administration (M.P.A.) degree may be completed in five years. Qualified students interested in careers in the public sector are encouraged to begin their preparation at the undergraduate level and follow a course of study that will allow them to move directly into the M.P.A. program. Students would enroll as political science majors and would obtain the B.A. at the end of the fourth year. Any time after the fourth semester, students can request admission to the

M.P.A. program. Students granted provisional admission are then allowed to take one graduate public administration course each semester counted as part of their undergraduate program and also as part of their M.P.A. degree. A final decision on M.P.A. admission is made during the eighth semester, at the end of which the B.A. in political science is awarded. If a student is admitted to the M.P.A. program, the remaining course requirements are completed during the fifth academic year.

## Combined Undergraduate/Graduate Law Programs (Leading to B.S./J.D. degrees)

Students in these programs do their undergraduate program at the Main Campus of IIT and the law school portion of the program at IIT's Chicago-Kent College of Law. Several combined undergraduate and graduate law degree programs are available. Political science and psychology majors in these programs can complete an undergraduate degree and law degree in six rather than the usual seven years. Students with

other majors who enter with substantial college credit, or who place out of a substantial number of courses may also complete both degrees in six years.

Pre-law undergraduate students also have access to seminars, pre-law advising, assistance preparing for the LSAT, pre-law internships and mentoring program.

## Special Programs

### Honors Law Program

Students apply to both the undergraduate program and the law school prior to the beginning of their freshman year and may receive admission to both the undergraduate program and the J.D. program at the time of their matriculation. Admission to the J.D. program is conditioned upon the following prior to beginning law school class work:

- a) maintaining a record which the law school director of admissions determines to be consistent with the character and fitness requirements of the bar examining authorities
- b) taking the LSAT exam
- c) completing a law school application

- d) fulfilling the undergraduate general education requirements and other requirements specified by their home department for students in the Honors Law Program.
- e) completion of required undergraduate courses

Students who major in political science or psychology normally complete both their B.S. and J.D. degrees in six instead of the usual seven years. Students in other majors who enter with sufficient college credit or who place out of a substantial number of courses may also accelerate the completion of both degrees, finishing in six instead of the usual seven years.

### Combined B.S./J.D. Program

This program is available to qualified students who are already enrolled at IIT. Students may apply to this program after their sophomore or junior year. Generally students with a GPA of 3.25 and an LSAT equal to the median score at the law school are admitted to the program. Students who can complete their general education and major course requirements prior to the beginning of the fall semester of their senior year can complete their undergraduate and law degrees in six years instead of the usual seven. Engineering majors usually take seven years to complete the program.

Admission to the law school during a student's sophomore year is contingent on the student maintaining a record which the law school director of admissions determines is consistent with the character and fitness requirements of the bar examining authorities. Students interested in this program should notify the pre-law adviser as soon as possible in order to obtain assistance in planning course schedules to meet both law school and undergraduate course requirements in the minimum amount of time.

### B.S./M.D. Programs

In addition to premedical studies, IIT offers two dual degree programs in which high-ability applicants simultaneously go through a joint admissions procedure at IIT and a participating medical school. Students earn a bachelor's degree from IIT and a medical degree from the medical school. The MCAT will not be required for admission but may be

required for tracking purposes. These innovative programs are designed to meet the urgent and intensifying need for technologically proficient physicians and researchers. For more information, contact the Office of Undergraduate Admission, 312.567.3025.

### IIT/Chicago Medical School Honors Program in Engineering and Medicine

The IIT/CMS Honors Program in Engineering and Medicine is an eight-year program open to freshman applicants, in which students complete their undergraduate degree at IIT in chemical engineering, mechanical engineering, electrical engineering, computer science or molecular biochemistry and biophysics during the first four years of the program. The

final four years are spent at the Finch University of Health Sciences/The Chicago Medical School, during which the student earns the M.D. degree.

## Special Programs

### IIT/Rush Medical College Combined Honors Engineering and Medicine Program

(Junior year transfer program)

The IIT/Rush Medical College program is a six-year program which begins in the student's junior year. It is open to IIT sophomores and to students attending other colleges or universities who transfer to IIT at the end of their sophomore year. Students admitted to this program will complete their undergraduate degree at IIT in chemical engineering,

mechanical engineering, electrical engineering, computer science or molecular biochemistry and biophysics during the first two years of the program. As part of this experience they will participate in a year-long research project that bridges engineering, science and medicine. The final four years are spent at Rush Medical College, during which time the student earns the M.D. degree. This program is designed for students who intend to become research-oriented physicians.

### International Education

IIT encourages students of all majors to consider studying abroad for part of their undergraduate career. Studying abroad enriches the college experience by providing a differ-

ent intellectual or cultural environment and often enriches the academic program by providing special research facilities or by giving breadth to the major discipline.

### Exchange Programs

IIT has undergraduate exchange programs with the following universities: Robert Gordon University, Scotland, architecture; Institute National des Sciences Appliquées (INSA), Lyon, France, engineering; Ecole Supérieure des Travaux Publics (ESTP),

Paris, engineering. Students interested in exchange programs should first contact the associate dean of the Undergraduate College and then the director of the International Cultural Center during their second year of study.

### Study Abroad Opportunities

IIT requires students to submit academically sound plans prior to participating in a study abroad program. The application process begins the year before study abroad is anticipated. Contact the International Center (IC) for information on universities that have study abroad relationships with IIT.

Application forms as well as a set of procedural guidelines for study abroad may be obtained from the IC or from the Undergraduate College.

Students wishing to study abroad must verify their eligibility with both the associate dean of the Undergraduate College and the director of the IC.

## Post-Baccalaureate Certificate and Certificate Programs

### Certificate Programs

The Department of Civil and Architectural Engineering offers two certificate programs: one in Architectural Technology and one in Engineering Graphics and CAD. These programs are designed to prepare specialists in graphics for positions in business and industry. Students

completing the specified courses with satisfactory grades will be awarded a Certificate of Completion. Consult the Civil and Architectural Engineering section in this bulletin for further information.

### Post-Baccalaureate Certificate Programs

IIT offers a number of certificate programs at the graduate level including Bioengineering, Computer Networking and Telecommunications, Computer Science, Construction Management, Earthquake and Wind Engineering Design, Electrical and Computer Engineering, Energy/Environment/Economics, Environmental Studies, Food Process Engineering, Geoenvironmental Engineering, Infrastructure Engineering

and Management, Intelligent Information Systems, Process Operations Management, Psychology, Software Engineering, Technical Communication, Transportation Systems Planning, and Wireless Communications Engineering. For information on Post-Baccalaureate Certificate Programs, please consult the Graduate College.

### Premedical Programs

IIT provides excellent preparation for students planning to attend medical or other health-related professional schools. Students majoring in various fields, listed below, earn a B.S. degree and, at the same time, fulfill the prerequisites for medical school:

- Applied Sciences for the Professions, with a concentration in Biology, Chemistry, Molecular Biochemistry and Biophysics, Physics or Psychology (see p. 32, 37, 92).
- Engineering (Chemical, Environmental, Electrical, Metallurgical and Materials, Mechanical) with a minor in Premedical Studies (see p. 109).
- Computer Science with a minor in Premedical Studies (see p. 109).

Rapidly advancing technology is changing the practice of medicine. Physicians who have a strong technical background will be among the best prepared to utilize the new technology. IIT's curricula emphasize technical proficiency as well as communication and teamwork, which help students develop the interpersonal skills that are critical in the health professions.

Students interested in pursuing careers in medicine, pharmacy dentistry, osteopathy, optometry, and veterinary should contact the Premedical Office for further information.

Each student works with a departmental premedical adviser to structure a course of study to meet medical school requirements and to prepare for the Medical College Admission Test in the Junior year.

The following is a list of IIT science courses that fulfill the premedical requirements of most medical schools: CHEM 124, CHEM 125, CHEM 237, CHEM 239, PHYS 123, PHYS 221, PHYS 223, BIOL 107, BIOL 109, BIOL 115, BIOL 117. To improve MCAT scores, BIOL 403 and BIOL 404 are recommended instead of BIOL 117. To improve performance during first year in medical school, BIOL 430 and BIOL 445 are recommended.

The Premedical Advisory Committee members monitor academic progress, gather information about volunteer and research opportunities, guide the student through the medical school application process, advise in choosing a medical school and in preparation of the AMCAS application, collect and prepare recommendation letters, and assist in preparation for interviews with medical school admission committees.

#### Premedical Advisory Committee:

Anna Dollar (chair) MMAE  
Dean Chapman BCPS  
Martha Evens CSAM  
Krishna Pagilla CHEE  
Satish Parulekar CHEE  
Robert Roth BCPS  
Tamara Sher PSYC  
Miles Wernick ECE

#### Premedical Office:

116 Engineering 1  
312.567.8852

#### Premedical Programs Home Page:

<http://www.iit.edu/~premed/>

## Special Programs

### Post-Baccalaureate Premedical Program

IIT prepares college graduates for application and admission to medical school. In many cases post-baccalaureate students were not pre-med in college and took few, if any, premedical science courses. In other cases, post-baccalaureate students are not recent graduates and wish to refresh their knowledge, improve their grade point averages, or prepare for the Medical College Admission Test (MCAT). Post-baccalaureate

students enroll on full-time or part-time basis in regular courses along with other IIT students and are advised by the IIT Premedical Advisory Committee. Students in the program have complete access to courses, faculty advising, student services, and campus facilities.

For more information, contact the Premedical Office.

### Reserve Officers Training Corps (ROTC)

ROTC programs are available as minors in the regular IIT degree programs. These programs enable men and women to become commissioned officers in the U.S. Air Force, Army, Marine Corps, or Navy upon graduation with a bachelor's

degree. ROTC/IIT combined scholarships in many cases allow winners to attend IIT free of charge. Contact the IIT Admission Office or any of IIT's ROTC departments for scholarship/program information.

### VanderCook College of Music

Full-time IIT students in good standing may take courses offered at VanderCook College of Music without additional tuition payment. Some non-performance VanderCook courses may be used to satisfy part of the general education requirement for an IIT degree. Performance courses may be used as free electives.

Admission to VanderCook courses is on a space-available basis, and students may be asked to audition or satisfy other requirements prior to acceptance into a VanderCook course.

IIT students wishing to take courses at VanderCook College of Music should contact the Office of Educational Services or the Undergraduate College Office for further information.



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## Course Descriptions

Numbers in parentheses indicate (lecture hours-laboratory hours-credit hours).

### Letters in parentheses

- (C) identifies courses that fulfill the communications General Educational Requirements
- (D) CAE design courses
- (H) identifies courses that fulfill humanities General Educational Requirements
- (N) identifies courses that fulfill natural science or engineering General Educational Requirements
- (P) ECE, CPE professional elective
- (S) identifies courses that fulfill social sciences General Education Requirements
- (T) CS technical elective.

## Art and Architectural History

### AAH 119,120

#### History of World Architecture I, II

Comprehensive background as well as concentration on individual cultures and their architects from ancient to modern times. Discussion of architectures from around the world. Specific details and expressions of more generalized theories and strategies will be explored. (3-0-3); (3-0-3) (C) (H)

### AAH 301

#### Thinking About Art

A course designed for those who find art pleasing, meaningful, or significant and who want to extend the range of their sensibilities. Theories of art will be studied for insight, as well as for historical interest and continuity. Works of art will be studied for their intrinsic value, for their relation to ideas and events, and as cultural artifacts. Regular visits to area museums and galleries will be required. Prerequisite: a 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### AAH 491

#### Independent Reading and Research

For advanced students. Prerequisite: Consent of the department. (Credit: Variable) (H) (C)

### AAH 494

#### Senior Seminar: Theories of Architecture in Historical Perspective

An investigation of the development of formal architectural theory in the West. Writings by architects from Vitruvius to the present will be studied, analyzed, and criticized. The relation between theory and practice will be emphasized. The implications of particular theories for such other questions as tradition, change, innovation, revolution, and meaning will be considered. Prerequisites: AAH 119, AAH 120 and ARCH 319, ARCH 320 or consent of instructor. (3-0-3) (C)

## Accounting

### ACCT 151

#### Financial and Managerial Accounting

Basic financial and managerial accounting topics: GAAP the major financial statements, accrual accounting, financial reporting alternatives, financial statement analysis, cost behavior, cost systems, short- and long-term decision-making and product costing. (3-0-3) Offered in fall and spring.

## Architecture

### ARCH 100,200

#### Introduction to Architecture

The fundamental objectives and philosophy underlining the architectural curriculum at IIT; the role of the architect as a professional related to the heritage of Chicago architecture; orientation to the local cultural, institutional, and architectural resources. (1-0-1); (1-0-1) (C)

### ARCH 109, 110

#### Freehand Drawing I, II

Drawing from still life, human figure, and architecture, both out-of-doors and in the studio; drawing from life in various mediums. ARCH 109 is prerequisite for ARCH 110. (0-4-2); (0-4-2)

### ARCH 113,114

#### Architecture Studio I, II

Studio exercises to develop excellence in craftsmanship and visual sensitivity as a foundation for a basic architectural language. Problems of various lengths will deal with the technical skills of drawing and model-making materials and in both two and three dimensions. Using problems of both an abstract and an architectural character, this course will build verbal communication skills and model shop ability. ARCH 113 is prerequisite for ARCH 114. (0-12-6); (0-12-6)

### ARCH 125

#### Introduction to Architectural Computing

Introduction to PC computing in architecture; covering basic concepts in word processing, spreadsheet, database, and business graphics and their use in architectural and engineering design; history and overview of computer use in a design office; introduction to computer programming using the BASIC language covering basic graphic concepts; and the use of the library and telecommunication facilities available on campus, including E-mail, CD-ROM, and Internet access. (1-2-3)

### ARCH 201,202

#### Architecture III, IV, Structures, Building Systems, and Assemblies

The development of architectural principles through the study and analysis of building materials. Development of the graphic language in architecture. Consideration of the appropriate use of materials, energy, and clear construction as the basis of architecture. Prerequisites: ARCH 113, 114. ARCH 201 is prerequisite for 202. (0-10-5); (0-12-6)

## Course Descriptions

### **ARCH 225**

#### **Computer-Aided Design in Practice**

This course reviews 2-D computer-aided design concepts. Prerequisite: ARCH 125. (0-3-3)

### **ARCH 305,306**

#### **Architecture V, VI**

Continued development of architectural principles of Arch 201 and 202 through the correlation of design process and building systems. Consideration of the interrelation of building, programming, site planning, structure, enclosure systems, energy consumption, and environmental control systems and the cultural concepts supporting their organization. Prerequisites: ARCH 201, 202. ARCH 305 is prerequisite for 306. (0-12-6); (0-12-6)

### **ARCH 309,310**

#### **Mechanical & Electrical Building Systems for Architects I, II**

Selection and design of building support systems: heating, ventilating, air conditioning, water supply, sanitary and storm drainage, power distribution, lighting, communications, and vertical transportation. Systems are analyzed for their effect on building form, construction cost, and operating efficiency. ARCH 309 is prerequisite for 310. (3-0-3); (3-0-3)

### **ARCH 313**

#### **Architectural Practice**

Lectures and practical problems dealing with specifications, specification writing, administration of construction, contracts, building law, and professional practice. (3-0-3) (C)

### **ARCH 314**

#### **Professional Practice: Building Case Studies**

Case study analysis of buildings, including the design process, building detailing, construction methods, government regulation, owner satisfaction and post-construction forensics. (3-0-3) (C)

### **ARCH 319**

#### **History of Modern Architecture**

These courses will offer specialized and advanced studies in the history and critical interpretation of architecture in the modern era. (3-0-3) (C)

### **ARCH 320**

#### **History of Chicago Architecture**

This course focuses on the Chicago School and offers specialized and advanced studies in the history and critical interpretation of various aspects of the related art, architecture and technology. (3-0-3) (C)

### **ARCH 321**

#### **History of Modern Thought in Architecture: 20th Century**

Mies, Gropius, Le Corbusier, and others constructed modernist canon as much with their manifestos-provocative, assertive, entirely subjective texts packaged in the rhetoric of objectivity-as with their buildings. This course studies the major texts and concepts that have produced architecture in the twentieth century. Study will be made of the modernist legacy and its basis in a canon that has experienced transformations across the course of decades, while retaining essential principles and mythic status today. (3-0-3) (C)

### **ARCH 331,332**

#### **Visual Training I, II**

Aesthetic expression as experience. Exercises in the study of form: proportion and rhythm, texture and color, mass and space. Exercises in visual perception and aesthetic judgment. Isolation and analysis; interdependence and integration of sensuous qualities. Aesthetic unity under restrictive conditions. ARCH 331 is prerequisite for 332. (3-0-3); (3-0-3)

### **ARCH 395**

#### **Technology as Design**

Since the development of cast iron as a viable construction material in the mid 1800's, there has been a path of architecture that has explored the open-ended possibilities of technology. Integrated within the culture, this determination to use the technology of one's time as the creative generator of a new evolving architecture becomes the historical precedent of the thesis of this course. (3-0-3)

### **ARCH 408**

#### **Freehand Drawing**

A multi-purpose drawing course offering students a chance to develop on-site sketching skills and creative expression

in drawing through a combination of sketching field trips and in-class drawing assignments. (0-3-3)

### **ARCH 409**

#### **Advanced Freehand Drawing**

Advanced development of freehand drawing skills in various mediums; still life, human figure, the natural and built environment; studio and field settings. Prerequisites: Arch 110, ARCH 408 or permission of the instructor. (0-3-3)

### **ARCH 417, 418**

#### **Architecture VII, VIII**

Structure as an architectural factor; space as an architectural problem; proportion as a means of architectural expression; the expressive value of materials; painting and sculpture in their relationship to architecture. Application of principles in comprehensive projects involving program, site, and code analysis. Prerequisites: ARCH 305, 306. ARCH 417 is prerequisite for 418. (0-12-6); (0-12-6)

### **ARCH 419,420**

#### **Architecture IX, X**

These studios represent the most extended and developed exercises in macro planning issues. First priority is given to the urgent needs of our environment such as housing, schools, or community buildings for urban centers; projects reinforce the entire curriculum, emphasizing complex relationships of buildings in an urban landscape taking all factors into consideration. Students increase their ability to make value judgments, and learn to critically review, test and improve conventional concepts of architecture relative to current demands placed upon the profession. These studios also offer students a variety of possible specialization topics. (0-12-6); (0-12-6)

### **ARCH 421,422**

#### **Energy Conscious Design I, II**

The application of energy conservation methods and renewable energy sources, such as wind power and passive solar systems, will be examined in the development of building energy budgets for a variety of building types. 421 is a prerequisite for 422. (3-0-3); (3-0-3)

## Course Descriptions

### **ARCH 423**

#### **Architectural Programming**

Study of the principles of problem definition, problem solving and decision-making in the process of design. Specific research methods are reviewed including those with computer-aided data collection potential. Course work includes: identification of client/project requirements and constraints; development of a building/project program; cost analysis; development of relevant design options; and presentation skills development. (3-0-3) (C)

### **ARCH 424**

#### **Architectural Construction Management**

A survey of the techniques and procedures of construction management as it relates to architectural practice. The organization of the building team, the collaborative design process, cost control, project scheduling, purchasing, accounting, and field supervision are described and documented. (3-0-3)

### **ARCH 425**

#### **Computer-Aided Design in Practice**

Review of drafting, modeling, and rendering computer hardware and software used in the practice of architectural design. Design and management issues are explored with the extensive use of PC CAD systems, including AutoCAD. Prerequisite: ARCH 125 or graduate standing. (2-2-3)

### **ARCH 426**

#### **3-D Modeling in CAD**

A review of 3-D modeling concepts, computer-aided rendering concepts and methods in the development of architectural design. Extensive use of PC CAD software is expected. Prerequisites: ARCH 425 and AutoCAD. (3-0-3)

### **ARCH 427**

#### **Image Processing in CAD**

Review of advanced methods in creating 2D and 3D images and their manipulation/transformation to produce architectural presentations, including scanning, image composition and texture cloning. Prerequisites: ARCH 425 and 426 or consent of instructor. (3-0-3)

### **ARCH 426**

#### **3D Animation in CAD Presentations**

Review 3D modeling concepts for animation, preparing camera movements, lighting conditions, special effects, and the digital editing of animation sequences. Extensive use of PC animation and editing software. Prerequisites: ARCH 425 and 426 or consent of instructor. (1-4-3)

### **ARCH 429**

#### **CAD Programming**

Review programming in CAD systems; programming basics in AutoCad, extensive creation of 2D and 3D objects, data interrogation, manipulation, and extraction, and 2D and 3D parametric and rule-based design. Investigation of form creation, based on mathematical relationships and random generation. Prerequisites: ARCH 425 and 426 or consent of instructor. (1-3-3)

### **ARCH 441. 442**

#### **Landscape Architecture I, II**

The natural landscape as a basis of landscape work. Ecotones and their relation to vital habitats including plant materials, their selection and installation. The focus will be on housing with its associated planting including various gardens both formal and informal. ARCH 441 is a prerequisite for ARCH 442. (2-2-3); (2-2-3)

### **ARCH 460**

#### **Chicago Architecture Practicum**

This course synthesizes the subject of architecture through a series of presentations and field trips. Students lead the ARCH 200 class in exercises on observation and documentation of the urban environment. Prerequisite: Consent of instructor. (1-4-3)

### **ARCH 467**

#### **Advanced Materials Workshop**

This course is designed to involve the students with the architectural craft of materials that can be applied to model and prototype construction. Included will be industrial tours and a product of the student's own choosing. (1-4-3)

### **ARCH 469**

#### **Drawing From Travel**

A drawing course that develops the perceptual and technical skills critical to drawing in the field. Particular emphasis

will be placed on the freehand travel sketch and its capacity to evoke both the physicality and character of a place. Production of a comprehensive drawn record of travels in the form of a journal/sketchbook is required. Various media will be explored. Requisite: European Study Program. (0-6-3)

### **ARCH 469**

#### **Urban Design in Europe**

This seminar course will explore current notions of urbanity as observed in the built environment of some cities in Europe. Projects and discussions will complement the design work undertaken in the architecture design studio. Assignments will focus on documentation and analysis of the various daily patterns and rituals of habitation. Requisite: European Study Program. (3-0-3)

### **ARCH 470**

#### **Image City: Mediation of Space**

This seminar surveys the interaction between media and the city from the 19th century to the present. A history of the technological innovations of the last two hundred years turns out to be in large part a history of the development of the contemporary city, and no account of contemporary urban issues can be considered complete without taking into account the role played in our lives by the media. Accordingly, every space we encounter or create has to be considered mediated. (3-0-3)

### **ARCH 471**

#### **Architecture and the City**

Students will investigate in a seminar format the development and design of cities through the analysis of urban culture, society, economics, government, economy, and architectural theory. (3-0-3)

### **ARCH 473**

#### **Conflict and Time**

This seminar employs comparative studies of other arts, in particular cinema, to illuminate architectural esthetics and the creative process. (3-0-3)

### **ARCH 474**

#### **Production/Design**

This seminar examines aspects of design in motion pictures. The premise underlying the course is that the act of perception constitutes an act of design; we produce and design the world

## Course Descriptions

we perceive. This becomes particularly evident through analysis of the artificially constructed, illusory reality of films. (3-0-3)

### **ARCH 485, 486**

#### **Structural Design in Architecture I, II**

This course reviews fundamental concepts in statics and strength of materials, calculations of the stresses and deflections in statically determinate systems, including beams, trusses, frames and arches. The design of steel compression, tension and flexural members, and the behavior of reinforced concrete, will all be explored. Computer programs will be used to analyze statically indeterminate systems. ARCH 485 is the prerequisite for ARCH 486. **(3-0-3); (3-0-3)**

### **ARCH 499**

#### **Long Span and Special Structures**

Introduction of structural systems for long spans and special structures. The structural behavior will be discussed and the required strength and stiffness will be evaluated. Individual projects will be assigned to students to be presented at the end of the course. (3-0-3)

### **ARCH 499**

#### **Structural Systems for Tall**

#### **Buildings and Long Span Structures**

This course reviews the historical development of the interaction of the structure with architecture and explores future trends and directions. The suitability of different materials and systems will be studied, with emphasis placed on efficiency. (3-0-3)

### **ARCH 494**

#### **Senior Theory Seminar**

An investigation of the development of formal architectural theory in the West. Writings by architects from Vitruvius to the present will be studied, analyzed, and criticized. The relation between theory and practice will be emphasized. The implications of particular theories for such other questions as tradition, change, innovation, revolution. (3-0-3)

### **ARCH 497**

#### **Special Projects**

Independent study of projects and problems. Students must be advised and have consent of the instructor and approval of the dean. (Credit: Variable)

## **Air Force Aerospace**

### **AS 101**

#### **Air Force Today I**

Survey course introduces students to the U.S. Air Force and Air Force ROTC, Air Force customs, core value and Air Force installations. Leadership Laboratory develops leadership potential and ability to work with small units. (1-2-1) (C)

### **AS 102**

#### **Air Force Today II**

Continuing study of topics covered in AS 101. Basic principles of leadership, communication skills, Air Force organizational structure and missions. Leadership Laboratory continued. (1-2-1) (C)

AS 147, 148, 247, 248, 347, 348, 447, 448

#### **Air Force Physical Training**

This course is offered to increase cadet's levels of physical fitness and to emphasize the importance of a healthy lifestyle. (0-3-2)

### **AS 201**

#### **Air Force Way I**

Survey course designed to facilitate the transition from Air Force cadet to Air Force ROTC candidate. Air Force heritage, Air Force leaders, Quality Air Force and introduction to ethics and values. Leadership Laboratory continued. (1-2-1) (C)

### **AS 202**

#### **Air Force Way II**

Continuing study of topics covered in AS 201. Concepts of ethical behavior, basics of leadership, Air Force officer environment, group leadership problems, and oral communication application. Leadership Laboratory continued. (1-2-1) (C)

### **AS 301**

#### **Air Force Leadership and Management I**

Study of leadership and quality management fundamentals, professional knowledge, Air Force doctrine, leadership ethics and communication skills required of an Air Force junior officer. Advanced Leadership Laboratory complements this course by providing leadership experiences in officer-type activities. (3-2-3) (C)

### **AS 302**

#### **Air Force Leadership and Management II**

Study of Air Force officer's responsibilities in counseling and feedback process, responsibility and authority of an Air Force officer and selected concepts, principles and theories of quality Air Force leadership and management. Continuation of Advanced Leadership Laboratory. (3-2-3) (C)

### **AS 401**

#### **Preparation for Active Duty I**

Study of the national security process, regional studies, advanced leadership ethics, Air Force doctrine and selected determinants and constraints relating to the use of national power. Special topics include the military as a profession, officership and military justice. Advanced Leadership Laboratory for development and practice in dealing with large and more complex groups. **(3-2-3) (C)**

### **AS 402**

#### **Preparation for Active Duty II**

Study of the responsibility, authority and functions of an Air Force commander and staff officer, Air Force issues, roles and missions. Continued emphasis on refining communications skills. Discussion of officer commissioning which will facilitate a transition from civilian to military life. Advanced Leadership Laboratory. (3-2-3) (C)

### **Leadership Laboratory**

A study of Air Force customs and courtesies, drills and ceremonies, issuing military commands, instructing, directing and evaluating the preceding skills, studying the environment of an Air Force officer and learning about the areas of opportunity as available to commissioned officers. Planning and controlling of military activities of the cadet corps, preparation and presentation of briefings and other oral and written communications. Providing interviews, guidance and information which will increase the understanding, motivation and performance of other cadets.

# Course Descriptions

## Biology

### BIOL 100

#### Introduction to the Profession I

Introduction to the biological sciences, scientific method, computing tools, and interrelations of biological sciences with chemistry, physics and other professions. (2-0-2) (C)

### BIOL 101

#### Introduction to the Profession II

Continuation of BIOL 101.

Applications of scientific fundamentals to basic problem solving in biological sciences. (2-0-2) (C)

### BIOL 107

#### General Biology Lectures

This course emphasizes biology at the organismal level. It provides an introduction to the study of the structure and function of plants and animals, their origin and evolution, their reproduction and genetics, their diversity and ecological relations. BIOL 107 and 109 plus BIOL 115 and 117 constitutes a one-year sequence in biology. Acceptable as part of the science component of the General Education Program. (3-0-3)

### BIOL 109

#### General Biology Laboratory

A laboratory course to accompany BIOL 107. Prerequisite: Concurrent or previous enrollment in BIOL 107. (0-2-2) (C)

### BIOL 115

#### Human Biology

This course covers selected topics in biology of particular relevance to humans and to human health and disease. Topics include biology of human cells and selected organ systems; neurobiology including psychoactive drugs and drug addiction; development and birth defects; genetics and genetic diseases; toxicology; the immune system and immunologic diseases such as AIDS; human nutrition and nutritional effects; microbial human diseases. BIOL 115 plus BIOL 107 (General Biology) constitutes a two-semester sequence in science. (3-0-3)

### BIOL 117

#### Experimental Biology

A biology laboratory course to accompany BIOL 115. A cellular approach to the functional organization of organs and organ systems. Laboratories will include the application of experimental methods and techniques for understanding the relationships between cell function and structure. (0-2-2) (C)

### BIOL 210

#### Microbiology Lectures

A study of microorganisms and their relation to water, sanitation, soil, disease, biotechnology, bioremediation, bioinformatics and genetic engineering. Prerequisite: BIOL 107 or 115 or equivalent. (3-0-3)

### BIOL 214

#### Genetics and Genetic Technology

An introduction to genetic engineering and genetics designed for both biology and other science majors. The course will focus on how the study of genetics has been adapted, from contemporary recombinant DNA research to the solution of various practical problems in biotechnology, agriculture, the environment, and the diagnosis and treatment of disease. Basic aspects of transmission, molecular, and population genetics will serve as the background. Prerequisite: One semester of college-level biology, e.g., BIOL 107 or 115, or consent of the instructor. (3-0-3)

### BIOL 225

#### Microbiology Laboratory

Isolation and identification of microorganisms, microbial growth, design of culture media, microorganisms as biocatalysts, environmental microbiology, quantitative microbiology, introduction to microbial genetics and genetic engineering. Prerequisites: BIOL 210 or consent of instructor. (0-4-2) (C)

### BIOL 301

#### Literature Survey/MCAT Preparation

A course to familiarize premed students with the biology literature and prepare them for MCAT examinations. (1-0-1)

### BIOL 320

#### Biological Literature

Library research on an advanced topic in biology, directed by a faculty member. (0-4-2) (C)

### BIOL 403

#### Biochemistry Lectures

Molecular organization of cell structures, cell membranes. Proteins, nucleic acids, carbohydrates and lipids, their molecular structure, characterization, chemical reactions. Enzymes and enzyme-catalyzed reactions and metabolism. Prerequisite: BIOL 107 or 115 and CHEM 237. (4-0-4)

### BIOL 404

#### Biochemistry Laboratory

Analytical methods in the chemistry and metabolism of proteins, amino acids, and nucleic acids, including chromatography, spectrophotometry, electrophoresis. Enzyme reactions. Prerequisite: Previous or concurrent enrollment in BIOL 403. (0-6-3) (C)

### BIOL 414

#### Genetics for Engineering Scientists

A course in genetics and genetic engineering designed for advanced students in engineering and related disciplines. The course will cover genetics at the molecular, cellular, organismal, and population levels as a basis for discussions of practical applications of recombinant DNA technology in industry and the fields of medicine, agriculture, etc. A term paper on a topic integrating engineering and biological principles will be required in addition to in-class examinations. Prerequisite: Consent of the instructor. (3-0-3)

### BIOL 423

#### Microbial Genetics Laboratory

Quantitative techniques in microbial genetics including mutagenesis, isolation and characterization of mutants, hybridization, random spore analysis and gene complementation. Basic techniques used in recombinant DNA technology (genetic engineering) will include restriction enzyme analysis and mapping, cloning of DNA fragments into plasmid vectors, transformation of cells with recombinant DNA, isolation and analysis of recombinant plasmids, Southern blotting and PCR. Prerequisites: BIOL 210, 225, and 403. (1-6-3) (C)

## Course Descriptions

### **BIOL 430**

#### **Animal Physiology: Lecture**

Respiration; circulation; energy metabolism; temperature regulation; water and osmotic regulation; digestion and excretion; muscle and movement; nerve excitation; information control and integration; chemical messengers. Emphasis on general principles with examples drawn from various animal phyla. Prerequisite: BIOL 107 or 115. (3-0-3)

### **BIOL 445**

#### **Cell Biology**

Modern studies of cell structure and function at the cellular, subcellular, and molecular levels. Topics include molecular components of cells, membranes, membrane bound organelles, microtubular and cytoskeletal components and principles of bioenergetics. Prerequisites: BIOL 107 or 115 and CHEM 237 or consent of the instructor. (3-0-3)

### **BIOL 446**

#### **Cell Biology Laboratory**

A laboratory course in cell biology to be taken concurrently with BIOL 445. (0-6-3) (C)

### **BIOL 490**

#### **Individual Study**

Prerequisite: Consent of instructor. (Credit: Variable; maximum 3 credit hours) (C)

### **BIOL 491**

#### **Biology Research Project**

An opportunity for advanced undergraduates to participate in research. A written report covering the procedures, data, and conclusion of the problem is required. Prerequisite: Consent of instructor. (Credit: Variable) (C)

### **BIOL 495**

#### **Colloquium**

Lectures by prominent scientists. Prerequisites: BIOL 107 and 115, or permission of instructor. This course may not be used to satisfy the natural science general education requirement. (1-0-1)

### **Graduate Courses**

Graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current *IIT Bulletin: Graduate Programs* for full descriptions.

### **BIOL 503**

#### **Viruses**

### **BIOL 513**

#### **Advanced Biochemistry**

### **BIOL 514**

#### **Toxicology**

### **BIOL 515**

#### **Molecular Biology**

### **BIOL 519**

#### **Biochemistry Laboratory**

### **BIOL 523**

#### **Methods in Microbial Genetics and Genetic Engineering**

### **BIOL 526**

#### **The Gene and Cell Development**

### **BIOL 527**

#### **Immunology and Immunochemistry**

### **BIOL 529**

#### **Applied Immunology**

### **BIOL 533**

#### **Laboratory in Cell and Molecular Biology**

### **BIOL 542**

#### **Advanced Microbiology Lectures**

### **BIOL 550**

#### **Industrial and Computational Biology**

### **BIOL 560**

#### **Microbial Physiology and Metabolism**

### **BIOL 561**

#### **Microbial Genetics and Genetic Engineering**

## **Civil and Architectural Engineering**

\* May only be taken by architecture students; not for civil and architectural engineering majors

### **CAE 100**

#### **Introduction to Engineering I**

Introduction to the profession; an introduction to engineering graphics as a problem-solving tool. Basic traditional techniques of orthographic projection, multiview sketching, isometric and oblique pictorials, sectioning, auxiliary views, dimensioning, detail drawing, use of ANSI standards; applications in civil and architectural engineering. (1-2-2)

### **CAE 101**

#### **Introduction to Engineering II**

A continuation of CAE 100. Application of PC-based CAD (computer-aided drawing and design) software to presentation and problem solving in civil and architectural engineering applications. Introduction to basic principles of design. Prerequisite: CAE 100. (0-4-2)

### **CAE 105**

#### **Geodetic Science**

Measurement of distances and angles. Theory of errors. Study of leveling traversing topographic mapping, route surveying, earthwork computation, photometry, and boundary surveys. Practice in the use of tapes, levels, transits, total stations and photogrammetric equipment. Corequisite: CAB 100. (2-2-3)

### **CAE 221**

#### **Engineering Geology**

Geology and its relationship to civil engineering; minerals; rocks; soil formation; geologic structure; groundwater hydraulics; frost action in soils, landslides, shoreline erosion, bluff instability; earthquakes; airphoto interpretation, soil and rock mechanics in relation to engineering geology; subsurface exploration; dams, reservoirs, tunnels; case-history illustrations. (3-0-3)

## Course Descriptions

### CAE 286\*

#### Theory and Concept of Structural Mechanics

Vectors, forces, free-body diagrams. Statics of particles and rigid bodies. Moments of forces, couples. Equations of equilibrium. Centroids, moment of inertia. Simple truss analysis. Cables. Strength of materials, stress and strains, stress-strain relations. Beam theory, shear and bending moment diagrams. Flexure and shear stresses, deflections. Prerequisite: MATH 122. (4-0-4)

### CAE 287\*

#### Structures I: Analysis and Behavior

Structural analysis, behavior of beams and frames. Buckling of columns. Stress calculations in trusses, cables, beams, and frames. Deflection of trusses and beams. Indeterminate systems, three-moment equations, computer application of structural analysis. Loads on structures, concept of design, definition of ASD and LRFD. Prerequisite: CAE 286. (3-0-3)

### CAE 301

#### Hydraulics and Hydrology

Collection and distribution of water. Flow of fluids through orifices, weirs, venturi meters. Laminar and turbulent flow in closed conduits. Open channel flow. Model analysis using the principles of dimensional analysis. Rainfall and runoff. Corequisite: MATH 252. (2-3-3)

### CAE 302

#### Fluid Mechanics and Hydraulics

Fundamental concepts; fluid statics; properties of fluid in motion; fluid flows through orifices, weirs, venturi meters; laminar and turbulent flow in closed conduits; flow in open channels; turbomachinery; measurement in fluid mechanics and hydraulics. Prerequisites: MATH 252. (3-0-3)

### CAE 303

#### Structural Design I

Design loads, factors of safety, load and resistance factors for steel and timber structures. Experimental and analytical study of steel and timber materials subjected to various states of stress. Failure theories, yield and post-yield criteria are treated. Fatigue and fracture mechanics phenomena are related to design practice. The design of

tension member, beams, and columns in steel and timber. Prerequisite: MMAE 202. (2-3-3) (D) (C)

### CAE 304

#### Structural Analysis I

The analysis of statically determinate trusses and frames. Determination of internal forces and calculation of deflections. Application of the principle of virtual work and energy methods. Column stability. Prerequisites: MMAE 202, MATH 252. (3-0-3)

### CAE 307

#### Structural Design II

Design loads, factor of safety, load and resistance factors for concrete structures. Properties of concrete-making materials and the proportioning of concrete mixtures. Experimental and analytical study of plain and reinforced concrete subjected to various states of stress. Failure theories and the ultimate strength of plain and reinforced concrete structural components. The design of beams, columns, and slabs in reinforced concrete. Prerequisites: MMAE 202,

#### CAE 304. (2-3-3) (D) (C)

### CAE 310

#### Structural Analysis II

The analysis of statically indeterminate frames. Application of classical methods including superposition, slope deflection, and moment distribution. Introduction to the direct stiffness method and computer analysis of structures. Prerequisite: CAE 304. (3-0-3)

### CAE 312

#### Engineering Systems Analysis

Applications of engineering and economic concepts and analysis to civil engineering systems; practical applications of elementary probability and statistics, operations research and economics in civil engineering. Prerequisite: MATH 251. (3-0-3) (C)

### CAE 315

#### Materials of Construction

Physical principles of elastic and plastic deformation of construction. Mechanical testing methods including tensile, compressive, toughness, creep and fatigue. Properties of aggregates, concrete, masonry, wood, bituminous material, iron and steel and other construction

materials. The emphasis is on concepts from solid mechanics which explain the behavior of materials to the extent needed in the design of load-bearing constructs. Prerequisite: MMAE 202. (2-3-3) (C)

### CAE 323

#### Soil Mechanics

Physical and mechanical properties of soils; elementary principles of soil identification and testing. Principles of soil permeability and seepage, consolidation, failure theories, earth pressures, and bearing capacity. Laboratory included. Prerequisites: MMAE 202, CAE 301. (2-3-3) (C)

### CAE 351\*

#### Structures II: Steel and Timber Design

Strength and behavior of structural steel. Design of steel tension, compression, and bending members. Steel truss and frame connection design and details. Beam-column design, base plate design and details. Strength and behavior of timber. Design of timber tension, bending, and compression members. Timber connections and details. Prerequisite: CAE 287. (3-0-3)

### CAE 352\*

#### Structures III: Reinforced Concrete and Masonry Design

Concrete as a material, behavior of reinforced concrete. Design of concrete beams, columns, one-way slabs, and simple footings. Detail of reinforcement. Deflection and cracking of concrete. Masonry structures, design of masonry load-bearing walls, reinforced and unreinforced masonry members. Prerequisite: CAE 287. (3-0-3)

### CAE 401

#### Building Systems Integration Studio I

Principles and elements of design; synthesis of structural, mechanical, electrical, sanitary, and construction, considering interrelationship in performance and economics. Emphasis will be given to system identification, typical usage and manner or means of integration. Prerequisites: CAE 111, 112, and senior standing. (1-3-2) (D)



## Course Descriptions

### CAE 402

#### **Building Systems Integration Studio II**

Continuation of CAE 401. An in-depth review of interference design. Design and detailed development of a major architectural project integrating all aspects of architecture and related disciplines in a professional manner and milieu. Prerequisite: CAE 401. (0-6-2) (D)

### CAE 408

#### **Bridge and Structural Design**

Design of modern bridges and other structures of steel and reinforced concrete. Prerequisite: CAE 437. (2-3-3) (D)

### CAE 410

#### **Introduction to Wind and Earthquake Engineering**

Kinematics of Particles, Newton's laws of motion, energy momentum. Kinematics of rigid bodies. Fundamentals of free, forced, and transient vibration of single and multi-degree of freedom structures. Analysis and design of structures for wind and earthquake loadings. Building code requirements. Prerequisite: CAE 310. (3-0-3)

### CAE 412

#### **Traffic Engineering Studies and Design**

Basic traffic engineering studies including traffic volume, speed, accident, and parking studies. Capacity and analysis for various traffic facilities. Design of traffic control devices. Prerequisite: Senior standing or consent of the instructor. (3-0-3) (D)

### CAE 415

#### **Pavement Design, Construction and Maintenance**

Pavement types, stresses in flexible and rigid pavements, vehicle pavement interaction. Mathematical models for pavement systems, subgrade support, design of flexible and rigid pavements. Construction procedure, drainage considerations, environmental effects. Rehabilitation and maintenance of pavements. Prerequisite: CAE 323. (3-3-4)

### CAE 416

#### **Facility Design of Transportation Systems**

Design and analysis of facilities of transportation systems. Integration of select transportation components and their interrelationships. Design of specific facilities: guideways, terminals, and other elements for railroads, airports, and harbors. Prerequisite: Senior standing or consent of the instructor. (3-0-3) (D)

### CAE 417

#### **Railroad Engineering and Design**

History of railroad industry. Train operation, train make-up, and handling. Design and analysis of railroad track structure, track irregularities, and their representation. Vehicle/track interaction and dynamic problems associated with it. Performance of railway vehicles. Prerequisite: Senior standing or consent of the instructor. (3-0-3) (D) (C)

### CAE 419

#### **Transportation Engineering and Design**

Highway functions, design controls and criteria, element of design, cross-section elements, local roads and streets, at-grade intersections, grade separation and interchanges, highway capacity analysis, and introduction to pavement management. (3-0-3) (D)

### CAE 420

#### **Introduction to Dynamics of Structures**

Fundamentals of free, forced, and transient vibration of single and multi-degree of freedom structures, including damping of lumped and distributed parameters systems. Time, frequency, and approximate methods of analysis. Application of numerical methods in time and frequency domain. Response spectra, normal modes, coupling and normal coordinates. Prerequisite: CAE 310. (3-0-3)

### CAE 421

#### **Risk Assessment Engineering**

Description and concept of risk, relationship between the likelihood of loss and the impact of loss, engineering hazards assessment and risk identification and evaluation using fault tree analysis, failure mode and effect

analysis, etc., risk analyses applications with practical statistics. (3-0-3)

### CAE 422

#### **Sprinklers, Standpipes, Fire Pumps, Special Suppression and Detection Systems**

Review and introduction to fluid dynamics applied to sprinklers, standpipes, fire pumps, and special suppression systems; hydraulic design criteria and procedures for sprinklers requirements, standpipes, fire pumps, special suppression systems, and alarm systems using nationally recognized design (National Fire Protection Association) standards, water supply requirement systems and distributions. Prerequisite: MMAE 310. (3-0-3)

### CAE 424

#### **Introduction to Fire Dynamics**

Introduction to fire, physics and chemistry, and mass and heat transfer principles, fire fluid mechanic fundamentals, fundamentals and requirements of the burning of materials (gases, liquids, and solids), fire phenomena in enclosures such as pre-flashover and post-flashover. Prerequisite: MMAE 310, MMAE 322, or consent of the instructor. (3-0-3)

### CAE 425

#### **Fire Protection and Life Safety in Building Design**

Fundamentals of building design for fire and life safety. Emphasis on a systematic design approach. Basic considerations of building codes, fire loading, fire resistance, exit design, protective systems, and other fire protection systems. For architects and engineers not majoring in fire protection and safety engineering. (3-0-3)

### CAE 426

#### **Computer Fire Modeling Theory and Applications**

Introduction to fire heat transfer processes and fire testing materials; application of a set of quantitative engineering tools (fire models) to construct a description of conditions that occur or might occur during the course of a fire; life and structural impacts from hostile fires in buildings. Prerequisite: CAE 424 or consent of instructor. (3-0-3)

## Course Descriptions

### CAE 430

#### **Probability Concepts in Civil Engineering Design**

Introduction to probability, modeling, and identification of non-deterministic problems in civil engineering.

Development of stochastic concepts and simulation models and their relevance to design and decision problems in various areas of civil engineering.

Prerequisite: MATH 252. (3-0-3) (D)

### CAE 431

#### **Steel and Timber Design**

Design of steel beams, plate girders, and beam columns. Bolted and welded connections. Design of typical frame systems. Prerequisites: CAE 307, 310. (3-0-3) (D)

### CAE 432

#### **Concrete and Foundation Design**

Design of reinforced concrete building frames and continuous structures. Design of girders, slabs, columns, foundations, and retaining walls. Prerequisites: CAE 307, 310. (3-0-3) (D)

### CAE 436

#### **Experimental Analysis of Structures**

The analysis of structures (prototypes) with the aid of models constructed from metal, wood, plastics, and other materials. Geometrical, mathematical, demonstration, graphical, direct and indirect models will be treated.

Comparisons of experimental results with results from computer models will be made. Similitude and the theory of models will be treated. Individual and group project work will be emphasized. Prerequisites: CAE 304, 310; or CAE 351, 352. (2-2-3)

### CAE 436

#### **Design of Masonry and Timber Structures**

Design of unreinforced and reinforced masonry structural elements and structures. Serviceability and ultimate capacity design. Seismic response, resistance and design. Design of wood columns and bending members. Mechanical Fasteners and Connectors. Prerequisites: CAE 310, 307 or 352 or consent of the instructor. (3-0-3) (D)

### CAE 442

#### **Finite Element Methods in Framed Structures**

Basic principles and review of elasticity, energy methods, stiffness method, element stiffness matrix, finite elements applications in frames, trusses, curved and non-prismatic and plate structures, convergence of finite element models, practical problems. Prerequisite:

CAE 310. (3-0-3)

### CAE 457

#### **Geotechnical Foundation Design**

Methods of subsoil exploration. Study of types and methods of design and construction of foundations for structures, including single and combined footings, mats, piles, caissons, retaining walls, and underpinning. Drainage and stabilization. Prerequisites: CAE 301, CAE 323. (3-0-3) (D)

### CAE 470

#### **Construction Methods and Cost Estimating**

The role of estimating in construction contract administration. Types of estimates. Unit costs and production rates; job costs. Preparing bid for complete building project using manual methods and the CSI format; checking quantity take-off and cost estimating in selected divisions using a computer package. Prerequisite: senior standing. (2-3-3) (D)

### CAE 471

#### **Construction Planning and Scheduling**

Planning, scheduling, and progress control of construction operations. Critical Path Method and PERT Resource leveling of personnel, equipment, and materials. Financial control/hauling of construction projects. Impact of delay on precedence networks. Construction contract administration. Computer applications. Prerequisites: CAE 470 and senior standing. (3-0-3) (D,C)

### CAE 472

#### **Construction Site Operation**

Construction site layout and mobilization. Liabilities of the parties. Methods of construction. Concrete form design and fabrication. Scaffolding, temporary facilities, and equipment. Safety on sites. Introduction to construction productivity, Prerequisite: Senior standing. (3-0-3)

### CAE 473

#### **Construction Project Administration**

Characteristics of the construction industry. Project delivery systems. Duties and liabilities of the parties at the pre-contract stage. Bidding. Contract administration including duties and liabilities of the parties regarding payments, retainage, substantial and final completion, scheduling and time extensions, change orders, changed conditions, suspension of work, contract termination, and resolution of disputes. Contract bonds. Managing the construction company. Labor law and labor relations. Prerequisite: Senior standing. (3-0-3)

### CAE 462

#### **Hydraulic Design of Open Channel Systems**

Uniform flow design; backwater profiles in natural streams; gradually varied flow practical problems; spatially varied flow; flow through non-prismatic and nonlinear channels; gradually varied unsteady flow; rapidly varied unsteady flow; flood routing; numerical solutions of open channels. Prerequisite: CAE 301 or consent of instructor. (3-0-3) (D)

### CAE 463,464

#### **Environmental Systems for Buildings I, II**

Introduction of the operation and design of building systems for climate control, water and drainage, fire safety, electrical supply, illumination, transportation, and noise control. (3-0-3); (3-0-3)

### CAE 466

#### **Soil and Site Improvement**

Theory of water flow through porous media. Site improvement techniques including grading and drainage, dewatering, reinforcement, and slurry trenches. Soil improvement techniques including replacement, in situ compaction, preloading and subsurface drainage, grouting, freezing, prewetting, and heating. Prerequisites: CAE 323 or consent of instructor. (3-0-3)

# Course Descriptions

## CAE 491

### Undergraduate Research

Special research problems in civil engineering under individual supervision of instructor. Seminar presentation is required. Prerequisite: Senior standing, minimum GPA of 3.0, and consent of instructor. (Credit: Variable; maximum 4 credit hours)

## CAE 497

### Special Project

Special design project under individual supervision of instructor. Prerequisite: Senior standing, minimum GPA of 3.0, and consent of instructor. (Credit: Variable; maximum 4 credit hours)

## Chemical Engineering

## CHE 100

### Introduction to the Profession I

Introduction to chemical engineering and engineering productivity software. Communication skills development, technical reporting and presentation, engineering ethics, and a variety of topics are discussed. (1-2-2) (C)

## CHE 101

### Introduction to the Profession II

A continuation of CHE 100. Advanced engineering applications of productivity software. Engineering graphics and technical flowsheeting. Team project research and project management skills. Internet publishing. Prerequisite: CHE 100. (0-4-2) (C)

## CHE 202

### Material and Energy Balances

Material and energy balances for engineering systems subjected to chemical and physical transformations. Calculations on industrial processes. Prerequisites: CS 105, MATH 152, and one semester of chemistry. (2-2-3) (C)

## IPRO 296

### Introduction to IPRO

Introduction to process design. Principles and techniques in effective team work. Performance of selected design tasks in project groups integrated with IPRO 496. Practice with process design software. First part of the IPRO 296-IPRO 496 project package. **Only CHE students should register for this course.** Prerequisite:

CHE 101, CHE 202, or consent of instructor. (0-2-1) (C)

## CHE 301

### Fluid Mechanics and Heat Transfer Operations

Flow of fluids and heat transfer. Fundamentals of fluid flow and heat transfer design equations as applied to selected unit operations. Prerequisites: CHE 202, MATH 252. Corequisite: CHEM 343, MATH 251. (3-0-3)

## CHE 302

### Mass Transfer Operations

Mass transfer in stage-wise and continuous contacting equipment. Mass transfer design equations as applied to selected unit operations. Unsteady state operations in mass transfer equipment. Prerequisite: CHE 301. (2-2-3)

## CHE 317

### Chemical Engineering Laboratory I

Laboratory work in the unit operations of chemical engineering, fluid flow, heat transfer, and other selected topics. Prerequisite: CHE 301. (1-3-2) (C)

## CHE 351

### Chemical Engineering Thermodynamics

Laws of thermodynamics and their application to chemical engineering operations. Prerequisite: CHEM 343. (3-0-3)

## CHE 402

### Introduction to Microelectronics Fabrication Technology

Fundamentals of integrated circuit technology, Epitaxy and doping of epitaxial layers. Film deposition techniques. Bipolar and MOS integrated circuit devices. Integrated and hybrid circuit fabrication. (3-0-3)

## CHE 406

### Transport Phenomena

The equations of change in different orthogonal coordinate systems (mass, momentum, and energy transport). Velocity distribution in laminar and turbulent flow. Formulation and analytical solutions to the problems of viscous flow, molecular diffusion, heat conduction and convection. Prerequisites: CHE 301, CHE 302, and MATH 252. (3-0-3)

## CHE 411

### Introduction to Bioengineering

Transport phenomenon and reaction kinetics. Application of engineering principles to biochemical and biomedical systems. Biochemical topics include: microbial pathways, biological systems, energetics and control systems, enzyme and microbial kinetics, and the design and analysis of biological reactors. Biomedical topics include: flow properties of blood, transport in the human cardiovascular system, and the analysis and design of organ functions including the kidney and lung. Prerequisites: CHE 301, CHE 302. Corequisite: CHE 423. (3-0-3)

## CHE 418

### Chemical Engineering Laboratory II

Laboratory work in distillation, humidification, drying, gas absorption, filtration, and other areas. Prerequisites: CHE 302, CHE 317. Corequisite: CHEM 247. (1-3-2) (C)

## CHE 423

### Chemical Reaction Engineering

Introduction to the fundamentals of chemical kinetics. The design, comparison, and economic evaluation of chemical reactors. Emphasis on homogeneous systems. Prerequisites: CHE 302, CHE 351, CHE 433. (2-2-3)

## CHE 426

### Statistical Tools for Engineers

Descriptive statistics and graphs, probability distributions, random sampling, independence, significance tests, design of experiments, regression, time series analysis, statistical process control, and introduction to multivariate analysis. Prerequisite: Junior standing. (3-0-3)

## CHE 430

### Petrochemical Process Operations and Design

Chemical and engineering aspects of current petrochemical and petroleum refining processes will be emphasized, including chemical conversions (catalytic and thermal), physical separations, and evaluation of alternatives. Design and simulation of refinery separation systems with emphasis on distillation columns. Prerequisite: CHE 495. (3-0-3)

## Course Descriptions

### CHE 431

#### Artificial Intelligence Applications in Engineering

Knowledge-based system (KBS) architecture, knowledge representation, inferencing strategies. Real-time KBS. Commercial KBS shells. Neural networks, back-propagation, radial basis functions, recurrent neural networks. Applications in product design, process modeling, diagnosis, and control. Prerequisite: Consent of the instructor. (3-0-3)

### CHE 433

#### Process Modeling and System Theory

Principles of process modeling. Modeling of non-reactive and reactive dynamic processes. Transfer functions. Modeling of multistage and non-linear processes. Discrete-event processes, Markov processes, and automata theory. Prerequisite: CHE 301. Corequisites: CHE 302, CHE 351. (2-2-3)

### CHE 435

#### Process Control

Dynamic process models, stability assessment, feedback and feedforward control strategies, design and tuning of closed-loop controllers, time domain and frequency domain design and performance assessment methods. Multivariable systems, interaction, multi-loop control. Software for process simulation and controller design. Prerequisite: CHE 302, CHE 433. (2-2-3)

### CHE 437

#### Discrete Time Systems and Computer Control

Sampling of continuous-time signals, Z-transforms, modeling, digital controller design using state-space and pole-placement design methods, adaptive control and self-tuning regulators. Emphasis on chemical process systems, applications. Prerequisite: CHE 433. (3-0-3)

### CHE 439

#### Numerical and Data Analysis

Utilization of numerical methods to find solutions to a variety of chemical engineering problems. Emphasis placed on problem formulation, development of computer code, and interpretation of results. Techniques covered include:

systems of algebraic equations, linear regression, and statistics. Numerical differentiation and integration, solution of ordinary and partial differential equations. Prerequisites: CHE 301, CHE 302, MATH 252. (3-0-3)

### CHE 450

#### Principles of Polymer Science and Engineering

This introductory course deals with the physics, chemistry, and engineering of polymer systems. Classical concepts and theories as well as recent developments are addressed. Topics to be discussed include: characterization, structure and properties, thermodynamics, polymerization reaction engineering, mechanical behavior, rheology, and processing. (3-0-3)

### CHE 451

#### Chemical Process Thermodynamics

Second law analysis of cooling, separation, combustion, and other chemical processes. Chemical reaction equilibrium and processing applications. Prerequisite: CHE 351. (2-0-2)

### CHE 455

#### Polymer Processing

Considerations of transport processes in the polymer industry. Analysis of heat, mass, and momentum transfer in molten polymers and polymer solutions. The polymer flow processes to be discussed will include: extrusion, calendaring, fiber spinning, injection molding, mixing, and polymerization reaction. Prerequisites: CHE 301, CHE 303. (3-0-3)

### CHE 465

#### Electrochemical Energy Conversion

Thermodynamics, kinetic and mass-transfer fundamentals of electrochemical devices. Potential and potential measurement. Batteries and fuel cells. Fundamentals of corrosion and corrosion prevention. Prerequisites: CHEM 244 and CHE 303, or comparable mass-transfer course. (3-0-3)

### CHE 475

#### Food Engineering I

Fundamentals of food engineering. Theory and practice in food processing operations including material and energy balances, flow of fluid foods, heat transfer, thermal process evaluation, and

evaporation. Problem-solving and calculation sessions. (3-0-3)

### CHE 476

#### Food Engineering II

Companion course to CHE 475 and normally follows it. Covers freezing and thawing, dehydration (including freeze-drying), distillation, and extraction. (3-0-3)

### CHE 481

#### Flow Through Porous Media and Fundamentals of Reservoir Engineering

Introduction to petroleum geology and formation of oil and gas. Reservoir and fluid properties. Single- and two-phase flow of gases and liquids through porous media. Darcy's Law and its application in oil and gas reservoirs. Fundamentals of enhanced oil and gas recovery. (3-0-3)

### CHE 482

#### LNG Fundamentals

Properties of liquid and gas mixtures at low temperatures. Vapor liquid equilibria. Thermodynamic analysis of natural gas liquefaction processes. Storage and transportation of LNG. Prerequisite: CHE 351 or MAE 205. (3-0-3)

### CHE 483

#### Synthetic Energy

Introduction to synthetic energy processes. Analysis, design, and operation features of synthetic energy conversion processes. Fluidized beds, packed beds, and dilute gas solids systems. The principles of low, medium, and high-BTU coal gasification and waste-to-energy conversion processes. Prerequisite: CHE 351 or MAE 205. (3-0-3)

### CHE 486

#### Applied Particulate Technology

Applications of particulate technology to industrial processes: sampling, collection, characterization, segregation, flow handling, storage, agglomeration, mixing, pulverization, attrition, and transport of particles. Application of powder technology to material processing and environmental engineering. (3-0-3)

## Course Descriptions

**CHE 489****Fluidization**

Regimes of fluidized beds, rheology behavior of fluidized beds, particle classification, properties of the bubble, emulsion, elutriation, and jet. Fluid mechanic theory and heat and mass transfer in fluidized bed. Design aspects of fluidized bed and pneumatic conveying. Industrial applications of fluidized beds (catalytic reactors, drying, coal conversion, waste treatment).

Prerequisite: CHE 303. (3-0-3)

**CHE 492****Senior Problems**

A senior research course that allows the student to pursue a largely independent study and research program in areas of current staff interest. Prerequisites: Senior standing and a GPA in major courses of 3.0 or better. (Credit: Variable; maximum 3 credit hours)

**CHE 494****Chemical Process Design**

Introduction to design techniques and economic aspects of chemical processes. The technical and economic aspects of equipment selection and design, alternative methods of operation. Prerequisite: CHE 302, CHE 351, CHE 433. (2-2-3) (C)

**I PRO 496****Design I PRO**

Group project in process design. Integration of technical, safety, environmental, economic and societal issues in process development and design. Final part of the I PRO project package. Project teams consist of chemical and environmental engineering students and students from other disciplines and professions. Students from other academic units should register for designated section of I PRO 297/397/497 (3 credits) and their contribution to the project tasks will be defined accordingly. **Only CHE students should register for this course.** Prerequisites: CHE 494, I PRO 296. Co-requisites: CHE 423, CHE 435. (1-2-2) (C)

**Graduate Courses**

Graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current **IIT**

**Bulletin: Graduate Programs** for course descriptions.

**CHE 501****Transport Phenomena****CHE 503****Chemical Engineering Thermodynamics****CHE 507****Computer-Aided Design****CHE 512****Heat Transfer****CHE 518****Principles of Diffusional Operations****CHE 525****Chemical Reaction Engineering****CHE 530****Advanced Process Control****CHE 535****Applications of Mathematics to Chemical Engineering****CHE 543****Energy, Environment and Economics****CHE 560****Statistical Quality and Process Control****CHE 587****Particle Processing and Characterization****Chemistry****CHEM 100****Introduction to the Profession I**

Introduction to the chemical sciences, scientific method, computing tools, and interrelations of chemical sciences with biology, physics and other professions. (2-0-2) (C)

**CHEM 101****Introduction to the Profession II**

Continuation of CHEM 100. Applications of scientific fundamentals to basic problem solving in chemical sciences. (2-0-2) (C)

**CHEM 124****Principles of Chemistry I**

Foundations of chemistry atoms and molecules, stoichiometry of chemical reactions, thermochemistry, properties of gases, states of matter, chemical solutions, kinetics. Molecular basis for chemical reactivity; atomic structure, periodicity, chemical bonding. (3-3-4) (C)

**CHEM 125****Principles of Chemistry II**

Chemical equilibria, the chemistry of acids and bases, solubility and precipitation reactions. Introduction to thermodynamics and electrochemistry. Chemistry of selected elements and their compounds. Prerequisite: CHEM 124. (3-3-4) (C)

**CHEM 126****Principles of Chemistry II**

Same as CHEM 125 except without the laboratory Prerequisite: CHEM 124. (3-0-3)

**CHEM 237****Organic Chemistry I**

The constitution and properties of the different classes of organic compounds, with considerable attention to stereochemistry, reaction mechanisms, synthetic organic and bio-organic chemistry, and spectroscopy. The laboratory work involves an introduction to the major synthetic and analytical techniques of organic chemistry including the preparation of representative organic compounds and the isolation of compounds from natural sources. Prerequisite: CHEM 125 or consent of instructor. (3-4-4) (C)

**CHEM 239****Organic Chemistry II**

Sequel to Organic Chemistry I. Constitution and properties of organic compounds at a fundamental level. Introduction to biological materials and synthetic polymers. Prerequisite CHEM 237. (3-0-3)

**CHEM 240****Organic Chemistry Laboratory**

Laboratory part of CHEM 239. Techniques for advanced organic preparations. Identification and characterization of organic compounds, including modern instrumental methods. Pre- or co-requisite: CHEM 239. (1-4-2) (C)

## Course Descriptions

### **CHEM 247**

#### **Analytical Chemistry**

Introduction to the theory and applications of analytical chemistry. Laboratory emphasis on obtaining and interpreting quantitative data. Statistical data analysis, equilibrium expressions, pH, volumetric and gravimetric analysis, fundamentals of spectroscopy, fundamentals of electrochemistry, and analytical separations. Laboratory experiments include acid-base behavior, potentiometry with ion-specific electrodes, spectroscopy (UV-visible and atomic absorption), and chromatography (ion-exchange, high pressure liquid, and gas-liquid). Prerequisite: CHEM 125 or consent of instructor. (2-4-3) (C)

### **CHEM 321**

#### **Instrumental Analysis**

Theory and application of modern instruments in chemical procedures. Standard spectroscopic methods including Fourier transform infrared spectroscopy, nuclear magnetic resonance spectroscopy and ultraviolet spectroscopy. Separation techniques using high pressure liquid chromatography and gas chromatography. Other topics relevant to advanced chemical instrumentation will also be covered. Prerequisites: CHEM 247, CHEM 344. Pre- or co-requisite: PHYS 223. (2-6-4) (C)

### **CHEM 334**

#### **Spectroscopic Methods in Identification and Analysis**

Characterization and analysis by mass, vibrational, nuclear magnetic resonance, and electronic spectroscopy. Structure-spectra correlations applied to organic and inorganic compounds with examples drawn from diverse areas, e.g., pollutants, toxic materials, polymers, etc. Prerequisites: CHEM 239, 247. (2-0-2)

### **CHEM 335**

#### **Spectroscopic and Separation Techniques**

Characterization of prepared or separated organic compounds by chromatographic, chemical, and spectroscopic methods. Prerequisites: CHEM 240, CHEM 247. Corequisite: CHEM 334. (0-6-2) (C)

### **CHEM 343**

#### **Physical Chemistry I**

Equations of state, kinetic molecular theory, temperature dependent enthalpies and heat capacities of chemical compounds and of chemical reactions, entropy and the Gibbs free energy, chemical equilibrium, phases with variable composition, solutions of charged particles, surface phenomena. Prerequisites: CHEM 247, PHYS 223, MATH 251. (3-0-3)

### **CHEM 344**

#### **Physical Chemistry II**

Quantum theory, molecular structure and spectroscopy, chemical equilibrium constants from statistical mechanics, phenomenological and mechanistic chemical reaction kinetics, transport phenomena from molecular perspective. The laboratory will include experiments dealing with gases, thermochemistry, liquid solutions, phase equilibria, electrochemistry, chemical kinetics, spectra, molecular structure and treatment of data. Prerequisite: CHEM 343. (Analytical Chemistry is recommended.) (3-4-4) (C)

### **CHEM 415**

#### **Inorganic Chemistry**

In-depth introduction to the vast subfield of the discipline dealing with all of the elements in the periodic table. Presents balanced blend of facts and theories in modern inorganic chemistry. Emphasis is on bonding, electronic, magnetic, and structural features exhibited by inorganic and organometallic compounds and their reactivities. Modern concepts including symmetry and group theory and their relevance in solving chemical problems. Bioinorganic chemistry, and "high tech" inorganic materials and solids are introduced. Prerequisite: CHEM 344. (3-0-3)

### **CHEM 416**

#### **Advanced Chemistry Laboratory**

An advanced laboratory with emphasis on synthesis and characterization of inorganic and organometallic compounds. Prerequisites: CHEM 240, CHEM 321. (1-7-3) (C)

### **CHEM 435**

#### **Introduction to Polymers**

An introduction to polymer science with major emphasis on background,

nomenclature, and synthesis. Selected processing and characterization techniques and applications to day-to-day encounters with modern intelligent polymeric materials are introduced. Prerequisites: CHEM 239, CHEM 344 or consent of instructor. (3-0-3)

### **CHEM 450**

#### **Introduction to Research**

Required for chemistry majors. Designed to give research experience in a faculty research laboratory. Prerequisites: CHEM 334, CHEM 335. (0-8-3) (C)

### **CHEM 451**

#### **Modern Techniques in Chemical Literature**

A guide to the use of traditional and automated methods for the storage and retrieval of chemical information. Prerequisites: CHEM 239, CHEM 343. (2-0-2)

### **CHEM 454**

#### **Computer Applications in Chemistry**

A numerical methods and computer applications course for chemists; emphasis on software rather than hardware; results of numerical analysis and linear algebra presented and applied to solution of chemical problems. Prerequisites: CS 105, MATH 152, CHEM 344. (3-0-3)

### **CHEM 455**

#### **Advanced Organic Chemistry**

A survey of organic name reactions and modern reagents for organic synthesis with an emphasis on their utility in multistep synthesis. Prerequisites: CHEM 239, CHEM 344. (3-0-3)

### **CHEM 467**

#### **Senior Thesis in Chemistry**

Original work carried on by the student under the guidance of a staff member. A careful search of the literature is required before the study is begun, and continued reference to the chemical literature is expected as the work progresses. A written report is required. (0-12-4) (C)

### **CHEM 497**

#### **Special Projects**

For juniors and seniors. (Credit: Variable) (C)

## Course Descriptions

### Graduate Courses

Graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current *IIT Bulletin: Graduate Programs* for full descriptions.

#### CHEM 500 Advanced Analytical Chemistry

#### CHEM 501 Liquid Chromatography

#### CHEM 502 Gas Chromatography, Gas Chromatography-Mass Spectrometry

#### CHEM 503 Chromatography Techniques

#### CHEM 504 Chemometrics

#### CHEM 505 Spectroscopic Methods

#### CHEM 506 Sampling and Sample Preparation

#### CHEM 508 Analytical Methods Development

#### CHEM 509 Spectral and Physical Methods

#### CHEM 510 Electronics and Interfacing

#### CHEM 518 Electrochemical Methods

#### CHEM 520 Advanced Inorganic Chemistry

#### CHEM 521 Structural Inorganic and Solid State Chemistry

#### CHEM 522 Efficient Chemical and Materials Synthesis

#### CHEM 524 Intellectual Property Management

#### CHEM 530 Organic Reaction Mechanisms

#### CHEM 531 Organic Synthesis

#### CHEM 535 Advanced Polymer Chemistry

#### CHEM 537 Polymer Chemistry Laboratory

#### CHEM 538 Physical Biochemistry

#### CHEM 539 Introduction to Pharmaceutical Chemistry

#### CHEM 542 Polymer Characterization and Analysis

#### CHEM 550 Chemical Bonding

#### CHEM 552 Chemical Kinetics

#### CHEM 553 Advanced Chemical Thermodynamics

### Computer Engineering

**CPE 100**  
**Introduction to the Profession I**  
Introduces the student to the scope of the engineering profession and its role in society and develops a sense of professionalism in the student. Provides an overview of computer engineering through a series of hands-on projects and computer exercises. Develops professional communication and teamwork skills. (1-2-2) (C)

**CPE 101**  
**Introduction to the Profession II**  
Continuation of CPE 100, primarily through short projects. Prerequisite: CPE 100. (0-4-2) (C)

### City and Regional Planning

**CRP 201**  
**The Dwelling**  
Programming and planning for human habitation in dwellings and neighborhoods. Housing as a response to human needs. Environmental impacts and their

amelioration. Building types and their impacts on programmatic needs. Examples of various housing schemes in and around Chicago. (1-4-3)

**CRP 203**  
**Housing and Housing Types**  
The planning of rooms, houses, and groups of houses. Analysis of climatological, physical, psychological, and social needs and their influence on the planning of housing. Government regulations, costs and financing and their impact on housing. Includes single-family detached, row housing, walk ups, and low-rise construction. Limited work in other buildings. Lectures, seminars, and drawing problems. Prerequisite: Drawing ability. (1-4-3)

**CRP 204**  
**Housing and Community Developments**  
Neighborhood and community theory and application. Housing, parks, shopping, work places and their relationships in size and location. Related infrastructure, including traffic, potable water, storm drainage, sewerage, natural gas, and electric. Prerequisite: CRP 203. (0-6-3)

**CRP 307**  
**Elements of City Planning**  
Theory of city planning and its application to new construction and to reconstruction of existing cities. The disposition of the various functions and activities of a city into a mutually supportive system. The acquisition and analysis of physical, social, and economic information. City prototypes and their application to specific locations. Government codes and regulations and their use and effect on cities. Prerequisite: CRP 203, CRP 204, or consent of instructor. (1-4-3)

**CRP 308**  
**City Planning and Replanning**  
The application of city planning theory to a specific area. Planning for the reuse of existing cities and for new construction. A project that applies various planning principles to an actual situation is the primary effort. Prerequisite: CRP 307. (1-4-3)

## Course Descriptions

### CRP 407

#### Infrastructure Planning

Planning for and the application of various utility systems. Current practice and recent developments in methods and materials. Political and social issues involved in planning. Finance and operating costs and procedures. Focus on the water supply, sewerage, storm drainage and transportation systems. (3-0-3)

### CRP 409

#### City Planning Practice

Program and procedure. City planning techniques and methods as developed in planning commissions. Technical experience as a procedural guide. General background knowledge of the scope and types of office techniques and tools used in the preparation of a city plan. (3-0-3)

### CRP 429.426

#### History and Architecture of Cities I, II

Selected topics in the history and development of human settlements. Examination of the forces affecting city development in history. These courses are taught as seminars and meet for one three-hour period per week. (3-0-3); (3-0-3)

### CRP 441

#### The Airport: An Introduction

Review of aircraft types and their evolution and use; airport development and planning. General aviation, regional, metropolitan, and major hub airport requirements; anatomy of the airport and requirements. Readings, written assignments, airport visits, and reports. Future airport/space port needs are analyzed. (3-0-3)

### CRP 495

#### The Ecological Basis of Planning

The role of natural systems in meeting human needs. Natural systems. Climate, geology, land forms, soils, vegetation, and animal populations as the bases of agricultural and industrial technologies. Competing demands on air, water, and land. Limiting factors. (3-0-3)

### CRP 470

#### Urban Form in History:

##### Pre-20th Century

This course studies historical and modern urban form in relation to con-

temporary urban problems. In the first semester, historical examples of high-density urban form and housing are selected and analyzed. Many examples of innovative urbanism and housing have features which are relevant to modern problems. They can be found in the different historical periods of major world regions, cultures and climates. Each student will take two or more examples and will prepare a report with text, diagrams and data. Prerequisite: Graduate or upper level undergraduate standing. (2-2-3) (C)

### CRP 471

#### Urban Form in History:

##### 20th Century Low-Rise Urbanism

The second semester of this course examines modern innovative examples of high-density, low-rise urban form, housing and neighborhood design. The redevelopment of urban residential areas and the rapid expansion of suburbs, low-density areas with the problems of environment, traffic, pollution, land-use, etc. logically call for an improved urbanism criteria. Modern low-rise, high-density examples, both built and theoretical, will be selected and analyzed. Each student will take two or more projects and prepare a report with diagrams, data and descriptive text. Prerequisite: CRP 470. (2-2-3) (C)

### CRP 472

#### Low-Rise Urbanism: House Components, Form/Cluster Design

As low-density suburbs expand so do the problems of environmental quality, land use, traffic, pollution, etc. The alternative model of high-density, low-rise, energy efficient urbanism is the subject of this course. The first semester deals with the components of the house and their assembly into unit form, the guiding principles of unit aggregation, solar orientation, gardens, access and garaging. Each student will prepare designs for unit types and diagrammatic clustering. Prerequisite: Graduate or upper level undergraduate standing. (2-8-6)

### CRP 473

#### Low-Rise Urbanism:

##### Residential High-Density Design

The second semester of this course focuses on the preparation of detailed

designs for houses and neighborhood clustering based on the high-density, low-rise concept. Basic determinants are passive solar design, type variety, minimum infrastructure and access, gardens, privacy, integrated garaging. Each student will develop and present one design project within an overall program of types. Prerequisite: CRP 472. (2-8-6)

### CRP 490

#### Directed Reading

Prerequisite: Consent of the instructor and approval of the dean. (Credit: Variable; maximum 3 credit hours)

### CRP 497

#### Special Problems

Independent study of projects and problems. Students must be advised and have consent of the instructor and approval of the dean. (Credits: Variable)

## Computer Science

### CS 100

#### Introduction to the Professions I

An introduction to science and engineering as a profession. Examines the problem-solving process used in engineering and science. Emphasizes the interdisciplinary and international nature of problem-solving and the need to evaluate solutions in terms of a variety of constraints: computational, financial, and social. (1-2-2) (C)

### CS 101

#### Introduction to the Professions II

An introduction to contemporary areas of research and practice in computer science. Examines the context in which projects evolve, the problems confronted, how theory becomes practice in their solution, and the role of computer scientists in research and industry. Prerequisite: CS 100 or equivalent. (0-4-2) (C)

### CS 104

#### Introduction to Computer Programming in FORTRAN

Introduces the use of the FORTRAN programming language as a problem-solving tool-including basic data structures and algorithms, structured programming techniques, and software documentation. Designed for



## Course Descriptions

students who have had little or no prior experience with computer programming. (2-1-2)

### CS 105

#### **Introduction to Computer Programming I**

Introduces the use of a high-level programming language (C/C++) as a problem-solving tool-including basic data structures and algorithms, structured programming techniques, and software documentation. Designed for students who have had little or no prior experience with computer programming. (2-1-2)

### CS 106

#### **Introduction to Computer Programming II**

Continuation of CS 105. Introduces more advanced elements of C++ programming-including pointers, recursion, classes, and object-oriented programming techniques. Pre-requisite: CS 105 or consent of instructor. (2-1-2)

### CS 200

#### **Introduction to C++ Programming**

Problem-solving and program design using C++. Introduces a variety of programming techniques, algorithms, and basic data structures-including an introduction to object-oriented programming. Prerequisite: Experience using another programming language (Pascal, BASIC, etc.). (2-2-3)

### CS 325

#### **Data Processing and File Management**

Introduction to database systems and file processing techniques using a standard file processing programming language (COBOL). Retrieval, access, and maintenance of sequential and direct-access files. Data storage and manipulation techniques. Methods of system analysis for designing and constructing information systems. Prerequisite: CS 105. (3-0-3)

### CS 330

#### **Discrete Structures**

Introduction to the use of formal mathematical structures to represent problems and computational processes. Topics covered include Boolean algebra, first-order logic, recursive structures,

graphs, and abstract language models.

Prerequisite: CS 106 or CS 200. (3-0-3)

### CS 331

#### **Data Structures and Algorithms**

Implementation and application of the essential data structures used in computer science. Analysis of basic sorting and searching algorithms and their relationship to these data structures. Particular emphasis is given to the use of object-oriented design and data abstraction in the creation and application of data structures. Prerequisite: CS 106 or CS 200. (2-2-3)

### CS 350

#### **Computer Organization and Assembly Language Programming**

Introduction to the internal architecture of computer systems-including micro-, mini-, and mainframe computer architectures. Focuses on the relationship between a computer's hardware, its native instruction set, and the implementation of high-level languages on that machine. Uses a set of assembly language programming exercises to explore and analyze a microcomputer architecture. Prerequisite: CS 106 or CS 200. (2-2-3) (C)

### CS 351

#### **Systems Programming**

Examines the components of sophisticated multi-layer software systems-including device drivers, systems software, applications interfaces, and user interfaces. Explores the design and development of interrupt-driven and event-driven software. Prerequisites: CS 331, CS 350. (2-2-3) (C)

### CS 397

#### **Special Projects**

Prerequisite: Written consent of instructor. (Credit: Variable)

### CS 411

#### **Computer Graphics**

Overview of display devices and applications. Vector graphics in two and three dimensions. Image generation, representation, and manipulation. Homogeneous coordinates. Modeling and hidden line elimination. Introduction to raster graphics. Perspective and parallel projections. Prerequisites: CS 331, CS 350. (3-0-3) (T)

### CS 425

#### **Database Organization**

Overview of database architectures, including the Relational, Hierarchical, Network, and Object Models. Database interfaces, including the SQL query language. Database design using the Entity-Relationship Model. Issues such as security, integrity, and query optimization. Prerequisite: CS 106 or CS 200 or CS 325. (3-0-3) (T)

### CS 430

#### **Introduction to Algorithms**

Introduction to the design, behavior, and analysis of computer algorithms. Searching, sorting, and combinatorial algorithms are emphasized. Worst case and average bounds on time and space usage. Prerequisites: CS 330, CS 331. (3-0-3) (T)

### CS 440

#### **Programming Languages and Translators**

Study of commonly used computer programming languages with an emphasis on precision of definition and facility in use. Scanning, parsing, and introduction to compiler design. Use of compiler generating tools. Prerequisite: CS 351. (3-0-3) (T)

### CS 441

#### **Current Topics in Programming Languages**

New topics in programming language design such as concepts of concurrent and distributed programming, communicating sequential processes, and functional programming. System development tools and language features for programming. An introduction to programming language semantics. Prerequisite: CS 440. (3-0-3) (T)

### CS 445

#### **Object-Oriented Design and Programming**

Introduction to methodologies for object-oriented design and programming. Examines the object model and how it is realized in various object-oriented languages. Focuses on methods for developing and implementing object-oriented systems. Prerequisite: CS 331 (3-0-3) (T)

# Course Descriptions

## CS 450

### Operating Systems

Introduction to operating system concepts-including system organization for uniprocessors and multiprocessors, scheduling algorithms, process management, deadlocks, paging and segmentation, files and protection, and process coordination and communication. Prerequisites: CS 331, CS 350, or ECE 242. (3-0-3) (T)

## CS 451

### UNIX Systems Programming

Introduction to systems programming using the UNIX operating system. Includes shells and shell script programming, use of systems calls in C/C++ programs, process control, interprocess communication, and basic system administration. Prerequisites: CS 351, CS 450. (3-0-3) (T)

## CS 455

### Data Communications

Introduction to data communication concepts and facilities with an emphasis on protocols and interface specifications. Focuses on the lower four layers of the ISO-OSI reference model. Prerequisite: CS 450. (3-0-3) (T)

## CS 460

### Fundamentals of Multimedia

Introduction to computer-based multimedia-including desktop publishing, hypermedia, presentation media, graphics, animation, sound, video, and integrated authoring techniques. Prerequisite: CS 105 or consent of instructor. (2-2-3) (C)

## CS 461

### Practicum in Teaching and Training Using Multimedia

Study and practical experience in teaching and training using computer-based multimedia. Introduction to the pedagogy and application of instructional methodologies. Prerequisite: CS 460. (3-0-3)

## CS 470

### Computer Architecture

Introduction to the functional elements and structures of digital computers. Detailed study of specific machines at the register transfer level illustrates arithmetic, memory, I/O, and instruc-

tion processing. Prerequisites: CS 350, ECE 218. (2-2-3) (C) (T)

## CS 471

### Design of Computer Processors

Further study of the internal design and organization of computer architectures. Methods of interconnecting devices: bus structures, independent channels, interrupt-driven controllers, synchronous and asynchronous devices. Survey of current microprocessors and microcomputer systems, including hardware/software interfacing and application of these systems. Hands-on experience in the construction of a microcomputer system. Prerequisites: CS 350, ECE 218. (2-2-3) (C) (T)

## CS 480

### Artificial Intelligence

Styles of programming and software engineering with applications to artificial intelligence and to the creation of good programming environments through the use of key ingredients of these styles. These include techniques of search, data-driven programming, demons, frames, object-oriented programming, production-rule systems, logic programming, and code that constructs code-including language-extension through macros. Prerequisite: CS 331. (3-0-3) (T)

## CS 485

### Computers and Society

Discussion of the impact of computer technology on present and future society. Historical development of the computer. Social issues raised by cybernetics. Prerequisites: CS 105 and at least junior standing. (3-0-3) (C)

## CS 487

### Software Engineering I

Study of the principles and practices of software engineering. Topics include software quality concepts, process models, software requirements analysis, design methodologies, software testing, and software maintenance. Hands-on experience building a software system using the waterfall life cycle model. Students working in teams develop all life cycle deliverables: requirements document, specification and design documents, system code, test plan, and user manuals. Prerequisite: CS 351. (3-0-3) (C) (T)

## CS 488

### Software Engineering II

Study of advanced principles and practices in software engineering-including evolutionary software development, software prototyping, object-oriented analysis and design, software system architectures, software project management, software testing, software metrics and measurement, software quality assurance, software reuse, software maintenance, reverse engineering, and computer-aided software engineering. Prerequisite: CS 487. (3-0-3) (T)

## CS 491

### Undergraduate Research

Prerequisite: Written consent of instructor. (Credit: Variable)

## CS 493

### Senior Design Project I

First part of a two-semester practicum in the design of software products. Emphasizes the relationship between users and designers, especially the need for effective communications between these groups during the design process. Offered fall semester only. Prerequisite: CS 351. (0-2-1) (C)

## CS 494

### Senior Design Project II

Continuation of CS 493. Students work in design teams that translate a loose set of constraints into a set of product objectives. They then develop product designs using contemporary software engineering techniques and tools. Emphasizes the need for innovation, experimentation, and communication in the design process. Offered spring semester only. Prerequisite: CS 493. (0-4-2) (C)

## CS 495

### Topics in Computer Science

This course will treat a specific topic, varying from semester to semester, in which there is particular student or staff interest. Prerequisite: Consent of instructor. (Credit: Variable)

## Course Descriptions

**Graduate Courses**

The following graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current *IIT Bulletin: Graduate Programs* for course descriptions.

**CS 511****Topics in Computer Graphics****CS 521****Object Oriented Analysis and Design****CS 524****Object Oriented Information Systems****CS 525****Advanced Database Organization****CS 527****Client/Server Applications Development I****CS 528****Client/Server Applications Development II****CS 530****Formal Theory of Computation****CS 531****Topics in Automata Theory****CS 532****Formal Languages****CS 535****Analysis of Algorithms****CS 536****Science of Programming****CS 537****Software Metrics****CS 540****Syntactic Analysis of Programming Languages****CS 541****Compiler Construction****CS 542****Computer Networks I: Fundamentals****CS 543****Advanced Topics in Computer Networks****CS 544****Computer Networks II: Network Services****CS 545****Concurrent Programming****CS 546****Parallel Processing****CS 548****Seminar in Broadband Integrated Services Networks****CS 550****Comparative Operating Systems****CS 551****Operating System Design and Implementation****CS 555****Analytic Models and Simulation of Computer Systems****CS 560****Computer Science in the Classroom****CS 561****The Computer and Curriculum Content****CS 565****Computer-Assisted Instruction****CS 566****Practicum in the Application of Computers to Education****CS 570****Comparative Computer Architecture****CS 572****Advanced Computer Architecture****CS 580****Medical Informatics****CS 581****Advanced Artificial Intelligence****CS 582****Robotics****CS 583****Expert Systems****CS 584****Neural Networks****CS 585****Natural Language Processing****CS 586****Software Systems Architectures****CS 587****Programming Project Management****CS 588****Advanced Software Engineering Development****CS 589****Software Testing and Quality Assurance****CS 595****Topics in Computer Science****Electrical and Computer Engineering****ECE 100****Introduction to the Profession I**

Introduces the student to the scope of the engineering profession and its role in society and develops a sense of professionalism in the student. Provides an overview of electrical engineering through a series of hands-on projects and computer exercises. Develops professional communication and teamwork skills. (1-2-2) (C)

**ECE 101****Introduction to the Profession II**

Continuation of ECE 100, primarily through short projects. Prerequisite: ECE 100. (0-4-2) (C)

**ECE 211****Circuit Analysis I**

Ohms Law, Kirchhoff's Laws, and network element voltage-current relations. Application of mesh and nodal analysis to circuits. Dependent sources, operational amplifier circuits, superposition, Thevenin's and Norton's Theorems, maximum power transfer theorem. Transient circuit analysis for RC, RL, and RLC circuits. Introduction to Laplace Transforms. Concurrent registration in ECE 212 and ECE 218 is strongly encouraged. Corequisite: MATH 252. (3-0-3)

## Course Descriptions

### ECE 212

#### Analog and Digital Laboratory I

Basic experiments with analog and digital circuits. Familiarization with test and measurement equipment; combinational digital circuits; familiarization with latches, flip-flops, and shift registers; operational amplifiers; and transient effects in first-order and second-order analog circuits; PSpice software applications. Concurrent registration in ECE 211 and ECE 218 is strongly encouraged. Corequisites: ECE 211, ECE 218. (0-3-1) (C)

### ECE 213

#### Circuit Analysis II

Sinusoidal excitation and phasors. AC steady-state circuit analysis using phasors. Complex frequency, network functions, pole-zero analysis, frequency response, and resonance. Two-port networks, transformers, mutual inductance, AC steady-state power, RMS values, introduction to three-phase systems and Fourier series. Concurrent registration in ECE 214 is strongly encouraged. Prerequisite: ECE 211. (3-0-3)

### ECE 214

#### Analog and Digital Laboratory II

Design-oriented experiments including counters, finite state machines, sequential logic design, impedances in AC steady-state, resonant circuits, two-port networks, and filters. A final project incorporating concepts from analog and digital circuit design will be required. Concurrent registration in ECE 213 is strongly encouraged. Prerequisite: ECE 212. Corequisite: ECE 213. (0-3-1) (C)

### ECE 218

#### Digital Systems

Number systems and conversions, binary codes, and Boolean algebra. Switching devices, discrete and integrated digital circuits, analysis and design of combinational logic circuits, Karnaugh maps and minimization techniques. Counters and registers. Analysis and design of synchronous sequential circuits. Prerequisite: Sophomore standing. Concurrent registration in ECE 211 and ECE 212 is strongly encouraged. (3-0-3)

### ECE 242

#### Digital Computers and Computing

Basic concepts in computer architecture, organization, and programming, including: integer and floating point number representations, memory organization, computer processor operation (the fetch/execute cycle), and computer instruction sets. Programming in machine language and assembly language with an emphasis on practical problems. Brief survey of different computer architectures. Prerequisites: CS 105, ECE 218. (3-0-3)

### ECE 307

#### Electrodynamics

Vector analysis applied to static and time-varying electric and magnetic fields. Coulomb's Law, electric-field intensity, flux density and Gauss's Law. Energy and potential. Biot-Savart and Ampere's Law. Maxwell's equations with applications including uniform-plane wave propagation. Prerequisites: PHYS 221, MATH 251. (3-3-4)

### ECE 308

#### Signals and Systems

Time and frequency domain representation of continuous and discrete time signals. Introduction to sampling and sampling theorem. Time and frequency domain analysis of continuous and discrete linear systems. Fourier series, convolution, transfer functions. Fourier transforms, Laplace transforms, and Z-transforms. Prerequisites: ECE 213, MATH 333. (3-0-3)

### ECE 309

#### Traveling Waves

Analysis and design of circuits using distributed network elements. Response of transmission lines with linear and nonlinear loads to digital and transient signals. AC steady-state of lossless and lossy lines. The Smith Chart as an analysis and design tool. Impedance matching methods, transmission line transformers. Prerequisites: ECE 213, PHYS 221. (3-0-3)

### ECE 311

#### Engineering Electronics

Physics of semiconductor devices. Diode operation and circuit applications. Regulated power supplies. Bipolar and field-effect transistor operating principles. Biasing techniques and

stabilization. Linear equivalent circuit analysis of bipolar and field-effect transistor amplifiers. Laboratory experiments reinforce concepts. Prerequisites: ECE 213, ECE 214. (3-3-4) (C)

### ECE 312

#### Electronic Circuits

Analysis and design of amplifier circuits. Frequency response of transistor amplifiers. Feedback amplifiers. Operational amplifiers: internal structure, characteristics, and applications. Stability and compensation. Laboratory experiments reinforce concepts. Prerequisite: ECE 311. (3-3-4) (C)

### ECE 319

#### Fundamentals of Power Engineering

Principles of electromechanical energy conversion. Fundamentals of the operation of transformers, synchronous machines, induction machines, and fractional horsepower machines. Introduction to power network models and per-unit calculations. Gauss-Siedel load flow. Lossless economic dispatch. Symmetrical three-phase faults. Laboratory considers operation, analysis, and performance of motors and generators. The laboratory experiments also involve use of PC-based interactive graphical software for load flow, economic dispatch, and fault analysis. Prerequisites: ECE 213, ECE 214, PHYS 221. (3-3-4) (C)

### ECE 383

#### Electric and Electronic Circuits

Circuit concepts, Ohm's Law. Kirchhoff's Laws, network theorems. Circuit elements, DC and AC network analysis. Diodes, transistors, and electronic amplifiers. Digital electronics circuits and instrumentation. Credit for this course not applicable to a B.S.E.E. or a B.S.C.P.E. degree and will not count in the E.E. or C.P.E. major GPA. Prerequisite: PHYS 221. (3-0-3)

### ECE 386

#### Analog and Digital Electronic Circuits

Circuit analysis including Kirchhoff's Laws, mesh and node analysis, Thevenin and Norton equivalent circuits. Sinusoidal steady state analysis applied to three phase circuits, power distribution, motors, generators, and transformers. Basic analog electronics: diodes, transistors, and amplifiers with instrumentation

## Course Descriptions

applications. Introduction to digital systems and microprocessors, including arithmetic, logic, and sequential operations. Credit for this course not applicable to a B.S.E.E. or B.S.C.P.E. degree and will not count in the E.E. or C.P.E. major GPA. Prerequisite: PHYS 221. (4-0-4)

### ECE 403

#### Communication Systems I

Power spectral density. Analysis and design of amplitude and frequency modulation systems. Signal-to-noise ratio analysis. Frequency division multiplexing: spectral design considerations. The sampling theorem. Analog and digital pulse modulation systems. Time division multiplexing. Design for spectral efficiency and crosstalk control. Introduction to information theory. Prerequisite: ECE 308. (3-0-3) (P)

### ECE 404

#### Communication Systems II

Lecture portion of ECE 406. Credit will be given for either ECE 404 or ECE 406, but not for both. Prerequisites: ECE 403, and ECE 475 or MATH 475. (3-0-3) (P)

### ECE 406

#### Digital and Data Communications

Channel capacity, entropy; digital source encoding considering bit rate reduction, quantization, waveshaping, and intersymbol interference. Analysis and design of digital modulators and detectors. Matched filters. Probability of error analysis. Laboratory covers modulation, detection, sampling, analog-to-digital conversion, error detection, and an open-ended project. Credit will be given for either ECE 404 or ECE 406, but not for both. Prerequisites: ECE 403, and ECE 475 or MATH 475. (3-3-4) (P) (C)

### ECE 407

#### Computer Communications Systems

The ISO-OSI layered architecture, packet switching and circuit switching, error detection and recovery (ARQ) protocols, bridges and routers, basic queueing theory, telephone switches, Erlang-B and Erlang-C blocking formulae, TCP/IP, X.25, signaling (Signaling System 7), Personal Communication Services (PCS) networks, Broadband

Networks. Prerequisite: ECE 475 or MATH 475. (3-0-3) (P) (C)

### ECE 409

#### Communication Electronics

Radio frequency AM, FM, and PM transmitter and receiver principles. Design of mixers, oscillators, impedance matching networks, filters, phase locked loops, tuned amplifiers, power amplifiers, and crystal circuits. Nonlinear effects, intermodulation distortion, and noise. Transmitter and receiver design specifications. Laboratory experiments reinforce concepts and include an open-ended design problem. Prerequisites: ECE 309, ECE 312. Corequisite: ECE 403. (3-3-4) (P) (C)

### ECE 410

#### Consumer Electronics

Information acquisition and signal processing techniques utilized in communication systems with emphasis on implementation in television. Topics covered include synchronization, surface acoustic wave filters, ultrasonic transducers, frequency-band utilization, colorimetry, color encoding and decoding. Prerequisites: ECE 308, ECE 312. (3-0-3) (P)

### ECE 411

#### Power Electronics

Analysis, design, and application of electronic devices to power and control systems. Control of AC-DC, DC-AC, DC-DC, AC-AC converters, motor speed, and switched-mode power supplies using devices such as power transistors, power MOSFETs, FETs, thyristors (SCRs), GTOs, IGBTs, and UJTs. Project laboratory emphasizes power electronic circuit analysis, design of converters, and design and control of devices and their cost/performance tradeoffs. Prerequisites: ECE 312 and ECE 319. (3-3-4) (P) (C)

### ECE 413

#### Modern Optics and Lasers

Geometrical and physical optics. Interference, diffraction, and polarization. Coherence and holography. Light emission and absorption. Principles of laser action, characterization of lasers and laser applications. Same as PHYS 412. Prerequisite: PHYS 348. (3-0-3)

### ECE 414

#### Audio and Electroacoustics

Analysis and design of audio preamplifiers, power amplifiers, passive and active filters. Acoustic principles. Basics of magnetic recording. Project laboratory: the design, construction, troubleshooting, and testing of components of an audio system. Prerequisite: ECE 312. (3-3-4) (P) (C)

### ECE 415

#### Solid State Electronics

Energy-bands and carrier transport in semiconductors and metals. Physical principles of p-n junction devices, bipolar junction transistors, FETs, Gunn diodes, IMPATT devices, light-emitting diodes, semiconductor lasers. Same as PHYS 415. Prerequisite: PHYS 348. (3-0-3) (P)

### ECE 418

#### Introduction to Lasers

Nature of light. Coherence and holography. Light emission and absorption. Principles of laser action. Characteristics of gas lasers, organic dye lasers, solid state lasers. Laser applications. Same as PHYS 418. Prerequisite: PHYS 348. (3-0-3)

### ECE 419

#### Power Systems Analysis

Transmission systems analysis and design. Large scale network analysis using Newton-Raphson load flow. Economic operation of power systems with consideration of transmission losses. Unsymmetrical short-circuit studies. Detailed consideration of the swing equation and the equal-area criterion for power system stability studies. Design of electric utility power systems using interactive graphical software. Prerequisite: ECE 319. (3-0-3) (P)

### ECE 420

#### Analytical Methods in Power Systems

Fundamentals of power systems operation and planning, power system dynamics and control. Design of reliable power systems, power systems security analysis, optimal scheduling of power generation, estimation of power system state. Prerequisite: ECE 309. (3-0-3) (P)

## Course Descriptions

### **ECE 421**

#### **Microwaves**

Lecture portion of ECE 423. Credit will be given for either ECE 421 or ECE 423, but not for both. Prerequisites: ECE 307, ECE 309. (3-0-3) (P)

### **ECE 423**

#### **Microwave Circuits and Systems**

Maxwell's equations, waves in free space, metallic and dielectric waveguides, microstrips, microwave cavity resonators and components, ultra-high frequency generation and amplification. Analysis and design of microwave circuits and systems. Credit will be given for either ECE 421 or ECE 423, but not for both. Prerequisites: ECE 307, ECE 309. (3-3-4) (P) (C)

### **ECE 426**

#### **Linear Integrated Circuits**

Analysis and design of linear analog integrated circuits. Contemporary semiconductors (Si, GaAs, InP), fabrication techniques (CVD, MOCVD), MOS and Bipolar devices and their models. Circuits (operational amplifiers, multipliers) and their subcircuit elements (differential amplifier, current source). Simulation of integrated circuits. Prerequisite: ECE 312. (3-0-3) (P)

### **ECE 427**

#### **Digital Integrated Circuits**

Analysis and design of input and output circuits for various logic families and their relation to specifications and interfacing techniques. Speed, fanout, noise immunity, and temperature dependence. The study of semiconductor memories, MSI, LSI circuits and applications. Prerequisites: ECE 218, ECE 312. (3-0-3) (P)

### **ECE 429**

#### **Introduction to VLSI Design**

Processing, fabrication, and design of Very Large Scale Integration (VLSI) circuits. MOS transistor theory, VLSI processing, circuit layout, layout design rules, layout analysis, and performance estimation. The use of Computer-Aided Design (CAD) tools for layout design, system design in VLSI, and Application-Specific Integrated Circuits (ASICs). In the laboratory, students create, analyze, and simulate a number of circuit layouts as design projects, culminating in a term design project.

Credit for ECE 429 will not be given if ECE 530 is taken. Prerequisites: ECE 218, ECE 311, and senior standing. (3-3-4) (P) (C)

### **ECE 433**

#### **Real-Time Data Acquisition and Processing**

A design-oriented course stressing real-time applications of signal and system theory, computers, and instrumentation. Analog and digital signals, transducers, signal conditioning, analog-to-digital and digital-to-analog conversion, real-time signal processing. The laboratory considers design problems from various fields. Prerequisites: ECE 308, ECE 312. (3-3-4) (P) (C)

### **ECE 434**

#### **Control Systems with Laboratory**

Signal flow graphs and block diagrams. Types of feedback control. Steady state tracking error. Stability and Routh-Hurwitz criterion. Transient response and time domain design via root locus methods. Frequency domain analysis and design using Bode and Nyquist methods. Introduction to state variable descriptions. The laboratory consists of the complete design of a control system, with major tasks being modeling, controller design, and performance testing. Credit will be given for either ECE 434 or ECE 438, but not for both. Prerequisite: ECE 308. (3-3-4) (P) (C)

### **ECE 435**

#### **Electrical, Magnetic and Optical Properties of Materials**

Electronic structure of solids. Semiconductor devices and their fabrication. Ferroelectric and piezoelectric materials. Magnetic properties, magnetocrystalline anisotropy, magnetic materials and devices. Optical properties and their applications. Generation and use of polarized light. Same as MMAE 465. Prerequisite: ECE 311 or MMAE 362. (3-0-3) (P)

### **ECE 436**

#### **Analysis and Processing of Discrete Signals**

Discrete-time system analysis, discrete convolution and correlation, Z-transforms. Realization and frequency response of discrete-time systems, properties of analog filters, IIR filter design, FIR filter design. Discrete Fourier

Transforms. Applications of digital signal processing. Credit will be given for either ECE 436 or ECE 437, but not for both. Prerequisite: ECE 308. (3-3-4) (P) (C)

### **ECE 437**

#### **Digital Signal Processing I**

Lecture portion of ECE 436. Credit will be given for either ECE 436 or ECE 437, but not for both. Prerequisite: ECE 308. (3-0-3) (P)

### **ECE 436**

#### **Control Systems**

Lecture portion of ECE 434. Credit will be given for either ECE 438 or ECE 434, but not for both. Prerequisite: ECE 308. (3-0-3) (P)

### **ECE 441**

#### **Microcomputers**

Microprocessors and stored program controllers. Memories. Standard and special interfaces. Hardware design. Software development. Interrupt systems. Hardware and software design tools. System design and troubleshooting. Emphasis on examples. Prerequisites: ECE 218 or CS 470, ECE 242 or CS 350, and senior standing. (3-3-4) (P) (C)

### **ECE 446**

#### **Logic Design and Implementation**

Design and implementation of complex digital systems under practical design constraints. Timing and electrical considerations in combinational and sequential logic design. Digital system design using Algorithmic State Machine (ASM) diagrams. Design with modern logic families, programmable logic, and Application-Specific Integrated Circuits (ASICs). Design-oriented laboratory stressing the use of programmable logic devices. Prerequisites: ECE 218, ECE 311, and senior standing. (3-3-4) (P) (C)

### **ECE 446**

#### **Mini/Micro Computer Programming**

Engineering applications programming using the C language in a UNIX environment. Use of UNIX tools including filters and shell scripts. Overview of UNIX software design practices using tools such as Make and SCCS. The UNIX system interface. Software design projects. Prerequisites: CS 106, ECE 242

## Course Descriptions

or CS 350, and senior standing.  
(3-0-3) (P)

### **ECE 449**

#### **Object-Oriented Programming and Computer Simulation**

The use of object-oriented programming to develop computer simulations of engineering problems. Programming with the C++ language in a UNIX environment. OOP concepts including classes, inheritance, and polymorphism. Programming with class libraries. Event-driven simulation techniques in an object-oriented environment. Programming projects will include the development of a simulator for an engineering application. Prerequisites: ECE 448 and senior standing.  
(3-0-3) (P)

### **ECE 470**

#### **Photonics**

Lecture portion of ECE 471. Credit will be given for either ECE 470 or ECE 471, but not for both. Prerequisites: ECE 307, ECE 309. (3-0-3) (P)

### **ECE 471**

#### **Photonics with Laboratory**

An engineering-oriented treatment of optics and photonics, concentrating on optical design for communications and sensor systems. Electromagnetic theory of optics and its application to free-space and guided-wave optical systems; polarization states; optical components; fiber and integrated-optic waveguides; semiconductor sources and detectors; electro-optic and acousto-optic modulation techniques. Laboratory section introduces optical measurement techniques. Characterization of passive optical components and dielectric waveguides. Design of interferometric sensors. Design and testing of optical transmitters and receivers for communication systems. Credit will be given for either ECE 470 or ECE 471, but not for both. Prerequisites: ECE 307, ECE 309, and ECE 312. (3-3-4) (P) (C)

### **ECE 475**

#### **Random Phenomena in Electrical Engineering**

Basic axioms of probability. Signals as random variables. Distribution and density functions. Functions of random

variables. Applications to the binary symmetric communication channel, square-law and other nonlinear devices. The Gaussian, Poisson, and other distributions. Application to photon counting. The signal-plus-noise problem. The DC and AC value of signals: mean and variances. The meaning of signal-to-noise ratio. Higher moments. Estimation of the mean and variance. Confidence intervals. Credit will be given for either ECE 475 or MATH 475, but not for both. Prerequisite: ECE 308. (3-0-3)

### **ECE 461**

#### **Image Processing**

Introduction to video and imaging systems. Application of communication theory, visual models, and probability theory in the design and synthesis of algorithms for image enhancement. Introduction to data compression and its application in the design and synthesis of image-compression algorithms. Introduction to image recognition, understanding, and interpretation. Prerequisite: ECE 308. Corequisite: ECE 475 or MATH 475. (3-0-3) (P)

### **ECE 463**

#### **Switching Circuit Theory**

Design, synthesis, and analysis of synchronous and asynchronous sequential circuits. Foundations of discrete logic, including set theory, graphs, algebraic structures. Descriptions and capabilities of sequential circuits. Properties of sequential circuits applicable to the design process. Minimization, decomposition, machine structure. Fault detection and hazards. Prerequisites: ECE 218 or CS 330, and senior standing. (3-0-3) (P)

### **ECE 491**

#### **Undergraduate Research**

Independent work on a research project supervised by a faculty member of the department. Prerequisites: Written consents of academic adviser and instructor. (Credit: 1-3 credit hours) (P)

### **ECE 497**

#### **Special Problems**

Design, development, analysis of advanced systems, circuits, or problems as defined by a faculty member of the department. Prerequisites: Written con-

sents of academic adviser and instructor. (Credit: 1-3 credit hours) (P)

### **Graduate Courses**

The following graduate courses are available to qualified degree-seeking undergraduate students with the written approval of the course instructor, faculty adviser, and department chair. Generally a 3.0/4.0 GPA is required for departmental approval. See the current *IIT Bulletin: Graduate Programs* for course descriptions.

### **ECE 502**

#### **Basic Network Theory**

### **ECE 504**

#### **Communication System Design**

### **ECE 509**

#### **Electromagnetic Field Theory**

### **ECE 510**

#### **Passive Network Synthesis**

### **ECE 511**

#### **Analysis of Random Signals**

### **ECE 513**

#### **Communication Engineering Fundamentals**

### **ECE 523**

#### **Electronic Circuit Theory**

### **ECE 524**

#### **Electronic Circuit Design**

### **ECE 526**

#### **Active Filter Design**

### **ECE 530**

#### **VLSI Design**

### **ECE 531**

#### **Linear System Theory**

### **ECE 535**

#### **Discrete Time Systems**

### **ECE 540**

#### **Reliability Theory and System Implementation**

### **ECE 541**

#### **Performance Evaluation of Computer and Communication Networks**

## Course Descriptions

### **ECE 545** **Computer Communication Networks**

### **ECE 556** **Modern Power System Analysis**

### **ECE 557** **Fault Tolerant Power Systems**

### **ECE 558** **Power System Reliability**

### **ECE 564** **Control and Operation of Electric Power Systems**

### **ECE 569** **Digital Signal Processing II**

### **ECE 575** **Electron Devices**

### **ECE 578** **Microwave Theory**

### **ECE 581** **Computer and Robotic Vision**

### **ECE 585** **Digital Computer Design**

### **ECE 586** **Fault Detection in Digital Circuits**

### **ECE 588** **CAD Techniques for VLSI Design**

## **Economics**

**ECON 211**  
**Principles of Macroeconomics**  
The determination of output, employment, and the rate of inflation. Topics include a broad-based discussion of the controversies in macro-economics, the appropriate use of fiscal and monetary policy, the effects of a budget deficit, determination of the rate of exchange, and the trade deficit. (3-0-3) (S)

**ECON 423**  
**Economic Analysis of  
Capital Investments**  
The evaluation of proposed capital investments in the public and private sectors. Equivalent worth, rate of return, and benefit/cost methods. Treatment of the time value of money,

taxes, inflation, risk, interrelated investments and capital budgeting. Prerequisite: Junior standing. (3-0-3) (S)

## **Engineering Graphics**

**EG 100**  
**Basic Technical Drawing**  
Designed for students who are not prepared to take EG 105 because they have had little or no high school technical drawing or who need a slower approach to the subject. Special emphasis is placed upon the use of instruments, lettering, line technique, and introductory multiview projection. (0-4-1)

**EG 105**  
**Engineering Graphics and Design**  
Basic traditional and computer-based techniques and applications, multiview sketching, orthographic projection, isometric and oblique pictorials, sectioning, auxiliary views, principles of descriptive geometry, dimensioning, detail drawings, introduction to design and computer-aided drafting and design (CAD). Prerequisites: Trigonometry. (1-2-2)

**EG 131**  
**Architectural Engineering Graphics**  
Basic techniques of engineering graphics, emphasizing application in architectural engineering. Lettering, multiview sketching, orthographic projection. Principles of dimensioning. Plan, elevation, and sectional views of structures. Isometric and perspective sketching and drawing. Introduction to building systems and materials. Introduction to computer-aided drafting and design (CAD). Prerequisite: Trigonometry. (1-2-2)

**EG 204**  
**Blueprint Reading for Machine Industries**  
Industrial prints, views of objects, analysis of edges and surfaces, sectional views, auxiliary views, screw threads and fasteners, dimensioning, shop processes, first-angle drawing, R.H. and L.H. drawings, and welding representation. (1-3-2)

**EG 224**  
**Blueprint Reading for Building Trades**  
Analysis of building construction drawings and details, dimensioning, shop processes, use of symbols and conventions, material takeoff, and elementary estimating. (1-3-2)

**EG 225**  
**Engineering Graphics for  
Non-Engineers**  
Designed for students in business, liberal arts and non-technical programs. Basic drafting techniques and applications, lettering, geometric constructions, charts and graphs, technical sketching, multiview projection, pictorial drawings, dimensioning, blueprint reading and working drawings. Introduction to computer graphics. Credit for this course is not applicable to an engineering degree. (2-1-3)

**EG 305**  
**Advanced Engineering Graphics  
and Design**  
Advanced study of auxiliary views and sectioning, gears and cams, threads and fasteners, working drawings, assembly drawings, electronic drafting, ANSI drafting standards, and computer-aided drafting and design. Engineering design project. Prerequisite: EG 105. (2-2-3)

**EG 306**  
**Engineering Descriptive Geometry**  
Graphic solutions of problems involving point, line, and plane relationships by auxiliary views and revolutions. Developments and intersections of surfaces. Parallelism and perpendicularity, vectors, mining and civil engineering problems. Shades and shadows, conics, map projection and spherical triangles. Emphasis on those applications which promote visualization and introduce new engineering experience. Applications of computers to problem solving. Prerequisite: EG 105. (2-2-3)

**EG 308**  
**Architectural Drawing I**  
Elements of architectural drafting. Lettering, symbols, plan layout, elementary design in basic materials. Standard details of windows, doors, floors, roofs, stairs, framing. Perspective sketching. Prerequisite: EG 105 or consent of instructor. (2-2-3)



## Course Descriptions

### EG 309

#### **Architectural Drawing II**

A continuation of EG 308, with more complicated layout problems of residential, small commercial, and industrial buildings. Detailed study of functions of the building. Methods of construction and use of materials and simple perspectives. Prerequisite: EG 308. (2-2-3)

### EG 310

#### **Architectural Drawing III**

Individual problems assigned to each student; each project developed from schematic plan through all stages of design, including sketches, working drawings, and presentation drawings; perspective drawing with rendering in all media. Prerequisite: EG 309. (2-2-3)

### EG 312

#### **Architectural Freehand Drawing**

Accurate and rapid sketching, with special emphasis on architectural forms, proportions, perspective; pencil, crayon, chalk, and brush techniques; simple composition problems. Prerequisite: EG 105 or consent of instructor. (2-2-3)

### EG 313

#### **Architectural Detailing**

Comprises design and drawing and the fitting together of various materials used in erecting and finishing contemporary and traditional buildings. Prerequisite: EG 309 or consent of instructor. (2-2-3)

### EG 325

#### **Advanced Engineering Graphics for Non-Engineers**

Continuation of EG 225. Threads and fasteners, sectioning and auxiliary views, limit dimensioning, detail and assembly drawings, data representation, principles of descriptive geometry, manufacturing processes and computer graphics/CAD. Credit for this course is not applicable to an engineering degree. Prerequisite: EG 225. (2-1-3)

### EG 329

#### **Graphic Representation for Non-Engineers**

Basic techniques of graphics applied to communications and report writing. Use of Harvard Graphics to generate charts and graphs including two- and three-dimensional line charts and pie

charts. Integration of graphical presentations into technical and business reports. Credit for this course is not applicable to an engineering degree. Prerequisite: EG 225. (2-2-3)

### EG 405

#### **Mechanical Design Graphics**

Basic concepts of mechanical design and analysis. Advanced design layouts, details, assemblies, tolerance systems, surface finish control, materials, processes, ANSI drafting standards, engineering data processing systems and procedures, application of computers to design. CAD/CAM. Prerequisite: EG 305. (2-2-3)

### EG 466

#### **Technical and Pictorial Illustration**

Theory and construction of parallel and perspective pictorial projections, axonometric and oblique projections, parallel and angular perspective. Exploded pictorial assemblies. Basic rendering techniques used in technical illustration. Introduction to computer-generated pictorials. Prerequisite: EG 105. (2-2-3)

### EG 409

#### **Computer Generated Pictorial Projections**

Study of computer-generated representations of three dimensional objects. Projections include multiview, perspective, axonometric and oblique. Prerequisites: EG 406. (2-2-3)

### EG 419

#### **Computer Graphics in Engineering**

Techniques of computer-aided design and computer-aided manufacturing. Study of various computer graphic hardware and software systems through demonstrations and use. Prerequisites: EG 105 and junior standing or consent of instructor. (2-2-3)

### EG 425

#### **Computer Graphics for Non-Engineers**

Principles and applications of computer graphics in business and nontechnical fields. Study of computer graphics hardware and software systems. Use of computer in producing charts, graphs, and technical drawings. Use of PC-CAD in problem solving and design. Credit for this course is not

applicable to an engineering degree. Prerequisite: EG 325. (2-1-3)

### EG 429

#### **Computer Graphics for Desktop Publishing**

Integration of computer graphic-generated images into technical and business reports produced with popular desktop publishing software. Emphasis on creation and selection of graphical presentations for optimum readability. Scanning and retouching techniques for two- and three-dimensional presentations. Introduction to multi-media and slide presentations. Credit for this course is not applicable to an engineering degree. Prerequisite: EG 329. (2-2-3)

### Graduate Courses

Graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current *IIT Bulletin: Graduate Programs* for course descriptions.

## English

### ENGL 101

#### **Writing in the University**

A study of the use of writing, reading, and discussion as a means of discovering, questioning, and analyzing ideas, with an emphasis on audience, context, and the use of revision. (3-0-3) (C)

### ENGL 110

#### **English Structure in Academic Prose**

ENGL 110 and ENGL 111 comprise a one-year sequence for students whose native language is not English. ENGL 110 helps students with the complex structure and vocabulary of academic writing, with an emphasis on short compositions. (3-0-3) (C)

### ENGL 111

#### **Writing in the University for Non-Native Students**

Equivalent to ENGL 101. Designed to deal with the special writing problems of those students whose native language is not English. (3-0-3) (C)

# Course Descriptions

## **ENGL 301**

### **Introduction to Linguistics**

The objective analysis of language structure and structural hierarchies; a survey of the basic concepts of linguistics; the phoneme, the morpheme, language change over time and space. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

## **ENGL 305**

### **Aspects of the American English Language**

Beginning with a survey of the development of the English language and its place in the world's languages, the course examines the structure of contemporary standard American English from a linguistic perspective and develops the concepts and vocabulary briefly to examine existing geographic and socio-economic variation. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

## **ENGL 334**

### **Literature of Modern Science**

A study of the literature of science from the Renaissance to modern times. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

## **ENGL 337**

### **Shakespeare: Early Work**

Study of Shakespeare's work before 1600, focusing on the histories, early comedies and tragedies. Close reading of the plays language and form, and emphasis on the place of drama in early modern culture. Syllabus varies but is likely to include Taming of the Shrew, Much Ado About Nothing, Parts 1 and 2 of Henry IV, Henry V, Hamlet. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

## **ENGL 338**

### **Shakespeare: Late Work**

Study of Shakespeare's work after 1600, focusing on the middle and late comedies and tragedies and the romances. Close reading of the plays' language and form, and emphasis on the place of drama in early modern culture.

Syllabus varies but is likely to include Twelfth Night, Macbeth, Coriolanus, Othello, King Lear, The Winter's Tale, and The Tempest. May be taken independently of ENGL 337. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

## **ENGL 339**

### **Short Fiction**

A formal and thematic analysis of a diverse selection of works of short fiction. The selection will be announced by the instructor when the course is scheduled. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

## **ENGL 340**

### **World Drama**

A study of major world dramatists. The syllabus varies, but may include works by Sophocles, Lope de Vega, Marlowe, Shakespeare, Moliere, Goethe, Ibsen, Soyinka and others. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

## **ENGL 341**

### **Modern Drama**

Study of major dramatists and movements in the theater since Ibsen and Strindberg, with special emphasis on such writers as Chekhov, Shaw, Brecht, O'Neill, Ionesco, and Pinter. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

## **ENGL 342**

### **Theater in Chicago**

Designed to introduce students to the variety of professional theater performances in and around Chicago. Main emphasis on seeing plays, ancient to contemporary; essays and oral reports; study of dramatic genres and theater history. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

## **ENGL 343**

### **Film Analysis**

Examination of the style and language of film as shown in a number of feature films, with emphasis on the various ways individual directors use the cinema for personal and cultural ends. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

## **ENGL 345**

### **The Novel**

Analysis of the novel as a literary form with attention to its place in ongoing cultural and political discourse. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

## **ENGL 347**

### **The Novel Today**

An examination of major world fiction since World War II. Readings will be chosen from such writers as Graham Greene, Alexander Solzhenitsyn, Heinrich Boll, Saul Bellow, Robertson Davies, and Gabriel Marquez, Nadine Gordimer, Toni Morrison, and Salman Rushdie. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

## **ENGL 348**

### **Poetry**

Study of poetry and imaginative prose, including an analysis of the theoretical, literary, and sociocultural contexts of these works. The course may include creative writing by students. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

## **ENGL 351**

### **Nineteenth Century American Literature**

Study of representative works of such writers as Franklin, Poe, Emerson, Hawthorne, Melville, Whitman, Mark Twain, Kate Chopin, and Emily Dickinson. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

## Course Descriptions

### ENGL 353

#### Writing in Black

An examination of works by Toni Morrison, Paule Marshall, W.E.B. DuBois, Richard Wright and other black writers. The course includes formal and ideological analysis, emphasizing both nationalism and transnationalism in black culture. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement.

(3-0-3) (H) (C)

### ENGL 356

#### World Literatures

Contemporary networks of global capital and information technologies provide the motivation for the reading strategies of this course. We will examine literary texts from a variety of global contexts from the perspectives of globalism and nationalism. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### ENGL 360

#### Chicago in Literature

A survey of great American novelists, poets, and dramatists who have lived and worked in Chicago from the time of the Great Fire to the present day, and who have made Chicago one of the great world literary centers. Writers discussed include such figures as Theodore Dreiser, Carl Sandburg, and Richard Wright. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### ENGL 362

#### Work, Worker and the Workplace: Changing Images in Literature and the Arts

An investigation of the changing images of work, workers, and the workplace from the 1890s to the 1990s. The course addresses the representation of both technological and social change in fiction, poetry, and art. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### ENGL 366

#### Twentieth Century American Literature

Study of such writers as Steinbeck, Frost, Eliot, Anderson, O'Neill, Hemingway, Cather, Wolfe, Faulkner, and contemporary writers such as Updike and Toni Morrison. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement.

(3-0-3) (H) (C)

### ENGL 371

#### Middle English and Renaissance Literature

Study of English literature from its beginnings-both oral and written-through the early 17th Century, in times of linguistic change, political revolutions, nation-building, and burgeoning empire. Reading list varies but is likely to include Arthurian romance, the Gawain poet, Chaucer, Margery Kempe, Medieval Drama, Spenser, Marlowe, Shakespeare, Elizabeth Carey, John Webster and other Elizabethan and Jacobean poets and playwrights, John Donne, and John Milton. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### ENGL 372

#### Restoration and Eighteenth-Century Literature

Study of English Literature in the Age of Enlightenment, from the late 17th to the late 18th century. Reading list varies but may include Donne, Milton, Bunyan, Behn, Dryden, Swift, Pope, Johnson, Boswell, Burke, Reynolds, Sterne. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### ENGL 373

#### The Romantic Rebellion and Its Aftermath

The foundations of modernism growing out of the upheaval that brought forth the poetry of Wordsworth, Keats, and Shelley, and a new vision of an industrialized world in the works of Dickens, Carlyle, Ruskin, and Tennyson. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### ENGL 374

#### Twentieth-Century British Literature

Study of such writers as Shaw, Yeats, Virginia Woolf, Joyce, Huxley, Auden, Spender, and Dylan Thomas. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement.

(3-0-3) (H) (C)

### ENGL 376

#### Science Fiction: I

A treatment of select science fiction texts in terms of how they reflect shifting forms of work and social life in the 20th century. The course will focus on how these texts translate shifts in social patterns and popular entertainment. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### ENGL 377

#### Science Fiction: II

An investigation of science fiction novels and what they tell us about our conceptions of "nature" and "technology," and about the possible outcomes for our cultural and technological processes. We will ask how these novels connect environmental or ecological themes with political and economic ones. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### ENGL 401

#### Advanced Composition and Prose Analysis

Critical analysis of various types of prose, with stress on the art as well as the craft of writing. The student is required to write several critical papers. Prerequisite: A 100-level humanities course and junior standing. (3-0-3) (C)

### ENGL 411

#### Workshop in Creative Writing

A workshop demonstrating principles of composition in fiction, poetry, or drama, studied from a writer's vantage point. Works by modern authors are analyzed. Student manuscripts are discussed and evaluated. Prerequisite: A 100-level humanities course and junior standing. (3-0-3) (H) (C)

## Course Descriptions

### ENGL 421

#### Technical Writing

Principles and practice in the communication of technical materials. Students work on the design, writing and revising of reports, articles, manuals, procedures, proposals, including the use of graphics. Works by modern writers are analyzed. Prerequisite: A 100-level humanities course and junior standing. (3-0-3) (C)

### ENGL 423

#### Writing in the Workplace

A study of communications relating to entrepreneurial and corporate structures. This course will help students develop business communication skills, including the ability to analyze situations, determine appropriate communications forms, write and revise business-related documents, and give oral presentations. Prerequisite: A 100-level humanities course and junior standing. (3-0-3) (C)

### ENGL 428

#### Verbal and Visual Communication

Introduces students to the issues, strategies, and ethics of technical and professional presentations, and provides students with opportunities to engage in public address, video presentations and conferencing, and group presentations. Analysis of audience types and presentation situations, group dynamics, persuasive theories, language, and mass media. Prerequisite: A 100-level humanities course and junior standing. (3-0-3) (C)

### ENGL 435

#### Intercultural Communication

An introduction to the problems of communication across cultures, with emphasis on the interplay of American civilization with those of other cultural areas. Prerequisite: A 100-level humanities course and junior standing. (3-0-3) (H) (C)

### ENGL 480

#### Special Topics in Shakespeare

An independent research project or small-group seminar addressing a particular Shakespearean work or theme, to be arranged in advance with the instructor. Enrollment limited. Prerequisite: ENGL 337 or 338, a 100-level humanities course, and satisfaction

of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### ENGL 491

#### Independent Reading and Research

For advanced students. Prerequisite: Consent of department. (Credit: Variable) (H) (C)

### ENGL 497

#### Special Project

(Credit: Variable)

## Environmental Engineering

### ENVE 100

#### Introduction to the Profession I

Introduction to environmental engineering and engineering productivity software. Communication skills development, technical reporting and presentation, engineering ethics, and a variety of topics are discussed. (1-2-2) (C)

### ENVE 101

#### Introduction to the Profession II

A continuation of ENVE 100. Advanced engineering applications of productivity software. Engineering graphics and technical flow-sheeting. Team project research and project management skills. Internet publishing. Prerequisite: ENVE 100. (0-4-2) (C)

### IPRO 296

#### Introduction to IPRO

Introduction to process design. Principles and techniques in effective team work Performance of selected design tasks in project groups integrated with CHE/ENVE 496. Practice with process design software. First part of the IPRO project package. **Only EWE students should register for this course.**

Prerequisite: ENVE 101, CHE 202 or consent of instructor. (0-2-1) (C)

### ENVE 302

#### Environmental Chemistry

Chemical principles of environmental systems, including an introduction to acid-base reactions, gas transfer, chemical speciation, precipitation, and oxidation-reduction reactions. Corequisite: CHEM 344. (2-3-3) (C)

### ENVE 305

#### Geochemical Cycles

The movement and fate of chemicals within the three phases of the environment: Air, water, and terrestrial solids. Emphasis is placed on models and mechanisms that determine the rates, lifetime, routes, and reservoirs of chemicals moving through the environment. Prerequisites: MATH 252, CHE 202, ENVE 302. (3-0-3)

### ENVE 401

#### Introduction to Water

#### Resources Engineering

Principles of hydraulics and water demand projections as used in the design of reservoirs, water distribution systems, and storm and sanitary sewers; aspects of water resource management and environmental engineering economics. Prerequisite: CHE 301. (3-0-3)

### ENVE 404

#### Water and Wastewater Engineering

Principles and applications of physical, chemical, and biological processes for water and waste purification. Design of engineering treatment systems to meet water quality and effluent standards. Prerequisite: ENVE 302. (3-0-3)

### ENVE 405

#### Environmental Impact Assessment

Modeling methods for the prediction and assessment of environmental impacts due to changes in the physical, chemical, or biological environment. Comparative studies of methodologies to assess immediate and extended effects, including trends in space and time due to changes in anthropogenic systems. Includes an overview of environmental regulations. Prerequisite: ENVE 305. (3-0-3)

### ENVE 407

#### Environmental Monitoring

Sampling and analytical methods used in the assessment of environmental impacts due to changes in the physical, chemical, or biological environment. There is an emphasis on sample planning, data evaluation, and interpretation. Corequisite: ENVE 426. (1-3-2) (C)

### ENVE 426

#### Statistical Tools for Engineers

Descriptive statistics and graphs, probability distributions, random sampling,

## Course Descriptions

independence, significance tests, design of experiments, regression, time series analysis, statistical process control, and introduction to multivariate analysis. Prerequisite: Junior standing. (3-0-3)

### ENVE 450

#### Analysis of Environmental Systems

Principles and procedures required for analysis of data from experimental, pilot, and full-scale environmental systems. Includes applications of statistical and other mathematical techniques in the design and evaluation of complex systems, and in the interpretation of environmental phenomena. (3-0-3)

### ENVE 463

#### Introduction to Air Pollution Control

Air pollution sources and characteristics of source emissions, atmospheric reactions, effects of pollutants, and techniques of emission control; legal and administrative aspects of air pollution control. Prerequisite: CHE 301. (3-0-3)

### ENVE 476

#### Engineering Control of Industrial Hazards

Design of control systems to enhance occupational safety and health; how to recognize and control existing or potential safety and health hazards. Prerequisites: ENVE 305, ENVE 426. (3-0-3)

### ENVE 490

#### Solid Waste Engineering

Quantities and characteristics of solid, hazardous, and municipal waste; collection methods, equipment, and costs; and refuse disposal practices, regional planning, and management. Prerequisite: ENVE 305. (3-0-3)

### ENVE 461

#### Hazardous Waste Engineering

Engineering principles applied to the control of hazardous waste generation, handling, collection, transport, processing, recovery, and disposal. Treatability and design of hazardous waste treatment processes. Corequisites: ENVE 404, ENVE 463. (2-3-3) (C)

### ENVE 495

#### Pollution Prevention

An interdisciplinary course that draws upon material from chemical, electrical,

environmental, and mechanical engineering disciplines. This course reviews regulations and explores the tools used to set up and maintain pollution prevention programs. Topics include process assessments; defining and ranking pollution prevention options; feasibility analyses including technical, environmental, and economic aspects; and life cycle analysis. (3-0-3)

### ENVE 490

#### Environmental Processes

##### Laboratory

Laboratory work in environmental processes including filtration, gas transfer, adsorption, biological systems, and other selected topics. Prerequisites: ENVE 404, ENVE 463. (1-3-2) (C)

### ENVE 494

#### Environmental Engineering Design

Application of technical and economic principles to the design of environmental equipment, processes, and systems. Material from previous courses is integrated into practical design problems. Offered jointly with CHE 495. Prerequisite: CHE 302. (2-2-3)

### IPRO 496

#### Process Design IPRO

Group project in process design. Integration of technical, safety, environmental, economic and societal issues in process development and design. Final part of the IPRO project package. Project teams consist of chemical and environmental engineering students and students from other disciplines and professions. Students from other academic units should register for designated section of IPRO 297/397/497 (3 credits) and their contribution to the project tasks will be defined accordingly.

**Only ENVE students should register for this course.** Prerequisites: ENVE 494, IPRO 296. Co-requisites: ENVE 404, ENVE 463. (1-2-2) (C)

### Graduate Courses

The following graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current *IIT Bulletin: Graduate Programs* for course descriptions.

### ENVE 501

#### Environmental Chemistry

### ENVE 503

#### Water and Wastewater Analysis

### ENVE 506

#### Chemodynamics

### ENVE 513

#### Biological Processes in Wastewater Treatment

### ENVE 542

#### Physical and Chemical Processes of Water and Waste Treatment

### ENVE 545

#### Environmental Regulations and Risk Assessment

### ENVE 570

#### Air Pollution Meteorology

### ENVE 572

#### Ambient Air Monitoring

### ENVE 576

#### Indoor Air Pollution

### ENVE 565

#### Groundwater Contamination and Pollutant Transport

## French

Most students may take 200-level foreign language courses for General Education in the Humanities, but students seeking engineering degrees must receive the permission of the Dean of the Undergraduate College in order to assure that they satisfy accreditation requirements. A student with prior acquaintance of a language is placed in a course at the proper level by the instructor. Most students with two years of high school French are prepared for FREN 201.

### FREN 101

#### Elementary French I

An introduction to modern French, with exercises in translation, grammar, conversation, and comprehension. (3-0-3)

### FREN 102

#### Elementary French II

A study of modern French emphasizing structural analysis and developing

## Course Descriptions

comprehension, translation, and conversation skills. Reading of selected French texts and exercises in composition. Prerequisite: FREN 101. (3-0-3)

### **FREN 201**

#### **Intermediate French I**

Continuation of training in written and oral expression. Study of French literary works and composition of reports. Prerequisite: FREN 102. (3-0-3) (H)

### **FREN 202**

#### **Intermediate French II**

Training towards fluency in modern French. Classroom analysis of French literature, with collateral readings, and with an emphasis on written reports. Prerequisite: FREN 201. (3-0-3) (H)

## **German**

Most students may take 200-level foreign language courses for General Education in the Humanities, but students seeking engineering degrees must receive the permission of the Dean of the Undergraduate College in order to assure that they satisfy accreditation requirements. A student with prior acquaintance of a language is placed in a course at the proper level by the instructor. Most students with two years of high school German are prepared for GER 201.

### **GER 101**

#### **Elementary German I**

An introduction to modern German, with exercises in translation, grammar, conversation, and comprehension. (3-0-3)

### **GER 102**

#### **Elementary German II**

A study of modern German emphasizing structural analysis and developing comprehension, translation, and conversation skills. Reading of selected German texts and exercises in composition. Prerequisite: GER 101. (3-0-3)

### **GER 201**

#### **Intermediate German I**

Continuation of training in written and oral expression. Study of German literary works and composition of reports. Prerequisite: GER 102. (3-0-3) (H)

### **GER 202**

#### **Intermediate German II**

Training towards fluency in modern German. Classroom analysis of German literature, with collateral readings, and with an emphasis on written reports. Prerequisite: GER 201. (3-0-3) (H)

## **History**

### **HIST 300**

#### **History of Western Civilization to the Renaissance**

Development of Greek and Roman civilization; beginnings of Christianity; Europe in the Middle Ages; feudalism and manorialism; organization of the Church; the Crusades; medieval intellectual life; the Renaissance. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### **HIST 301**

#### **History of Western Civilization from the Renaissance**

Protestant Reformation; the Scientific Revolution; Age of Louis XIV; Enlightenment; the Age of Democratic Revolution; Industrial Revolution; Nationalism and Imperialism; World War I; Communism and Fascism; World War II and after. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### **HIST 305**

#### **Latin America: 1810-Present**

The history of Latin America from colonial times emphasizing the political evolution of the several republics. Special consideration will be given to the political, economic, military, and social relations of the U.S. with Latin American countries in the 20th century. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### **HIST 310**

#### **Nineteenth-Century Europe:**

##### **1789-1900**

Survey and analysis of nineteenth-century European history. The French Revolution and Napoleon; conservatism, liberalism, and romanticism; Industrial Revolution; nationalism and the unifi-

cation of nation states; revolutions of 1848, imperialism; and major intellectual movements. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### **HIST 311**

#### **Twentieth-Century Europe: 1890-1945**

Nationalism and nation states; patterns of diplomacy; origins, conduct, and settlement of World War I; Russian Revolution; fate of democracy; rise of totalitarianism; World War II and the Holocaust. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### **HIST 312**

#### **Introduction to Contemporary Europe, 1945-Present**

Settlement of World War II; political and economic reconstruction; Cold War; Third World nationalism and the end of colonialism; the United States and Europe; Soviet Union and Eastern Europe from Stalin to Yeltsin; the end of communism in Eastern Europe and the disintegration of the Soviet Union. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### **HIST 320**

#### **Nineteenth-Century European Intellectual and Cultural History**

Survey of major developments in political, literary, scientific, religious, philosophical, and social thought. Topics vary and may include Romanticism, Positivism, Liberalism, Socialism, Darwinism, Religion and Science Controversy, and movements in art and literature. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### **HIST 333**

#### **Ethnicity in American History and Life**

Examines the creation of the American nationality from its diverse roots, which include almost all of the world's great cultures. Special stress on immigration, African American history, and the relationships among concepts of race, class,

## Course Descriptions

and gender. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### HIST 334

#### **The Creation of America: The New World to 1789**

Examines how the U.S., its values, and its institutions came to be. Colonization, "Indian" relations, slavery, the American Revolution, and the Constitution are studied in the context of the colonial world, including Latin America. Controversial issues and the challenge of discovery are stressed. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### HIST 336

#### **The Industrialization of America: 1789-1898**

Traces America's transformation from agrarian republic to Industrial Empire. Stresses impact of industrialization on all aspects of life, the nature of slavery, the failures of "Reconstruction," and the western and urban frontiers. Explores the adventures that made America a great power. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### HIST 337

#### **The American Century: 1898-1975**

Traces how America attained economic and military power and what it did with that power at home and abroad. Discusses the World Wars, the Great Depression, the limits of the "welfare state," the movement for Black equality, and the transformations of the 1960s. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### HIST 338

#### **Contemporary America: 1960 and After**

Explores the historical roots of contemporary issues. Topics vary by semester but always include the Cold War and America's international position, tensions over immigration and racial integration, and the historic roots of changes in popular culture and daily life. Prerequisite: A 100-level humani-

ties course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### HIST 340

#### **History of American Business**

Surveys America's "business civilization" and the forces shaping its institutions. Charts advent of management, marketing, decentralization, and evolving government-business relations. Concludes with "reindustrialization" case study Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### HIST 341

#### **Modern East Asia**

A survey of East Asia history since 1800, with a special emphasis on the political and cultural history of China, Japan, and the Koreans. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### HIST 346

#### **America and Vietnam**

Utilizing video materials, course covers the history of Vietnam under French domination, independence, civil war, and the eventual participation of the United States in its longest and most divisive war. (3-1-3) (H) (C)

### HIST 349

#### **African-American Experience**

A study of the African-American experience since 1800, including African roots, formal and informal institutions of oppression, change in continuity in folk culture, and history of social institutions. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### HIST 350

#### **U.S. Urban History**

Basic facts and issues of U.S. urban history; reasons for the growth, development, and decay of cities; origins of contemporary urban political, social, and economic problems. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### HIST 352

#### **History of Chicago**

Basic institutions of the contemporary city studied in their historical context, using Chicago as a case study. Political machines, social and political reform traditions, planning agencies, ethnic neighborhoods, organized crime, and many other urban institutions. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### HIST 372

#### **History of Engineering**

An introduction to the history of engineering in the United States. The course will focus on the contributions of individual engineers and a social history of the engineering profession. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### HIST 380

#### **The Origins of Modern Science**

An examination of the profound change in our conception of the natural world from Copernicus (1500 A.D.) to Newton (1700 A.D.). How the adoption of experimentation, quantification, and new instruments created a new conception of scientific method and the goals and nature of scientific knowledge. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### HIST 381

#### **Science in Industrial Society: 1750-1900**

The transformation of the physical and biological sciences from the Enlightenment to the 20th Century and its effects on culture, politics, and belief; the creation of science-based technologies and the creation of the profession of scientist. Prerequisites: ENGL 101, HUM 102, or equivalents; a 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### HIST 382

#### **Technology in History: 1500-1850**

Explores the process of technological change during the birth of industrial

## Course Descriptions

societies. Considers the context of early industrial development in Europe, then examines the industrial revolution in Britain and America. Concludes by assessing technology's role in European domination of Asia and Africa.

Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement.

**(3-0-3) (H) (C)**

### **HIST 383**

#### **Technology in History: 1850 to Present**

Examines technological change as a characteristic activity of modern societies. Investigates the science-based "second" industrial revolution in Europe and America. Explores the varied responses of artists, writers, architects, and philosophers to the machine age. Concludes by discussing technology's place in the modern nation-state. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### **HIST 384**

#### **Science in the Twentieth Century**

Development of quantum theory, relativity, and molecular biology: the growth of science to its present important position in government, economic life, and technological development. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement.

**(3-0-3) (H) (C)**

### **HIST 491**

#### **Independent Reading and Research**

For advanced students. Prerequisite: Consent of department. (Credit: Variable) (H) (C)

### **HIST 494**

#### **Senior Seminar in European History**

Prerequisite: Consent of the department.

**(3-0-3) (H) (C)**

### **HIST 495**

#### **Senior Seminar in American History**

Prerequisite: Consent of the department

**(3-0-3) (H) (C)**

### **HIST 496**

#### **Senior Seminar in Urban History**

Prerequisite: Consent of the department.

**(3-0-3) (H) (C)**

### **HIST 497**

#### **Senior Seminar in the History of Science and Technology**

Prerequisite: Consent of the department.

**(3-0-3) (H) (C)**

## Humanities

### **HUM 102**

#### **Industrial Culture**

An interdisciplinary course which examines the development of modern industrial society and the impact of science and technology on our culture. Readings drawn from history, literature, and philosophy. (3-0-3) (H)(C)

### **HUM 104**

#### **Age of Darwin**

An introduction to the humanities through an investigation of important changes in our culture associated with Darwin's theory of evolution. Readings drawn from literature, philosophy, and science. (3-0-3) (H) (C)

### **HUM 106**

#### **Life Stories**

An interdisciplinary study of autobiographies, written chiefly by Americans. The syllabus varies, but may include Benjamin Franklin, Harriet Jacobs, Maya Angelou, Malcolm X, Langston Hughes, Richard Rodriguez, Thomas Merton, Frank Lloyd Wright, Judy Chicago. In addition to considering autobiography as a genre, the course examines the historical events and the philosophical issues that have shaped the lives and attitudes of these writers.

**(3-0-3) (H) (C)**

### **HUM 315**

#### **Creativity in Art, Science and Technology**

An exploration of processes of creative thinking and action across the fields of art, science, and technology. The course examines creative cognitive styles, creativity in individuals, and the dynamics of creative groups. It aims to discover patterns of thought or techniques that can enhance creativity. Emphasis on student projects. Prerequisite: a 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

## Interprofessional Projects

### **IPRO 297, 397, 497**

Interprofessional projects allow students to learn teamwork, leadership and project management skills, while working in multidisciplinary teams on projects involving technical, ethical, environmental, economic, public policy and legal issues. IPRO project teams are typically comprised of 6-10 students from sophomore through graduate level and from all disciplines that can broadly contribute to a project effort. While every effort will be made to accommodate students' first choices, it may be necessary to balance students across all projects that will be scheduled for the semester or to consolidate students into fewer projects to meet minimum team requirements. Specific rules about selection of IPRO projects may apply in certain degree programs. Some projects may carry Humanities or Social Sciences credit. Students must consult the lead faculty member for the project and their faculty advisor before registering for a project. (1-6-3) (C)

## Mathematics

\* This course does not count for graduation in any engineering, mathematics, natural science or computer science degree program

### **MATH 119\***

#### **Geometry for Architects**

Basic analytic geometry in two and three dimensions; trigonometry. Equations of lines, circles and conic sections; resolution of triangles; polar coordinates. Equations of planes, lines, quadratic surfaces. Applications. (3-0-3)

### **MATH 122\***

#### **Introduction to Mathematics II**

Basic concepts of calculus of a single variable; limits, derivatives, integrals. Applications. (3-0-3)

### **MATH 123\***

#### **Applied Mathematics**

Basic concepts of calculus of single variable: limits, derivatives, integrals. Applications. Systems of linear equations and matrices. Linear Programming. **(4-0-4)**



## Course Descriptions

### **MATH 148\***

#### **Calculus/Precalculus I**

Review of algebra and analytic geometry. Functions, limits, derivatives. Trigonometry, trigonometric functions and their derivatives. Chain rule, implicit and inverse functions, inverse trigonometric functions. (4-0-4)

### **MATH 146**

#### **Calculus/Precalculus II**

Applications of derivatives: related rates, maxima and minima, monotonicity, concavity, graphing, optimization. Antiderivatives, first order differential equations. Definite integral and applications. (4-1-5) (C)

### **MATH 151**

#### **Calculus I**

Analytic geometry. Functions and their graphs. Limits and continuity. Derivatives of algebraic, trigonometric and inverse trigonometric functions. Applications of the derivative. Introduction to integrals and their applications. Prerequisite: Placement. (4-1-5) (C)

### **MATH 152**

#### **Calculus II**

Transcendental functions and their calculus. Integration techniques, Applications of the integral. Indeterminate forms and improper integrals. Polar coordinates. Numerical series and power series expansions. Prerequisite: Grade of "C" or better in MATH 151 or MATH 149 or Advanced Placement. (4-1-5) (C)

### **MATH 161**

#### **Honors Calculus I**

Functions, limits, and continuity. Derivatives of algebraic, trigonometric, and inverse trigonometric functions. Implicit functions. Applications of the derivative: rates, graphing, optimization. Introduction to integration. Applications of the integral: area, volume, work. Prerequisite: Placement. (4-1-5) (C)

### **MATH 162**

#### **Honors Calculus II**

Calculus of logarithmic exponential and hyperbolic functions. Integration techniques. Indeterminate forms and improper integrals. Parametric equations. Polar coordinates. Numerical series. Power series expansions. Prerequisite: Grade of "C" or better in MATH 161 or

advanced placement for MATH 151 or consent of the department. (4-1-5) (C)

### **MATH 221\***

#### **Basic Probability and Statistics**

Introduction to probability and statistics for students in the natural and social sciences or humanities; no calculus background required. Same as MSC 221. (3-0-3)

### **MATH 251**

#### **Multivariate and Vector Calculus**

Analytic geometry in three-dimensional space. Partial derivatives. Multiple integrals. Vector analysis. Applications. Prerequisite: MATH 152 or MATH 162. (4-0-4)

### **MATH 252**

#### **Introduction to Differential Equations**

Linear differential equations of order one. Linear differential equations of higher order. Series solutions of linear DE. Laplace transforms and their use in solving linear DE. Introduction to matrices. Systems of linear differential equations. Prerequisites: MATH 152 or MATH 162. (4-0-4)

### **MATH 300**

#### **Calculus Investigations**

Short projects chosen from a variety of mathematical areas and applications including analytic geometry, fractals, probability, mechanics, number theory, and topology. Each project explores some part of calculus with emphasis on its utility and its extensions. Corequisite: MATH 152 or MATH 162 and permission of instructor. (3-2-3)

### **MATH 331**

#### **Mathematical Methods**

Matrices; matrix operations, transpose, rank, inverse. Determinants. Solutions of linear equations. Eigenvalues and eigenvectors. Fourier series; half-range series. Applications of solution to potential, wave, and heat equations. Prerequisites: MATH 251 and MATH 252. Credit not granted for both MATH 331 and MATH 333. (3-0-3)

### **MATH 332**

#### **Matrices**

Matrix algebra, rank, inverses; systems of linear equations, determinants; eigenvalues and eigenvectors. Corequisite: MATH 251. (3-0-3)

### **MATH 333**

#### **Matrix Algebra and Complex Variables**

Vectors and matrices; matrix operations, transpose, rank, inverse; determinants; solution of linear systems; eigenvalues and eigenvectors. The complex plane; analytic functions; contour integrals; Laurent series expansions; singularities and residues. Prerequisite: MATH 251. Credit not granted for both MATH 331 and 333. (3-0-3)

### **MATH 400**

#### **Analysis I**

Real numbers, continuous functions; differentiation and Riemann integration. Functions defined by series. Prerequisite: MATH 251 or consent of instructor. (3-0-3)

### **MATH 401**

#### **Analysis II**

Functions of several variables, partial differentiation, multiple integrals. Prerequisite: MATH 400. (3-0-3)

### **MATH 402**

#### **Complex Analysis**

Analytic functions, conformal mapping, contour integration, series expansions, singularities and residues, applications. Intended as a first course in the subject for students in the physical sciences and engineering. Prerequisite: MATH 251. (3-0-3)

### **MATH 405**

#### **Introduction to Iteration and Chaos**

Functional iteration and orbits, periodic points and Sharkovsky's cycle theorem, chaos and dynamical systems of dimensions one and two. Julia sets and fractals, physical implications. Prerequisites: MATH 251 and MATH 252 and one of the following: MATH 331, MATH 332, or MATH 333, or consent of the instructor. (3-0-3)

### **MATH 430**

#### **Algebra**

Introduction to groups, rings, fields, vector spaces, polynomials. Prerequisite: MATH 332. (3-0-3)

### **MATH 445**

#### **Mathematical Logic**

Models of languages; propositional, Aristotelian, and predicate logic; formal theories. Prerequisite: CS 330 or consent of instructor. (3-0-3)

## Course Descriptions

### **MATH 451**

#### **Differential Geometry**

Theory of curves, the Frenet formulas; theory of surfaces, fundamental forms, curvature; further selected topics.

Prerequisite: MATH 252. (3-0-3)

### **MATH 452**

#### **Topology**

Fundamentals of point-set topology; metric and topological spaces, study of continuous mappings; further selected topics. Prerequisite: MATH 400. (3-0-3)

### **MATH 461**

#### **Fourier Series and Boundary-Value Problems**

Fourier series and integrals. The Laplace, heat, and wave equations: Solutions by separation of variables. D'Alembert's solution of the wave equation.

Boundary-value problems. Prerequisites: MATH 251 and MATH 252. (3-0-3)

### **MATH 471**

#### **Numerical Methods I**

Taylor polynomials, computer representation of numbers, error, numerical linear algebra. Prerequisite: Familiarity with Fortran. Corequisite: MATH 331, MATH 332, or MATH 333. Credit will not be given for both MATH 370 and MATH 471. (3-0-3)

### **MATH 472**

#### **Numerical Methods II**

Interpolation, approximation of functions, numerical integration and differentiation, and numerical solution of differential equations. Prerequisites: MATH 252 and MATH 471. (3-0-3)

### **MATH 474**

#### **Probability and Statistics**

Elementary probability theory including discrete and continuous distributions, sampling, estimation, confidence intervals, hypothesis testing, and linear regression. Prerequisite: MATH 251. Credit not granted for both MATH 474 and MATH 475. (3-0-3)

### **MATH 475**

#### **Probability**

Elementary probability theory; combinatorics; random variables; discrete and continuous distributions; joint distributions and moments; transformations and convolution; basic theorems; simulation. Prerequisite: MATH 251. Credit not granted for both MATH 474 and MATH 475. (3-0-3)

### **MATH 476**

#### **Statistics**

Estimation theory; hypothesis tests; confidence intervals; goodness-of-fit tests; correlation and linear regression; analysis of variance; non-parametric methods. Prerequisite: MATH 475. (3-0-3)

### **MATH 482**

#### **Introduction to Markov Processes**

Random walks, discrete time Markov chains; Poisson processes, continuous time Markov chains; renewal theory. Prerequisite: MATH 475. (3-0-3)

### **MATH 483**

#### **Design and Analysis of Experiments**

Principles of estimation; hypothesis tests, confidence intervals. Contingency tables; goodness-of-fit. Analysis of variance; linear regression. Hierarchical and split-plot designs; analysis of covariance. Multiple regression. Prerequisite: MATH 221 or MATH 476. (3-0-3)

### **MATH 486**

#### **Mathematical Modeling I**

A general introduction to optimization problems. Linear programming: the simplex method. Elements of graphs and networks. Introduction to game theory. Applications. Prerequisite: MATH 475 or consent of the instructor. (3-0-3)

### **MATH 487**

#### **Mathematical Modeling II**

The formulation of mathematical models, solution of mathematical equations, interpretation of results. Selected topics from queueing theory and financial derivatives. Prerequisite: MATH 252. (3-0-3)

### **MATH 488**

#### **Ordinary Differential Equations**

Boundary-value problems: Green's functions, Sturm-Liouville theory, eigenfunction expansions. Linear and nonlinear systems: existence and uniqueness, Floquet theory, stability concepts. Phase-plane analysis: critical points, limit cycles. Prerequisite: MATH 252. (3-0-3)

### **MATH 489**

#### **Partial Differential Equations**

First-order equations, characteristics. Classification of second-order equations. Laplace's equation: potential theory, Green's function, maximum principles. The wave equation: characteristics, general solution. The heat equation: use of integral transforms. Prerequisite: MATH 461. (3-0-3)

### **MATH 490**

#### **History of Mathematics**

A history of mathematics from ancient times to the twentieth century. Prerequisite: MATH 152. This course does not count for graduation in any ECE degree program. (3-0-3)

### **MATH 491**

#### **Reading and Research**

(Credit: Variable)

## Management

### **MGT 351**

#### **Theory of Organization and Management**

Introduction to the theory and practice of management; includes the basic managerial functions-planning, organizing, leading, and controlling. Communication, motivation, and decision-making techniques are stressed. Also covered are organization structure and design, the dynamics of individual and group interaction, organization climate, managerial styles, the implications of increasing work force diversity, coping with conflict, and methods for achieving organizational improvement. Issues in international business are dealt with at relevant points. Prerequisite: junior standing. (3-0-3)

## Course Descriptions

### Military Science

#### MILS 010

##### Freshman Recitation

A structured tutorial and learning environment for first-year army ROTC students; development of improved academic abilities and a better understanding of the military discipline. Students must be enrolled in their initial year of ROTC. (1-0-1)

#### MILS 101

##### Leadership Dynamics

Discussion and practical application of fundamentals, principals, and traits of leadership. An introduction to the history and practical application of the U.S. Army customs and traditions. A practical laboratory is required for Army ROTC cadets. (1-2-1) (C)

#### MILS 102

##### U.S. Defense Establishment

An examination of the nation's defense establishment. Emphasis is placed on the structural aspects and the authority relationships of the Department of Defense and the Department of the Army; constitutional provisions for the common defense; the concept of civilian control of the military. A practical laboratory is required for Army ROTC cadets. (1-2-1) (C)

#### MILS 107

##### American Military History

In-depth study of American military history through examination of evolution of the Army and warfare. (3-2-3)

#### MILS 147

##### Aerobic Conditioning

Participation in aerobic exercise program; evaluation of the level of cardiovascular fitness. (0-3-2)

#### MILS 148, 247, 248, 347, 348, 447, 448

Same as above. (0-3-2)

#### MILS 201

##### Leadership Techniques

Study and practical application of basic leadership techniques to include motivating and counseling. Emphasis on communication skills to include oral presentations and the army writing style. A practical laboratory is required for Army cadets. (2-2-2)

#### MILS 202

##### Introduction to United States

##### Military History

Analytical study of American military history from its origin through the present. Emphasis on leadership, strategy, the principles of war, and growth of the military in the United States. A practical laboratory is required for Army ROTC cadets. (3-2-3)

#### MILS 301

##### Military Operations and Tactics I

Introduction to the principles of war; practical exercises in small unit leadership and combined arms operations. Study of land navigation techniques and field communications equipment operating procedures with actual field application. A practical laboratory is required for Army ROTC cadets. Prerequisites: MILS 101, MILS 102, and MILS 201 or the equivalent and departmental approval. (3-2-3) (C)

#### MILS 302

##### Military Operations and Tactics II

Detailed study of Army tactical combat doctrine to include organization, patrolling, offensive, and defensive tactics at the small unit level. Advanced techniques of planning, organization, delegation, and control with practical application. A practical laboratory is required for Army ROTC cadets. Prerequisites: MILS 101, MILS 102, and MILS 201 or the equivalent and departmental approval. (3-2-3)

#### MILS 401

##### Training and Resource Management

Nature of command and staff relationships; theory and application of U.S. Army training management doctrine; operations and intelligence functions; professional ethics. A practical laboratory is required for Army ROTC cadets. Prerequisites: MILS 101, MILS 102, and MILS 201 or the equivalent and departmental approval. (3-2-3) (C)

#### MILS 402

##### The Professional Officer

Study of the nature, structure, powers, and procedures of the military justice system; reserve components of the Army; senior and subordinate relationships; obligations and responsibilities of an officer on active duty. A practical laboratory is required for Army ROTC cadets.

Prerequisites: MILS 101, MILS 102, and MILS 201 or the equivalent and departmental approval. (3-2-3) (C)

#### MILS 499

##### Advanced Independent Research

Intensive research and study of selected topics. May be repeated for a maximum of six credit hours. A practical laboratory is required for Army ROTC cadets. Prerequisite: Department approval. (Credit: 1-4 hours)

### Marketing

#### MKT 371

##### Marketing

Introduction to the activities and decisions faced by marketing managers in modern organizations. Topics include: consumer and organizational buying behavior, marketing research, market segmentation, new product development, product line decisions, pricing channels, distribution, promotion, international marketing, and introduction to marketing strategic planning. (3-0-3) Offered in fall and spring.

### Mechanical, Materials and Aerospace Engineering

#### MMAE 100

##### Introduction to the Profession I

Introduces the student to the scope of the engineering profession and its role in society, develops a sense of professionalism in the student, confirms and reinforces the student's career choices, and provides a mechanism for regular academic advising. Provides integration with other first-year courses. Applications of mathematics to engineering. Emphasis is placed on the development of professional communications and teamwork skills. (1-4-3) (C)

#### MMAE 101

##### Introduction to the Profession II

Continuation of MAE 100, primarily through short projects. (1-4-3) (C)

#### MMAE 200

##### Introduction to Mechanics

Equilibrium concepts. Statics of a particle. Statics of a system of particles and rigid bodies. Distributed forces, centroids and center of gravity. Friction.

## Course Descriptions

Kinetics of particles: Newton's Laws of motion, energy and momentum. Kinematics of particles. Dynamics of rotating bodies. Credit for this course is not applicable to BSME, BSMME and BSAE programs. Prerequisites: PHYS 123, MATH 152, CS 105. Corequisites: MATH 252. (3-0-3)

### **MMAE 201**

#### **Mechanics of Solids I**

Free body diagrams. Equilibrium of a particle, a system of particles, and a rigid body. Distributed forces, centroids, centers of gravity, and moments of inertia. Analysis of structures. Friction. Internal loads in bars, shafts, and beams. Stress and strain in axially loaded members. Prerequisites: CS 105, MMAE 101, PHYS 103. Corequisite: MATH 152. (3-0-3)

### **MMAE 202**

#### **Mechanics of Solids II**

Stress and strain relations, mechanical properties. Axially loaded members. Torsion of circular shafts. Plane stress and strain, Mohr's circle, stress transformation. Elementary bending theory, normal and shear stresses in beams, beam deflection. Combined loading. Prerequisite: MMAE 201. (3-0-3)

### **MMAE 271**

#### **Engineering Materials and Design**

Mechanical behavior of metals, polymers, ceramics and composites, laboratory testing methods including tension, torsion, hardness, impact, toughness, fatigue and creep. Evaluation of structural performance in terms of material processing, service conditions and design. Prerequisites: MS 201, MMAE 201. Corequisite: MMAE 202. (2-3-3) (C)

### **MMAE 303**

#### **Mechanics of Solids III**

Analysis of stress and strain. Design of torsional and bending structural elements. Energy methods. Curved beams. Thick-walled cylinders, spinning disks. Stability of columns. Stress concentration, stress intensity factors, fractures toughness. Fatigue. Theories of failure and yield. Design applications. Prerequisites: MMAE 202, MMAE 271, MATH 251, MATH 252. (3-0-3)

### **MMAE 304**

#### **Mechanics of Aerostructures**

Loads on aircraft, and flight envelope. Stress, strain, and constitutive relations. Torsion of open, closed, and multi-cell tubes. Bending of multi-cell tubes. Energy methods. Castigliano's theorems. Structural instability. Prerequisites: MMAE 202, MATH 251 and MATH 252. (3-0-3)

### **MMAE 305**

#### **Dynamics**

Kinematics of particles. Kinetics of particles: Newton's laws of motion, energy: momentum. Systems of particles. Kinematics of rigid bodies. Plane motion of rigid bodies: forces and accelerations, energy, momentum. Prerequisite: MMAE 201. Corequisite: MATH 252. (3-0-3)

### **MMAE 310**

#### **Fluid Mechanics**

Basic properties of fluids in motion. Lagrangian and Eulerian viewpoints, material derivative, streamlines, etc. Continuity, energy, and linear and angular momentum equations in integral and differential forms. Integration of equations for one-dimensional flows and application to problems. Incompressible viscous flow; Navier-Stokes equations, parallel flow, pipe flow, and the Moody diagram. Introduction to laminar and turbulent boundary layers and free surface flows. Lab Component: Introduction to measurements of fluid properties and basic features of fluid flows; flow through pipes and channels, flow-induced forces on bodies; First Law of Thermodynamics; Six laboratory experiments in small groups supplemented by demonstrations and films. Prerequisites: MMAE 305, MATH 251 and MATH 252. Corequisite: MMAE 320. (3-3-4) (C)

### **MMAE 311**

#### **Compressible Flow**

Regimes of compressible perfect-gas flow. Steady, quasi one-dimensional flow in passages. Effects of heat addition and friction in ducts. Design of nozzles, diffusers, and wind tunnels. Simple waves and shocks in unsteady duct flow. Steady two-dimensional supersonic flow including oblique shocks and Prandtl-Meyer expansion

sions. Prerequisites: MMAE 310, MMAE 321. (3-0-3)

### **MMAE 312**

#### **Aerodynamics of Aerospace Vehicles**

Analysis of aerodynamic lift and drag forces on bodies. Potential flow calculation of lift on two-dimensional bodies; numerical solutions; source and vortex panels. Boundary layers and drag calculations. Aerodynamic characteristics of airfoils; the finite wing. Prerequisites: MMAE 310, MMAE 321, MMAE 350. (3-0-3)

### **MMAE 313**

#### **Fluid Mechanics**

Same as MMAE 310 without the laboratory component. Prerequisites: MMAE 305, MATH 251 and MATH 252. Co-requisite: MMAE 320. (3-0-3)

### **MMAE 320**

#### **Thermodynamics**

Introduction to thermodynamics. Thermodynamic concepts: properties; the first and second laws, energy analysis of thermodynamic systems, flowing and nonflowing, including power and refrigeration systems. Second law limitations. Prerequisites: CHEM 124, PHYS 104, CS 105, MATH 251. Corequisite: MATH 252. (3-0-3)

### **MMAE 321**

#### **Applied Thermodynamics**

Second-law analysis of engineering systems. Chemical Equilibrium. Thermodynamics of non-reacting systems. Water-air mixtures. Phase diagrams. Thermodynamics of reacting systems. Combustion. Fuel cells. Analysis and design of refrigeration and power generation systems. Prerequisites: MMAE 320, MATH 251. Corequisite: MMAE 310. (3-0-3)

### **MMAE 322**

#### **Heat and Mass Transfer**

Basic laws of transport phenomena. Similarity relations and analogies. Steady-state heat conduction; heat generation and extended surfaces. Multi-dimensional and transient heat conduction. Numerical and graphical analysis. Fundamentals and empirical relations of forced and natural convection. Radiation concepts, networks, solar energy. Combined effects. Lab Component: Introduction to thermal

science measurements; combustion, thermodynamics cycles; conduction, convection and radiation heat transfer. Six Laboratory experiments in small groups. Prerequisites: MMAE 320, MMAE 310, MMAE 350, CS 105. (3-3-4) (C)

### **MMAE 350** **Computational Mechanics**

Special emphasis will be given to engineering problems in solid mechanics, fluid mechanics and heat transfer. Topics will include solution of nonlinear equations of one variable, numerical differentiation and integration, solution of systems of linear algebraic equations, linear discrete systems, approximate methods for solving ordinary differential equations, and design of numerical experiments. Lab Component: Numerical solutions to practical engineering problems and interpretation of results using commercially available software. Prerequisites: MATH 251, MATH 252, MMAE 202, CS 105. (3-3-4)

**MMAE 361**  
**Fundamentals of Crystalline Solids**  
Imperfections in metals and ceramics. Dislocations and plastic deformation. The thermodynamic and kinetic principles of binary phase diagrams. Diffusion. Solidification. Prerequisites: MS 201, MMAE 271. (3-0-3)

**MMAE 362**  
**Physics of Solids**  
Introduction to crystallography; crystal structure, crystal systems, symmetry, stereographic representation. Crystal structures in materials. X-ray diffraction; character of X-rays and their interaction with crystals, diffraction methods. Structure of the atom and the behavior of electrons in solids. Band theory of solids. Electrical, thermal, and magnetic behavior. Theory of phase stability in alloys. Prerequisite: MS 201. (3-0-3) (C)

**MMAE 363**  
**Metallurgical and Materials Thermodynamics**  
The three laws of thermodynamics. Extensive problem solving in metallurgical and materials applications of heat and mass balances, free energy criteria, and equilibrium relations. Prerequisite: MS 201. (3-0-3)

**MMAE 370**  
**Materials Laboratory I**  
Introduction to materials characterization techniques including specimen preparation, metallography, optical and scanning electron microscopy, temperature measurement, data acquisition and analyses. Prerequisite: MS 201. Corequisite: MMAE 271. (1-6-3) (C)

**MMAE 406**  
**Mechanical Vibrations**  
Study of free, forced, and damped vibrations of single degree of freedom mechanical systems: resonance, critical damping, vibration isolation. Two degree of freedom systems: natural frequencies, normal modes, resonances, vibration absorbers. Introduction to vibrations of multiple degree of freedom. Prerequisites: MMAE 305, MMAE 350. (3-0-3) (C)

**MMAE 407**  
**Biomechanics: Solids**  
Properties of mathematical models for bone, soft tissues, tendons, ligaments, cartilage and muscles. Human body structure, posture, movement and locomotion. Spine mechanics and joint mechanics. Mechanics of occlusion and mastication. Exo- and endo-prosthetics. Implants and biomechanical compatibility. Prerequisites: MMAE 303 and consent of instructor. Corequisite: MMAE 430. (3-0-3) (C)

**MMAE 423**  
**Air Conditioning and Refrigeration**  
Environmental control for winter and summer, elements of psychrometrics, load calculations. Space heating and cooling methods, extended surface coils, absorption refrigeration, system analysis and planning. Prerequisites: MMAE 321, MMAE 322. (3-0-3)

**MMAE 424**  
**Internal Combustion Engines**  
Fundamentals of spark ignition and diesel engines. Combustion knock and engine variables, exhaust gas analysis and air pollution, carburetion, fuel injection, lubrication, engine performance, vehicle performance. Engine balance and vibrations. Electronic control. Prerequisites: MMAE 321, MMAE 322. (3-0-3)

**MMAE 425**  
**Direct Energy Conversion**  
A study of various methods available for direct conversion of thermal energy into electrical energy. Introduction to the principles of operation of magneto-hydrodynamic generators, thermoelectric devices, thermionic converters, fuel cells, and solar cells. Prerequisites: MMAE 321 and PHYS 208. (3-0-3)

**MMAE 430**  
**Engineering Measurements**  
Introduction to applications of measurement instrumentation and design of engineering experiments. Generalized characteristics of sensors and measurements systems. Signal conditioning and computer-based data acquisition and analysis. Measurement of motion, force, strain, torque, shaft power, pressure, sound, flow, temperature and heat flux. Design of experiments proposals. Team-based projects addressing application of engineering measurements to a variety engineering problems. Effective communication of experimental results. Prerequisite: PHYS 300. (2-6-4) (C)

**MMAE 431**  
**Design of Machine Elements**  
Design factors and fatigue. Application of principles of mechanics to the design of various machine elements such as gears, bearings, clutches, brakes and springs. Prerequisite: MMAE 303. (2-3-3)

**MMAE 432**  
**Design of Mechanical Systems**  
Small group design projects drawn from industry. Prerequisite: MMAE 431. (1-6-3) (C)

**MMAE 433**  
**Design of Thermal System**  
Application of principles of fluid mechanics, heat transfer, and thermodynamics to design of components of engineering systems. Examples are drawn from power generation, environmental control, air and ground transportation, and industrial processes, as well as other industries. Groups of students work on projects for integration of these components and design of thermal systems. Prerequisites: MMAE 321, MMAE 322. (2-3-3) (C)

## Course Descriptions

### **MMAE 434**

#### **Design for Mechanical Reliability**

Reliability and hazard functions; statics and dynamic reliability models for series, parallel and complex systems; reliability allocation. Probabilistic design; stress and strength distributions; safety factors; loading random variables; geometric tolerances, linear and nonlinear dimensional combinations; stress as random variable; material properties as random variables; failure theories; significant stress-strength models; reliability confidence intervals. Prerequisite: MMAE 431. (3-0-3)

### **MMAE 435**

#### **Design for Safety in Machines**

A critical study of the interface between law and safety engineering, which embraces not only statutory law, such as OSHA and the Consumer Products Safety Act, but also case law arising out of product liability suits. Detailed analysis of actual industrial and consumer accidents from the investigative stages through their litigation. Formulation of general safety design techniques for mechanical engineering systems and the development of courtroom communication skills for expert witnesses. Prerequisite: Senior standing. (3-0-3)

### **MMAE 436**

#### **Design of Aerospace Vehicles**

Aircraft design including aerodynamic, structural, and powerplant characteristics to achieve performance goals. Focus on applications ranging from commercial to military, from man-powered to high-speed to long-duration aircraft. Semester project is a collaborative effort in which small design groups complete the preliminary design cycle of an aircraft to achieve specific design requirements. Prerequisites: MMAE 304, MMAE 311, and MMAE 312. (2-3-3) (C)

### **MMAE 440**

#### **Introduction to Robotics**

Classification of robots; kinematics and inverse kinematics of manipulators; trajectory planning; robot dynamics and equations of motion; position control. Prerequisite: MMAE 305, PHYS 300. (3-0-3)

### **MMAE 441**

#### **Spacecraft and Aircraft Dynamics**

Two-body central force motion, orbital dynamics and orbital maneuvers. Rigid body kinematics, Euler angles, dynamics, and attitude reorientation of spacecraft. Aircraft equations of motion; longitudinal and lateral stability Design of aircraft components for stability. Prerequisite: MMAE 312. (3-0-3)

### **MMAE 442**

#### **Aircraft and Spacecraft Response and Control**

Aircraft lateral modes of motion and approximations; the yaw damper. Aircraft response to control and external inputs; introduction to automatic control. Spacecraft attitude control devices, gyroscopic instruments, momentum exchange and mass movement techniques, gravity gradient stabilization. Introduction to spacecraft automatic attitude control systems. Prerequisite: MMAE 441. (3-0-3)

### **MMAE 443**

#### **Systems Analysis and Control**

Mathematical modeling of lumped-parameter dynamical systems. Linearization techniques. Laplace transformation and transfer functions. Transient and frequent response. Stability theory. Control of single-input, single-output systems. Types of controllers and their design employing root locus. Design of state feedback controllers. Pole placement and state observer design. Prerequisites: MMAE 305, PHYS 300. (3-0-3)

### **MMAE 444**

#### **Design for Manufacture**

The materials/design/manufacturing interface in the production of industrial and consumer goods. Material and process selection; process capabilities; modern trends in manufacturing. Life cycle engineering; competitive aspects of manufacturing; quality, cost, and environmental considerations. Prerequisite: MMAE 485 or equivalent. (3-0-3)

### **MMAE 445**

#### **CAD/CAM with Numerical Control**

Computer graphics in engineering design and CAD software and hardware. Numerical control of machine tools

by various methods. Prerequisite: CS 105, MATH 252. (3-0-3)

### **MMAE 451**

#### **Finite Element Methods in Engineering**

Principles of minimum potential energy of structures-stiffness matrices, stress matrices, and assembly process of global matrices. The finite element method for two-dimensional problems-interpolation functions, area coordinates, isoparametric elements, and problems of stress concentration. General finite element codes-data generation and checks, ill-conditioned problems, node numbering. Prerequisite: MMAE 304 or MMAE 303. (3-0-3)

### **MMAE 452**

#### **Aerospace Propulsion**

Analysis and performance of various jet and rocket propulsive devices. Foundations of propulsion theory. Design and analysis of inlets, compressors, combustion chambers, and other elements of propulsive devices. Emphasis is placed on mobile power plants for aerospace applications. Prerequisites: MMAE 311 and MMAE 312. (3-0-3)

### **MMAE 464**

#### **Physical Metallurgy**

Principles of solid state phase transformations in metals and alloys with extensive reference to the significance of the principles in the context of commercial alloy systems. Strengthening mechanisms in metals and alloys and their relationship to phase structure. Prerequisite: MMAE 271. (3-0-3)

### **MMAE 465**

#### **Electrical, Magnetic and Optical Properties of Materials**

Electronic structure of solids, semiconductor devices and their fabrication. Ferroelectric and piezoelectric materials. Magnetic properties, magnetocrystalline anisotropy, magnetic materials and devices. Optical properties and their applications, generation and use of polarized light. Same as ECE 435. Prerequisite: ECE 311 or MMAE 362. (3-0-3)

**MMAE 466**

**Microstructural Characterization of Materials**

Advanced optical microscopy. Scanning and transmission electron microscopes. X-ray microanalysis. Surface characterization. Quantitative microscopy.

Prerequisite: MMAE 370. (2-3-3) (C)

**MMAE 467**

**Fundamental Principles of Polymeric Materials**

An overview of the basic principles of polymeric materials. Topics discussed include types of polymers, methods of polymers synthesis, structure, and morphology and their relationship to properties, and basic polymer processing methods. (3-0-3)

**MMAE 468**

**Introduction to Ceramic Materials**

The structure and structure/properties relationships of ceramic materials. Topics include: crystal structure types, crystal defects, structure of glass, phase equilibria and how these affect applications for mechanical properties, electrical properties, and magnetic properties. Sintering and ceramic reactions are related to microstructure and resultant properties. Prerequisite: MS 201. (3-0-3)

**MMAE 472**

**Ferrous Technology**

Production of ferrous materials in the integrated steel mill, including treatment of the iron blast furnace and steelmaking in the basic oxygen furnace. Processing of the materials in the plant and thermodynamic reaction considerations. Other ferrous processes discussed include gas-metal reactions and surface treatments. Prerequisite: MMAE 361. (3-0-3)

**MMAE 473**

**Corrosion**

Theory and prevention of corrosion of metals, including oxidation, sulphidation, other atmospheric attacks, aqueous corrosion, and other topics. Prerequisite: MMAE 361. (3-0-3)

**MMAE 474**

**Metals Processing**

The principles and practice of (a) melting and casting processes; sand, die, investment, evaporative mold, and permanent mold casting processes; (b) the heat treatment of carbon and

low alloy steels, stainless steels, tool steels, cast irons, and selected non-ferrous alloys including titanium, aluminum and nickel base alloys.

Prerequisite: MMAE 464. (2-3-3) (C)

**MMAE 475**

**Powder Metallurgy**

Production, pressing, and sintering of metal powders. Effects of particle size, friction and die design on pressed densities. Theories of sintering. Relation of sintering practice to physical properties. Homogenization of alloys. Industrial equipment. Applications. Laboratory simulation of a series of P/M manufacturing cycles from powder to finished product are used to reinforce the classwork.

Prerequisite: MMAE 361. (2-3-3) (C)

**MMAE 476**

**Materials Laboratory II**

Advanced synthesis, processing and characterization of metallic, non-metallic and composite materials. Investigation of the relationships among materials structures, processing routes and physical properties. (2-3-3) (C)

**MMAE 477**

**Commercial Alloys**

Classification of the commercially significant groups of ferrous and non-ferrous alloys. Mechanical, chemical and physical behavior; the relationship to basic structure-property principles. The significance of the various alloy groups in engineering practice.

Prerequisite: MMAE 464. Corequisite: MMAE 474. (3-0-3)

**MMAE 478**

**Service Failure Analysis**

Theory and analyses of materials failures. Prerequisite: Consent of instructor. (2-3-3)

**MMAE 480**

**Forging and Forming**

Mechanical and metallurgical basis for successful production of forgings and stampings. Prerequisite: MMAE 271 or consent of instructor. (3-0-3)

**MMAE 461**

**Welding and Fabrication**

Principles and processes for metal joining by welding, brazing, and soldering. Metallurgy of joining steels, aluminum, and other metals. Industrial applications

of welding technology including quality control and specification development.

Prerequisite: MMAE 361. (2-3-3)

**MMAE 482**

**Composites**

This course focuses on metal, ceramic and carbon matrix composites.

Types of composite. Synthesis of precursors. Fabrication of composites. Design of composites. Mechanical properties and environmental effects. Applications. (3-0-3)

**MMAE 483**

**Structure/Property Relationship in Polymers**

Detailed study of the relationship between polymer structure, morphology, and properties. Topics include theories of rubber elasticity, the glassy state, semi-crystalline structure, and polymers melts. Effects of molecular weight and different types of intermolecular interactions are presented. (3-0-3)

**MMAE 484**

**Materials and Process Selection**

Context of selection. Decision analysis. Demand, materials and processing profiles. Design criteria. Selection schemes. Value and performance oriented selection. Case studies. (3-0-3) (C)

**MMAE 485**

**Manufacturing Processes**

Principles of material forming and removal processes and equipment. Force and power requirements, surface integrity, final properties, and dimensional accuracy as influenced by material properties and process variables. Design for manufacturing. Factors influencing choice of manufacturing process. Prerequisite: MMAE 271. (3-0-3)

**MMAE 486**

**Properties of Ceramics**

Thermal, optical, mechanical, electrical, and magnetic properties of ceramics and their applications. Includes a review of defect equilibria and ceramic microstructures. Prerequisites: MS 201, MMAE 361. (3-0-3)

## Course Descriptions

### **MMAE 467**

#### **Fiber Reinforced Polymeric Composite Materials**

The materials, structure and fabrication methods for fiber reinforced polymeric composites will be discussed. Prediction of mechanical properties such as stiffness and strength. Prediction methods for laminates. Thermal and diffusion properties. Prerequisite: MMAE 202. (3-0-3)

### **MMAE 491**

#### **Undergraduate Research**

Student undertakes an independent research project under the guidance of an MMAE faculty member. Requires the approval of the MMAE Department Undergraduate Studies Committee. (Credit: Variable; 3 hours maximum.)

### **MMAE 494**

#### **Undergraduate Design Project**

Student undertakes an independent design project under the guidance of an MMAE faculty member. Requires the approval of the MMAE Department Undergraduate Studies Committee. (Credit: Variable; 3 hours maximum.)

### **MMAE 497**

#### **Undergraduate Special Topics**

(Credit: Variable)

### **Graduate Courses**

Graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current

**IIT Bulletin: Graduate** Programs for course descriptions.

## **Materials Science**

### **MS 201**

#### **Materials Science**

The scientific principles determining the structure of metallic, polymeric, ceramic, semiconductor and composite materials; electronic structure, atomic bonding, atomic structure, microstructure and macrostructure. The basic principles of structure-property relationships in the context of chemical, mechanical and physical properties of materials. Prerequisite: CHEM 124. (3-0-3)

## **Manufacturing Technology**

### **MT 300,315**

#### **Manufacturing Enterprises**

This course provides an introduction to the world of manufacturing. The world-wide evolution of manufacturing will be considered, leading to today's competitive world. The range of manufacturing activities will be reviewed. The students will be introduced to the organization and purpose of manufacturing. (3-0-3)

### **MT 301**

#### **Technical Communications**

Communication formats found in manufacturing environments. Identify, analyze, and practice verbal and written communications exercises that include technical writing, word processing, discussion leadership, and audio-visual and related graphic communications enhancement. (3-0-3) (C)

### **MT 305**

#### **Computers in Manufacturing**

Review and summary of various computer applications in the manufacturing environment. Hands-on proficiency development with current software packages supporting the manufacturing enterprise. Networking, database management, spreadsheet applications, and computer graphics. Classroom demonstration and student homework occur in place of scheduled lab time. (3-0-3)

### **MT 311**

#### **Production and Operations**

Introduces industrial engineering concepts and prepares the learner to perform fundamental engineering tasks. These include design of work stands, human factors, work groups, plant layout, and equipment selection. (3-0-3)

### **MT 313**

#### **Materials in Manufacturing**

Introduction to solid materials, including metals, plastics, and natural materials. Mechanical, physical, and electrical properties of metals will be considered as they relate to engineering applications and manufacturing. Product integrity and environmental aspects, such as disposal, human acceptance, and economic considerations. (3-0-3)

### **MT 321**

#### **Computer Integrated Manufacturing**

Explores application of computer systems to manufacturing processes, such as production planning and control, product design, and quality control. Prerequisite: MT 305. (3-0-3)

### **MT 323**

#### **Manufacturing Management and Planning**

This course introduces students to various concepts of management, specifically as applicable to manufacturing companies. Management of people and organization will be considered, as well as concepts of forecasting and strategic planning. Prerequisites: MT 301, MT 305, MT 315. (3-0-3) (C)

### **MT 331**

#### **Product Design in Manufacturing**

The array of products resulting from manufacturing mandates close attention to the relationship between product design and other plant operations. This course will introduce product design and principles, such as value, structure, and image, as well as such areas as design planning and computer applications in design. Prerequisite: MT 305. (3-0-3) (C)

### **MT 333**

#### **Resource Management in Manufacturing**

Resources to be managed in manufacturing include materials, labor, capital and time. Coverage will include financial analysis, cost accounting, program management, investments, and scheduling. Cost is primary but not only basis for managing manufacturing operations. Prerequisite: MT 305. (3-0-3) (C)

### **MT 404**

#### **Sales, Marketing and Product Introduction in Manufacturing**

Techniques of marketing research, strategies for new product introduction, and sales management and planning. Prerequisite: MT 323. (3-0-3) (C)

### **MT 406**

#### **Quality Control in Manufacturing**

Topics include quality control based on metrology and overall quality control systems. Metrological techniques covered include mechanical, electrical, materials, and chemical perspectives.



Such QC issues as SPC, ISO 9000, MilSpec, and TQM are examined. Emphasis is on exploring options and consequences of selecting appropriate methodologies. (3-0-3)

#### **MT 412**

##### **Manufacturing Processes**

Process areas studied include metals, plastics, and electronics manufacturing. Key processes in each of these industries are explored, with particular consideration given to interactions between materials and processes, as well as related design issues. Prerequisites: MT 313, MT 315. (3-0-3)

#### **MT 414**

##### **Topics in Manufacturing**

Students will use this course to capitalize on previous studies to select and complete a "job specific" project. Topics are selected with the approval of the student's employer and MT staff and presentation of the project report is made to both. Prerequisite: Completion of all 300-level MT courses. (3-0-3) (C)

#### **MT 422**

##### **Manufacturing Technology**

This course reviews current technologies applied to manufacturing operations. Emphasis is on technologies not included in other courses, such as automated manufacturing, group technology, flexible manufacturing systems, numerical control, robotics, and artificial intelligence. Prerequisites: MT 321, MT 412. (3-0-3)

#### **MT 424**

##### **Management Information Systems in Manufacturing**

Integration of all elements of manufacturing enterprise into a common database is critical to efficiency and profitability. This course details how Management Information Systems (MIS) ties together such operational aspects as order entry, production scheduling, quality control, shipping, and collections. Prerequisite: MT 321. (3-0-3)

#### **MT 426**

##### **Decision Making and Risk Analysis in Manufacturing**

Course presents the range of decision-making and risk analysis theories and procedures, including software systems

and management group techniques for determining and prioritizing company decisions related to such areas as products and work force distribution. Prerequisites: MT 323, MT 333, MT 404, MT 406. (3-0-3) (C)

#### **MT 432**

##### **Vendor/Customer Relations in Manufacturing**

Relations with customers and vendors constitute a critical aspect of company profitability. The course pursues such topics as appropriate involvement of customers and vendors in product development, as well as price and contract negotiations. Prerequisite: MT 404. (3-0-3)

#### **MT 434**

##### **Manufacturing Futures**

This course allows a futuristic view of manufacturing of interest to the student and MT staff who must work to develop projects which can be individual or group. Prerequisite: Completion of all 300-level MT courses. (3-0-3) (C)

## **Naval Science**

#### **NS 101**

##### **Introduction to Naval Science**

A general introduction to seapower and the naval service. The instruction places particular emphasis on the mission, organization, regulations, and broad warfare components of the Navy. Included is an overview of officer and enlisted rank and rating structures, procurement and recruitment, training and education, promotion and advancement, and retirement policies. The course also covers the basic tenets of naval courtesy and customs, discipline, naval leadership, and ship's nomenclature. The student is made cognizant of the major challenges facing today's naval officer, especially in the areas of human resource management. Prerequisite: Consent of instructor. (2-2-2)

#### **NS 102**

##### **Naval Ships Systems**

Designed to familiarize midshipmen with the types, structure, and purpose of naval ships. The design of naval ships is examined with respect to safety of operations and ship stability charac-

teristics. Included are nuclear and conventional propulsion systems, auxiliary power systems, interior communications, and basic damage control. Prerequisite: Consent of instructor. (3-2-3) Offered fall semester.

#### **NS 201**

##### **Naval Weapons Systems**

This course provides an introduction to the theory and principles of operation of naval weapons systems. It includes coverage of types of weapons and fire control systems, capabilities and limitations, theory of target acquisition, identification and tracking, trajectory principles, and basics of naval ordnance. Prerequisite: Consent of instructor. (3-2-3) Offered spring semester.

#### **NS 202**

##### **Seapower and Maritime Affairs**

A course based on the premise that the student must develop knowledge and interest in seapower and maritime affairs. The course is oriented toward the general concept of seapower (including the merchant marine), the role of various warfare components of a navy in supporting the Navy's mission, the implementation of seapower as an instrument of national policy, and a comparative study of U.S. and Soviet naval strategies. Prerequisite: Consent of instructor. (3-2-3) Offered spring semester. (C)

#### **NS 301,302**

##### **Navigation and Naval Operations I, II**

A comprehensive study of the theory, principles, and procedures of ship navigation, movement, and employment. Competency is achieved in the areas of piloting and celestial and electronic means of shipboard navigation. Operations topics include communications, sonar-radar search, and screening theory. Tactical formations and dispositions, relative motion, maneuvering board, and tactical plots are analyzed for force effectiveness and unity. Rules of the road, lights, signals, and navigational aids are also covered. Prerequisite: Consent of instructor. (3-2-3); (3-2-3)

#### **NS 310**

##### **Evolution of Warfare**

A survey of all military history designed to provide the student with a basic knowledge of the art and concepts

## Course Descriptions

of warfare and its evolution from the beginning of recorded history to the present. Included within this study is a consideration of the influence that leadership, political, economic, sociological, and technological factors have had on warfare and the influence they will continue to exert in the age of limited warfare. Prerequisite: Consent of instructor. (3-2-3) (C)

### NS 401

#### **Leadership and Management**

This course is a comprehensive advanced-level study of organizational behavior and management. Topics include a survey of principal management functions. Major behavioral theories as well as practical applications are explored by the use of experiential exercises, case studies, and laboratory discussions. Other topics include decision-making, communication, responsibility, authority, accountability, and total quality leadership (TQL). (2-2-2) (C)

### NS 402

#### **Naval Leadership and Ethics**

This course discusses ethical considerations in military leadership including the development of common core values among a diverse population and application of those values in the problematic context of the use of military force in support of national policy. A capstone course integrating professional competencies of prior course and training. (2-2-2) (C)

### NS 410

#### **Amphibious Warfare**

The course is designed to provide the student with an historical survey of the evolution of amphibious warfare in the twentieth century. An in-depth survey of the Gallipoli landing is followed by a study of the development of modern amphibious doctrine. Emphasis is placed on case studies of WW II: Pacific landing operations and Allied landings in north Africa, northern Europe, and Italy. Prerequisite: Consent of instructor. (3-2-3) (C)

## Operations Management

### OM 312

#### **Introduction to Operations Management**

Operational problems studied from a systems viewpoint. Development and application of policies, techniques, and models for making decisions in the areas of product and service design, design of operating systems, production and control of the product or service. Prerequisite: Junior standing. (3-0-3) Offered in fall and spring.

## Public Administration Courses

Undergraduates may enroll in the following courses with departmental permission.

### PA 501

#### **Introduction to Public Management**

### PA 502

#### **Complex Organizations**

### PA 503

#### **Administrative Law**

### PA 513

#### **Public Policy Analysis and Evaluation**

### PA 514

#### **Government Management and Information Systems**

### PA 522

#### **Public Personnel Administration**

### PA 531

#### **Governmental Accounting and Budgeting**

### PA 532

#### **Public Finance**

### PA 542

#### **Planning for Governments and Agencies**

### PA 551

#### **Public Works Management**

### PA 552

#### **Health and Human Services Policy and Administration**

### PA 553

#### **Police Administration**

### PA 554

#### **Administration of Science and Technology**

### PA 561

#### **Political Process and Administration**

### PA 562

#### **Urban and Metropolitan Government**

### PA 563

#### **Intergovernmental Relations**

### PA 564

#### **Comparative Administration and Policy**

### PA 577

#### **Topics in Public Management**

### PA 590

#### **Internship in Public Administration**

## Philosophy

### PHIL 301

#### **Ancient Philosophy**

A study of major works by Plato, Aristotle, and other important ancient philosophers. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H)(C)

### PHIL 302

#### **Origins of Modern Philosophy**

A study of major 17th and 18th century philosophers, such as Descartes, Hobbes, Spinoza, Locke, Leibniz, Berkeley, Hume, and Kant. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H)(C)

### PHIL 304

#### **19th Century Philosophy**

A study of major 19th century philosophers, such as Hegel, Comte, J. S. Mill, Peirce, James, Nietzsche. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H)(C)

## Course Descriptions

### PHIL 305

#### 20th Century Philosophy

A study of recent philosophical trends (or movements), including logical positivism, existentialism, ordinary language philosophy, etc. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### PHIL 310

#### American Philosophy

A survey of the most important thinkers and movements in American philosophy. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H)(C)

### PHIL 311

#### Great Philosophers

An in-depth study of a single outstanding philosopher, chosen by the instructor. The focus of the course will be announced when the course is scheduled. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H)(C)

### PHIL 326

#### Philosophy of Language

An analysis of the concept of language in both the works of philosophers and the works of linguists. The course looks into theories of linguistic meaning, sentence structure, speech acts, and the assumptions underlying research in modern linguistics. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H)(C)

### PHIL 335

#### Theory of Knowledge

An inquiry into how knowledge in general is possible, whether we can achieve certainty, and the role of reason and experience in the acquisition of knowledge. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H)(C)

### PHIL 340

#### Symbolic Logic

An introduction to propositional and predicate calculus, with applications

to the theory of language, the concept of argumentation, and the foundations of mathematics. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (C)

### PHIL 341

#### Philosophy of Science

Through an analysis of the concepts of explanation, theory, hypothesis, experiment, and observation, this course seeks an understanding of how the growth of scientific knowledge is possible. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H)(C)

### PHIL 342

#### Philosophy of Mind

An examination of the conception of "mind" as opposed to body, and its implications for psychology, artificial intelligence, and neuroscience. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### PHIL 343

#### Philosophy of Social Inquiry

An examination of the methods and theories of the social sciences, especially sociology and anthropology, and their relationships to the natural sciences. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### PHIL 345

#### Space and Time

An investigation into philosophical problems of space and time raised by modern physics and geometry. Issues include problems raised by studies of relativity, the topology of space and time, the direction of time, etc. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### PHIL 350

#### Science and Method

A history of the interaction between science and philosophy in recent centuries, showing how changing con-

ceptions of metaphysics and scientific method have influenced the development of Renaissance astronomy, nineteenth century atomic theory, ether theories, theories of geological and biological change, etc. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### PHIL 360

#### Ethics

A study of the fundamental issues of moral philosophy. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H)(C)

### PHIL 361

#### Political and Social Philosophy

An analysis of the concepts of legitimate political authority, social justice, natural rights, sovereignty, etc. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H)(C)

### PHIL 362

#### Philosophy of Law

An analysis of the concept of law and how it differs from custom, religion, and morality. The course looks into issues of judicial reasoning, the assumptions that underlie the criminal justice system and the imposition of liability, and legal ethics. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H)(C)

### PHIL 363

#### Aesthetics

The philosophy of the fine arts, including an analysis of the concepts of beauty, representation, expression and the purpose of art. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### PHIL 365

#### Philosophy of Free Speech

Analysis of the philosophical foundations of the right of free speech within the American Constitutional framework. Topics include: the philosophical underpinnings of the right of free speech, judicial review under the U.S.

## Course Descriptions

Constitution, selected free speech issues such as libel, defamation, speech in the workplace, pornography, flag-burning, and others. Prerequisite: a 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H)(C)

### **PHIL 370**

#### **Moral Issues in Engineering**

A study of the problems of moral and social responsibility for the engineering profession, including such topics as safety, confidentiality, government regulation, etc. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H)(C)

### **PHIL 371**

#### **Moral Issues in Architecture**

Examination of moral problems faced by architects and planners; the concept of professional behavior. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H)(C)

### **PHIL 373**

#### **Moral Issues in Business**

Ethical issues relating to individual and corporate responsibility, self- and governmental regulation, investment, advertising, urban problems, the environment, preferential hiring. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### **PHIL 374**

#### **Moral Issues in Computer Science**

Moral problems that confront professionals in computer-related fields, including questions raised by the concept of intellectual property and its relationship to computer software, professional codes of ethics for computer use, responsibility for harm resulting from the misuse of computers. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement. (3-0-3) (H) (C)

### **PHIL 380**

#### **Topics in Philosophy**

An investigation into a topic of current interest in philosophy. The topic for

the course will be announced by the instructor when the course is scheduled. Prerequisite: A 100-level humanities course and satisfaction of the Basic Writing Proficiency requirement.

**(3-0-3) (H) (C)**

### **PHIL 490,491**

#### **Independent Study**

Supervised individual research for advanced students. Prerequisite: Consent of the department. (Credit: Variable.) (H)(C)

## Physics

### **PHYS 100**

#### **Introduction to the Profession I**

Introduction to the physical sciences, scientific method, computing tools, and interrelations of physical sciences with chemistry, physics and other professions. (2-0-2) (C)

### **PHYS 101**

#### **Introduction to the Profession II**

Continuation of PHYS 101. Applications of scientific fundamentals to basic problem solving in physical sciences. (2-0-2) (C)

### **PHYS 120**

#### **Astronomy**

A descriptive survey of observational astronomy, the solar system, stellar evolution, pulsars, black holes, galaxies, quasars, the origin and fate of the universe. (3-0-3)

### **PHYS 123**

#### **General Physics I: Mechanics**

Vectors and motion in one, two and three dimensions. Newton's Laws. particle dynamics, work and energy. Conservation laws and collisions. Rotational kinematics and dynamics, angular momentum and equilibrium of rigid bodies. Simple harmonic motion, gravitation and fluid mechanics. Oscillations and waves. (3-3-4) (C)

### **PHYS 211,212**

#### **Basic Physics I, II**

Intended to give students in the liberal arts, architecture, and design an understanding of the basic principles of physics and an appreciation of how the results of physics influence contemporary

society, Prerequisite: MATH 122. This course does not count for graduation in any engineering or physical science program. (3-0-3); (3-0-3)

### **PHYS 213**

#### **Basic Physics Lab: Mechanics**

Corequisite: PHYS 211. (0-3-1) (C)

### **PHYS 214**

#### **Basic Physics Lab:**

#### **Electromagnetism and Optics**

Corequisite: PHYS 212. (0-3-1) (C)

### **PHYS 221**

#### **General Physics II:**

#### **Electromagnetism and Optics**

Charge, electric field, Gauss' Law and potential, Capacitance, resistance, simple a/c and d/c circuits. Magnetic fields, Ampere's Law, Faraday's Law, induction. Maxwell's equations, electromagnetic waves and light. Reflection and refraction, lenses, interference and diffraction. Prerequisite: PHYS 123. (3-3-4) (C)

### **PHYS 223**

#### **General Physics III:**

#### **Thermal and Modern Physics**

Temperature, first and second laws of thermodynamics, kinetic theory and entropy, Gratings and spectra, polarization. Light and quantum physics, wave nature of matter, structure of the hydrogen atom. Atomic physics, electrical conduction in solids, nuclear physics and particle physics. Prerequisite: PHYS 221. (3-3-4) (C)

### **PHYS 224**

#### **General Physics III Lecture:**

#### **Thermal and Modern Physics**

Temperature, first and second laws of thermodynamics, kinetic theory and entropy. Gratings and spectra, polarization. Light and quantum physics, wave nature of matter, structure of the hydrogen atom. Atomic physics, electrical conduction in solids, nuclear physics and particle physics. Prerequisite: PHYS 221. (3-0-3)

### **PHYS 240**

#### **Computational Science**

This **course** provides an overview of introductory general physics in a computer laboratory setting. Euler-Newton method for solving differential equations, the trapezoidal rule for numerical quad-

ture and simple applications of random number generators. Computational projects include the study of periodic and chaotic motion, the motion of falling bodies and projectiles with air resistance, conservation of energy in mechanical and electrical systems, satellite motion, using random numbers to simulate radioactivity, the Monte Carlo method, and classical physical models for the hydrogen molecule and the helium atom. Prerequisite: PHYS 223 or permission of the department. (2-3-3) (C)

### PHYS 300

#### Instrumentation Laboratory

Basic electronic skills for scientific research. Electrical measurements, basic circuit analysis, diode and transistor circuits. Transistor and integrated amplifiers, filters, and power circuits. Basics of digital circuits, including Boolean algebra and design of logic circuits. Prerequisite: PHYS 223. (2-3-3) (C)

### PHYS 304

#### Kinetic Theory and Thermodynamics

The notion of phenomenological characterization: pressure, volume, temperature, etc. The first and second laws of thermodynamics. Transport phenomena; thermodynamic functions and their applications. Introduction to Maxwell-Boltzmann statistics. Prerequisite: PHYS 223. (3-0-3)

### PHYS 308,309

#### Classical Mechanics I, II

Newton's Laws, one-dimensional motion, vector methods, kinematics, dynamics, conservation laws, and the Kepler problem. Collisions, systems of particles, and rigid-body motion. Approximation techniques, Lagrangian and Hamiltonian formulations of classical mechanics, small oscillations. Prerequisites: PHYS 223, MATH 252. (3-0-3); (3-0-3)

### PHYS 348

#### Modern Physics for Scientists and Engineers

An introduction to modern physics with the emphasis on the basic concepts that can be treated with elementary mathematics. Subjects covered include Einstein's special theory of relativity, black body radiation, the Bohr atom, elementary wave mechanics, and atomic

and molecular spectra. Prerequisite: PHYS 223. (3-0-3)

### PHYS 401

#### Statistical Physics

Statistical basis of thermodynamics. Kinetic theory. Fundamentals of statistical mechanics. Quantum statistics. Fluctuations and noise. Transport phenomena, Boltzmann equation. Prerequisites: PHYS 223, PHYS 304, PHYS 309. (3-0-3)

### PHYS 403

#### Relativity

Introduction to the special and general theories of relativity, Lorentz covariance. Minkowski space. Maxwell's equations. Relativistic mechanics. General coordinate covariance, differential geometry, Riemann tensor, the gravitational field equations. Schwarzschild solution, astronomical and experimental tests, relativistic cosmological models. Prerequisites: PHYS 309, MATH 251, or consent of instructor. (3-0-3)

### PHYS 404

#### Subatomic Physics

Historical introduction; general survey of nuclear and elementary particle physics; symmetries and conservation laws; leptons, quarks, and vector bosons; unified electromagnetic and weak interactions; the parton model and quantum chromodynamics. Prerequisite: PHYS 223. (3-0-3)

### PHYS 405

#### Fundamentals of Quantum Theory I

A review of modern physics including topics such as blackbody radiation, the photoelectric effect, the Compton effect, the Bohr model of the hydrogen atom, the correspondence principle and the DeBroglie hypothesis. Topics in one-dimensional quantum mechanics such as the particle in an infinite potential well, reflection and transmission from potential wells, barriers and steps, the finite potential well and the quantum harmonic oscillator. General topics such as raising and lowering operators, Hermitian operators, commutator brackets and the Heisenberg Uncertainty Principle are also covered. Many particle systems and the Pauli Exclusion Principle are discussed. Three-dimensional quantum mechanical systems,

orbital angular momentum, the hydrogen atom. Prerequisites: PHYS 308, PHYS 348, MATH 252 or permission of department. (3-0-3)

### PHYS 406

#### Fundamentals of Quantum Theory II

Zeeman and Stark Effects. Addition of spin and orbital angular momenta, the matrix representation of quantum mechanical operators, the physics of spin precession and nuclear magnetic resonance. Time independent and time dependent perturbation theory, Fermi's Golden Rule and the physics of radiation emitted in the course of atomic transitions. Indistinguishable particles in quantum mechanics, the helium atom. Scattering theory, using partial wave analysis and the Born approximation. Prerequisite: PHYS 405. (3-0-3)

### PHYS 410

#### Molecular Biophysics

Thermodynamic properties of biological molecules. Irreversible and open systems, information theory. Biophysical measurements. Structure and properties of proteins. Enzyme action. Structure and properties of nucleic acids. Genetics at the molecular level. Molecular aspects of important biological systems. Prerequisite: Consent of instructor. (3-0-3)

### PHYS 411

#### Astrophysics

Celestial mechanics and planetary motion; stellar structure and evolution; energy generation in stars; theory of white dwarfs, pulsars (neutron stars), and black holes; quasars; cosmology, background microwave radiation, and the big bang model. Prerequisite: PHYS 223 or consent of instructor. (3-0-3)

### PHYS 412

#### Modern Optics and Lasers

Geometrical and physical optics. Interference, diffraction, and polarization. Coherence and holography. Light emission and absorption. Principles of laser action, characterization of lasers, and laser applications. Same as ECE 413. Prerequisites: PHYS 348 or consent of instructor, CS 105. (3-0-3)

## Course Descriptions

### PHYS 413

#### Electromagnetism

Differentiation and integration of vector fields, and electrostatics and magnetostatics. Calculation of capacitance, resistance, and inductance in various geometries. Prerequisites: PHYS 308, MATH 252. (3-0-3)

### PHYS 414

#### Electromagnetism

Propagation and generation of electromagnetic radiation. Antennas and waveguides. Maxwell's equations. Electromagnetic properties of materials. Classical electrodynamics; special relativity. Prerequisite: PHYS 413. (3-0-3)

### PHYS 415

#### Solid State Electronics

Energy bands and carrier transport in semi-conductors and metals. Physical principles of p-n junction devices, bipolar junction transistors, FETS, Gunn diodes, IMPATT devices, light-emitting diodes, semiconductor lasers. Same as ECE 415. Prerequisite: PHYS 348 or consent of instructor. (3-0-3)

### PHYS 418

#### Introduction to Lasers

Nature of light. Coherence and holography. Light emission and absorption. Principles of laser action. Characteristics of gas lasers, organic dye lasers, solid state lasers. Laser applications. Same as ECE 418. Prerequisite: PHYS 348 or consent of instructor. (3-0-3)

### PHYS 421,428

#### Advanced Physics Laboratory I, II

Experiments related to our present understanding of the physical world. Emphasis is on quantum phenomena in atomic, molecular, and condensed matter physics, along with the techniques of measurement and data analysis. The second semester stresses project-oriented experiments on modern topics including spectroscopy, condensed matter physics, and nuclear physics. Prerequisite: PHYS 300 or consent of instructor. (2-3-3); (2-3-3) (C)

### PHYS 437

#### Solid State Physics

Crystal structure and binding, lattice vibrations, phonons, free electron model, band theory of electrons. Electrical, thermal, optical, and magnetic properties of solids. Superconductivity. Prerequisite: PHYS 348 or consent of instructor. (3-0-3)

### PHYS 440

#### Computational Physics

Root finding using the Newton-Raphson method; interpolation using Cubic Splines and Least Square Fitting; solving ordinary differential equations using Runge-Kutta and partial differential equations using Finite Difference and Finite Element techniques; numerical quadrature using Simpson's Rule, Gaussian Quadrature and the Monte Carlo Method; and spectral analysis using Fast Fourier Transforms. These techniques are applied to a wide range of physics problems such as finding the energy levels of a finite quantum well using a root finding technique, solving the Schrodinger equation using the Runge-Kutta-Fehlberg method, using random numbers to simulate stochastic processes such as a random walk, using the Fast Fourier Transform method to perform a spectral analysis on non-linear, chaotic systems such as the Duffing oscillator, and using auto-correlation functions to simulate sonar or radar ranging problems. Prerequisites: PHYS 240, PHYS 308, PHYS 348, PHYS 405 or permission of department. (2-3-3) (C)

### PHYS 491

#### Undergraduate Research

Student participation in undergraduate research, usually during the junior or senior year, Prerequisite: Recommendation of adviser and approval of the department chair. (Credit: Variable) (C)

### PHYS 497

#### Special Topics in Physics

(Credit: Variable) (C)

#### Graduate Courses

Graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current *IIT Bulletin: Graduate Programs* for full descriptions.

### PHYS 501

#### Methods of Theoretical Physics I

### PHYS 502

#### Methods of Theoretical Physics II

### PHYS 505

#### Electromagnetic Theory

### PHYS 507

#### Electrodynamics

### PHYS 508

#### Analytical Dynamics

### PHYS 509

#### Quantum Theory I

### PHYS 510

#### Quantum Theory II

### PHYS 515

#### Statistical Mechanics

### PHYS 521

#### Quantum Electronics

### PHYS 537

#### Physics of the Solid State I

### PHYS 538

#### Physics of the Solid State II

### PHYS 553

#### Quantum Field Theory

### PHYS 561

#### Radiation Biophysics

### PHYS 570

#### Introduction to Synchrotron Radiation Research

### PHYS 571

#### Health Physics I

### PHYS 572

#### Health Physics II

### PHYS 573

#### Standards, Statistics and Regulations

### PHYS 574

#### Dosimetry

### PHYS 575

#### Case Studies in Health Physics

## Political Science

### PS 200

#### American Government

Surveys American politics and government. The informal political institutions, such as parties and interest groups, are analyzed and related to the formal governmental institutions, such as the presidency and the Congress. Emphasis is placed on how the American political culture shapes these institutions and how public policies are produced. (3-0-3) (S) (C)

### PS 201

#### Politics and Public Policy

Analyzes how social problems become public problems and how the government develops public policies and with what effect. Emphasizes the characteristics of the American policy-making process. Case studies are used to clarify the process. (3-0-3) (S) (C)

### PS 256

#### Law in American Society

Examines the nature of law and the legal system in American society. Special attention will be paid to the institutions of the legal system, how they are supposed to function, and how they actually function. Topics for study may include the police, prosecutors, lawyers, judges, juries, grand juries, and public defenders. The courts, ranging from the U.S. Supreme Court to local trial courts, are studied. The impact of U.S. Supreme Court decisions on the system of justice in America is explored. (3-0-3) (S) (C)

### PS 273

#### Great Political Thinkers

Introduces students to the ideas of the world's great political philosophers. Plato, Aristotle, Hobbes, Locke, Rousseau, Marx, and others will be covered. (3-0-3) (S) (C)

NOTE: All political science courses numbered above 300 require as prerequisites successful completion of at least one other course marked with an (S), and satisfaction of the basic writing proficiency requirement.

### PS 300

#### Introduction to the Social Sciences

The course introduces the foundations of the social science disciplines, notably economics, history, political science, psychology, and sociology. Primary emphasis will be placed on how the disciplines employ distinctive assumptions and perspectives, which are used to generate understanding, form explanations, and construct theories. (3-0-3) (S)

### PS 303

#### Politics and the Media

Analyzes the media's role in contemporary American politics and government. Emphasis is placed on how the media, both newspapers and television, manufacture the news and how the news influences political and government agenda, decision making, and public policies. (3-0-3) (S)

### PS 309

#### Research Methods in Social and Political Science

Introduces students to explanation in the social sciences and both qualitative and quantitative research methods. Topics covered include formulation of research questions, measurement, data collection, survey research, significance tests, experimental and quasi-experimental design, sampling, and various techniques of qualitative research. Prerequisite: A statistics course approved by the department. Same as SOC 309. (3-0-3) (S) (C)

### PS 310

#### Social and Political Thought

Examines central social and political theories and their ideas concerning such things as the relationship between individual and society, social harmony and conflict, social equality, and the role of the state. Same as SOC 310. (3-0-3) (S) (C)

### PS 315

#### Urban Politics

Examines city and metropolitan politics and government. Emphasizes how economic and demographic changes influence local politics, how local politics work, and how state and national policies influence local politics. Special attention is devoted to Chicago politics. (3-0-3) (S)

### PS 317

#### Chicago Politics

The study of Chicago's politics and government from both historical and contemporary perspectives. Emphasis is placed on changes that have significantly shaped the direction of Chicago's politics. Special attention is devoted to social class, ethnicity, race, and ideology as factors that have influenced the Democratic political machine and its opposition. (3-0-3) (S)

### PS 318

#### Contemporary Constitutional Issues

The course examines how decisions about some of our basic rights are made. Emphasizes U.S. Supreme Court decisions in the areas of criminal law, desegregation, education, welfare, housing, and consumer law. Related topics of special interest to students in the class can be added to the syllabus. Supreme Court decisions are read and supplemented by textual material. (3-0-3) (S) (C)

### PS 330

#### International Relations

Examines the relations among nations from the perspective of both the international system and the nation state. Emphasizes the transformation in the international system caused by weapons, production, and communications technologies. Compares the nature, function, and purpose of modern warfare and other forms of conflict with the prospects for international order through law, organization, communications, and arms control. Gives special attention to the international policies of the United States toward various regions and its role in international organizations. (3-0-3) (S) (C)

### PS 332

#### Politics of Science and Technology

Explores the complex interrelationships among science, technology, and politics, with emphasis on the political issues created by contemporary scientific advances. Gives roughly equal attention to the politics of scientific discovery; the development of government organization for science and scientific advice to government; the impact of industrialized science and advanced technology on the economy

## Course Descriptions

and society; and the growing debate over the social implications of science and technology and how they can be predicted, measured, and controlled. Same as SOC 304. (3-0-3) (S) (C)

### PS 333

#### National Defense Policy

Examines the formulation and implementation of national security and military policy in the United States. Surveys the emergence and growth of military strategy and the defense establishment, with primary emphasis on contemporary issues, institutions and policies, and prospects for the future. Emphasizes the impact of nuclear weapons on military strategy and security and the post Cold war struggle over forces and missions. (3-0-3) (S) (C)

### PS 338

#### Energy and Environmental Policy

Places energy and environmental policy in domestic and global contexts. Traces the economic and political implications of dependence on fossil fuels and the attempt to develop alternate energy sources and promote conservation. Assesses the environmental effects of resource consumption and the effort to control these effects by increased efficiency and regulation of pollution. Explores such problems as nuclear waste, acid rain, global warming, and deforestation. Examines national and international attempts at economic, political, and technological solutions. (3-0-3) (S) (C)

### PS 339

#### Nuclear Energy and Society

Explores the relationship between nuclear energy-science, technology, and products, and society-national, local, and global. Gives detailed attention to the discovery of nuclear fission and its exploitation during World War II and after, culminating in the global nuclear arms race. Examines the emergence and growth of nuclear power and the rise of the controversy over its safety, security, and economy. Considers the risks of continued proliferation, the prospects for arms control and the "peaceful atom," and the chances for survival in a nuclear world. Uses films, case studies, guest lectures, and simulations where appropriate. (3-0-3) (S) (C)

### PS 345

#### The American Presidency

Surveys the evolution of the office and powers of the presidency as a result of historical forces, institutional factors, and the actions of those who have served as president. Studies the relationships of presidents with political parties, Congress, the bureaucracy, media, and the public, emphasizing both domestic and foreign policy. Gives major attention to changes in the presidential selection process and their implications for those who run and win the office. Examines the alleged crisis of the contemporary presidency and the proposals for overcoming it. (3-0-3) (S) (C)

### PS 351

#### Public Administration

Examines the nature of administrative organization, decision making in organization, and organization structure and processes: division of work, authority, communications, and planning. Considers the role of the government executive. Analyzes relation of fiscal procedures and personnel management to organization. (3-0-3) (S) (C)

### PS 355

#### Political Sociology

Surveys major issues and problems in the field of political sociology. Topics include the forms of political power structures, elitist approaches to politics, community and national power structure, and political socialization. (3-0-3) (S)

### PS 488

#### Methods of Policy Analysis

Introduces students to the field of Policy Analysis and acquaints students with basic methods policy analysis and urban planning. Course covers methods of analyzing and resolving policy issues relating to a broad range of public sector problems. Emphasis is on methods of analysis and problem solving rather than on politics or political process. Topics include decision theory, benefit/cost analysis, problem simulation, population projection, problem formulation and definition. Course will be taught using the case method. The course is of particular interest to students interested in applications of quantitative models to solve public sector problems. (3-0-3) (S) (C)

### PS 452

#### Bureaucracy

Analyzes bureaucracy in its social context. The evolution of the theory and practice of bureaucracy as a form of control, coordination, and social order are considered. Emphasizes government bureaucracies, with selected examples from other organizations. (3-0-3) (S) (C)

### PS 453

#### Regulatory Policy and Politics

Examines the changing role of government regulation of private and public activities from a political and administrative perspective. Explores reasons for the growth of government regulation from the Progressive era through the New Deal to the social regulation of the 1970s and for the subsequent controversy over economic and social deregulation. Investigates the regulatory process, including administrative law, standards for rule-making, and the involvement of organized groups and the courts. Studies specific cases from such areas as transportation, environment, energy, public health, and research and development. (3-0-3) (S) (C)

### PS 482

#### American Governmental Institutions

An advanced course in American government intended to develop knowledge and analytical skills to assess how well our government works and how it might work better. The course focuses on the operation of federal executive, legislative, and judicial institutions, the policy-making process (including the role of administrators), and the power exercised by organized groups, experts, and the media (3-0-3) (S) (C)

### PS 477

#### Topics in the Study of Politics

Provides students a reading and seminar course on a selected topic of politics. Subject matter will change in successive offerings of the course. (3-0-3) (S) (C)

### PS 497

#### Directed Readings in Political Science

Consists of independent reading and analysis, centered on particular problems and supervised by a member of the political science faculty. Prerequisite: Consent of instructor. (Credit: Variable; maximum 4 credit hours) (S) (C)



## Psychology

### PSYC 100

#### Introduction to Professions

Introduction to psychology and social science professions. Topics include problem formulation and career opportunities, spreadsheets and relevant computer applications, as well as data search tools. (2-0-2) (C)

### PSYC 204

#### Experimental Psychology and Research Methods

Introduction to experimental methodology in learning, motivation, and psychophysics. Design, performance, and analysis of basic experiments. Prerequisites: PSYC 221 or PSYC 222, MATH 221. Note: Offered every other year. (2-2-3) (N,C)

### PSYC 221

#### Human Behavior, Growth and Learning

Survey of personality, developmental, assessment, learning and social psychological aspects of human behavior. (3-0-3) (S) (C)

### PSYC 222

#### Brain, Mind and Behavior

Survey of sensation, perception, motivation, physiological and neuropsychological bases of behavior. (3-0-3) (S) (C)

### PSYC 238

#### Professional Skills

Didactic and applied approach to professional skill development in the areas of oral communication, conflict management and interpersonal dimensions of the work setting. (3-0-3)

### PSYC 301

#### Industrial Psychology

Survey of practical applications of psychology to problems of business and industry; work, job placement, morale, safety, turnover, absenteeism, and training. (3-0-3) (S) (C)

### PSYC 303

#### Abnormal Psychology

Survey of the dynamics underlying behavior deviations. Considers therapeutic procedures, psychopathology. (3-0-3) (S,C)

### PSYC 310

#### Social Psychology

Description and analysis of behavior and experience as determined by social conditions. Includes social issues, human relations, prejudice, and leadership. (3-0-3) (S)

### PSYC 406

#### History and Systems of Psychology

Historical development of influential psychological systems: structuralism, functionalism, behaviorism, psychoanalysis, and Gestalt psychology. Prerequisite: 12 hours of psychology. (3-0-3) (S)

### PSYC 409

#### Psychological Testing

Survey of current group tests, emphasizing basic concepts; e.g., validity, reliability, as well as practical applications and measurement techniques. Prerequisites: PSYC 221, PSYC 222 and MATH 221. (3-0-3)

### PSYC 410

#### Vocational Rehabilitation

Historical, philosophical, and legal bases of rehabilitation. Study of vocational, independent living, public and private rehabilitation, service delivery systems, and roles and functions of the practitioner. Prerequisite: PSYC 221. (3-0-3) (S) (C)

### PSYC 411

#### Medical Aspects of Disabling Conditions

Survey of human organ systems, medical terminology, unique characteristics of disabling conditions, including severe disabilities. Vocational consequences, environmental impact and implications for the rehabilitation process. One of a two-course sequence. Prerequisite: PSYC 221, PSYC 222. (3-0-3) (N)

### PSYC 412

#### Psychosocial Aspects of Disabling Conditions

Personal adaptation and coping processes following disability, psychological and social consequences of disabling conditions, sexuality and disability, attitudes toward persons with disabilities, stigma management. One of a two-course sequence. Prerequisite: PSYC 221, PSYC 222. (3-0-3) (S) (C)

### PSYC 414

#### Physiological Psychology

An introduction to the biological bases of behavior with an emphasis on the neuroanatomy and neurophysiology of sensory and central nervous systems. Prerequisites: PSYC 221, PSYC 222 (3-0-3) (N)

### PSYC 420

#### Single Subject Design and Applied Behavior Analysis

Single-subject experimental designs for the evaluation of environmental variables on behavior of individuals. Applied behavior analysis, precision teaching, and frequency measures for logical inference. Ethical, logical, scientific, and practical aspects of "real-world" experimentation for optimizing performance or learning in education, treatment, and training. (3-0-3) (S)

### PSYC 423

#### Learning Theory

Survey of contributions of major learning theorists and pertinent studies. Prerequisite: 12 hours of psychology. Note: Offered every other year. (3-0-3) (S) (C)

### PSYC 426

#### Cognitive Processes

Survey of research in cognitive psychology; affirmative, conjunctive, and disjunctive rules, transfer paradigms, distinctiveness of cues, shift paradigms. Prerequisite: PSYC 204. (3-0-3) (S)

### PSYC 431

#### Measurement of Attitudes

Survey of methods used in attitude scale construction. Development and use of such scales. Multidimensional scaling. Prerequisite: MATH 221. (3-0-3)

### PSYC 435

#### Early Development

Processes and theories of mental, social, emotional and physical development of infants, children and adolescents. Prerequisite: 9 hours of psychology or consent of instructor. (3-0-3) (S)

## Course Descriptions

### **PSYC 436**

#### **Adult Development**

Explores processes and changes in cognitive, social, physical and emotional functioning across adult life. Prerequisite: 9 hours of psychology or consent of instructor. (3-0-3) (S)

### **PSYC 449**

#### **Practicum in Rehabilitation Services**

Seminar and supervised fieldwork experience in a rehabilitation setting with disabled individuals. Emphasizes service delivery, interviewing techniques, and caseload management. Prerequisites: SOC 480, PSYC 410, PSYC 411, and PSYC 412 or concurrent registration. (3-0-3)

### **PSYC 452**

#### **Personality Theory**

Survey of personality theories and their application to everyday life. Prerequisites: PSYC 221, PSYC 222. (3-0-3) (S)

### **PSYC 456**

#### **Engineering Psychology**

Theory of human physical and psychological abilities as they relate to design of transportation, housing, workplace, defense, and recreational systems. Topics include theories relating to psychophysiology, anthropometry, communications, man-machine interactions, training, maintainability, safety, and engineering evaluation. Prerequisites: PSYC 221, PSYC 222. (3-0-3) (S)

### **PSYC 482,483**

#### **Undergraduate Research Seminar I, II**

An introduction to applied research in psychology, Includes a didactic review of basic and current issues in psychological research as well as an experiential component. Students actively participate in ongoing faculty research programs and are exposed to all areas of research. Prerequisites: PSYC 221, PSYC 222 and PSYC 204, or consent of instructor. (1-2-3)

### **PSYC 487**

#### **Integrative Psychology Seminar I**

A synthesis of issues and areas in psychology. Prerequisites: Junior standing, 21 credit hours in psychology, and MATH 221. (3-0-3)

### **PSYC 488**

#### **Integrative Psychology Seminar II**

Seminar integrating seminal and cutting edge psychological writings both empirical and conceptual to address key issues in contemporary psychology. Prerequisite: Third-year standing, 24 credits in psychology. (3-0-3)

### **PSYC 489**

#### **Undergraduate Psychology Seminar**

Reports and discussion of current problems and issues in psychology. Prerequisites: PSYC 221, PSYC 222 and PSYC 204, or consent of instructor. (3-0-3) (S)

### **PSYC 497**

#### **Special Problems**

Independent study involving compilation and analysis of data bearing on a significant problem. Prerequisites: Junior standing and consent of instructor. (Credit: Variable)

### **Graduate Courses**

The following graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current *IIT Bulletin: Graduate Programs* for course descriptions.

### **PSYC 501**

#### **Psychological Foundation of Behavior**

### **PSYC 502**

#### **Social Bases of Behavior**

### **PSYC 503**

#### **Learning, Cognition and Motivation**

### **PSYC 504**

#### **Individual Differences and Personality Development**

### **PSYC 513**

#### **Vocational Evaluation I**

### **PSYC 523**

#### **Introduction to Theories of Psychology**

### **PSYC 545**

#### **Graduate Statistics**

### **PSYC 556**

#### **Organizational Psychology**

### **PSYC 561**

#### **Applied Counseling Techniques**

### **PSYC 563**

#### **Vocational Counseling**

### **PSYC 574**

#### **Administration in Social Service Delivery**

### **PSYC 583**

#### **Rehabilitation Engineering Technology**

## **Sociology**

### **SOC 200**

#### **Introduction to Sociology**

Introduces students to the structure and operation of Society Analyzes individual behavior. Emphasizes the structure and problems of American society. (3-0-3) (S) (C)

### **SOC 201**

#### **Social Psychology**

Examines how contemporary society molds individuals to its image. Topics include: human instinct, values and needs, attitudes, the process of socialization, suggestion and propaganda, rumor, prejudice, social conflict, conformity, social values, and interaction. (3-0-3) (S) (C)

### **SOC 210**

#### **Society, Environment and Ecology**

An introductory survey course with no prerequisites. Aims at providing environmental literacy and understanding of the changing arguments in the environmental debate. Traces the relationship between Man and Nature from early industrial optimism to the 1960's rise of concerns about pollution, the 1970's limits to growth debate, and today's concerns with global climate change and the fate of Earth itself. Explores the possibility of a new paradigm of clean, innovative technology, and its social, economical, and political implications. (3-0-3) (S) (C)

**SOC 240**

**Social Problems**

Analyzes selected problems affecting American society, including: poverty among and discrimination against minorities; crime and delinquency; urban problems; United States and world population problems; foreign policy and militarism. (3-0-3) (S) (C)

**SOC 242**

**Industrial Society**

Analyzes social issues of particular relevance to scientists and engineers: demographic trends and their effects on schools, labor markets, workplaces, and other institutions; the changing role of the United States in the world political economy; the impact of changing technology on work and employment; the shift to a service economy; the Japanese challenge to American business and industry; responses of both the public and private sectors to these issues. (3-0-3) (S) (C)

**SOC 249**

**Sociology of the Family**

This course examines the family in its cultural, social, and economic contexts: how the family forms, function, and ideology are related to other aspects of society; and how the family serves as the environment for interpersonal behavior. Among the topics to be considered are feminine and masculine roles, alternative lifestyles, parenthood, and the changes in family related to the human life cycle. (3-0-3) (S) (C)

**SOC 259**

**Race and Ethnic Relations**

The course examines the social, psychological, and cultural dimensions of race and ethnic relations in the context of modern society. Major theories regarding the origins and impact of interracial and inter-ethnic conflict are analyzed, with special emphasis placed on the consequences of such conflict for the wider society. Governmental responses to prejudice and discrimination also are examined. (3-0-3) (S) (C)

NOTE: All sociology courses numbered above 300 require as prerequisites successful completion of at least one sociology course at the 200 level, at least one other course marked with an (S), and satisfaction of the basic writing proficiency requirement.

**SOC 301**

**The Social Dimension of Science**

Examines how social and psychological factors influence the reasoning and behavior of scientists. Through contrasting traditional views of science with actual scientific practice, the course aims at understanding such phenomena as "hype," resistance to scientific discovery, controversy, vicious competition, error, self-deception, and fraud. (3-0-3) (S) (C)

**SOC 302**

**Science and Belief**

Explores the relationship between science and belief through comparing Western science with other belief systems, science with religion, and science with pseudo-science. The course also examines cultural and ideological influences on scientific knowledge and public faith in science. (3-0-3) (S) (C)

**SOC 303**

**Science in Society**

Examines the role of the institution of science, scientific knowledge, and scientists in society. The course focuses on areas where science significantly influences and is influenced by political, economic, and cultural institutions and contexts. The course addresses broader theoretical issues such as boundaries of science, autonomy, and control of science, and science and power. (3-0-3) (S) (C)

**SOC 304**

**Politics of Science and Technology**

Explores the interrelationships among science, technology, and politics, with emphasis on the political issues created by contemporary scientific advances and molecular biology. Investigates the politics of scientific discovery, procedures for scientific advice to government, the impact of industrial technology on the economy and society, and the social implications of science and technology and how they can be predicted, measured, and controlled. Same as PS 332. (3-0-3) (S) (C)

**SOC 305**

**Social Communication**

This course studies the variety of subtle ways-verbal and nonverbal-in which humans communicate in personal, professional and public life, and how to identify and solve problems and misunderstandings that typically arise. Topics include the social nature of humans, interpersonal communication, interaction within and between groups, teamwork, leadership, and intercultural communication. Group and individual exercises develop skills in social analysis, problem finding, problem solving, and oral and written presentation, (3-0-3) (S) (C)

**SOC 309**

**Research Methods in Social and Political Science**

Introduces students to explanation in the social sciences and both qualitative and quantitative research methods. Topics covered include formulation of research questions, measurement, data collection, survey research, significance tests, experimental and quasi-experimental design, sampling, and various techniques of qualitative research. Prerequisite: A statistics course approved by the department. Same as PS 309. (3-0-3) (S) (C)

**SOC 310**

**Social and Political Thought**

Examines central social and political theories and their ideas concerning such things as the relationship between individual and society, social harmony and conflict, social equality, and the role of the state. Same as PS 310. (3-0-3) (S) (C)

**SOC 311**

**Comparative Social Structure**

Examines theories of social organization with particular focus on complex bureaucratic organizations, social stratification, and social change; also considers basic social institutions (e.g., family, government) in light of relevant theories. (3-0-3) (S) (C)

## Course Descriptions

### **SOC 321**

#### **Social Inequality**

Evaluates the patterns and dimensions of social, economic, and political inequality in American society and how these compare with other societies; who gets ahead and why; the relationship of social class to other features of society; some consequences of social stratification; and outlooks for the future of inequality in the United States. (3-0-3) (S) (C)

### **SOC 330**

#### **Sports and Society**

Exploration of sports as a multi-billion dollar "microcosm" of society. How do structure and cultural expectations constrain various participants and viewers of the sports worlds? Through a combination of academic readings, popular commentary, documentaries and movies, the course will explore American business, values, preferences, gender and ethnic expectations, and education as reflected in and affected by sports. (3-0-3) (S) (C)

### **SOC 346**

#### **Deviant Behavior and Conformity**

Analyzes the definition, development, and control of deviant behavior in relation to social processes. Societal reaction to and the amount, distribution, and behavior systems of various forms of deviance (drug addiction, suicide, crime, alcoholism, illegitimacy, etc.) are examined. (3-0-3) (S) (C)

### **SOC 350**

#### **Urban Sociology**

This three-part course investigates the role cities have played in the development of industrial societies; analyzes the historical development of American cities and the problems they face today, including poverty and racial tensions, fiscal strain, and population and industrial decline (with an emphasis on Chicago); and examines urban patterns and problems in the third world. (3-0-3) (S) (C)

### **SOC 352**

#### **Sociology of Education**

Analyzes the organization and purpose of schooling in American society including the historical development of American education; the relationship of schooling to life chances and individual success; the bureaucratic characteristics of schooling; contemporary problems facing American education and proposals recommended for their solution; and how the U.S. educational system compares with those of other societies. (3-0-3) (S) (C)

### **SOC 354**

#### **Gender and Work**

What are the effects of gendered expectations about "work"? The historical roots and nature of gendered work in and outside the home, especially focusing on wage work within blue collar, service, and professional occupations.

(3-0-3) (S) (C)

### **SOC 355**

#### **Political Sociology**

Surveys major issues and problems in political sociology, including the forms of political power structures, elitist approaches to politics, community and national power structure, voting behavior, nation building and modernization, and civil-military relations.

(3-0-3) (S) (C)

### **SOC 362**

#### **Technology and Social Change**

Examines major changes in social institutions and the role that technical innovations have played. Introduces the student to various approaches to assessment and forecasting. (3-0-3) (S) (C)

### **SOC 371**

#### **Occupations and Professions**

This course considers all factors affecting work, including the transition from school to work; the determinants of earnings and other job benefits; job satisfaction; labor unions and professional associations; class position in American society; the effects of foreign competition; government labor force policies; and the work environment in a comparative perspective. (3-0-3) (S) (C)

### **SOC 411**

#### **The Social Use of Space**

Explores the interaction of spatial and social dimensions of the city, including such topics as territoriality, neighboring, perceptions of community, effects of physical design and scale on human behavior, and urbanism and suburbanism as ways of life. Emphasizes case studies and direct observation of actual communities, with special attention to Chicago. (3-0-3) (S) (C)

### **SOC 415**

#### **The New Workplace**

In a few years, many workers will no longer commute to downtown offices for a nine-to-five workday. Instead they will join the ranks of telecommuters and other homeworkers who design, write, and talk with each other from their homes. This course will examine the assumptions about time and space and home and work currently operating within the workplace. (3-0-3) (S) (C)

### **SOC 420**

#### **Managers and Management**

Managers possess unique positions within the workplace. This course examines the structural constraints and cultural expectations associated with the role of "manager." We will draw from works within the sociology of business, organizations, work, and occupations to explore the historical development and place of managers in society, and the current expectations, reward structure, and dilemmas of managers in a variety of work settings. Some of the dynamics we will address are distinctions between managers, their employers and their subordinates, the infiltration of managerial ideology throughout the broader society; constraints on managers' decision-making processes; currently popular policies and attitudes among managers in business; and experimental employer/management/employee configurations. This is a readings and discussion seminar. Prerequisite: SOC 200 or, with approval of instructor, significant life experience relevant to course subject matter. (3-0-3) (S) (C)

**SOC 431**

**Development of**

**Sociological Thought**

Surveys ideas and issues that have influenced the history of sociology and continue to bear significantly on current theory. Analyzes major figures, schools of thought, conceptual themes, and controversies. (3-0-3) (S) (C)

**SOC 480**

**Sociology of Disability  
and Rehabilitation**

Examines the institutions and groups that interact with disabled individuals. Topics include the service professions and rehabilitation; labeling and disability; sheltered care versus mainstreaming; disability and the family; the role of support groups; employment of individuals; and a cross-cultural survey of rehabilitation. (3-0-3) (S) (C)

**SOC 491**

**Undergraduate Research  
in Sociology**

Students engage in supervised readings or research in order to obtain more intensive training in special interest areas of sociology. Prerequisite: Consent of instructor. (Credit: Variable) (C)

**SOC 497**

**Directed Readings**

Students read selected literature on a particular topic. Prerequisite: Consent of instructor. (Credit: Variable) (S) (C)

**Spanish**

Most students may take 200-level foreign language courses for General Education in the Humanities, but students seeking engineering degrees must receive the permission of the Dean of the Undergraduate College in order to assure that they satisfy accreditation requirements. A student with prior acquaintance of a language is placed in a course at the proper level by the instructor. Most students with two years of high school Spanish are prepared for SPAN 201.

**SPAN 101**

**Elementary Spanish I**

An introduction to modern Spanish, with exercises in translation, grammar, conversation, and comprehension.

**(3-0-3)**

**SPAN 102**

**Elementary Spanish II**

A study of modern Spanish emphasizing structural analysis and developing comprehension, translation, and conversation skills. Reading of selected Spanish texts and exercises in composition.

Prerequisite: SPAN 101. (3-0-3)

**SPAN 201**

**Intermediate Spanish I**

Continuation of training in written and oral expression. Study of Spanish literary works and composition of reports.

Prerequisite: SPAN 102. (3-0-3) (H)

**SPAN 202**

**Intermediate Spanish II**

Training towards fluency in modern Spanish. Classroom analysis of Spanish literature, with collateral readings, and with an emphasis on written reports.

Prerequisite: SPAN 201. (3-0-3) (H)

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## Academic Policies and Procedures

### Academic Loads

The average full-time academic load during the fall or spring semester is 15-18 credit hours. The minimum registration required for full-time status for those semesters is 12 credit hours. During the summer session, six credit hours is regarded as full-time enrollment for financial aid consideration. Students who wish to enroll for more than 18 credit hours during the fall or spring semester must obtain permission from the dean of the undergraduate college. Students who wish to enroll for more than two courses during the summer must

obtain permission from the dean of the undergraduate college. Part-time degree-seeking students who wish to enroll for 9 to 11 credit hours must have permission from the dean of the undergraduate college. Non-degree students requesting a course overload must obtain permission from the Office of Educational Services. Students who wish to change their class schedule must do so at the Student Services Center. Changes can only be made according to the deadlines stated in the *IIT Bulletin: Schedule of Classes*.

### Academic Program Audit

An academic audit provides a summary of a student's academic status to date and lists the courses to be completed in order to receive a degree. Most undergraduate students who have completed at least 70 semester hours (including applicable transfer credit) will receive an audit from the Office of

Educational Services. Some students will be required to submit an Approved Program of Study and should consult their departmental adviser regarding this requirement. After receiving their first audit, students may request periodic updates.

### Academic Progress, Probation and Dismissal

All students who are degree candidates are expected to maintain satisfactory grade point averages and a satisfactory rate of progress toward the completion of their degree programs.

Students who do not maintain at least 2.00 cumulative and 1.85 current grade point averages and a 2.00 cumulative average in their major field are placed on academic probation. Their eligibility for financial aid will also be reviewed.

Degree-seeking students also are expected to maintain a satisfactory rate of progress. For full-time students, this means a minimum of 12 credit hours per semester applicable to their degrees. For part-time students, a satisfactory rate of progress will enable them to graduate within 12 academic years after achieving degree-seeking status. Students who do not maintain a satisfactory rate of progress in a given semester are placed on probation the following semester.

Students on probation are not permitted to:

1. Register for more than 15 credit hours per semester.
2. Hold office in any student organization.
3. Represent the university on any athletic team, student organization, or committee.

Students who are on academic probation for two consecutive semesters are subject to dismissal from IIT.

The progress of non-degree students also is reviewed and any such student failing to maintain an acceptable record is subject to being placed on probation or being dismissed.

A student dismissed by the university can petition the Academic Standing Committee to review his or her case. The student must present substantial academic or other relevant new evidence not available at the time of dismissal in support of the petition for reinstatement. The chair of the Academic Standing Committee will determine whether the new documentation warrants a further review of the case.

### Advisers

Each undergraduate student is assigned to a faculty adviser who is available to discuss opportunities and career plans in the student's chosen field and to plan and approve course work to meet department and university requirements. Students are urged to consult their advisers often. The

associate and assistant deans are the initial contact for the dean of the undergraduate college. They, too, can offer information on the university requirements and are responsible for most student academic records.

# Academic Policies and Procedures

## Change or Declaration of Major

A student who wishes to change or declare a major must obtain a “Change of Major Form” from the Office of Educational Services. After completing the form, the student must have

the signature from the department chair of the intended major and the dean of the undergraduate college before returning the form to the Office of Educational Services.

## Change of Status

Students who wish to change their classification and/or registration status must complete the applicable procedures listed below no later than two weeks prior to registration (or preregistration).

- Students changing from full-time degree-seeking status to part-time degree-seeking status must notify the Financial Aid Office if they are receiving financial aid. International students with student visas must be registered as full-time students and are not permitted to change to part-time status.
- Students changing from part-time degree-seeking status to full-time degree-seeking status must inform their department and obtain the necessary adviser’s approval for a full-time course load. Also, students in this category who wish to apply for financial aid must notify the Financial Aid Office regarding their change of status.
- Students changing from part-time non-degree status to full-time or part-time degree-seeking status must contact the Office of Educational Services. Students must have completed at least one semester of relevant coursework at IIT and must be in academic good standing in order to be eligible for changing their status.
- Students changing from graduate status to undergraduate full-time or part-time status must apply for reinstatement as an undergraduate student in the Office of Educational Services.

## Class Attendance

All students are expected to attend their classes regularly. Excessive absences may be grounds for receiving a failing grade. In case of illness or hospitalization that will require

a student to be absent for more than two days of classes, the Office of Student Affairs (312.567.3080) should be notified at the earliest possible date.

## Credit by Examination

Credit may be earned through one or more of the following examination procedures. Total credit from Proficiency

Examinations and CLEP may not exceed 18 semester hours. There is no limit for Advanced Placement credit.

## Advanced Placement Program

Refer to the section on admission, page 14.

## College Level Examination Program (CLEP)

For these examinations, which are administered by the College Entrance Examination Board, IIT will award credit under the following conditions:

1. The CLEP examination and the score achieved meet the standards of the IIT department that offers courses in the area of the examination.
2. The CLEP examination is taken before the student enters IIT.
3. Students must observe all rules of the College Level Examination Program regarding the taking of CLEP examinations.

**NOTE:** Previous acceptance of the examination by another institution does not imply acceptance by IIT.



## Proficiency Examinations

Any student who believes that, through self-study or outside experience, he or she has gained the substantive equivalent of the content of a specific course may ask for an examination. With the approval of the chair of the department offering the course and the dean of the undergraduate college, a proficiency examination will be administered. This is a graded exam and the letter grade will be entered on the permanent

record. Proficiency examinations are not allowed for courses in which the student has previously enrolled and must be completed before a student's final 45 semester hours of enrollment at IIT. The "Credit by Examination Form" can be obtained in the Student Services Center and a fee of \$100 per credit hour is charged for each examination.

## Dean's List

The names of all undergraduate students who have completed at least 12 graded hours without any "D" or "E"

grades and who have a semester grade point average of 3.50 or better appear on the Dean's List.

## Grade Point Average

To determine a grade point average (GPA), divide the total number of grade points earned by the total number of graded semester hours. Note that graded semester hours do not

include courses graded "I," "W," or "X." All courses taken at IIT apply to the cumulative GPA, including those that do not apply toward graduation.

## Grades

The following grades are used to report the quality of an undergraduate student's work:

**A** Excellent, 4 grade points for each semester hour.

**B** Good, 3 grade points for each semester hour.

**C** Satisfactory, 2 grade points for each semester hour.

**D** Minimal Passing, 1 grade point for each semester hour.

**E** Failure, 0 grade point for each semester hour.

**W** Withdraw. To withdraw from a course with a grade of "W," a student must submit a "Drop/Add Form" to the Student Services Center before the end of the 10th week of the semester (the sixth week of an eight week summer session and the fourth week of a six-week summer session). Withdrawal without submission of this form is unofficial and will result in a grade of "E."

**NOTE:** Withdrawal with a grade of "W" is not possible for a student who has been assigned a failing grade because of academic dishonesty.

**X** Audit. A student may register to audit a course. A "Request to Audit Form" must be submitted at the time of registration and courses may not be changed to or from audit after registration. There is no credit given for an audited course. Regular tuition rates apply.

**I** Incomplete Work. The "I" grade indicates that the student's work to date is of passing quality but is incomplete for reasons acceptable to the instructor. A grade of "I" will be assigned only in the case of illness or for unusual or unforeseeable circumstances that were not encountered by other students in the class and that prevent the student from completing the course requirements by the end of the semester. The student also should have a substantial equity in the course, with no more than four weeks of classroom work remaining to be completed. Prior to assignment of the "I" grade, a written agreement will be reached with the instructor concerning the work still outstanding.

A grade of "I" will be removed with the approval of the department chair and the dean of the undergraduate college after all remaining work is completed and the instructor assigns a regular grade. The work must be completed by no later than the end of the sixth week of class of the next regular (fall or spring) semester. If no regular grade has been received in the Office of Student Records and Registration by that date, the "I" grade will revert to a grade of "E."

# Academic Policies and Procedures

## Retaking Courses for a Grade Change

Students may repeat a course for a change of grade. A "Course Repeat Form" must be submitted with the registration form at the time of registration. Both grades will be recorded on all transcripts issued. However, only the second grade will be used to compute the cumulative GPA, even if the second grade is lower, except when the second grade is "W" or "X." The course repeat policy is as follows:

1. A course repeated for a grade change must be taken within one calendar year after initial enrollment in that course or the next time it is offered (whichever is longer).
2. The same course may be repeated only once for a grade change.
3. No more than three courses may be repeated for a grade change.
4. Re-registration for courses in which a student received a passing grade requires the approval of the student's academic adviser and the dean of the undergraduate college.
5. If a course is no longer offered by the university, the provision to repeat the course for a grade change does not apply.

## Graduate Course Enrollment Approval

An undergraduate degree-seeking student who wishes to enroll in a graduate 500-level course must first obtain written approval from the course instructor and faculty adviser stating that the student is qualified. This approval must be presented at the time of registration. An undergraduate

non-degree student may be allowed to enroll in a graduate 500-level course in certain instances, but will require the permission of the Office of Educational Services. All undergraduate students who enroll in graduate courses are governed by the graduate grading system for those courses.

## Graduation Requirements

The student is responsible for fulfilling graduation requirements as specified in the **IIT Bulletin** in effect at the time of his or her admission to IIT.

In the event that curriculum requirements change before the student completes a specified degree program, he or she may follow a curriculum in a subsequent **IIT Bulletin** with the approval of the relevant department chair.

When an earlier curriculum is no longer available, the individual degree program of a student who has been following this earlier curriculum will be modified by the relevant department chair.

The student has the ultimate responsibility to fulfill degree requirements, to attain eligibility to enroll in particular courses, and to comply with all applicable academic rules governing his or her academic program.

**NOTE:** Students must file an "Application for Graduation Form" with the Office of Educational Services at the beginning of the semester in which they plan to graduate. Failure to do so will result in the postponement of the student's graduation. Please refer to the IIT calendar for specific deadlines.

To graduate, students in all undergraduate curricula must complete:

1. Departmental curriculum as listed under various departmental headings or an Approved Program of Study.
2. Credit hour requirements as appropriate to the various curricula (a minimum of 126 hours).
3. General Education requirements as outlined on page 30.
4. Residence requirements as outlined on page 177.
5. A minimum cumulative grade point average of 2.00 and a minimum grade point average of 2.00 in the student's major department courses. A student who completes all course requirements with an average below the minimum grade point requirements may, with permission of his or her department chair and the dean of the undergraduate college, take additional courses to raise the grade point average.

## Academic Policies and Procedures

6. Completion of all the above within a period of eight calendar years from the semester of initial admission for full-time students or twelve calendar years for part-time students after achieving degree-seeking status. A student may petition the major department and the dean of the undergraduate college to have this period extended. If the petition is approved, this extension may involve additional compensating academic requirements.

7. Payment of all financial obligations to the university.

All incomplete coursework must be submitted to the instructor prior to the date of graduation. A recorded grade of "I" (incomplete) in a course required for graduation will result in deferral of that student's graduation until the next term. A new application for graduation must then be submitted.

### Graduation with Honors or High Honors

The award of "Honors" or "High Honors" is made at each commencement to a graduating senior who has taken a minimum of 60 graded semester hours required for a particular degree at IIT.

A student who has a grade point average of 3.50 or higher for work completed at IIT will graduate with "High Honors." A student who has a grade point average of at least 3.00 but less than 3.50 for work completed at IIT will graduate with "Honors."

### Placement Testing

Prior to first enrollment, all first-year and transfer students are required to take the English Proficiency Examination administered by the undergraduate dean's office. For those entering students who do not have college credit for a course in calculus, a mathematics placement test also is required. Other placement tests also may be required depending on the entering student's intended major.

For students entering in the fall semester, placement tests are scheduled in the summer preceding matriculation and must be completed prior to matriculation. In the case of students entering in the spring semester (January), special arrangements will be made by the Office of Admission with the individual candidate.

### Residence Requirements

All undergraduate degree-seeking students must observe the following residence requirements:

1. Once enrolled at IIT, a student is not permitted to enroll at another institution without obtaining permission. A student must submit an academic petition to the Office of Educational Services for approval prior to registration at another institution,

2. A course failed at IIT must be repeated at IIT. No transfer credit will be awarded for any course equivalent to a course failed at IIT.
3. The final 45 semester hours of work must be completed in residence at IIT. Any proficiency examinations or enrollment at another institution must be completed before this period.

### Second Bachelor's Degree

A student whose first degree was granted by IIT must complete a minimum of 15 additional credit hours at IIT. A student whose first degree was awarded by another institution must complete a minimum of 45 additional credit hours at

IIT. All other graduation requirements apply for the second degree. The GPA required for "Honors" or "High Honors" for the second degree includes all IIT coursework.

# Academic Policies and Procedures

## Standards of Conduct

IIT believes that acquiring self-discipline is part of the educational process. As in any society, students are responsible for their own conduct. They are therefore responsible for any damage they may do to university property and should maintain satisfactory standards of conduct on and off campus. Students also must adhere to the Code of Academic Honesty which is found in the ***Student Handbook***.

Complaints of student misconduct are handled by the Campus Judicial Officer, the Campus Judicial Board, or, in case of less serious incidents concerning fraternity or sorority regulations, by the Greek Council.

Students are expected to inform themselves of all university regulations and requirements that are published in the ***Student Handbook***.

## Student Academic Petitions

A student may request a review of decisions concerning academic status or regulations by submitting a student petition. Students must contact the Office of Educational Services to receive a petition as well as instructions regarding the petition process.

Students who wish to take a course at another institution during the summer must submit a student petition to the Office of Educational Services in order to receive university approval.

## Transcripts

Transcripts can be requested from the Student Services Center. Requests must have the signature of the student to comply with the Family Educational Rights and Privacy Act of 1974 as amended. Requests for transcripts should be made at least 10 days prior to the date the transcript is needed; during

registration week, please allow additional time for processing transcripts. Transcripts will be released only after the student has fulfilled all financial obligations to the university. Official copies of transcripts are not issued directly to students. A fee of \$5 is charged for each transcript issued.

## Withdrawal from the University

A full-time degree-seeking student who withdraws from all of his or her courses is in effect withdrawing from the university. A student who intends to withdraw from the university must file an "Official Withdrawal Form" in the Office of Educational Services. Failure to submit an official withdrawal

form may create difficulties in the student's eligibility to receive tuition credit, if any is appropriate; in clearing his or her financial record; and in having academic records reflect an official withdrawal.

# Campus Resources

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## Academic Resources

### Career Development

The Career Development Center (CDC) helps match students with cooperative education opportunities and provides a variety of career services to students and alumni.

Cooperative education is a learning approach that integrates college studies with professional working experiences in industry, business, or government. Students alternate semesters between full-time work and full-time study. Salaries among IIT co-op students are competitive and help defray educational expenses. Frequently the co-op experience improves employment opportunities upon graduation.

Full-time IIT students who are in their second through fifth semesters at IIT and who have and maintain at least a 2.0 GPA are eligible to apply for the co-op program.

Additional services provided by CDC include on-campus interviewing; candidate referral program to companies; individualized job search and career development assistance; resume writing/interviewing techniques workshops; resume critiques and mock employment interviews; employer library and videotape collection; labor market and salary data; summer internship assistance; job listings.

### Computer Facilities

The Main Campus operates DEC minicomputers, a Silicon Graphics "Challenge" Unix multiprocessor, and local Unix servers. Terminals and microcomputers are located in most academic buildings across the campus, residence halls, and in the Galvin Library. There are microcomputer classrooms where seminars and tutorials and computer lab work are conducted.

At the Rice Campus, a Sun CAD facility is available with a network of eleven SPARC 1 and 2 workstations. Personal computer facilities include both PCs and Macintoshes.

Laboratory equipment is available to support courses in engineering and computer science. The Rice Campus computers are networked with Main Campus computers.

The Educational Technology Center, located on the Main Campus, is a multimedia resource center. Microcomputers dedicated to running various educational and professional software packages are in place. A comprehensive library of math, physics, chemistry, psychology, and self-help videotapes are available. The Center also provides peer tutoring.

### Educational Services

The Office of Educational Services provides a variety of academic services to undergraduate students. These include evaluations of transfer credits; student petitions; admission of part-time undergraduate students and reinstatement of

former undergraduate students; monitoring of academic progress; processing of change of major; academic advising; academic program audits; withdrawal from the university; and certification of students' eligibility for graduation.

### International Center

The International Center's focus is on international student recruitment and retention. The center provides services to all international students on matters related to orientation, personal, visa, and immigration concerns. The center also is a resource for information about job availability, study

abroad programs, social, personal and cultural matters. The office coordinates campus activities designed to encourage cross-cultural awareness and understanding among the members of the IIT community.

# Campus Resources

## Libraries

As the central library, the Paul V. Galvin Library provides a broad range of services including information on engineering, business, science, mathematics, the humanities, architecture, and design via the Internet; numerous electronic and paper-based databases; a document delivery service; interlibrary loan; and special collections. Students can access holdings through the ILLINET Online Cataloging System, which provides information about the collections of 800 libraries throughout Illinois, and through corporate memberships at The John Crerar Library at the University of Chicago. Patrons of the Galvin Library can use a World Wide Web-based network providing access to Engineering Village and ProQuest, two comprehensive, full-text databases in engineering and business, as well as many other CD-ROM indexes, abstracts and full text databases.

The Graham Resource Center on the lower level of S.R. Crown Hall houses architectural and city and regional planning materials.

The Center for the Study of Ethics in the Professions Library in Stuart Building contains a variety of material dealing with topics in practical and professional ethics.

The Louis Biegler Library on the Rice Campus contains a collection of electrical engineering materials. The focus is on electronic access to information.

The Chicago-Kent College of Law Library at the Downtown Campus is a technologically advanced library with outstanding collections in law, business, and the social sciences. Chicago-Kent also houses one of the largest collections of international law and commerce materials in the Midwest.

The library at the Moffett Campus supports research on food technology and safety.

## Multicultural Programs

The Center for Multicultural Programs (CMP) assists minority students with transition from high school. One aspect of IIT's success in retaining and graduating minority students is the Academic Challenge for Excellence program, a collection of personal and professional development activities. These include a weekly fall semester orientation class; academic and

personal counseling; academic monitoring; and assistance in obtaining pre-professional employment and scholarships. CMP offers opportunities for collaborative study and peer mentoring. CMP maintains a computer lab, interactive learning software and learning aids, and a video library of historical, cultural, and social topics.

## Women's Center

IIT's Women's Educational Development Center assists women students in their academic programs. Social, cultural, and educational events are planned for women students,

faculty, and staff through the Women's Network, a support group of women on campus.

## Student Affairs

The Office of Student Affairs oversees many areas of student life and serves as the primary advocate and ombudsperson for students. Students, faculty and staff are encouraged to contact the office for help or referrals.

Activities outside the classroom and laboratory complement and enhance IIT's central educational mission. IIT encourages

all students to participate in athletics, student organizations and professional societies. Students are also encouraged to take advantage of the cultural, educational and recreational resources on campus, as well as in the Chicago area. For additional information on activities, organizations and services consult the ***IIT Student Handbook***.

## Athletics and Recreation

The Department of Athletics and Recreation offers a comprehensive program of varsity sports, intramural competition, instruction, and informal recreational activities for both men and women. The Scarlet Hawks men's varsity teams compete in intercollegiate baseball, basketball, cross-country, and swimming; women's varsity teams compete in cross-country, swimming, basketball, and volleyball. The university is

an active member of the National Association of Intercollegiate Athletics (NAIA).

For nonvarsity athletes, intramural teams provide spirited competition in basketball, handball/squash, racquetball, softball, tennis, touch football, swimming, cross-country, and volleyball. Recreational activities, open swimming and open free-play activities are all available.

## Campus Ministry

The Campus Ministry works with student religious organizations on campus. These organizations sponsor activities for faith development, worship, socializing, and service. The

campus minister is available to discuss personal or spiritual issues in a confidential setting and to help students look for opportunities for volunteering or community services.

## Counseling and Health Services

This office provides help with educational, personal and medical problems. Educational counseling can help a student study more efficiently by teaching a variety of study skills. Personal counseling can help students get through crises or deal with a variety of problems, big and small. Medical

problems are treated on-site by a physician and a nurse practitioner or referred to local clinics and hospitals. All counseling and health services are strictly confidential. This office also oversees the student health insurance program as well as the university's immunization policy.

## Disability Resources

Services for persons with disabilities are coordinated by the Center for Disability Resources and Educational Development. Persons with disabilities who are interested in applying for admission to any of IIT's educational

programs are invited to call the center prior to their arrival on campus to discuss their individual needs. Enrolled students with disabilities are encouraged to consult the office regarding access to IIT facilities.

## Residence and Greek Life

More than half of IIT's full-time undergraduates live on campus. The Residence Life Office offers a wide range of programs and services designed to enhance campus life. The office coordinates resident advisers, student security, and the Residence Hall Association.

In addition to seven residence halls, there are seven fraternity houses. The seven fraternities and two sororities have very active programs, and membership is open to commuting as well as resident students. Housing for married students is available in four campus apartment buildings.

## Student Activities

Co-curricular activities and events provide opportunities for students to expand their intellectual, social and recreational interests. The Hermann Union Building (HUB) is the site for feature films, theatrical productions, and concerts. The HUB has lounges, study areas, meeting rooms, student organization offices, an auditorium, a ballroom, a cafeteria, a pub, a bowling alley and a game room. The HUB Office oversees many student groups and acts as liaison between the administration and the various organizations.

The campus is home to numerous student organizations including the Student Leadership Committee, IIT's student government; the Residence Halls Association (RHA), which governs the hall councils; Greek Council, the governing organization for social fraternities and sororities; the Organization of African-American Students Impacting Society (OASIS); Latinos Involved in Further Education (LIFE); Union Board, which plans much of the social and cultural activities on campus; Technology News, the student newspaper; WOUI-FM, the student radio station; and TechMate, the commuter student organization.



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Professor of Physics,  
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## Getting to the Main Campus

### Airports

IIT and Chicago are served by O'Hare International Airport and Midway Airport. Public and private transportation is available from the airports to downtown Chicago and IIT campuses.

### Train

Commuter railroads to Union and North Western stations, then public transportation, taxi or IIT shuttle bus from the Downtown Campus at 565 West Adams Street to Main Campus.

### Bus

To Greyhound terminal, then taxi or public transportation to IIT

### Public Transportation

1. CTA Red Line (Howard-Dan Ryan) to 35th Street Station.
2. CTA Green Line (Lake-Englewood-Jackson Park) to 35-Bronzeville-IIT station.
3. CTA bus lines with stops on State Street (#29) or Michigan Avenue (#35).

### Automobile

From North: Dan Ryan Expressway east to 31st Street exit, continue south to 33rd Street, turn left (east) to just past State Street. Visitor parking is on the right (southeast corner).  
 From South: Dan Ryan Expressway west to 35th Street exit, continue north to 33rd Street, turn right (east) to just past State Street. Visitor parking is on the right (southeast corner).  
 From Lake Shore Drive: Exit at 31st Street, go inland (west) to State Street, turn left (south) to 33rd Street, turn left and visitor parking is on the right (southeast corner).

### Parking

Some visitor parking is available in lots at the southeast corner of 33rd and State streets and the northeast corner of 31st and State streets. By special arrangement, events parking is usually available in the fraternity lot at 33rd and Wabash and, for evening events, in the lot west of Hermann Union Building. A few hourly spaces are available just south of the Commons Building and west of Hermann Union Building. Please call the Public Safety Department at 312.808.6300 if you need assistance in finding parking.



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## Administrative and Service

Office of Undergraduate Admission (full-time) .....	567.3025	Housing.. .....	567.5075
Admission (part-time) .....	567.3300	IITV .....	567.3460
Alumni Relations .....	567.5040	International Center.. .....	808.7105
Athletics and Recreation .....	567.3298	Galvin Library (Main Campus) .....	567.3355
Bookstore.. .....	567.3120	Moffett Campus .....	708.563.1576
Bursar's Office .....	567.3100	Multicultural Programs Center .....	567.5249
Campus Ministry.. .....	567.3 160	Public Relations .....	567.3104
Career Development Center .....	567.6800	Public Safety Department .....	808.6300
Computing and Network Services .....	567.5962	Residence Life Office .....	808.6400
Counseling and Health Service .....	808.7100	Daniel F. and Ada L. Rice Campus .....	630.682.6000
Disability Resources.. .....	567.5744	Student Affairs .....	567.3080
Educational Services Office .....	567.3300	Student and Greek Activities .....	567.3075
Financial Aid (new students) .....	567.3025	Student Services Center .....	567.3100
Financial Aid (continuing students) .....	567.7219	Women's Educational Development Center.. .....	567.3775

## Colleges and Academic Units

Air Force Aerospace Studies .....	567.3526	Graduate College .....	567.3024
College of Architecture .....	567.3230	Humanities .....	567.3465
Armour College .....	567.3009	Manufacturing Technology .....	567.3650
Biological, Chemical and Physical Sciences .....	567.3480	Mechanical, Materials and Aerospace Engineering.....	567.3175
School of Business, Stuart .....	906.6500	Military Science .....	567.7553
Chemical and Environmental Engineering.. .....	567.3040	Naval Science.. .....	567.3530
Civil and Architectural Engineering.. .....	567.3540	Institute of Psychology.. .....	567.3500
Computer Science and Applied Mathematics.. .....	567.5150	Social Sciences .....	567.5128
Institute of Design .....	595.4900	Undergraduate College.....	567.3163
Electrical and Computer Engineering .....	567.3400		