ABET
Self-Study Report

for the

Civil Engineering

Program

at

Illinois Institute of Technology

Chicago, Illinois USA

ILLINOIS INSTITUTE OF TECHNOLOGY

Transforming Lives. Inventing the Future. www.iit.edu

July 1, 2008

Table of Contents

Self-Study Report

Civil Engineering

Bachelor of Science

Illinois Institute of Technology

BACKGROUND INFORMATION

- **Contact information**

Jamshid Mohammadi, Chair
Department of Civil, Architectural and Environmental Engineering
3201 S. Dearborn
Chicago, Illinois 60616
Tel.: (312) 567-3540
Fax: (312) 567-3519
E-mail:mohammadi@iit.edu

- **Program History**

  <<Include year implemented and summarize major program changes with an emphasis on changes occurring since the last visit>>

There have been no major Program changes since the last visit in 2002.

- **Options**

  Five professional specialization areas are listed under civil engineering. These are: (1) structural engineering; (2) construction engineering and management; (3) geotechnical engineering; (4) transportation engineering; and (5) civil-environmental engineering. Each specialization requires taking nine credit hours among those listed under the specialization and three additional credit hours from any 400-level (senior-level) courses with approval by the student's advisor. The required courses for each specialization area are listed in IIT's Undergraduate Bulletin (Page 73, 2006-2008 Bulletin).

- **Organizational Structure**

  <<Use text and/or organization charts to describe the administrative structure of the program from the program to the department, college, and upper administration of your institution, as appropriate>>

The organization chart showing the administration of the program, Department, College and upper administration is provided in the accompanying illustration.

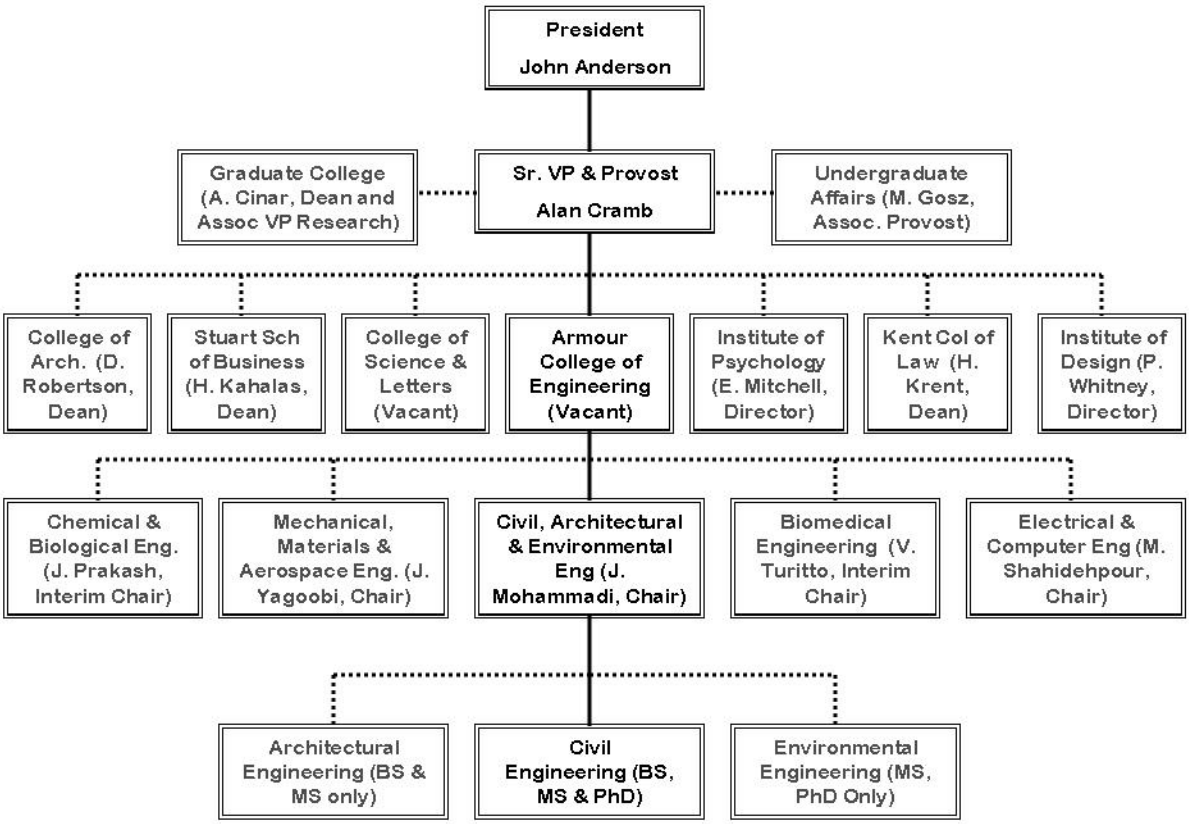


Fig. 1 Organization Chart of the Program Administration

- **Program Delivery Modes**

Day program. No other alternative modes are available. The Co-op option is possible. However, the Co-op experience is not counted toward any credit hours.

- **Deficiencies, Weaknesses or Concerns Documented in the Final Report from the Previous Evaluation(s) and the Actions taken to Address them**

  <<Summarize the Deficiencies, Weaknesses, or Concerns documented in the Final Report from the previous general evaluation and succeeding interim reviews, if any. Describe the actions taken to address them, including effective dates of actions, if applicable. If this is an initial accreditation, it should be so indicated.>>

The Program underwent ABET review in 2002 with an interim report required in 2004. At the time of the 2004 interim report, all weaknesses and deficiencies were resolved. The only outstanding issue after the 2004 report was a "concern" as described below:

Criterion 7: Institutional Support and Financial Recourses

Concern area reported by ABET Team: "*The previous review noted that an additional laboratory technician was needed to adequately maintain and operate the laboratory equipment."*

2004 Visit Comment: *"Several measures have been implemented, such as using graduate student, sharing technicians between departments, and establishing an agreement with the institution's Computer and Network Services organization to provide the level of support required to adequately maintain and operate laboratory equipment. However, the university has not yet approved the hiring of an additional technician."*

Actions Implemented to Resolve the Stated "Concern": The university authorized hiring of a laboratory technician in 2006. The CAEE Department hired an experienced laboratory technician (O. Stanley Johnson) in 2007. With this hiring, the Department is currently utilizing the services of two full-time technicians. These services are available to the Program in Civil Engineering for laboratory courses.

CRITERION 1. STUDENTS

- **Student Admissions**

  <<Summarize the requirements and process for admission of students to the program. Complete and include the appropriate version of Table 1-1 for a baccalaureate or masters program>>

Full-time undergraduate students (both freshmen and transfer students) and part-time students are all admitted by the Office of Admissions. The number of students in the latter category constitutes less than five percent of the undergraduate population. The admission standards are at a selective level. The average composite SAT I score is approximately 1260 (average ACT score about 28). In general the Admissions office admits students possessing a composite of: a Math SAT I greater than 600 and an upper quartile class rank. Students possessing credentials close to these minimum levels are considered by a faculty-admissions committee.

A freshman possessing an AP score of 4 or 5 is granted credit for a math course. Credit is also awarded for BC exams for a score of 3 only if the student's Calculus AB Subscore is a 4 or 5.

- **Evaluating Student Performance**

  <<Summarize the process by which student performance is evaluated and student progress is monitored>>

Student performance in each course is evaluated, and their progress is monitored, by the instructor, who will assign a grade for the course. Although varied to a limited extent, the assignment of the grade is generally based on (a) homework problems, (b) quizzes and mid-tem exams, (c) final exam, (d) project and laboratory reports (if any), and (e) other assignments including presentation of projects, which may be required in some courses.

The senior capstone design course (IPRO Capstone) requires a group project involving a complete design that may contain a host of modules including architectural design, structural and foundation design, cost estimating and bid document preparation, construction scheduling, building mechanical and electrical system design, transportation and traffic flow studies around the facility to be designed, building occupancy and accessibility studies, elevator design, etc. The IPRO Capstone design course is a multi-disciplinary effort; and as such it may involve students from other disciplines in addition to those in civil engineering. The selection of the number of modules in the project depends on the number of students from various sub-disciplines within civil engineering and those from the architectural engineering program, College of Architecture, mechanical engineering and electrical engineering programs. As a minimum, the project always involves an architectural design, structural and foundation design, and at least one other module such as cost estimating, construction scheduling or transportation and traffic flow studies, etc. The student performance in the IPRO Capstone course is evaluated through weekly progress reports by students, mid-term presentation of project progress, final presentation of the project (slide and poster presentation), examination on the learning objectives of IPRO courses, results of ethics study (including preparation of a code of

ethics by students), and preparation of a complete project report that contains all design drawings and calculations. The IPRO courses also involve leadership and oral and writing components as part of their learning objectives.

The student performance in courses involving laboratory also includes evaluation of laboratory reports required from students. Grading of laboratory reports is rigorous and involves evaluation of technical contents, clarity and coherence of presented materials, and writing skills.

Many of the civil engineering senior level courses also involve projects (e.g., CAE 408, CAE 431, CAE 432, CAE 470, CAE 471 and CAE 457). In addition to homework problems, exams, etc. the student evaluation in these courses is also achieved through review of their final project reports and in some cases the oral presentation of their work (e.g. in CAE 431, CAE 470).

- **Advising Students**

  <<Summarize the process by which students are advised regarding curricular and career matters>>

Curricular Advising – The fundamental object of the advising process is to maximize retention and minimize the average time to graduation, subject to the constraint of maintaining a high quality program of study.

The associate chair advises all freshman and transfer students. Starting with Spring 2008, another faculty member has also been helping with the advising. Either the chair or associate chair advises the majority of all other students. Students with honor scholarship (Camras Scholars) have a scholarship advisor, but use the associate chair in the selection of courses. Similarly there is a CO-OP advisor who interacts with the student and the associate chair. In the latter part of each semester the students meet with their advisor for approximately a half-hour. More recently a number of students have shown a preference for email-based advising. The main purpose of this meeting is selection of courses for the forthcoming semester. However the advisor also chats with the student to achieve a sense of his/her general well being. Two physical files are maintained on each student. The official file is maintained in the Educational Services Office, while the Department maintains an informal file. Contained in the latter file is an advising form. When a student comes in for advising, the advisor records courses the student is enrolled in and those that are completed. This form gives a sense of progress in completing the program of study. The form is also used as an informal contract between the advisor and the student in the selection of courses for the forthcoming semester. Both parties initial and date the form. The advisor removes a flag on the student's electronic file allowing the student to register on-line. The Educational Services Office automatically runs an official audit on the student's record when he/she has completed approximately 60 credit hours and when the student applies for graduation. In consultation with their advisor, most students will request an additional audit from Educational Services Office at about the 100 credit hour point in their program of study. These audits inform the student of which required courses still need to be completed.

The associate chair advises the Educational Services Office on appropriate substitutions, if any. The Educational Services office maintains a written record of such substitutions. There is an exception to this rule. If the course is part of the general education requirement, then only the Undergraduate Dean has the authority to make a substitution.

The Department policy on course substitution was adopted in 2004. Any decision for course substitution is now discussed on a case by case basis in a meeting of the Undergraduate Curriculum Committee and evaluated by the associate chair, chair and the civil engineering faculty. The Undergraduate Curriculum Committee identified a few courses that can be used as legitimate substitutes for others. Any substitutions will be based on: (1) the student's standing; (2) the course contents; and (3) the relevance of the contents to the student's concentration area and the subject area of the course that is being substituted. These requirements for course substitutions were clearly identified and are now enforced during advising. For all other required courses, where no reasonable equivalent substitution can be made, the CAEE Department is enforcing its advising procedure in assuring that students take all of these courses per program requirements. Parallel to the CAEE Department policy on course substitution, the engineering College also maintains a policy on course substitutions applicable at the College level.

The above stated advising procedures are sufficient for the majority of students. There are a few students that have special needs that require additional advisor/student interaction. Students involved in study abroad (both sending and receiving) require considerable advisor oversight. Students having disabilities require significant advisor interaction, as do also students with emotional problems. Obviously, the advisors are not trained therapists; however they can act as a frontline resource in advising the students to seek help at the counseling office. The advisors also work with students who are experiencing academic difficulties. Due to IIT's high standards of admission, all students have the talents necessary to succeed. For reasons other than ability, some students do not succeed. In these cases the advisor works with the Office of the Associate Provost for Undergraduate Affairs. Immediately after the grades are issued, this office generates a report, listing students who have performed at a sub-par level. The associate chair and a representative from the Office of Associate Provost for Undergraduate Affairs meet and discuss each individual case. If it is a mild, first time problem, the student is placed on probation and sent a warning letter. More serious difficulties require that the student meet with the associate chair to discuss his/her situation. Prior to a formal dismissal, the Office of the Associate Provost for Undergraduate Affairs prepares an individualized plan for the student. Among other actions implemented in the plan, it also includes enrollment in a specialized psychology class in which topics such as time management, study skills, exam preparation, etc. are taught. Follow up actions and advice on how to prepare for courses are also administered by the Associate Provost Office to help the student back on a regular track as a last effort before a formal dismissal decision is made. The psychology class taken by the student, as part of this plan, is not counted toward the general education requirement.

Advising on Career Matters – The Department periodically invites speakers from professionals within the field of civil engineering to deliver seminars to graduating seniors. These seminars are organized with help of students through the student organizations. These

seminars are intended to provide the students with insight on career choices, job opportunities, salaries, expected responsibilities within various starting positions, future promotions, etc. In addition, IIT's Career Management Center organizes career fairs in which potential employers gather on campus describing various job opportunities, choice of careers, employment requirements, etc. The Career Management Center also provides advising to graduating seniors on such matters as the interview process, resume presentation, job negotiations, etc. The CAEE Department works closely with the Career Management Center in organizing the career fairs, and in various meetings between potential employers and the Center. Through this participation, the CAEE Department brings issues of importance to students in regard to employment and future job responsibilities and skills. The Department also receives information from potential employers regarding job opportunities frequently. All such information are posted for students review and shared with the Career Management Center.

- **Transfer Students and Transfer Courses**

  <<Summarize the requirements and process for accepting transfer students and transfer credit. Complete and include Table 1-2>>

Transfer students are admitted through a similar process as the case for freshman admission. However, the Educational Services Office performs an evaluation of courses taken at other institutions, comparing them to courses offered at IIT. They are very careful when examining course prerequisites. For example if the student had a physics course that did not have calculus as a prerequisite, then that student would not be able to substitute that course for the required physics course. Occasionally a transfer student will petition that a more advanced course that he/she took at another institution should be transferred in. This occurs most frequently with international students. The student must present a portfolio for the course including homework assignments, projects, and examinations. An IIT faculty member, who teaches the impacted course, examines the portfolio and makes a determination of equivalence and informs Educational Services of his/her decision. In any case, in order for a student to receive a degree from IIT, his/her last 45 credit hours, before graduation, must be taken at IIT.

- **Graduation Requirements**

  <<Summarize the process for ensuring that each graduate completes all the graduation requirements for the program>>

The process for ensuring that each graduate completes the graduation requirements is summarized below:

(a) Student Files – All students have two files. An informal file is kept in the Department. This file contains the student's advising sheet, his/her performance records, and all memos and papers pertinent to his/her advising. The advisor meets with each student at least once every semester to ensure that he/she is keeping up with the curriculum, the prerequisite requirements, required courses for the specialization areas and capstone design course requirement. A second, and more formal file, is kept in the Educational Services Office. The Office conducts an automatic audit of the student's courses when approximately 60 credit hours have

been completed. In consultation with their advisor, most students will request an additional audit from Educational Services Office at about the 100 credit hour point in their program of study. The Educational Services Office will then send a report to the students and the Department providing specific data on the courses completed and those needed to be completed for graduation.

(b) All course requirements including the General Education Requirements, basic math and sciences, humanity and social sciences, professional and specialization courses, and capstone design courses required for graduation are checked prior to graduation for each student by the Educational Services Office before a student is cleared for graduation.

(c) For transfer students, a candidate for graduation is also audited to ensure that he/she has complied with the minimum number of credit hours that must be taken at IIT.

(d) Each candidate for graduation from the civil engineering program must comply with the curriculum and completed the required 137 credit hours.

(e) Each candidate for graduation must take the Fundamentals of Engineering Examination in his last semester at IIT and provide the proof that he/she has taken the exam before receiving a clearance for graduation.

- **Enrollment and Graduation Trends**

  <<Summarize the enrollment and graduation trends for the past five years>>

Table 1-1. History of Admissions Standards for Freshmen Admissions for Past Five Years
Civil Engineering

Fall of Academic Year	Composite ACT		Composite SAT		Percentile Rank in High School		Number of New Students Enrolled
	MIN.	AVG.	MIN.	AVG.	MIN.	AVG.	
2007-8	15	27	970	1250			20
2006-7	22	28	1090	1279			24
2005-6	20	27	1060	1263			20
2004-5	23	28	960	1262			13
2003-4	23	28	1070	1252			14

Table 1-2. Transfer Students for Past Five Academic Years

Fall of Academic Year	Number of Transfer Students Enrolled
2007-8	17
2006-7	7
2005-6	14
2004-5	13
2003-4	8

Table 1-3. Undergraduate Enrollment Trends for Past Five Academic Years

Academic Year:	2003-4	2004-5	2005-6	2006-7	2007-8
Enrollment during Fall					
Full-time Students	61	69	106	112	123
Part-time Students	5	12	8	16	9
Student FTE[1]	64.5	76.5	116.5	125.9	133.6
Completions between 7/1 and 6/30					
Graduates	19	13	16	35	10

[1] FTE = Full-Time Equivalent: 15 Credit hours = 1FTE

2007-8 Graduate value includes ONLY Summer and Fall, not Spring as those values are not yet available.

Table 1-4. Program Graduates

(For Past Five Years or last 25 graduates, whichever is smaller)

Civil Engineering

Name of Student	Numerical Identifier	Year Matriculated	Year Graduated	Certification/ Licensure (If Applicable)	Initial or Current Employment/ Job Title/ Other Placement
Shorette, Lucas	10239242	2003 Fall	2007 Fall		*
Szwajnos, Joanna	10242844	2004 Fall	2007 Fall		Engineer, Commonwealth Edison
Lapa, Grzegorz	10284583	2001 Spr	2007 Fall		*
Chandler, Julie A.	10302728	2002 Fall	2007 Fall		*
Dow, Daniel C.	10323007	2003 Fall	2007 Fall		*
Giana, Emiliano	10392657	2004 Fall	2007 Fall		*
Tambah, Prince D.	10412252	2005 Fall	2007 Fall		*
Parv, Ionut Razvan	10412634	2006 Spr	2007 Fall		Technical Staff, Kiewit, Inc.
Mahoney, Heather	10195803	2004 Fall	2007 Sum		*
Atewologun, Gbadebo	10404885	2005 Fall	2007 Sum		*
Gibbs, Matthew	10214054	2002 Fall	2007 Spr		Engr, Chicago Transit Authority
Purpura, John	10216167	2003 Fall	2007 Spr		*
Fahs, David Mark	10218046	2004 Spr	2007 Spr		2nd Lt, US Army
Hernandez, Daniel	10228033	2003 Fall	2007 Spr		Engr, Sargent & Lundy
Featherstone, Amanda	10233240	2004 Fall	2007 Spr		St Engr, TY Lin Bascor
Swiderski, Melissa	10248309	2002 Fall	2007 Spr		*
Schug, Timothy A.	10272510	2002 Fall	2007 Spr		IIT – Office of the Registrar
Kazi, Syed S.	10274048	2003 Fall	2007 Spr		Grad School, Stanford
Hiner, Ross D.	10296498	2003 Fall	2007 Spr		*
Racheva, Mira R.	10372215	2003 Fall	2007 Spr		Engr, Chicago Transit Authority
Tam, Chi Hang	10389654	2004 Fall	2007 Spr		Civil Engr, Teng & Assoc
Patel, Jinit R.	10390431	2004 Fall	2007 Spr		Civil Engr, Rausch Construction
Polena, Sotiel Sam	10395169	2004 Fall	2007 Spr		*
Sanchez, Gerardo	10396917	2004 Fall	2007 Spr		*
Welsh, Lee	10402706	2005 Spr	2007 Spr		Civil Engr, FHP Tectonics

(Note: ABET recognizes that current information may not be available for all students)

* Per IIT's Career Management Center, the employment of civil engineering graduates have also been with the following companies in addition to those listed in the table: Antunovich Associates, Cemcom, Ltd, Bulley & Andrews, City of Aurora Dept of Engineering, Collins Engineers, Concord Homes, Inc., Cook County Highway Department, Jacob & Hefner Associates, United States Air Force, and Water Reclamation District of Greater Chicago.

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

ABET Definition: *Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.*

ABET definition: *Assessment under this criterion is one or more processes that identify, collect, and prepare data to evaluate the achievement of program educational objectives.*

ABET definition: *Evaluation under this criterion is one or more processes for interpreting the data and evidence accumulated through assessment practices. Evaluation determines the extent to which program educational objectives are being achieved, and results in decisions and actions to improve the program.*

- **Mission Statement**

  <<Provide a copy or summary of any applicable institutional, college, departmental, and program Mission Statements and document where they are published>>

Department Mission Statement:

To prepare students to begin the practice of the profession and for challenges facing civil, architectural and environmental engineers in the 21st century with competitive programs and facilities, such as modern laboratories, state-of-the-art instructional aids and computer equipment.

This statement is published in the Department website:
http://www.iit.edu/engineering/cae/about/mission.shtml

Armour College of Engineering Mission Statement:

(1) Provide state-of-the art education and research programs; educate a new breed of engineers with a strong fundamental knowledge of engineering principles, the capability to apply their knowledge to broad interdisciplinary areas, and an understanding and appreciation of the economic, environmental, and social forces that impact intellectual choices; and enhance Armour's reputation as an internationally recognized engineering school (*Transforming Lives*).

(2) Strengthen Armour's leadership role by focusing on the core research competencies and enhancing partnerships with industry, government laboratories and academic and research institutions (*Inventing the Future*).

This statement is published in the College website:

http://www.iit.edu/engineering/about/mission.shtml

University Mission Statement:

To advance knowledge through research and scholarship, to cultivate invention improving the human condition, and to educate students from throughout the world for a life of professional achievement, service to society, and individual fulfillment.

This statement is published at IIT's website:

http://www.iit.edu/about/index.html

- **Program Educational Objectives**

  <<List the Program Educational Objectives and state where these are published>>

The objective of the Civil Engineering Program is to produce graduates that are prepared to enter the civil engineering profession. As well, this program will prepare students to begin graduate studies in engineering. This program provides breadth in core sub-disciplines and depth in at least one area of specialization.

Graduates of the program, who follow civil engineering as their career path, are qualified to be involved in an area related to civil engineering or pursuing a graduate or professional degree, within several years following graduation from IIT.

The program objective is published in:

(1) IIT's Undergraduate Bulletin. The Bulletin is published biannually.

(2) The web site of the Department of Civil, Architectural and Environmental Engineering (www.iit.edu/~ce).

The program objective is also publicized in the annual report of the Department. The annual report is presented every year (in Spring) during the meeting of the Board of Advisors of the Department and (in Fall) during the meeting of the Subcommittee on the Program Objective and Outcome Assessment of the Board of Advisors. A Copy of the annual report is also sent to the Dean of Armour College of Engineering.

- **Consistency of the Program Educational Objectives with the Mission of the Institution**

  <<Describe how the Program Educational Objectives are consistent with the Mission of the Institution>>

The objective of the Civil Engineering Program is consistent with the mission of the Department, College and University. Every year in March, when the chairman of the CAEE Department prepares the Department budget, the statements of objectives and missions are also presented to the Dean of Armour College of Engineering.

The statement of the objective of the Program constitutes a subset of what is embodied in the mission of the Department, College and the university. An essential part of preparing students to enter the profession is providing students with an education program that is contemporary and consistent with the demand in industry. Also, preparing students to enter graduate studies requires providing an educational background which is the basic acceptance requirements by graduate programs in universities across the United States. Fulfilling both these objectives requires a state-of-the art education with modern laboratory and computer facilities as indicated

both in the mission statements of the Department, the College and the University. The program curriculum emphasizes inter-professional and leadership, ethics, communication and writing competency through its interprofessional (IPRO) courses and other design-oriented courses.

The success of the graduates of the program in their careers as civil engineers is measured through the program annual assessment process. The assessment process provides a powerful tool to evaluate the professional competency of the graduates several years following their graduation as means of fulfilling the program objective within the mission of the Department, College and the University.

- **Program Constituencies**

  <<List and describe the Program Constituencies>>

The constituencies of the Civil Engineering Program are significant, and actively involved, in the development and revision of the Program objectives and outcome assessment. These constituencies are:

- Civil engineering students
- Faculty of the CAEE Department
- Alumni
- Members of the Board of Advisors of the CAEE Department
- Employers of the graduates of the Civil Engineering Program.

The participation of students in the Program objective and outcome assessment process and their interaction with other constituencies of the Program are through their membership in the Board of Advisor, meeting with Department Chair, and students' own meetings. Student organizations are very active in their respective local/regional chapters. And as such they are in contact with the practitioners. In addition, students organize seminars, which are delivered by alumni and employers of the graduates of the Program. These seminars also provide an avenue for students to interact with the Alumni and employers.

The Board of Advisor consists of industry exerts, most of whom are alumni of the CAEE Department. They are mostly registered professional engineers and are primarily at top technical and managerial positions in their respective companies. The following table provides the list of members of the advisory board.

Board Member	Position and Affiliation	Company Address	Phone Number	E-mail
Bolin, Robert				
Cevallos-Candau, Pedro	Principal, Primera Engineers	100 S. Wacker Dr., Chicago, IL 60606	(312) 606-0910	pcevallos@primerachicago.com
Clark, Raymond	Former Senior SOM Staff	2107 Old Oak Drive Valparaiso, IN 46385	(219) 477-8941	raymond.clark@comcast.net
Daly, Jack	VP, Sargent & Lundy Engineers	55 E. Monroe, Chicago, IL 60601	(312) 269-6257	jack.m.daly@slchicago.infonet.com
Dennis, Nicole*	Student Member	CAEE Dept., IIT, Chicago, IL 60616	(312) 567-3540	ndennis@iit.edu
Frampton, Catherine	Project Manager, Jones Lang LaSalle	200 E. Randolph, Chicago, IL 60601	(312) 782-5800	cframpton@joneslanglasalle.com
Grawbowski, Donald*	Sr. Engineer, HDR, Inc.	8550 W. Bryn Mawr Ave, Chicago, IL 60631	(773) 380-7900	dgrabowski@cityofchicago.org
Hannemann, Michael	VP, McDonough, Assoc.	130 E. Randolph, Chicago, IL 60601	(312) 946-8600	mhannemann@maiengr.com
Haubert, Andrew	Ex. Sr. VP, STS Consultants,	750 Corporate Woods Hwy, Vernon Hills, IL 60061	(847) 279-2500	haubert@stsltd.com
Iwankiw, Nestor*	Sr. Engineer, Hughes Associates	5963 N. Oconto Avenue Chicago, IL 60631	(773) 467-2013	niwankiw@haifire.com
Kaderbek, Stan-Lee	Walsh Group	929 W. Adams, Chicago, IL 60607	(312) 563-5400	skaderbek@walshgroup.com
Karp, Jeffrey	President, Power Construction	2360 Palmer, Schaumburg, IL 60173	(773) 467-2013	jkarp@pcec.net
Lewis, Burton	Retired Engineer	3450 North Lake Shore Chicago, IL 60657	773-525-1251	lewis@iit.edu
Leu-Hing, Cecil	Retired R&D Director, Met. Water Rec. of Greater Chicago	6815 County Line Ln. Burr Ridge, IL 69527	630-986-5751	clhai@aol.com
O'Neill, John	Sr. VP, A. Espetein and Son, International	600 W. Fulton, Chicago, IL 60661	(312) 429-8326	joneill@epstein-isi.com
Pease, Charles	President, Charles E. Pease and Associates	18 Executive Dr., S. Barrington, IL 60010	(847) 849-6930	cepassoc@dls.net
Peshia, Terry	President, Garbe Iron Works	456 N. Broadway Aurora, IL 60505	(630) 897-5100	tpeshia@aol.com
Thomas, Varckie	Former SOM Staff	300 N. State Street, Apt 3635, Chicago, IL 60610	(312) 595-161	varkie.thomas@iit.edu
Rokita, Mark*	Student Member	CAEE Department, IIT, Chicago, IL 60616	(312) 567-3540	rokimar@iit.edu
Weir, Ewa	VP, Jones, Lang LaSalle	200 E. Randolph, Chicago, IL 60601	(312) 782-5800	Ewa.Weir@am.joneslangLasalle.com

* Member of Subcommittee on Program Objectives and Outcome Assessment

- **Process for Establishing Program Educational Objectives**

  <<Describe the process that periodically documents and demonstrates that the Program Educational Objectives are based on the needs of the program's various constituencies>>

Preparation of the educational objectives of the Civil Engineering Program and any related revisions are initiated by the Department Undergraduate Committee and discussed in the Department faculty meetings. Comments on the objectives are also sought from the members of the Board of Advisors of the CAEE Department. In the Fall meeting of the Board's Subcommittee on the Program Objective and Outcome Assessment, the assessment report and metric values developed using various instruments are reviewed and areas where improvements may be needed are identified and reported to the faculty for evaluation. The faculty evaluate any such recommendations and suggest appropriate actions that may be necessary to improve the learning experience and to meet the objectives. These recommendations along with suggested actions are then presented before the Board of Advisors during the Board meeting in spring. All Board members, as well as the faculty and student representatives attend this meeting. This meeting contains an open discussion period during which issues related to the program objectives, curricular matters, development of new directions for the Program and actions suggested are discussed to receive the members' input and comments. Upon approval of any new actions by Board members, the departmental Committee on Undergraduate Studies will work on any changes in course contents, curriculum, etc. and present the recommendations to the university Committee on Undergraduate Studies for final approval. The changes are then implemented and the assessment data gathering continues. This last step constitutes the "closing loop" in the assessment process. Please see Figure 2.

- **Achievement of Program Educational Objectives**

  <<Describe the assessment and evaluation process that periodically documents and demonstrates the degree to which the Program Educational Objectives are attained >>

Through participation from its constituencies, the CAEE Department uses the following methods to evaluate the achievement of the objective of the Civil Engineering Program and performance of its graduates (more detailed description of these methods are also provided later under the section on "Program Outcomes").

- Seniors exit questionnaire. This process is administered by the CAEE Department. Exit questionnaires are distributed to the civil engineering seniors in their last semester before graduation. Statement of Program objectives are printed on the questionnaire. Opinions of students on the Program objectives are sought through this questionnaire. Upon receiving the questionnaires, they are reviewed by the chair, associate chair and the members of the Department Undergraduate Committee and the members of the Board of Advisors' Subcommittee on the Program Objective and Outcome Assessment. Specific comments by graduates are especially noted and evaluated. The questionnaires are kept in the Department files. This instrument was initiated in 1999.

- Alumni survey. Currently, the Armour College of Engineering conducts this survey using the services of an outside firm. The first round of results using this survey was obtained in 2005 and is repeated every two years.

- Fundamentals of Engineering (FE) examination results. All undergraduate students in the CAEE Department at IIT are required to take this examination in their senior year. The results are used to assess the Program objectives in meeting the breadth in core education. The Department receives the results of the overall performance of the civil engineering students in the morning and afternoon subjects. The data is used to evaluate the performance of civil engineering graduates as a means to assess the Program course objectives in providing the breadth in core education. The procedure used to ensure that the graduating seniors actually take the examination is documented in the Program Objectives and Outcomes Assessment Report.

- Course assessments by individual instructors and students. Each instructor sets a series of course objectives for his/her course. These objectives are consistent with the Program educational objectives. These objectives meet the requirements on subjects to be covered in each course (as published in IIT's Undergraduate Bulletin). The course objectives along with specific subjects to be covered in each course, the laboratory and project experience, computer application, and contribution of the course to meeting the Program curriculum areas (including the design experience) are prepared and documented at the beginning of each semester. Each instructor also lists a series of measures that he/she will use to assess students' performance to meet the course objectives. At the end of the semester, students' performance in the course is evaluated by the instructor. This evaluation summarizes the percentages of students who have performed satisfactorily and have gained the intended knowledge in the course.

  In 2007, the CAEE Department developed and adopted a procedure for instructor's self assessment of the courses. This procedure is now used as the standard for assessment of course objectives. The main component of the procedure and standard for the course objective and outcome assessment by each instructor is in using samples of students' work as well as their performance, class participation, grades and other means used by individual instructors. Samples of work by students are compiled by the instructor, and stored in a file. These samples are from homework problems, examinations and projects. They are taken from three groups of students: (1) those performing in the lower 50-percentile (below expectation); (2) those performing in the 50 – 75 percentiles (meet expectation); and (3) those in the upper 75 percentile (exceed expectation). In addition to other means used by each instructor, these samples are examined by the instructor in summarizing the final assessment of the course objectives and learning experience by students in his/her class. The purpose of this document is to provide a consistent method of course evaluation by instructors across CAEE Department and to produce assessment metrics to assess the Program objectives.

  In parallel with the self evaluation of each course by the instructor, starting with Fall 2007, the CAEE Department also conducts a course evaluation by students. The course objectives introduced earlier in the course are again provided to the students at the end

of the semester. The students' input on whether the materials offered have met the objectives is then complied and used in the program outcome assessment process.

- Input from the members of the Board of Advisors of the CAEE Department. The CAEE Department Board of Advisors acts as a major element of the process by which the Department evaluates its curricula to meet the Program educational objectives. Broad membership comprises of industry experts (among which are alumni and several employers of our graduates) and current undergraduate students. New initiatives (areas where more emphasis must be placed regarding new courses, course contents, design, laboratory and theoretical course-contents) are often suggested by the Board, evaluated by the faculty and implemented.

  As of 2004, the members of the Board of Advisors have also been involved in the development and implementation of an employer survey. A questionnaire was designed by the Board Subcommittee on Program objectives and outcomes assessment and used in compiling assessment data from employers of our graduates for the first time in 2004. This method of assessment data compilation is repeated every two years. The statement of Program objectives is printed on the form and the employers' input in assessing the objectives is sought through this instrument.

- Students entering graduate programs. An objective of our program in civil engineering is to prepare students entering graduate programs. Two questionnaires are used to compile data on the performance of our students who continue into graduate programs. These questionnaires are used to assess the objective of the Program in preparing students to begin their graduate studies. (a) Students who have entered graduate programs are asked to fill out a questionnaire comparing themselves with their graduate classmates and provide information on what they perceive as their preparedness for their graduate studies. (b) Advisors of these students are also asked to fill out a questionnaire evaluating the students and providing information on how prepared our BS graduates are in beginning their post-baccalaureate studies.

Program Objectives Achievement Goals

The level of achievement of the Program objectives is measured through a set of achievement goals that are established, reviewed and approved by the Program constituencies through their representation in the Board of Advisors' Subcommittee on Program Objectives and Outcomes Assessment. These achievement goals are summarized below:

(a) Fundamental of Engineering Exam – Students' performance is compared with respect to the national average in each subject. Moving averages (over a 4-year period) is used. When the average for IIT students falls more than 10% below the national average, the subject area is flagged for further investigation and potential actions.

(b) Instructor's Survey – For individual courses, the achievement of course objectives are assessed by the instructor through evaluation of percentage of students who meet or exceed the leaning objective and knowledge gain in the course.

(c) Students' Survey of Courses – For individual courses, students' perception of the course meeting its published objectives is compiled and evaluated.

(d) All other Questionnaires – Individual items in questionnaires administered by the CAEE Department have scores 1-5 (5=strongly agree; 1=strongly disagree). For each item, when the average (over a 4-year period) falls below 3.0, the item will be flagged for evaluation and development of action items to improve the score. For the alumni survey (which is administered by the Armour College) scores 1-7 are used (1=lowest score; 7=highest score). For this survey, the achievement goal is set at 4.0 (out of a maximum 7 score). Assessment items below 4.0 are flagged for further evaluation and monitoring and implementation of any necessary action items, if the score for the item shows consistently lower than 4.0 in two consecutive rounds of survey.

Documentary Evidence

The CAEE Department prepares the Program Objectives and Outcomes Assessment Report annually for civil engineering. This report summarizes the metrics from various assessment methods as well as the moving averages for a year-to-year comparison and evaluation of trends in these metrics. A summary of actions that need to be implemented, as a result of the metrics obtained from various surveys, minutes of the meetings of the Subcommittee on the Program Objectives and Outcomes, and samples of various questionnaires are also included in the report. The complete report prepared for the most recent assessment cycle as well as the reports from all previous assessment cycles are available for review by the ABET team at the time of their visit.

The following tables are taken from the report prepared for the most recent assessment cycle for the Architectural engineering Program and summarize:

(1) Various components of the Program objectives and specific assessment methods that are used to evaluate extent to which the objectives are met; and

(2) The metric values for the Program objective assessment (from the most recent assessment cycle) and their comparison with the stated achievement goals.

Summary of Achievement Goals for the Program Objectives

Program Objective	Assessment Measure Used	Achievement Goals
To produce graduates that are prepared to enter the civil engineering profession	Seniors Exit Questionnaire	>3.0 average score
	Employer Survey	>3.0 average score
	Alumni Survey	>4.0
To prepare students to begin graduate studies in engineering	Student Survey	>3.0 average score
	Faculty Advisor Survey	>3.0 average score
To provides breadth in core sub-disciplines	Seniors Exit Questionnaire (a-k outcomes)	>3.0 average score
	Faculty and students' Course Evaluation (a-k outcomes)	>50%
	Employer Survey (a-k outcomes)	>3.0
	FE Exam results (AM Subjects)	< 10% below National Average
	Alumni Survey (Factors 5, 7, 9 and 11)	>4.0
To provides depth in at least one area of specialization	Seniors Exit Questionnaire	>3.0 average score
	Faculty Course Evaluation	>50%
	Students Course Evaluation	>50%
	Employer Survey (Questions 1 and 2)	>3.0
	FE Exam results (PM Subjects)	< 10% below National Average
	Alumni Survey (Factors 1 and 2)	>4.0
Alumni Performance and Career Choice Satisfaction Several Years After Graduation	Alumni Survey (Factors 1, 2 and 3)	>4.0

Summary of Metrics used in Assessment of Program Objectives (from Most Recent Program Objectives and Outcomes Assessment Report)

Program Objective	Assessment Measure Used	Metrics and Their Values	Achievement Goals	Status
To produce graduates that are prepared to enter the civil engineering profession	Seniors Exit Questionnaire	Average Score 3.7 (out of 5.0)	>3.0 average score	Objective met
	Employer Survey	Average Score 4.0 (out of 5.0)	>3.0 average score	Objective met
	Alumni Survey	Average score 4.90 (out of 7)	>4.0	Objective met
To prepare students to begin graduate studies in engineering	Student Survey	Average score 4.7 out of 5.0)	>3.0 average score	Objective met
	Faculty Advisor Survey	Average score 4.6 out of 5.0	>3.0 average score	Objective met
To provides breadth in core sub-disciplines	Seniors Exit Questionnaire (a-k criteria)	Average score 4.3 (out of 5.0)	>3.0 average score	Objective met
	Faculty and students' Course Evaluation (a-k criteria)	% of meets/exceeds 92.8% (Faculty's response) 93.2% (Students' response)	>50%	Objective met
	Employer Survey (a-k criteria)	Average score 4.65 (out of 5.0)	>3.0	Objective met
	FE Exam results (AM Subjects)	a. % students passed (71.5%); b. AM exam Av score (59.3%)	< 10% below National Av of: a (74.3%), b. (58.5%)	Objective met
	Alumni Survey (Factors 5, 7, 9 and 11)	Av. Scores (out of 7.0) Factor 5: 4.29 Factor 7: 5.27 Factor 9: 4.97 Factor 11: 4.79	>4.0	Objective met
To provides depth in at least one area of specialization	Seniors Exit Questionnaire	Average score 3.7 (out of 5.0)	>3.0 average score	Objective met
	Faculty Course Evaluation	% of students meeting : a. knowledge gain (80.6%); b. effort (79.8%)	>50%	Objective met
	Students Course Evaluation	% of Students who believe objectives were fully met (93.5% on materials covered); (93.1 on exams, HM, etc).	>50%	Objective met
	Employer Survey (Questions 1 and 2)	Average score 4.0 (out of 5.0)	>3.0	Objective met
	FE Exam results (PM Subjects)	a. % students passed (71.5%); b. PM exam Av scores CE =53%; General=53%; Env Eng=49%	< 10% below National Av of: a (75.8%), b. 52% (CE); 49% (General); 52% (Env Eng)	Objective met

	Alumni Survey (Factors 1 and 2)	Av Scores (out of 7.0) Factor 1: 4.61 Factor 2: 5.14	>4.0	Objective met
Alumni Performance and Career Choice Satisfaction Several Years After Graduation	Alumni Survey Factors 1, 2 and 3	Av Scores (out of 7.0) Factor 1: 4.61 Factor 2: 5.14 Factor 3: 6.48	>4.0	Objective met

CRITERION 3. PROGRAM OUTCOMES

ABET definition: *Program outcomes are narrower statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program.*

ABET definition: *Assessment under this criterion is one or more processes that identify, collect, and prepare data to evaluate the achievement of program outcomes.*

ABET definition: *Evaluation under this criterion is one or more processes for interpreting the data and evidence accumulated through assessment practices. Evaluation determines the extent to which program outcomes are being achieved, and results in decisions and actions to improve the program.*

- **Process for Establishing and Revising Program Outcomes**

  <<Describe the process used for establishing and revising Program Outcomes>>

Establishing and revising the Program outcomes are initiated by the Department Undergraduate Committee and discussed in the Department faculty meetings. Comments on the Program outcomes are also sought from the members of the Board of Advisors of the CAEE Department. In the Fall meeting of the Board's Subcommittee on the Program Objective and Outcome Assessment, the assessment report and metric values developed using various instruments are reviewed and areas where improvements may be needed are identified and reported to the faculty for evaluation. The faculty evaluate any such recommendations and suggest appropriate actions that may be necessary to improve the Program outcomes. These recommendations along with suggested actions are then presented before the Board of Advisors during the Board meeting in spring. All Board members, as well as the faculty and student representatives attend this meeting. This meeting contains an open discussion period devoted to issues related to curricular matters, and development of new directions as pertain to establishment and revision of the Program outcomes. Any actions suggested are discussed to receive the members' input and comments. Upon approval of any new actions by Board members, the Departmental Committee on Undergraduate Studies will work on any changes in course contents, curriculum, etc. and present the recommendations to the university Committee on Undergraduate Studies for final approval. The changes are then implemented and the outcomes assessment data gathering continues. This last step constitutes the "closing loop" in the outcome assessment process. Please see Fig. 2.

- **Program Outcomes**

  <<List the Program Outcomes and describe how they encompass Criterion 3 and any applicable Program Criteria. Indicate where the Program Outcomes are documented>>

The Civil Engineering Program emphasizes on the following twelve outcomes in assessing the learning experience and subject competency of students. These outcomes are labeled as items *a* through *k*. The "significant design experience" is also included as a Program outcome item.

Program Outcome	Description
a	An ability to apply knowledge of math, engineering, science
b	An ability to design and conduct experiments; analyze and interpret data
c	An ability to design system, component, or process to meet needs
d	An ability to function on multi-disciplinary teams
e	An ability to identify, formulate, and solve engineering problems
f	A respect for, and understanding, the professional and ethical responsibility
g	An ability to communicate effectively
h	An appreciation for broad education and understanding other disciplines as relate to civil engineering
i	A recognition of the need for life-long learning and continuing education
j	A knowledge of contemporary issues within civil engineering
k	An ability to use techniques, skills, and tools in engineering practice
Significant Design Experience	Ability to use knowledge gained in courses in a major capstone design project

Program Outcome Documentations

The program outcomes are published and documented in the annual program objective and assessment report. This report is circulated to various constituencies of the Program. In addition to the listing of the Program outcomes, the report also contains a summary of metrics used in the assessment of the Program outcomes. All the supporting documents (returned questionnaires, FE exam results, alumni survey results, course evaluation by students and instructors, etc.) are kept in the Departmental files.

- **Relationship of Program Outcomes to Program Educational Objectives**

  <<Describe how the Program Outcomes lead to the achievement of the Program Educational Objectives>>

The Program outcomes emphasize competency in the *a-k* categories (explained above) as well as a major design experience. These categories satisfy the Program objectives in providing the breadth in core sub-disciplines and depth in at least one area of specialization. The curriculum consists of basic sciences, core and specialty courses to meet these objectives. The Program outcomes are assessed annually to ensure the compliance with the intended Program objectives.

- **Relationship of Courses in the Curriculum to the Program Outcomes**

  <<Describe the relationship of courses in the curriculum to the Program Outcomes>>

The Program objectives are achieved as outcomes are emphasized in the courses through instructors' self evaluation of courses and the assessment measures indicated earlier. The relationship between course contents and these criteria are listed in each course descriptions. In addition, the following methods are also used to ensure competency in these criteria (the pertinent outcomes are indicated in the parenthesis).

1. Monitoring the general education requirements (Outcome *a*).

2. Monitoring through advising and tracking forms that students take courses with the communication (C) requirement and IPROs; checking the contents of IPROs (Outcomes *f* and *g*).

3. Monitoring through advising and tracking forms the number of design (D) courses that students take (Outcome *c* and significant design experience).

4. Compiling departmental records of academic cheating; administering department policy on academic honesty; interfacing with the Humanities Department to coordinate the offering of courses in ethics; sending faculty to attend short courses and workshops in ethics; coordinating the CAE courses that include an ethics dimension (Outcome *f*).

5. Coordinating the number and content of all courses including lab courses in all sub-disciplines (structural, geotechnical, transportation, construction engineering, and building systems design) (Outcomes *b*, *c*, *e*, and *k*).

6. The undergraduate student advisor routinely monitors each student's status concerning the general education requirements by using the standard tracking forms for advising students. All students are advised by using a tracking sheet that clearly shows the courses the students took, the courses the student needs to take to graduate, the general education requirements, the specialization requirements, the design (D) requirements, the communication (C) requirements, and any other notes deemed necessary by the advisor (Outcomes *a*, *c*, *e* and *g*).

7. Laboratory courses as well as all IPRO courses emphasize communication skills and involve setting up experiments, collecting data, analyzing data, interpreting findings, and writing reports. IPRO courses also emphasize project management, interdisciplinary interaction, solution to open-ended problems, and human relations. Courses that cover communication skills are denoted by (C) in the catalog. Every student has to fulfill a minimum requirement in this respect (Outcomes *a* through *k*).

8. A significant design experience is emphasized through the senior-level IPRO (capstone design course) as well as through several other courses (Outcomes *c*, *d*, *e*, *f* and *k*).

Individual course syllabi provided in this report summarize the specific Program outcomes incorporated in course instruction. The following is a summary table listing *a* through *k* and the design experience outcomes in all courses required by the Program and technical elective courses that are frequently offered.

Program Outcomes in Required Courses and Frequently-Offered Technical Elective Courses

Program Outcome → Course ↓	a	b	c	d	e	f	g	h	i	j	k	Sig. Design Exp
CAE 100 & 101, Introduction to Profession (EG and CAD)	x	x	x		x	x	x		x	x	x	
CAE 105, Geodetic Science	x	x	x		x			x		x	x	x
CHEM 124	x	x										
MATH 151, 152, 251, 252	x	x										
PHYS 123, 221, 224	x											
CS 105, Programming	x											
MAE 201 & 202, Mechanics of Solids I and II	x		x		x		x	x	x	x	x	
MMAE 305, Dynamics	x	x		x	x						x	
Humanities & Social Sciences						x	x					
CAE 221, Engineering Geology		x					x	x			x	
CAE 301, Hydraulics & Hydrology												
CAE 302, Fluid Mechanics and Hydraulics	x		x		x			x		x	x	
CAE 303, Structural Design I, Steel	x		x		x	x	x	x	x	x	x	x
CAE 304, Structural Analysis I	x				x			x		x	x	
CAE 307, Structural Design II, Concrete	x	x	x		x		x	x		x	x	x
CAE 310, Structural Analysis II	x				x			x		x	x	
CAE 312, Eng System Analysis (Econ, Prob & Statistics)	x			x	x	x		x		x	x	
CAE 315, Materials of Construction	x	x			x							
CAE 323, Soil Mechanics	x	x			x			x		x	x	
CAE 408 (Elective) Bridge & Structural Design	x		x		x	x	x	x	x	x	x	x
CAE 410 (Elective) Intro to Wind & Earthquake Eng	x		x		x	x		x		x	x	x
CAE 416 (Elective) Facility Design of Transportation Systems												
CAE 419, Transportation Engineering & Design	x		x		x		x	x		x	x	
CAE 420 (Elective) Structural Dynamics	x		x		x			x		x	x	
CAE 430 (Elective) Probability Concepts in Civil Engineering	x		x	x	x			x		x	x	
CAE 431, Steel & Timber Design	x		x		x	x	x	x	x	x	x	x
CAE 432, Concrete & Foundation Design	x		x		x	x	x	x	x	x	x	x
CAE 435 (Elective) Experimental Analysis of Structures	x	x	x	x	x			x		x	x	
CAE 436 (Elective) Des of Masonry, Timber Structures	x		x		x	x		x	x	x	x	x
CAE 439 (Elective) Introduction to GIS	x	x	x		x		x	x	x	x	x	
CAE 442 (Elective) Finite Element Methods in Framed Struct	x			x	x			x		x	x	
CAE 457 Geotechnical Foundation Design	x		x	x	x	x		x		x	x	
CAE 470 Construction Method & Estimating	x		x		x		x	x		x	x	
CAE 471 (Elective) Construction Planning & Scheduling	x		x		x			x		x	x	
CAE 472 (Elective) Construction Site Operation	x		x		x			x		x	x	
CAE 473 (Elective) Construction Contract Administration	x				x	x	x	x		x	x	
CAE 482 (Elective) Hydraulic Design of Open Channels	x		x	x	x			x		x	x	
CAE 486 (Elective) Soil & Site Improvement	x		x		x			x	x	x		
ENVE 310 (Elective) Intr to Environmental Eng	x	x	x		x	x	x		x	x	x	x
ENVE 404 (Elective) Water and Wastewater Engineering	x	x	x		x	x	x		x	x	x	x
ENVE 426 (Elective) Environmental Tools for Engineers	x	x			x	x	x		x	x	x	
ENVE 463 (Elective) Intr to Air pollution Control	x	x			x	x	x		x	x	x	
ENVE 485 (Elective) Industrial Ecology	x	x	x	x		x	x	x	x	x	x	x
Interprofessional Project (IPRO) Junior Year	x		x	x	x	x	x	x		x	x	
Interprofessional Project (IPRO Senior Capstone Design)	x	x	x	x	x	x	x	x	x	x	x	x

- **Documentation**

  <<Describe by example how the evaluation team will be able to relate the display materials, i.e., course syllabi, sample student work, etc., to each Program Outcome>>

A complete listing of course objectives, outlines, materials covered in courses, course contribution to meeting curriculum areas, the relation between course contents and program outcomes for the Program and the assessment methods used for learning outcomes are provided in this report. Samples of students' works including notes, materials supplied to students, exams, homework problems, projects, etc. are compiled and are made available for review by the evaluation team at the time of their visit.

- **Achievement of Program Outcomes**

  << Explain the assessment and evaluation processes that periodically document and demonstrate the degree to which the Program Outcomes are attained. Describe the level of achievement of each Program Outcome. Discuss what evidence will be provided to the evaluation team that supports the levels of achievement of each Program Outcome>>

The assessment and evaluation process for periodic documentation and demonstration of the degree to which the Program outcomes are attained is similar to the evaluation process used for program objectives. The following items describe the specific instruments used in the assessment process.

- Exit questionnaire system. As described earlier, seniors' exit questionnaires are distributed to the civil engineering seniors in their last semester before graduation. Through this questionnaire, opinions of students on the Program outcomes are sought.

- Alumni survey. Currently, the Armour College of Engineering conducts this survey using the services of an outside firm. The first round of results using this survey was obtained in 2005 and is repeated every two years.

- Fundamentals of Engineering (FE) examination results. All undergraduate students in the CAEE Department at IIT are required to take this examination in their senior year. The procedure used to ensure that all graduating seniors actually take the exam is documented in the Program Objectives and Outcomes Assessment Report.

  The Department receives the results of the overall performance of the civil engineering students in the morning and afternoon subjects. The data is used to evaluate the performance of civil engineering graduates as a means to assess the students' competency in courses compared to their peers.

- Course assessments by individual instructors and students. These questionnaires are completed by both the instructors and students. The questionnaires contain a direct set of questions for assessing each course through *a-k* outcomes. Each instructor also outlines a series of measures to improve the future performance of students in the

course as a way of improving the learning objectives in the course consistent with the Program outcomes. The procedure for instructor's self assessment is described in Criterion 2 of this report and is kept in the Departmental files.

- Input from the members of the Board of Advisors of the CAEE Department. After consideration of results from other assessment means, the Board of Advisors often provides input on the Program outcomes as may be necessary. This is often achieved through the Board's Subcommittee on the Program Objectives and Course Assessment.

- Employers' Questionnaire. As indicated earlier, employers' survey is also used as a method of compiling data on the performance of the Program graduates. This questionnaire also contains specific question on *a-k* outcomes.

- Writing-components in courses. To comply with the Program outcome on writing competency, in addition to the evaluations by individual instructors, samples of student writings are provided to the Department of Humanities, Director of Communication Across the Curriculum for evaluation and input. Courses that require technical writing include those in civil engineering laboratory and design courses. In addition, the Interprofessional (IPRO) design courses also have a major writing component, which is embodied in the final project report.

- Oral communication. As indicated earlier, Oral communications are embodied in design courses and the Interprofessional (IPRO) courses. The evaluation of students' performance is primarily done by the instructors in design courses. In IPRO courses, students will present their project on "IPRO Day." The oral communication is assessed by IPRO judges who evaluate individual projects.

The following table summarizes the Program outcomes and various tools used in compiling data for the assessment of these outcomes.

Tool→ ↓Outcome	Exit Ques-tionnaire	Alumni Survey	FE Exam	Employer Survey	Instructor Course Survey	Student Course Survey	Writing Commu-nication Center	IPRO Assess-ment
a	X	X	X	X	X	X		
b	X			X	X	X		
c	X	X		X	X	X		X
d	X	X		X	X	X		X
e	X	X		X	X	X		X
f	X	X		X	X	X		X
g	X	X		X	X	X	X	X
h	X	X		X	X	X		X
i	X	X		X	X	X		
j	X	X		X	X	X		X
k	X	X		X	X	X		X
Sig. Design Exp.		X			X			X

Achievement Goals

The level of achievement of the Program outcomes is measured through a set of achievement goals established by the Program and reviewed and approved by the Program constituencies through their representation in the Board of Advisors' Subcommittee on Program Objectives and Outcomes Assessment. These achievement goals are summarized below:

(a) Fundamentals of Engineering Exam – Students' performance is compared with respect to the national average in each subject. Moving averages (over a 4-year period) is used. When the average for IIT students falls more than 10% below the national average, the subject area is flagged for further investigation and potential actions.

(b) Instructor's Survey – for individual courses, when any of the a-k assessment items receive a "Below Expectation" (i.e., B score) two years in a row, the course and the assessment item is flagged. The instructor is then notified to provide an action plan to improve students' performance. For the aggregate of courses, the percentages for individual scores; i.e. Exceeded (E), Meet Expectation (M) and Below Expectation (E); are computed for each of the a-k items. Moving averages for the percentage of E+M (over a four-year period) is computed. If for any one item, the average for percentage of E+M scores drops below 50%, the item is flagged for evaluation and development of action items to improve the score.

(c) Students' Survey of Courses – for individual courses, when any of the a-k assessment items receive a "Below Expectation" (i.e., B score) two years in a row, the course and the assessment item is flagged. The instructor is then notified to provide an action plan to improve students' performance. For the aggregate of courses, the percentages for individual scores; i.e. Exceeded (E), Meet Expectation (M) and Below Expectation (E); are computed for each of the a-k items. Moving averages for the percentage of E+M (over a four-year period) is computed. If for any one item, the average for percentage of E+M scores drops below 50%, the item is flagged for evaluation and development of action items to improve the score.

(d) All other Questionnaires – Individual items in questionnaires administered by the CAEE Department have scores 1-5 (5=strongly agree; 1=strongly disagree). For each item, when the average (over a 4-year period) falls below 3.0, the item will be flagged for evaluation and development of action items the score. For the alumni survey (which is administered by the Armour College) scores 1-7 are used (1=lowest score; 7=highest score). For this survey, the achievement goal is set at 4.0 (out of a maximum 7 score). Assessment items below 4.0 are flagged for further evaluation and monitoring and implementation of any action items, if the score for the item shows consistently lower than 4.0 in two consecutive rounds of survey.

Documentary Evidence

The students' performance and metrics obtained from various assessment methods are summarized in the Program Objectives and Outcomes Assessment Report. As indicated earlier, the complete report prepared for the most recent assessment cycle as well as the reports from all previous assessment cycles are available for review by the ABET team at the time of their visit.

Figure 2 shows the process via which the Program objectives and outcomes assessment is achieved and recommendations for any action items are made and implemented.

The table on the next page is taken from the report prepared for the most recent assessment cycle for the Civil engineering Program and summarizes the metric values for the Program outcomes assessment (from the most recent assessment cycle) and their comparison with the stated achievement goals.

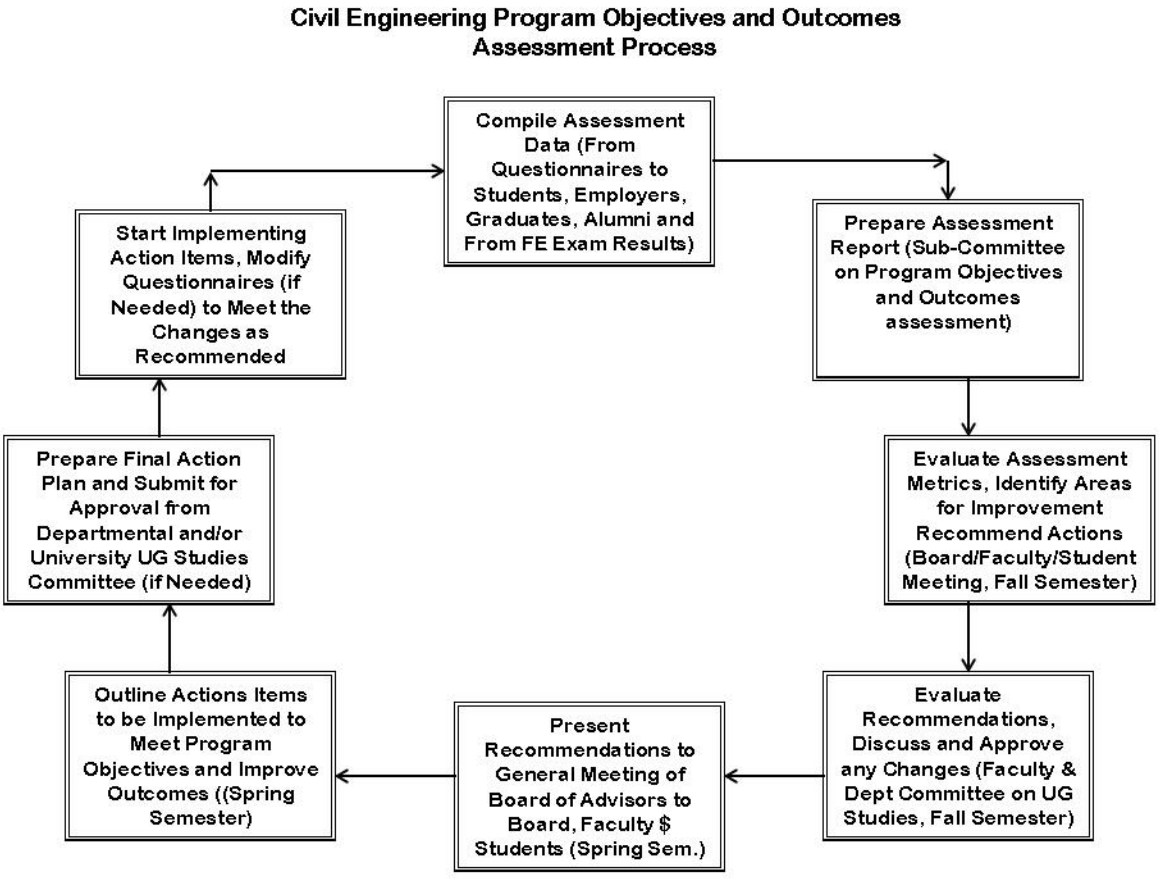


Figure 2

Summary of Metrics used in Assessment of Program Outcomes (from Most Recent Program Objectives and Outcomes Assessment Report)

Tool→ ↓Outcome	Exit Questionnaire Max=5.0 Goal=3.0	Alumni Survey Max=7.0 Goal=4.0	FE Exam (See Note 1)	Employer Survey Max=5.0 Goal=3.0	Instructor Survey % meet & Exceed	Student Course Survey % meet & Exceed
a	4.6	5.4	66% (AM) 56% (PM)	3.3	97	89
b	4.9	4.3		4.7	87	87
c	3.9	5.2		4.2	88	92
d	4.4	4.6		4.0	100	94
e	4.7	5.3		4.3	100	98
f	4.5	6.1		4.4	96	98
g	4.1	4.8		3.5	91	98
h	4.0	4.7		4.0	95	89
i	4.3	5.1		3.8	96	95
j	3.8	5.9		3.8	92	97
k	4.2	4.7		4.4	100	88
Design Exp.	3.7	4.3		4.2	88	
Status	Note 4	Note 4	Note 4	Note 4	Note 4	Note 4

Note 1: The score for FE exam is average for morning (AM) and afternoon (PM) subjects. National average= 64% for AM and 53 for PM subjects.
Note 2: IIT's Writing & Communication Center has a separate assessment report
Note 3: IIT's IPRO office has a separate assessment report
Note 4: All achievement goals on Program outcomes are met

CRITERION 4. CONTINUOUS IMPROVEMENT

- **Information Used for Program Improvement**

  <<Describe the available information, such as results from the Criteria 2 and 3 processes, commonly used in making decisions regarding program improvements>>

The Program improvement is achieved through a comprehensive assessment process as described earlier. The results from various surveys conducted in connection with the Program educational objectives and outcomes assessment (as described in Criteria 2 and 3 and shown graphically on previous pages) are used as the source of information for this purpose.

- **Actions to Improve the Program**

  <<Describe actions taken to improve the program since the last general review. Indicate why (the basis for taking action) and when each action was implemented and the results of the implementation. >>

Closing the outcome assessment loop is achieved through specific action items recommended by the Subcommittee on the Program Objectives and Outcomes Assessment of the Board of Advisors. These action items are reported in our annual assessment report and are based on the review of various assessment metric data compiled by the Department. The following tables provide a summary of actions taken in the most recent assessment cycle (2006-2007) as well as those taken in previous assessment cycles since the last general review.

Action Items Implemented in 2006-2007 Cycle

Action Implemented	Why	When	Results
New courses in environmental engineering were introduced as electives. The environmental engineering subject was introduced in the FE review course	Lower than national average scores in environmental engineering subjects in FE exam	2006 and 2007	First round of results in 2007 showed improvement in scores. The score will be monitored in next cycle again.
Assessment of course objectives and learning outcomes was expanded by involving students in the evaluation process.	To have a more consistent and objective Program objective and outcome assessment process	Fall 2007	The results will be monitored over the next assessment cycles.
Laboratory and building renovation plan was prepared and submitted to the University.	Modernization of UG laboratories	2006	University has included the proposal in near future building and lab renovation plan
Started a closer cooperation with IIT's Placement Office and Career Development Center	Low score in 2005 alumni survey regarding assistance to select a career (Question 14)	2006	Participation by the Chicago firms and public sector in IIT's Career Fairs improved; will monitor Alumni Survey in the next cycle.
Department started offering more sections of junior-level courses (CAE 105, 303, 304, 310 and 323).	To allow students more flexibility in arranging their program of study and reduce a need for course substitutions.	2006	To allow students more flexibility in arranging their program of study and reduce the need for course substitutions and adhering to Program objectives.

Action Items Implemented in 2005-2006 Cycle

Action Implemented	Why	When	Results
Subjects of interest to civil engineering students were provided to the instructors teaching strength of materials (this course is offered by Mechanical Engineering Dept). Overview of bending moment and shear diagrams are included in our first course in structural analysis.	Lower than national average score in strength of materials in the FE exam results	2005	No low score was observed in the following cycles; continued monitoring scores for strength of materials.
Surveying course restructured by adding more hands-on problems in classroom; and offering course twice a year.	Lower than national average score in surveying in the FE exam results	2006	No low score was observed in the following cycles; continued monitoring scores for surveying.
Started discussions with continuing education office to include a refresher course in environmental engineering	Lower than national average score in environmental engineering in the FE exam results	2006	Continued monitoring scores for another cycle.
Curriculum was slightly modified; increased credit hours for CAE 100 and 101 (Introduction to the Profession) by 1 each (from 2 to 3). These courses primarily discuss graphics and CAD. With more emphasis in CAD, our effort is to increase the competency of our graduates in this subject.	The emphasis on more coverage in CAD was recommended by members of our Board of Advisors; in an effort for students to gain more competency in CAD	2006	Improvement in CAD competency was noted in instructor's self course evaluation after the first implementation of the additional credit hours in 2007.

Action Items Implemented in 2004-2005 Cycle

Action Implemented	Why	When	Results
Seniors' exit questionnaire was revised to include more specific questions on Program outcomes (a-k items).	To provide assessment metrics specific to the Program outcomes.	2004	Metrics on Program outcomes were obtained consistent with the a-k items.
New employer questionnaire introduced and implemented with specific questions on Program outcomes (a-k items).	To provide assessment metrics specific to the Program outcomes.	2004	Metrics on Program outcomes were obtained consistent with the a-k items.
Instructor self evaluation form was revised to include more specific questions on Program outcomes (a-k items).	To provide assessment metrics specific to the Program outcomes.	2004	Metrics on Program outcomes were obtained consistent with the a-k items.
Developed and implemented new questionnaires for students who enter graduate schools and for their advisors	To compile assessment data on the Program objectives regarding preparation of students to enter graduate studies.	2004	Metrics on Program objective was obtained consistent with the statement of the Program objectives
The course substitution policy was enhanced and now requires a case-by-case evaluation of the student's courses.	To allow students to adhere with curriculum and reduce a need for course substitutions.	2004	Resulted in reduction in the need for course substitutions and adhering to Program ejectives
Additional offering of the 300 level essential courses implemented to reduce the need for course substitutions.	To allow students to adhere with curriculum and reduce a need for course substitutions.	2004	Resulted in reduction in the need for course substitutions and adhering to Program ejectives
Frequent meeting with students was coordinated. Department chair started attending all meetings of students' organizations. Discussed in these meetings are: role of students in the assessment process, FE exam awareness, students' open dialogue with the chair and Board of Advisors.	More active participation of students in the Program objectives and outcomes assessment process.	2004	Students' participation in the Program objectives and outcome assessment process was substantially improved; increase in the number of returned questioners observed.
Revised the structure of the Board of Advisors to include students as members and also include students in the Subcommittee on Program Objective and Outcome Assessment.	More active participation of students in the Program objectives and outcomes assessment process; provide a means for students to bring their views to the Board.	2004	Students' participation in the Program objectives and outcome assessment process was substantially improved; increase in the number of returned questioners observed.

Action Items Implemented in 2002-2003 and 2003-2004 Cycles

Action Implemented	Why	When	Results
The Department made a proposal to make the senior-level IPRO course a design capstone course.	To provide a comprehensive design experience to civil engineering graduates consistent with ABET.	2003	The capstone course has become a major component of the curriculum providing graduates with a major design experience, since 2003.
The Department made a request to College for a comprehensive review of contents in statics and strength of materials courses; the Department made a request that coverage of materials pertinent to civil engineering be expanded in these courses.	Lower than national average scores in statics and strength of materials courses in the FE exam.	2003	A committee was formed by the College to review the course contents; the Department followed up with the issue and continued monitoring scores in subsequent assessment cycles.
The course contents of MMAE 201 and MMAE 202 were discussed in the meeting of the engineering department chairs.	Lower than national average scores in statics and strength of materials courses in the FE exam.	2004	The College started reviewing the possibility for co-teaching these courses by MMAE and CAEE Department to enhance coverage of pertinent civil engineering topics.
A review of basic beam analysis techniques is included in the course in structural analysis (CAE 304) to bring students up to speed on such topics as beam theory, internal force and stress analyses.	Lower than national average scores in statics and strength of materials courses in the FE exam.	2004	Continued monitoring FE scores in subsequent assessment cycles; improvement was observed; 4-year moving average of scores was consistent with national averages.
Question regarding the humanities and social science courses in seniors' exit questionnaire were changed to acquire information on the effectiveness of these courses in improving technical writing, communication and appreciation for social and contemporary issues.	Low scores for humanity and social science courses were observed in seniors' exit questionnaire suggesting that the questions may have not been clear enough.	2004	Continued monitoring the results of the new questions in the exit questionnaire in subsequent assessment cycles; slight improvement was observed.
Enforce a better advising system to place students in courses that would help them better with writing, communications, effective presentation and appreciation for social issues civil and architectural engineering will be facing in their careers.	Low scores for humanity and social science courses were observed in seniors' exit questionnaire suggesting that the questions may have not been clear enough.	2004	Continued monitoring the results of the new questions in the exit questionnaire in subsequent assessment cycles; slight improvement was observed.

CRITERION 5. CURRICULUM

- **Program Curriculum**

  <<Describe how students are prepared for a professional career and further study in the discipline through the curriculum and indicate how the curriculum is consistent with the Program Educational Objectives and Program Outcomes>>

The Program's aim is to meet the educational objectives and outcomes and to educate graduates that are well-rounded to enter the profession or to pursue graduate studies. This is achieved through a well-balanced set of courses to ensure the strength needed in basic science and engineering, basic civil engineering, hands-on experience through laboratory and projects, humanities and social sciences, senior level civil engineering professional experience and major design experience through senior-level courses and the capstone design course. The courses required are versatile. Each course has a set of objectives that focuses on learning the materials needed to ensure the level of competency required from students. The Program outcomes are listed in each course descriptions; and the specific relevance of the course to various outcomes is indicated. The instructor ensures the compliance with the course objectives and outcomes in an evaluation of students' performance in the course. This evaluation is used to improve the course, if students' performance falls short of intended learning objectives, in an effort to maintain compliance with the Program educational objectives and outcomes.

<<Provide evidence that the minimum credit hours and distribution, as specified in Criterion 5, are met>>

The curriculum in civil engineering has a requirement of one hundred and thirty seven (137) semester credit hours. This curriculum is organized under five general categories: Basic Science and Mathematics, Humanities and Social Sciences, Basic Engineering, Introductory Civil Engineering, and Professional Level Civil Engineering. More specifically, the content of the curriculum takes the following form.

1) Basic Sciences and Mathematics
(38 credit hours – 1.126 years)

- Mathematics — Four courses inclusive of differential equations totaling 18 credit hours.
- Physics — Three calculus based courses two with labs totaling 11credit hours.
- Chemistry — One course with a lab - 4 credit hours.
- Geology — One course with a lab - 3 credit hours.
- Computer Science — One course with a lab - 2 credit hours

2) Humanities and Social Sciences
(21 credit hours – 0.622 years)

IIT's general education requirement specifies three courses in humanities and three in social sciences with a seventh course that can be either a humanities or social science. All freshmen take a writing placement examination. If a student fails this examination, then he/she is required to take an introductory English writing course, which is in addition to the required credit hours in this category.

Humanities courses include a selection from architectural history, history, literature, and philosophy. Social science courses include a selection from economics, political science, psychology, and sociology. A total of four courses, two from each area, need to be at a junior or senior level.

In defining courses within these categories we use traditional ABET standards as defined by the following simple examples: anything Shakespeare counts, technical writing does not; macroeconomics counts, accounting does not.

3) Basic Engineering
(21 credit hours – 0.622 years)

- Introduction to the profession — Three courses taught in the freshman year that presents a basic introduction to engineering as a profession, while giving a grounding in a engineering skill set including engineering graphics, CAD, and land surveying. Each of these courses involves a laboratory.
- Engineering Science — Four courses including: statics, dynamics, strength of materials, and fluid mechanics.

4) Introductory Civil Engineering
(24 credit hours - 0.711 years)

- A course in civil engineering materials. This course involves a laboratory.
- Two courses in structural analysis, both of which includes a computer laboratory.
- Two courses in structural design, one of which has a laboratory.
- A course in soil mechanics that includes a laboratory.
- A course in hydraulics and hydrology that includes a laboratory.
- A course in engineering systems analysis. This course addresses topics in applied probability and statistics, engineering economics, and professional ethics.

5) Professional level Civil Engineering
(33 credit hours - 0.978 years)

- Two additional courses in structural design.
- A course in geotechnical foundation design.
- A course in transportation engineering.
- A course in construction management.

- Five technical electives (fifteen credit hours), one of which must be a junior-level IPRO course
- One capstone design course (senior-level IPRO course)

The required courses listed under the heading of professional level civil engineering are all design orientated. Each course has as very significant design project as part of its core requirement. These projects are team-oriented, and most expand beyond the focus of the material in question. For example, in the case of the concrete design course, a typical project is the design of a small factory or a low-rise parking garage. The students perform the structural analysis, the design of columns, foundations, shear walls and slabs. They also consider questions associated with cost and construction methods.

Of the five technical electives; one must be a junior-level IPRO course. This course is interdisciplinary, combining small groups of seniors, juniors and a few sophomores in the conduct of an open-ended project. The senior-level IPRO course involves a capstone design project, which provides a significant design experience (as explained later).

The technical elective courses are selected by the student with the advice of the academic advisor. If a student wishes to select these courses broadly from a number of sub-disciplines, then he/she can do so. However, the Department recommends that each student specialize in a professional specialization area. These areas are: construction management and engineering, environmental engineering, geotechnical engineering, structural engineering, and transportation engineering. A professional specialization in any one of these areas involves taking three courses (technical electives) within that area. Courses acceptable for the specialization are listed in the bulletin.

The university bulletin lists a number of possible minors. Each minor requires a minimum of five courses. A civil engineering student can take one of these minors with the approval of the student's advisor, but it often requires that the student must complete more than the one hundred and thirty-seven (137) credit hour minimum for graduation.

> <<Describe the culminating major design experience, including how it is based on the knowledge and skills acquired in earlier course work and how appropriate engineering standards and multiple realistic constraints are incorporated in the experience>>

All seniors in civil engineering are required to take the senior-level IPRO capstone design course. The senior capstone design course (IPRO Capstone) requires a group project involving a complete design that may contain a host of modules including architectural design, structural and foundation design, cost estimating and bid document preparation, construction scheduling, building mechanical and electrical system design, transportation and traffic flow studies around the facility to be designed, building occupancy and accessibility studies, elevator design, etc. The IPRO Capstone design course is a multi-disciplinary effort; and as such it may involve students from other disciplines in addition to those in civil engineering. The selection of the number of modules in the project involves the number of students from various sub-disciplines within civil engineering and those from the architectural engineering program, College of Architecture, mechanical engineering and electrical engineering programs. As a minimum, the project always involves an architectural design, structural and foundation design, and at least

one other module such as cost estimating, construction scheduling or transportation and traffic flow studies, etc. The deliverables required for this course include oral and poster presentation of the project and a complete set of documents including CAD drawings of all designs. The capstone design course is intended for students to use their knowledge gained in all previous courses in a realistic project that would involve a major design experience.

<<Demonstrate that adequate time and attention are given to each curricular component, consistent with the outcomes and objectives of the program and the institution>>

The distribution of time for each of the five components of the curriculum is consistent with the breadth and depth required in each component (as described earlier in this section).

<<Describe the provisions for any cooperative education that is used to satisfy curricular requirements. Include a description of the academic component evaluated by program faculty>>

There is a very limited participation by students in cooperative education. And as such, the Program has no special provisions for cooperative education.

<<Describe the additional materials that will be available for review during the visit to demonstrate achievement related to this criterion>>

Individual course files are available for review at the time of visit. Each file contains samples of course notes, homework problems, examinations and projects. Students' homework problems and examinations are from three groups – those at 75% and above performance level; those in the 50 to 75% levels and those with performance below 50%.

Samples of students' projects in the senior level capstone design course are also available for review. In addition to these, samples of presentations, reading materials, quizzes and other materials covered in the discussion of the professional ethics are available for review.

Furthermore, the Program has enjoyed a 100% placement among its graduates over the past six years since the last ABET visit. The placement records are available through IIT's Career Management Center.

- **Prerequisite Flow Chart**

  {{Attach a flow chart showing the prerequisite structure of program's courses required or allowed towards the major.}}

The flow chart for course prerequisite and co-requisite structure of the Program is provided on the next page. Prerequisites are shown with solid arrow lines. Co-requisites are shown with dotted lines.

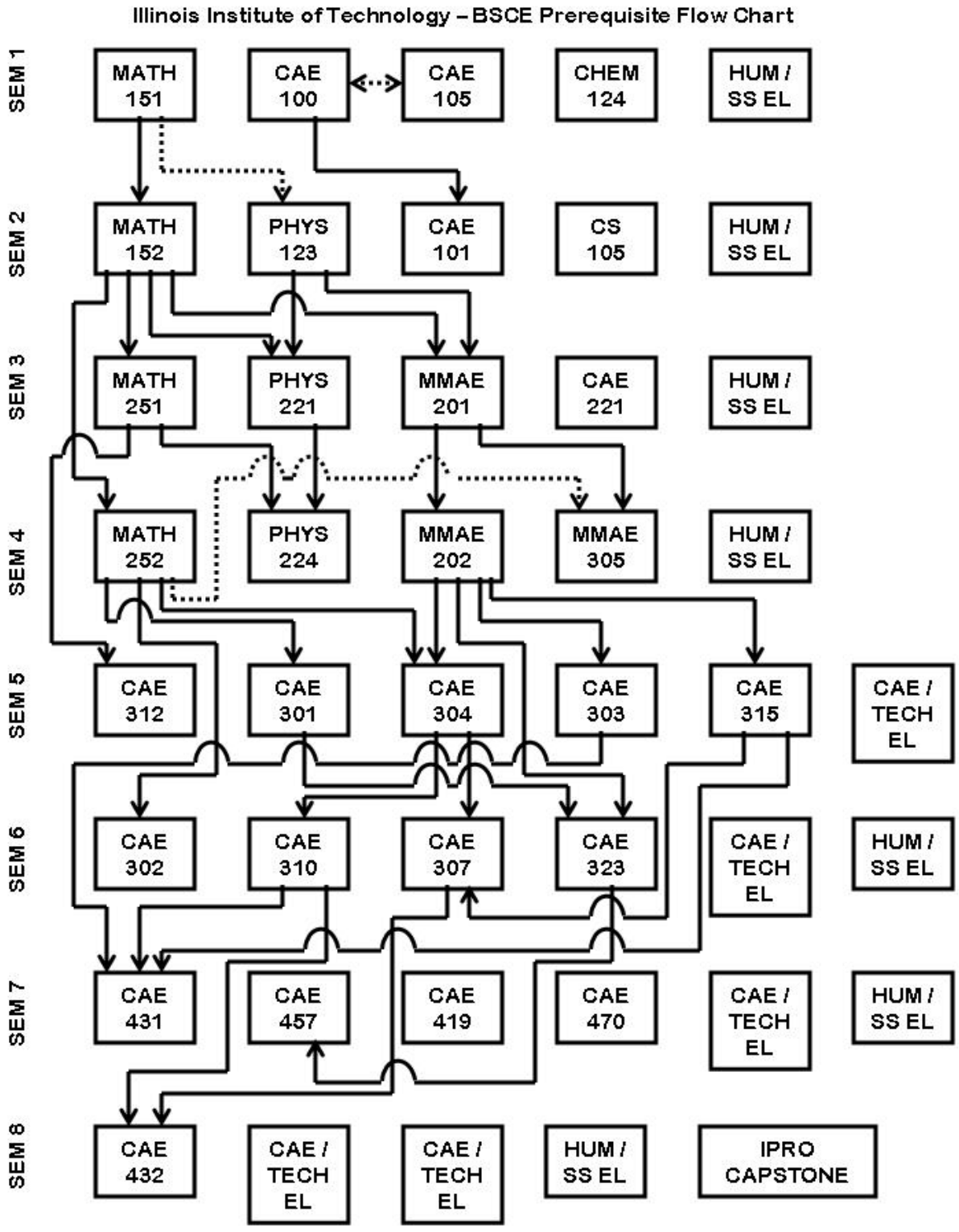

Illinois Institute of Technology – BSCE Prerequisite Flow Chart
SEM 1
MATH 151
CAE 100
CAE 105
CHEM 124
HUM / SS EL
SEM 2
MATH 152
PHYS 123
CAE 101
CS 105
HUM / SS EL
SEM 3
MATH 251
PHYS 221
MMAE 201
CAE 221
HUM / SS EL
SEM 4
MATH 252
PHYS 224
MMAE 202
MMAE 305
HUM / SS EL
SEM 5
CAE 312
CAE 301
CAE 304
CAE 303
CAE 315
CAE / TECH EL
SEM 6
CAE 302
CAE 310
CAE 307
CAE 323
CAE / TECH EL
HUM / SS EL
SEM 7
CAE 431
CAE 457
CAE 419
CAE 470
CAE / TECH EL
HUM / SS EL
SEM 8
CAE 432
CAE / TECH EL
CAE / TECH EL
HUM / SS EL
IPRO CAPSTONE

Figure 3

- **Course Syllabi**

  {{Attach course syllabi in Appendix A for each course used to satisfy the mathematics, science, and discipline-specific requirements required by Criterion 5 or any applicable Program Criteria. The syllabi formats should be consistent for each course, must not exceed two pages per course, and, at a minimum, contain the following information:

  Department, number, and title of course
  Designation as a Required or Elective course
  Course (catalog) description
  Prerequisites
  Textbook(s) and/or other required material
  Course learning outcomes / expected performance criteria
  Topics covered
  Class/laboratory schedule, i.e., number of sessions each week and duration of each session
  Contribution of course to meeting the requirements of Criterion 5
  Relationship of course to Program Outcomes
  Person(s) who prepared this description and date of preparation}}

Table 5-1 Curriculum

Civil Engineering

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours)			
		Math & Basic Sciences	Engineering Topics *Check if Contains <u>Significant</u> Design (✓)*	General Education	Other
Freshman, Fall	MATH 151-CALCULUS	5	( )		
	CHEM 124-PRINCIPLES OF CHEMISTRY	4	( )		
	CAE 100-INTRODUCTION TO THE PROFESSION I		2 ( )	1	
	CAE 105-GEODETIC SCIENCE		3 ( )		
	HUM OR SOCIAL SCIENCE ELECTIVE		( )	3	
Freshman. Spring	MATH 152-CALCULUS II	5	( )		
	CS 105-INTRODUCTION TO COMPUTING	2	( )		
	CAE 101-INTRODUCTION TO THE PROFESSION II		2 ( )	1	
	PHYS 123-GENERAL PHYSICS I: MECHANICS	4	( )		
	HUM OR SOCIAL SCIENCE ELECTIVE		( )	3	
Sophomore, Fall	MATH 251-MULTIVARIABLE AND VECTOR ANALYSIS	4	( )		
	MMAE 201-MECH OF SOLIDS I		3 ( )		
	CAE 221-ENG GEOLOGY	3	( )		
	PHYS 221- GENERAL PHYSICS II: ELECTROMAG. AND OPTICS	4	( )		
	HUM OR SOCIAL SCIENCE ELECTIVES		( )	3	
Sophomore, Spring	MATH 252-INTRODUCTION TO DIFFERENTIAL EQUATIONS	4	( )		
	MECH 305-DYNAMICS		3 ( )		
	MECH 202-MECH. OF SOLIDS II		3 ( )		
	PHYS 224-GENERAL PHYSICS III: THERMAL & MODERN PHYSICS	3	( )		
	HUM OR SOCIAL SCIENCE ELECTIVE		( )	3	

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours)			
		Math & Basic Science	Engineering Topics *Check if Contains <u>Significant</u> Design (✓)*	General Education	Other
Junior, Fall	CAE 301-HYDRAULICS & HYDROLOGY		3 ( )		
	CAE 303-STRUCTURAL DESIGN I		3 (✓)		
	CAE 304-STRUCTURAL ANALYSIS I		3 ( )		
	CAE 312-ENG SYSTEMS ANALYSIS		3 ( )		
	CAE 315_MATERIALS OF CONSTRUCTION		3 ( )		
	TECHNICAL ELECTIVE*		3 (✓)		
Junior, Spring	CAE 302-FLUID MECH & HYDRAULICS		3 ( )		
	CAE 307-STRUCTURAL DESIGN II		3 (✓)		
	CAE 310-STRUCTURAL ANALYSIS II		3 ( )		
	CAE 323- SOIL MECHNICS		3 ( )		
	TECHNICAL ELECTIVE*		3 (✓)		
	HUM OR SOCIAL SCICE ELECTIVE		( )	3	
Senior, Fall	CAE 419-TRANSPORTATION ENGINEERING AND DESIGN		3 (✓)		
	CAE431-STEEL & TIMBER DESIGN		3 (✓)		
	CAE 457-GEOTECHNICAL FOUNDATION DESIGN		3 (✓)		
	CAE 470-CONSTRUCTION METHODS & COST ESTIMATING		3 (✓)		
	TECHNICAL ELECTIVE*		3 (✓)		
	HUM OR SOCIAL SCIENCE ELECTIVE			3	
Senior, Spring	CAE 432-CONCRETE AND FOUNDATION DESIGN		3 (✓)		
	TECHNICAL ELECTIVE*		6 (✓)		
	IPRO-CAPSTONE DESIGN COURSE		3 (✓)		
	HUM OR SOCIAL SCIENCE ELECTIVE			3	

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours)			
		Math & Basic Science	Engineering Topics *Check if Contains Significant Design (✓)*	General Education	Other
TOTALS-ABET BASIC-LEVEL REQUIREMENTS		38	76 (39✓)	23	
OVERALL TOTAL FOR DEGREE	137				
PERCENT OF TOTAL		27.7%	55.5%	16.8%	
Totals must satisfy one set	Minimum semester credit hours	32 hrs	48 hrs		
	Minimum percentage	25%	37.5 %		

* Of the total of five technical electives, one must be a junior year IPRO.

✓39 credit hours contain a significant design component.

Summary:

Total Mathematics Requirements: 18 credit hours
Total Chemistry Requirements: 4 Credit Hours
Total Computer Science Requirements: 2 Credit Hours
Total Physics Requirements: 11 Credit Hours
Total Humanities and Social Science Requirements: 21 Credit Hours
Total Engineering (other than civil engineering) Requirements: 9 Credit Hours
Total Civil Engineering Requirements: 54 credit hours
Total CAE & Technical Electives: 12 Credit Hours
Junior Level IPRO: 3 Credit Hours
Senior-Level Capstone Design IPRO: 3 Credit Hours

Table 5-2. Course and Section Size Summary

Civil Engineering

Course No.	Title	Responsible Faculty Member	No. of Sections Offered in Current Year	Avg. Section Enrollment	Lecture[1]	Laboratory[1]	Other[1]
CAE 100	Introduction to the Profession I	Novak; Snyder	2	15	33%	67%	
CAE 101	Introduction to the Profession II	Novak; Snyder	2	14	33%	67%	
CAE 105	Geodetic Science	Rohter, L.	1	55	50%	50%	
CAE 221	Engineering Geology	Budiman, J.	1	31	50%	50%	
CAE 301	Hydraulics and Hydrology	Paintal, A.	1	32	40%	60%	
CAE 302	Fluid Mechanics and Hydraulics	Paintal, A.	1	45	100%		
CAE 303	Structural Design I	Shen, J.	2	30	60%	40%	
CAE 304	Structural Analysis I	O'Leary, J.	2	28	60%	40%	
CAE 307	Structural Design II	DeSantiago, E.	3	16	40%	60%	
CAE 310	Structural Analysis II	O'Leary, J.	2	12	50%	50%	
CAE 312	Engineering Systems Analysis	Mohammadi, J.	1	45	100%		
CAE 315	Materials of Construction	Longinow, A.	3	15	40%	60%	
CAE 323	Soil Mechanics	Budiman, J.	2	25	40%	60%	
CAE 408	Bridge and Structural Design	Longinow, A.	*	20	100%		
CAE 410	Introduction to Wind & Earthquake Engineering	Shen, J.	*	15	100%		
CAE 412	Traffic Eng. Studies and Design	Li, Z.	*	N/A	100%		
CAE 415	Pavement Design, Construction and Maintenance	Budiman, J.	*	N/A	50%	50%	
CAE 416	Facility Design of Transportation Systems	Grabowski, D.	1	9	100%		
CAE 419	Transportation Eng. & Design	Li, Z.	1	50	100%		
CAE 420	Introduction to Structural Dynamics	Shen, J.	1	30	100%		
CAE 430	Probability Concepts in Civil Engineering Design	Mohammadi, J.	*	15	100%		
CAE 431	Steel and Timber Design	Shen, J.	1	48	100%		
CAE 432	Concrete and Foundation Design	Mohammadi, J.	1	40	100%		

CAE 435	Experimental Analysis of Structures	Guralnick, S.	1	10	40%	60%	
CAE 436	Design of Masonry and Timber Structures	Carreira, D.	*	15	100%		
CAE 442	Finite Element Methods in Frames Structures	DeSantiago, E. /O'Leary, J.	1	15	100%		
CAE 457	Geotechnical Foundation Design	Budiman, J.	1	40	80%	20%	
CAE 470	Construction Method and Cost Estimating	Lemming, R.	2	55	40%	60%	
CAE 471	Construction Planing & Sched	Shi, J.	1	46	100%		
CAE 472	Construction Site Operation	Domel, A.	1	65	100%		
CAE 473	Construction Project Admin	Arditi, D.	1	40	100%		
CAE 482	Hydraulic Design of Open Channel Systems	Piantal, A.	*	10	100%		
CAE 486	Soil and Site Improvement	Gill, S.	1	9	100%		
CAE 497	Special studies	Staff	3	2			100%
IPRO	Senior-Level Capstone Design	Mohammadi, J.	2	16	100%		
ENVE 310	Int to Environmental Eng	Noll, K.	1	9	100%		
ENVE 404	Water & Wastewater Eng	Pagilla, K.	1	17	75%	25%	
ENVE 426	Statistical Tools for Engineers	Moschandreas, D.	1	5	70%	30%	
ENVE 463	Int to Air Pollution Control	Moschandreas, D.	1	5	100%		
ENVE 485	Pollution Prevention	Anderson, P.	1	8	100%		
MATH 151	Calculus I	APM Dept. Staff	12	30	100%		
MATH 152	Calculus II	APM Dept. Staff	12	25	100%		
MATH 251	Multivariable & Vector Analysis	APM Dept. Staff	12	29	100%		
MATH 252	Intr to Differential Equations	APM Dept. Staff	12	30	100%		
CHEM 124	Priciples of Chemistry I	BCPS Dept Staff	7	59	50%	50%	
PHYS 123	General Physics I, Mechanics	BCPS Dept Staff	8	17	60%	40%	
PHYS 221	Gen Physics II, Elec & Mag	BCPS Dept Staff	8	17	60%	40%	
PHYS 224	Gen Physics III, for Engrs	BCPS Dept Staff	6	43	100%		
CS 105	Intr Computer Prog I	CS Dept Staff	8	19	50%	50%	
MMAE 201	Mechanics of Solids I	MMAE Dept Staff	5	27	100%		
MMAE 202	Mechanics of Solids II	MMAE Dept Staff	5	26	100%		
MMAE 305	Dynamics	MMAE Dept Staff	5	27	100%		

* The course was not offered in the 2007-2008 academic year. Any data listed for enrollment is based on prior years averages.

CRITERION 6. FACULTY

- **Leadership Responsibilities**

  <<Identify the person who has leadership responsibilities for the program. Describe the leadership and management responsibilities of that person. >>

The chairman of the CAEE Department (Dr. Jamshid Mohammadi) oversees the affairs of the Civil Engineering Program. All the responsibilities and management of the Program including the representation at the college and upper administration, budgetary decisions and allocation of funds for the Program, assignment of duties of the fulltime and adjunct faculty and the staff, assignment of duties of the teaching assistants, and purchasing decisions are carried out by the CAEE Chairman. To oversee the affairs of the Program, the chairman is assisted by the associate chairman, an administrative associate and an administrative assistant. The chairman reports to the Dean of Armour College of Engineering. The associate chairman oversees the advising of undergraduate students in civil engineering, prepares scheduling of courses in civil engineering, acts as the liaison between the CAEE Department and the Office of Undergraduate Admissions and also acts as a liaison between the CAEE Department and the Office of Educational Services for the affairs related to transfer students to the Civil Engineering Program. The administrative associate is primarily responsible for coordinating graduate admissions. The administrative assistant conducts the everyday clerical work of the Department.

The academic affairs of the Civil Engineering Program are coordinated through several departmental committees. Each committee consists of 2-3 members and a chairman. The appointment of these committees is done by the chairman every year at the beginning of the academic year. The chairs of various committees work as the departmental representatives to pertinent college or university committees. The listing of these committees, and their members and responsibilities are available in the CAEE Department files.

- **Authority and Responsibility of Faculty**

  <<Describe the role played by the program faculty with respect to course creation, modification, and evaluation. Describe the roles played by others on the campus, e.g., Dean's Office, Provost's Office, with respect to these areas. Describe the process used to ensure consistency and quality of the courses taught>>

  Individual faculty members are responsible for quality instruction and delivering courses in their respective areas. The faculty initiate and suggest new courses. The Department Chair reviews the proposed new courses, consults with the Departmental Undergraduate Committee regarding the proposal. If the course is approved, it is sent to the Office of the Dean of Engineering for their approval. Any course modification also follows a similar process as that in new course suggestions. The faculty is ultimately responsible for evaluation of the courses they teach. Results of instructor course evaluations (conducted by students) are reviewed by the CAEE Department Chair and the Dean and shared with the faculty. Faculty members with high evaluation marks receive an appreciation letter from the Dean; while those with unfavorable scores are reminded of their performance. In this

regard, the Chairman is given the responsibility of discussing the matter with the faculty to find areas where improvement in teaching may be necessary.

Each faculty member also conducts an evaluation of performance of students in his/her courses as part of the Program objectives and outcome assessment process. A summary report on the performance of students (to meet the Program objectives) and compliance with the Program outcomes is prepared and submitted to the Department Chair for the assessment purposes.

The Dean of Armour College of Engineering requests and receives an annual report on the performance of the faculty of the Program. The CAEE Chairman prepares and submits this report at the end of each budget cycle. The report highlights individual faculty performances in several key areas including their teaching performance, scholarly activities, research, etc. Individual faculty members receive comparative scores based on their performances. Theses scores and performance report are intended as a method to maintain continuity in the quality of education and in identifying areas where a particular faculty may be performing at a level lower than the average maintained by the rest of the faculty.

- **Faculty**

  <<Describe the composition, size, credentials, experience, and workload of the faculty that supports this program. Complete and include Tables 6-1 and 6-2>>

The composition of the faculty involved in the Program is as follows:

Construction Engineering and Management: 2 full-time, 2 adjunct faculty members
Geotechnical Engineering: 1 full-time and 2 adjunct faculty members
Graphics (engineering graphics and CAD), 1 full-time and 1 adjunct faculty member
Hydraulics and hydrology: 2 adjunct faculty members
Structural Engineering: 4 full-time and 6 adjunct and/or emeritus faculty members
Surveying: 1 adjunct faculty
Transportation: 1 full-time and 2 adjunct and/or emeritus faculty members

In addition, the following is the composition of other programs with the CAEE Department.

Architectural Engineering: 3 full-time and 1 adjunct faculty members
Environmental Engineering: 4 full-time faculty members

Eight full-time faculty members and nearly all adjunct faculty have professional licenses. Faculty teaching capstone design and all upper level courses that have a significant design components all have PE licenses. Courses in the construction specialty area are taught either by full-time faculty with many years of experience or by adjunct faculty with experience and PE licenses.

The hiring of the new faculty is conducted through a national search by a Departmental committee, which is responsible for screening the application materials, inviting applicants for

interview and recommending the hiring. Qualifications of the new faculty are carefully reviewed before final hiring is done.

The CAEE Department has encouraged the junior faculty to participate in ASCE-sponsored teaching workshops (such as ExCEEd Program) to improve their teaching skills. Armour College of Engineering also schedules workshops and seminars on teaching quality. These workshops and seminars have been regularly attended by the faculty teaching in the Civil Engineering Program.

The workload of the individual faculty depends on their research and other scholarly activities. Tenure track faculty members carry a load of 3 courses per year in their first 2 years of employment. The normal teaching load of faculty members who are involved in a moderate level of research and scholarly activities is 4 courses per year. Additional research support (in the form of a charge off) can reduce this load to 3. Most other faculty members with lower research and scholarly activities have a teaching load of 5 – 6 courses per year. Two such courses are generally IPRO project-based courses.

The information on the years of experience of the individual faculty members and their qualifications are summarized in the accompanying tables. The resumes are attached as requested.

- **Faculty Competencies**

  <<Describe the competencies of the faculty and how they are adequate to cover all of the curricular areas of the program>>

Out of the five areas of the curriculum described earlier, the faculty of the Civil Engineering Program teach a small portion of the Basic Engineering, and all of the Introductory Civil Engineering and Professional Civil Engineering areas of the curriculum. Most of the Basic Engineering and all of the Sciences and Mathematics and Humanities and Social Sciences areas of the curriculum are covered by faculty from other engineering departments and faculty from the College of Sciences and Letters.

The civil engineering faculty are all well qualified individuals in their respective areas to cover pertinent courses in the curriculum. The qualifications of individual faculty members are indicated in their resumes provided in the appendix to this self-study report. They are mostly members of various professional societies and some hold membership in various committees within these societies. Nearly all faculty members regularly publish and are involved in ongoing research proposal writing and research activities. Four of our faculty members are members of editorial boards of journals; and two are, or have been, editors of journal publications of ASCE. The average teaching scores (from course evaluations conducted by the university every semester) has been at or better than 4 (out of a maximum score of 5). Five of our faculty members have won the university-wide excellence in teaching awards and one faculty member has been the recipient of a regional teaching award by Chi Epsilon. Five of our faculty members have published textbooks, in (1) transportation engineering, (2) systems engineering, (3) engineering graphics and technical drawings, (4) environmental engineering,

and (4) statistics in engineering. These textbooks are adopted by several other universities either as a main textbook or as major references. In particular, the textbook on engineering graphics was the bestseller for many years. Overall, the competency of the civil engineering faculty is adequate to deliver the curricular areas of the program as pertains to Basic Engineering, Introductory Civil Engineering and Professional Level Civil Engineering.

The faculty members from other departments within the College of Engineering and those from the College of Science and Letters are also all competent in delivering curricular areas of the Program as pertain to Basic Engineering, Basic Science and Mathematics and Humanities and Social Sciences. Nearly all these faculty members have extensive teaching experiences and are involved in professional activities, research and are authors of textbooks.

- **Faculty Size**

  <<Discuss the adequacy of the size of the faculty and describe the extent and quality of faculty involvement in interactions with students, student advising, service activities, and professional development>>

With the growth of the Program and increase in enrollment, the size of the full-time faculty is barely adequate to fully deliver the instruction commitments of the Program. The Department chair has requested new opening in areas such as the materials of construction, transportation engineering and civil/environmental engineering. Although the university has agreed that there is a need for these positions, no hiring has been authorized thus far, because of budgetary restrictions.

The Program has always provided an excellent advising to all students. The associate chair (John O'Leary), who has been doing all the advising, thus far, has received an award of service excellence for the quality of advising he offers to students. He has also been consulted by other programs across the main campus for matters related to advising. Starting with Spring 2008, another faculty member (Mark Snyder) has also been assigned to help with the advising. This has resulted in a reduction in advising load of the associate chair and a better distribution of advising load. Dr. Snyder has many years of experience serving as the chair of IIT's ROTC Department of the Air Force. He brings this experience to the Program in helping students with advising needs.

The quality and extent of the involvement of faculty in interaction with students is comparable with those in other institutions. The interaction of most faculty with students (in addition to classroom teaching) is through advising the three main student organizations, the project-based capstone design IPRO courses, students' social events (which occurs two times a year), involvement of students in the Board of Advisors, and other extra-curricular activities (bridge building and other contests).

{{Attach as Appendix B an abbreviated resume for each program faculty member with the rank of instructor or above. The format should be consistent for each resume, must not exceed two pages per person, and, at a minimum, must contain the following information:
Name and academic rank
Degrees with fields, institution, and date
Number of years of service on this faculty, including date of original appointment and dates of advancement in rank
Other related experience, i.e., teaching, industrial, etc.
Consulting, patents, etc.
States in which professionally licensed or certified, if applicable
Principal publications of the last five years
Scientific and professional societies of which a member
Honors and awards
Institutional and professional service in the last five years
Percentage of time available for research or scholarly activities
Percentage of time committed to the program}}

Please see the appendix for the faculty resumes.

Faculty Development

<<Describe the plan that is in place for faculty development and the funding available to execute this plan. Provide detailed descriptions of professional development activities for each faculty member>>

The Program encourages faculty development in (1) teaching and education activities; (2) research and scholarly activities; and (3) participation in the professional societies and conferences. To various degrees, the faculty have been involved in:

- Research through external and internal support
- Professional society meeting attendance
- Professional society committee membership
- Journal editorship
- Journal articles and books publications
- Summer research
- Research meetings
- Proposal-writing activities
- ASCE-sponsored summer programs

Support for the faculty's professional development has been provided through the following sources (all on a very limited basis):

- CAEE Department's budget
- CAEE Department's discretionary funds
- Research projects

- Professional societies (e.g. ASCE's funds to support committee members' travel)
- Start-up funds
- IIT's research and educational incentives

The Armour College of Engineering has also provided support for faculty who attend teaching workshops. IIT's Graduate College has been providing seed money for research and education initiation studies. In the past 6 years, two faculty members have received this fund (each for about $10,000 to $15,000). Also, more recently, faculty participation in undergraduate student research has been encouraged; and limited funds have been provided to faculty for this purpose. New ideas in delivering courses have also been encouraged through support for initiating and implementing these ideas at the classroom level. Two faculty members received such awards in 2007.

The average travel support per faculty provided by the University is less than one travel per faculty per year. To supplement the travel budget, the CAEE Department's discretionary funds, faculty's own research budget and other sources (ASCE support) have been utilized.

Start-up funds are provided by the university to new hires. The amount received by each faculty depends on the faculty member's research and a need for laboratory equipment. The amount that was made available to the most recent hire (Dr. Zongzhi Li) was $50,000 in 2004 for the development of his computer laboratory in transportation engineering.

Finally, in the past three years, the Department has received a total of $48,000 per year for delivering IPRO courses. This amount has been spent for faculty development in support of their educational, research and scholarly activities.

Table 6-1. Faculty Workload Summary

Civil Engineering

Faculty Member[1] (Name)	FT or PT (%)	Classes Taught (Course No./Credit Hrs.) Term and Year Term (Fall 07)	Term (Spr-08)	Total Activity Distribution[2] Teaching Term	Year	Research Term	Year	Other Term	Year
P. Anderson	FT	ENVE485/3; ENVE501/3	ENVE506/3	40%	40%	45%	45%	15%	15%
D. Arditi	FT	CAE 574/3; CAE575/3	CAE473/3; CAE 577/3	50%	50%	35%	35%	15%	15%
J. Budiman	FT	CAE221/3; CAE475/3	CAE323/3; CAE 562/3; CAE563/0	60%	60%	20%	20%	20%	20%
E. DeSantiago	FT	CAE503/4; CAE530 &MMAE532/3, IPRO/3	CAE307/3 (2 sections), IPRO/3	60%	55%	20%	20%	20%	25%
Z. Li	FT	CAE419/3; CAE 555/3	CAE568/3	40%	40%	55%	55%	5%	5%
A. Megri	FT	CAE 331/3; CAE464/3	CAE511/3; CAE 461/3, IPRO/3	65%	65%	25%	25%	10%	10%
J. Mohammadi	FT	CAE312/3, IPRO/3	CAE432/3, IPRO/3	35%	35%	15%	15%	50%	50%
D. Moschandreas	FT	ENVE426/3, CAE 523/3	ENVE576/3; ENVE463/3	40%	40%	25%	25%	35%	35%
R. Muehleisen	FT	CAE403/2, CAE 463/3, IPRO/3	CAE334/3, CAE 466 & 528/3, IPRO/3	50%	55%	30%	30%	20%	15%
K. Noll	FT	ENVE310/3; ENVE580/3	ENVE578/3	40%	40%	45%	45%	15%	15%
J. Novak	FT	CAE100/2; EG 105/2; EG419/3; EG225&G425/3	CAE101/2; EG105/2; EG419&305/3	75%	75%	0	0	25%	25%
J. O'Leary	FT	CAE304/3	CAE310/3	55%	55%	5%	5%	40%	40%
K. Pagilla	FT	ENVE513/3; ENVE590 (seminar); CAE 593 (seminar)	ENVE404/3; ENVE551; ENVE590 (seminar), CAE 593 (seminar)	40%	40%	45%	45%	15%	15%
J. Shen	FT	CAE303/3; CAE431/3, IPRO/3	CAE525/4; CAE303/3, IPRO/3	60%	60%	30%	30%	10%	10%
J. Shi	FT	CAE571/3; CAE572/3	CAE471/3; CAE573/3	60%	60%	30%	30%	10%	10%
M. Snyder	FT	CAE 100/2	CAE 101/2, CAE 309/3	60%	60%	20%	20%	20%	20%

1. Full-time faculty in alphabetical order by last name. 2. Term: Spring 2008; Year: 2007-2008 (Combined Fall 2007 and Spring 2008).

Table 6-1. Faculty Workload Summary (Continued)

Civil Engineering

Faculty Member[1] (Name)	FT or PT (%)	Classes Taught (Course No./Credit Hrs.) Term and Year Term (Fall 07)	Term (Spr-08)	Total Activity Distribution[2] Teaching Term	Year	Research Term	Year	Other Term	Year
D. Carreira	PT	CAE551/3	CAE 518/3	N/A					
A.W. Domel	PT	-	CAE473/3	N/A					
S. Gill	PT	CAE564/4	CAE486/3	N/A					
D. Grawbowski	PT	-	CAE 416/3	N/A					
S. A. Guralnick	PT/FE	CAE520/4	CAE435/3	N/A					
J. Jahedi	PT	CAE468/2	CAE 469/2	N/A					
J. Khisty	PT/FE	-	-	N/A					
A. Kurzydlo	PT	IPRO/3	-	N/A					
R. Lemming	PT	CAE470/3	CAE470/3	N/A					
A. Longinow	PT	CAE 351/3	CAE508/3	N/A					
A. Oskouie	PT	CAE 584	-	N/A					
A. Piantal	PT	CAE301/3	CAE302/3	N/A					
R. Rohter	PT	CAE 105/3, IPRO/3	CAE539/3, IPRO/3	N/A					
P. Sriraj	PT	CAE 548/3	CAE 546/3	N/A					

1. Part-time faculty (PT) and faculty emeritus (FE) in alphabetical order by last name.
2. Term: Spring 2008; Year: 2007-2008 (Combined Fall 2007 and Spring 2008).

Table 6-2. Faculty Analysis

Civil Engineering

Name*	Rank	Type of Academic Appointment TT, T, NTT	FT or PT	Highest Degree	Institution from which Highest Degree Earned & Year	Years of Experience			State in which Registered	Level of Activity (high, med, low, none) in:		
						Govt./ Industry Practice	Total Faculty	This Institution		Professional Society (Indicate Society)	Research	Consulting/ Summer Work in Industry
P. Anderson	Assoc Prof	T	FT	PhD	U. of Washington, 1988	9	22	22	WA	High (Am Chem Soc; Assoc Env Eng & Sc Prof; Am Water Works Assoc)	High	Low
D. Arditi	Prof	T	FT	PhD	Loughbrough, UK, 1973	2	33	27	**	High (ASCE, CMAA, PMI, AACE)	High	Low
J. Budiman	Assoc Prof	T	FT	PhD	Colorado, Boulder, 1985	4	22	22	IL	Med (ASCE, EERI)	High	Med
E. DeSantiago	Sr Lec	NTT	FT	PhD	Stanford, 1996	1	11	11	IL	Med (ASCE)	High	Low
Z. Li	Asst Prof	TT	FT	PhD	Purdue University, 2003	5	4	4	-	Med (ITE, IORMS, ASCE)	High	Low
A. Megri	Sr Lec	TT	FT	PhD	INSA, Lyon, France, 1993	-	12	12	-	High (ASCE,CEBQ) ASHRAE, AQME,	High	Low
J. Mohammadi	Prof	T	FT	PhD	Illinois, Urbana, 1980	3	28	28	IL, CA	High (ASCE, EERI, ACI, ASEE, SEAOI)	High	Low
D. Moschandreas	Prof	T	FT	PhD	Cincinnati, 1972	19	17	17	-	High (ASHRAE, Int Soc of Indoor Air Qual & Clim, Int Soc of Exposure Anal	High	Low
R. Muehleisen	Asst Prof	TT	FT	PhD	Pennsylvania State, 1996	2	10	5	IL	High (ASCE, ASA, ASEE, ASHRAE, IEEE, INCE)	High	Low
K. Noll	Prof	T	FT	PhD	U. of Washington, 1969		38	33	IL, CA	High(Air Poll Control Asoc, ASCE, Am Asoc for Aerosol Res)	High	Med
J. Novak	Sr Lec	NTT	FT	MS	IIT, 1971	3	41	41	-	Low (ASEE, IDEA)	Low	Low
J. O'Leary	Assoc Prof	T	FT	PhD	Texas, Austin, 1981	11	27	27	-	Low (ASCE)	Low	Med

K. Pagilla	Prof	T	FT	PhD	California, Berkeley, 1994	4	13	13	IL, CA	High (AEESP, WEF, IWA)	High	Low
J. Shen	Assoc Prof	T	FT	PhD	California, Berkeley, 1992	1	15	15	IL, CA	Low (ASCE, AISC)	High	Low
J. Shi	Prof	T	FT	PhD	Alberta, Canada, 1995	-	14	9	**	Med (ASCE, CMAA, HKIE)	High	Low
M. Snyder	Sr. Lecturer	NTT	FT	PhD	Texas Tech, 1988	23	8	8	-	Low	Med	Low

* Full-time faculty in alphabetical order by last name

** Foreign Country Professional Registration

Column 3 Code: TT=Tenure Track, T=Tenured, NTT=Non Tenure Track

Table 6-2
Faculty Analysis (Continued)
Civil Engineering

Name*	Rank	Type of Academic Appointment TT, T, NTT	FT or PT	Highest Degree	Institution from which Highest Degree Earned & Year	Years of Experience			State in which Registered	Level of Activity (high, med, low, none) in:		
						Govt./ Industry Practice	Total Faculty	This Institution		Professional Society (Indicate Society)	Research	Consulting/Summer Work in Industry
D. Carreira	Adj Prof	NTT	PT	PhD	IIT, 1984	5	42	20	IL	High (ACI)	Med	N/A
A. W. Domel	Adj Prof	NTT	PT	PhD, JD	Illinois, Chicago, 1988, Loyola, 1992	16	16	16	IL	Low (ACI, SEAOI, ABA)	Low	N/A
S. Gill	Adj Prof	NTT	PT	PhD	Northwestern, 1970	41	28	28	IL, WI, KY	Med (ASCE, ISSAE)	Low	N/A
D. Grabowski	Adj Asst Prof	NTT	PT	BS	IIT, 1988	20	1	1	IL	Low	None	N/A
S. A. Guralnick	Prof Emeritus	NTT	PT	PhD	Cornell, 1958	4	54	50	IL, PA	High (ASCE, ACI, ASEE SEAOI)	High	N/A
J. Jahedi	Adj Prof	NTT	PT	PhD	IIT, 1987	18	14	14	IL, IN, WI, FAIA	Low (ASCE, AIA)	Low	N/A
C. J. Khisty	Prof Emeritus	NTT	PT	PhD	Ohio State, 1977	25	33	18	OH, WA	High (ASCE, ASEE, TRB)	Med	N/A
A. Kurzydlo	Adj Prof	NTT	PT	PhD	IIT, 1992	19	7	7	IL, IA, WI	Low (ASCE, ASTM)	Low	N/A
R. Lemming	Adj Prof	NTT	PT	MBA, JD	Centr Mich, 1977, IIT-Kent, 1986	28	15	15	IL	Low (ASCE, ABA)	None	N/A
A. Longinow	Adj Prof	NTT	PT	PhD	IIT, 1980	35	11	9	IL	High (ASCE)	Low	N/A
A. Oskouie	Adj Prof	NTT	PT	PhD	IIT, 1996	7	12	12	None	Med (Water Env Fed, Am Asoc for Aer Res)	Low	N/A
A. Paintal	Adj Prof	NTT	PT	PhD	Minn 1969	35	35	33	IL, WV	Low (ASCE)	None	N/A
L. Rohter	Adj Prof	NTT	PT	MS	Georgia Tech, 1974	33	5	5	IL	Med (IL GIS)	Low	N/A
P.S. Sriraj	Adj Assoc Prof	NTT	PT	PhD	IIT, 1999	9	3	3	None	Low (ASCE)	High	N/A

* Part-time faculty and faculty emeritus in alphabetical order by last name
Column 3 Code: TT=Tenure Track, T=Tenured, NTT=Non Tenure Track

CRITERION 7. FACILITIES

- **Space**

  <<Summarize the availability of program facilities and indicate how adequate they are for supporting the educational objectives and outcomes of the program>>

  <<Discuss the following>>

  - Offices

  - Classrooms

  - Laboratories

  - Library

The Program in Civil Engineering is part of the CAEE Department which is housed in Alumni Memorial Hall. The following is a summary of space facilities that support the Program educational objectives and outcomes.

Offices – The administrative offices of the CAEE Department is located in Alumni Memorial Hall. Eleven faculty members have offices in Alumni Memorial Hall; four faculty members (in environmental engineering) have offices in Perlstein Hall and one faculty member (in engineering graphics) has his office in Main Building next to the EG classrooms. Teaching assistants' offices are all located in Alumni Memorial Hall. The teaching assistants share a total of four area offices. In general, the faculty offices have not been keeping up with the increase in student population, faculty size and teaching assistants. The CAEE Department prepared a comprehensive proposal and presented to the Provost's Office requesting the renovation of the Alumni Memorial Hall to open additional offices and TA rooms in 2006. Although the university has agreed on this plan, its implementation has been delayed due to budgetary restrictions.

Currently, the office space allotted to the faculty is barely sufficient. With any addition of new faculty, the Program will have a difficulty accommodating the new offices needed.

Classrooms – Currently, there are only two classrooms in Alumni Memorial hall that are equipped with state-of-the-art audiovisual devices. A third classroom/lab space is also available – however, its use is limited to the laboratory instruction in architectural engineering and several other small-size classes. Four additional classrooms are also available in Main Building. These are used exclusively for the Program graphics courses. All other classrooms are scattered in different buildings around the campus.

The Registrar's Office is responsible for assigning appropriate classrooms to individual courses. In most cases, this Office has been cooperating with the Civil Engineering Program to accommodate our classroom needs in terms of the size and equipment. Thus, the classroom space has been adequate for the Program in meeting its educational objectives and outcomes.

Laboratories – The following is the details of laboratory facilities available to the Program in meeting its educational objectives and outcomes.

Materials Testing Laboratory

Concrete Laboratory

Structural Models Laboratory

Burton and Erma Lewis Construction Engineering and Management Laboratory

Surendra K. Saxena Geotechnical Engineering and Soil Mechanics Laboratory

Transportation Engineering Laboratory

Engineering Graphics Laboratory

Computer Laboratory

Surveying Equipment Room

Fluid Mechanics Laboratory

Environmental Engineering Laboratories

With the exception of some of the EG drawing rooms, which are housed in Main Building, all other facilities are located in Alumni Memorial Hall. All these laboratories are used extensively for instructional purposes. Furthermore, with the exception of the surveying equipment and CAD laboratories, all the other laboratory facilities also provide support for ongoing research activities of the civil engineering faculty and graduate students.

The civil engineering curriculum is designed such that students extensively utilize the services of the Departmental laboratory facilities. These facilities have continuously undergone a development process. Since the last ABET visit, gifts from alumni, proceeds from laboratory fees (added to the undergraduate tuition starting in 2006), and funds provided from Armour College of Engineering have been used to upgrade and/or purchase new equipment for these laboratories. Among major upgrades include equipment modernization in the material testing laboratory, new equipment for the soil mechanics laboratories, renovation of the engineering graphics traditional drafting classroom, modernization of equipment in the computer graphics classrooms, purchase of new surveying equipment, and purchase of modern computers for the transportation engineering laboratory. Furthermore, new workstations were purchased for the computer CAD laboratory to replace older computers. The new equipment is now capable of supporting the latest versions of CAD (Autocad), structural analysis (SAP) and mathematics tool (Mathcad and Maple) software.

Please see also the detailed list of equipment provided later in this report.

The following presents a description of lab facilities to support the Program educational objectives and outcomes.

Materials Testing Laboratory: This laboratory occupies a space consisting of three 24’ x 24’ bays. It contains a 800,000 lbs. capacity Riehle universal testing machine, a computer-controlled MTS Model 810 Hydraulic Material Test System of 50,000 lbs. capacity, 60,000 lbs. capacity and 400,000 lbs. capacity universal testing machines, a Tinius Olsen Charpy Impact Tester, and a Tinius Olsen Brinell Hardness Testing Machine. In addition, the laboratory houses a 20’ x 20’ steel horizontal testing frame for beam to column connection investigations under cyclic loading. The universal testing machines are primarily used for undergraduate instruction while the MTS system and the horizontal testing frame are used mainly for graduate student research. Experiments can be carried out on specimens made of a wide variety of materials including glass, steel, aluminum, wood, and various plastics and ceramics. All necessary instrumentation for strain and deformation measurements is on hand including both mechanical and electronic instrumentation. There is also a separate machine shop dedicated to the fabrication of the specimens, jigs, and fixtures needed by this laboratory. In addition, the full-time technician in charge of the machine shop is responsible for the maintenance of all testing equipment housed in the structural engineering laboratories. The 150,000-lb Pegasus cyclic fatigue-testing machine also housed in the laboratory, used primarily for graduate student research, is currently not operational.

Concrete Laboratory: This laboratory is devoted to the investigation of the constituents of concrete, the proportioning of concrete and concrete mixtures, the mechanical properties of fresh and hardened concrete and the load and deformation behavior of full-size, or nearly full-size, reinforced and prestressed concrete members and assemblages. It contains equipment for the fabrication and testing of members and/or assemblages up to 32 feet in length and 18 feet in width. The fabrication equipment includes various forms and molds and a bin and batch unit for sand and gravel, two concrete mixers and a concrete vibrator. Investigations of mechanical properties of hardened concrete can be conducted either on a Dillon Lo-Capacity (10,000 lbs.) Tensile Testing Machine or on a Riehle Universal Testing Machine of 300,000 lbs. capacity. Investigations of the properties of the constituents of concrete and the proportioning of concrete mixtures can be carried out according to all relevant ASTM Standards with the various small items of equipment and glassware housed in this laboratory. The lab contains two double-sided bench clusters, which can accommodate a total of sixteen students per laboratory period. The various specialized areas in the laboratory are contiguous with one another thus making multiple usage possible to maximize the efficient use of space.

The laboratory occupies four 12 foot by 24 foot bays of the building, or a total of 2304 gross square feet. The main test bed consists of a “grillage” of 13 inch deep steel beams which is 32 feet long by 18 feet wide and it is served by a floor-mounted traveling crane of 3-ton capacity. The specimen fabrication bay is 24 feet by 24 feet high. The remaining three bays of the laboratory are 12 feet high. The 24 feet high-bay is served by a five-ton overhead crane, which is motorized in all three directions. In addition, this high-bay area opens to the outside of the building where it is served by a loading dock.

Various kinds of test fixtures, jigs, bearings, loading rams, hydraulic pumps and fittings and data acquisition equipment exist in the laboratory to perform a wide variety of tests of reinforced or prestressed concrete members or assemblages to be carried out on the main test bed.

Structural Models Laboratory: This laboratory is devoted to the investigation of the mechanical behavior of small-scale structural models and fatigue behavior of metals. It contains a small machine shop for the fabrication of test specimens, fixtures and jigs, a small image processing laboratory, nearly two 24' x 24' bays of space devoted to various test beds and testing apparatus. Fatigue experiments may be conducted on a computer-controlled MTS Model 810 Hydraulic Material Test System of 25,000 lbs. capacity. The various pieces of testing equipment and ancillary apparatus have been selected to provide the utmost flexibility on the kinds of materials and structural models that can be investigated. Again, as in the case of the other two structural engineering laboratories, the Models Laboratory is intensively used both for research and "hands-on" instruction in engineering coursework at the undergraduate and graduate levels. It is worth noting that several years ago the facilities of this laboratory were reviewed by a distinguished panel of engineering educators convened by the National Science Foundation. The unanimous conclusion of the panel was that the layout of the laboratory, the equipment chosen or fabricated for the laboratory and the student experiments chosen could well serve as an example to the nation.

It may also be noted that the facilities of the laboratory permit experimental investigations to be conducted using transmission and/or reflection photoelasticity, moiré methods, electric resistance strain gage methods, magnetic field measurements as well as conventional stress versus strain measurements obtained via computerized data acquisition techniques.

Fatigue Laboratory: The Fatigue Laboratory consists of two MTS computer-controlled fatigue testing machines. One of these machines is housed in the Materials Laboratory and the other is housed in the Models Laboratory. There is no separate space devoted to this laboratory. In addition, the Materials Laboratory houses two recently acquired R. R. Moore-type fatigue testing machines.

Burton and Erma Lewis Construction Engineering and Management Laboratory: The Construction Engineering and Management Laboratory is equipped with four workstations and full-slab digitizers. The latest versions of AutoCad, Primavera and Timberline software are available to students. The workstations are connected to the Internet. Laser printers, scanners, and a plotter are available in the lab. All the workstations and an additional number of stand-alone PCs are used by research students.

At the undergraduate level, most laboratory work is conducted in CAE 470 - Construction Methods and Cost Estimating and in CAE 471 - Construction Planning and Scheduling. In both courses, students are asked to work in small teams or individually to undertake a complete estimating and scheduling project, respectively. The projects are first conducted manually and then using commercially available and popular software (Timberline and Means for estimating and Primavera for scheduling). Students use the computers in the lab to access these programs. They are also given student versions for their use at home. The plotting and printing is normally done in the lab. Students who take CAE 497 – Special Problems as well as graduate students also make use of this

lab depending on the subject matter of the special problem. The lab's direct contribution to our graduates' marketability has been invaluable.

Surendra K. Saxena Geotechnical and Soil Mechanics Laboratory: The laboratory houses experimental equipment for graduate research, and for teaching both graduate and undergraduate programs. The equipment includes:

Graduate Research:
1. True triaxial cell: used to investigate the behavior of soil subjected to three independently controlled principal stresses under static or dynamic loading of cubical sample.
2. Resonant column: used to determine the dynamic properties of soils.
3. Hollow cylinder shear: used to investigate behavior of soil under continuous rotation of principal stress direction.
4. MTS dynamic loading machine.
5. Carbonated rock compatibility testing unit: used for investigating long term performance crushed carbonated stone in drainage system.
6. Soil vapor extraction unit.
7. Track model testing bed.

Teaching Graduate Courses:
1. Transmissivity testing unit: used to determine in-plane hydraulic behavior of geosynthetics.
2. Large direct shear apparatus: used for investigating interface behavior of soil-geosynthetic system.
3. Conventional triaxial units.
4. Loading machine for creep test on geosynthetics. This equipment was donated by STS Consultants, Ltd. March 2002.
5. Rock jaw-crusher.
6. Field dilatometer testing unit.

Teaching Undergraduate Courses:
1. All standard equipment for CAE-323 Introduction to Soil Mechanics laboratory. The equipment is used to conduct: specific gravity test, Atterberg tests, grain size distribution test, compaction test, permeability test, density test, consolidation test, direct shear test, unconfined compression test.
2. Mechanical soil compactors.
3. Mechanical sieve shaker.
4. The laboratory also houses a collection of mineral samples for laboratory experiment of CAE-221 Engineering Geology.

Transportation Engineering Laboratory: The Transportation Engineering Laboratory has 4 PCs, a printer, and a scanner. A wide variety of software for problem-solving has been acquired in the areas of geometric design, transportation economics, transportation planning, traffic engineering, transportation systems analysis, evaluation, and asset management, highway safety analysis, and risk and uncertainty modeling. Major software packages used include AutoCAD, AutoCivil, MathCAD, ArcGIS 9, SPSS, NLOGIT, GWR, HCS, Synchro, CORSIM, VISSIM, VISUM, MicroBENCOST, StratBENCOST, IDAS, @Risk, IBMS, INHAMS, GIDEN, and more that

offers comprehensive data processing, analysis, and management for a variety of transportation research initiatives.

Engineering Graphics and CAD Laboratory: Engineering graphics and CAD courses are presently taught in facilities located in Main Building (Rooms 402, 403, 413 and 414).

Rooms 403 and 413 are traditional drawing classrooms equipped with modern drafting consoles, excellent lighting, chalkboard, and projection equipment; Two CAD Labs, Rooms 402 and 414, are adjacent to the traditional labs. The combinations of 402/403 and 413/414 are used to teach an integrated traditional-and-CAD course, EG 105, for mechanical engineering freshmen. The introductory course CAE 100 is also taught in Rooms 403 and 413. The labs are equipped with Dell Pentium D Dual Processor PCs networked to two HP laser printers with 11 x 17 inch capacity, one of which has color capabilities. High brilliance projection systems are available for demonstrations. These rooms are used for CAE 101, an AutoCAD course taken by all freshman civil engineering majors, as well as by students enrolled in advanced EG courses. The GIS (Geographic Information System) and GPS (Global Positioning System) Lab which had been housed in IIT's Galvin Library has also been relocated to Room 402.

New Equipment in Engineering Graphics and CAD Laboratory Since Last ABET Visit: Due to rising enrollments and increased interest in engineering graphics, two additional classrooms on the fourth floor of Main Building, Rooms 413 and 414, were completely renovated and furnished as traditional and CAD labs during the 2007-2008 academic year. During the Summer and early Fall of 2007, Room 402's old PC equipment was replaced with new Dell Pentium D dual processor units and 19 inch flat panel monitors, along with a color laser printer. The latest version of AutoCAD (AutoCAD 2008) is used in both CAD labs, and when new versions are released, the updated programs will be installed. The new CAD lab, Room 414, was similarly equipped in Spring 2008. Several GIS and GPS software packages have been installed in 402. High brilliance PC projectors and new screens were installed in both 402 and 414. All four rooms were also equipped with air conditioning in 2007.

At present, it is felt that the engineering graphics lab facilities provide our students with an excellent experience using equipment equivalent to or in some cases better than would be found in industry. Owing to the extremely rapid advancements in computing hardware and software that can be expected to continue in the foreseeable future, it is necessary to regularly reevaluate the facilities and upgrade equipment as needed, usually within 4-5 years.

Surveying Equipment: Surveying equipment is used in CAE 105 - Geodetic Science. Even though new pieces of equipment have been purchased to support the laboratory portion of the geodetic science course, the equipment is still considered inadequate compared with today's state-of-the-art instruments. Furthermore, the number of available instruments has not been adequate to meet the demand. Current technologies in surveying make use of advanced electronic and GIS systems. The department lacks such equipment for undergraduate education.

Fluid Mechanics Laboratory: CE students' fluid mechanics laboratory work is done in the fluid mechanics laboratory facilities of the Department of Mechanical, Materials and Aerospace Engineering. This laboratory work is in conjunction with CAE 301-hydraulics and hydrology.

Environmental Engineering Laboratories: The Safety Kleen Environmental Engineering Laboratory, Room 218 Perlstein Hall, is a modern teaching laboratory to teach undergraduate environmental unit processes and analytical methods courses. The laboratory is approximately 1000 sq. ft. in size and is equipped with fume hoods; lab work stations with water, gas, and compressed air; laboratory safety equipment; and sample storage facilities. It contains all the standard laboratory small equipment such as DO meters, pH meters, stirrers, sterlizers, water baths, incubation ovens, drying ovens, titrimeters, etc. Specialized analytical instruments such as UV-VIS spectrophotometer, compound microscope with digital imaging, fluorometer, atomic absorption spectrophotometer, total organic carbon analyzer, etc., are located in the Environmental Engineering Research Laboratories in Room 210 Alumni Hall are available for teaching ENVE lab courses. Additional lab space in Room 210 (approx. 600 sq ft) with all necessary lab facilities (such as distilled water, DI water, fume hoods, air/water/gas) is available for conducting specialized graduate and undergraduate lab demonstrations and exercises.

Library – Although the journal and book collection pertaining to the Civil Engineering Program is limited, the library offers an adequate Internet service with links to resources such as the Compendex, Academic Press Journals, EI Village, ASCE, etc. Inter-library connection can also provide faculty and students with resources of other universities. Through the inter-library loan services, faculty and students can borrow journals and books available in many other Illinois libraries. The library has a staff member that works as a liaison with the CAEE Department. The liaison has been very helpful in acquiring materials that will be needed for the Program. In addition, he has been given seminars to the students in the Program regarding use of resources in the library. These services are adequate to support the Program educational objectives and outcomes.

- **Resources and Support**

  <<Describe the computing resources, hardware and software used for instruction. Specify any limitations that impact the student's ability to achieve the program's outcomes and the faculty's teaching and scholarly activities>>

Individual faculty members are each provided with a desk-top and laptop computer. New faculty members hired are provided with a workstation as part of their start-up packages. Requests for upgrading and/or purchase of computers for faculty are processed through IIT's Office of Technology Services (OTS) – formerly, Computing and Network Services (CNS). The response by OTS to the calls made the CAEE Department has been adequate. In addition to individual faculty members' computers, teaching assistants are also provided with computers in their offices. The CAEE Department also maintains several notebook computers and LCD projectors for faculty use. The CAEE Department is also equipped with a state-of-the-art computer lab (as described earlier), which is used by students in courses in the Civil Engineering Program.

Requests for software are also done through OTS. IIT maintains site licenses on a variety of software to support the Program educational objectives and outcomes. Software most frequently used by undergraduate students are: structural analysis software (SAP); mathematics tool software (Mathcad and Maple); word processing, spreadsheet, presentation software (Microsoft Office), graphics software (Autocad), cost estimating and construction scheduling software

(Timberlane, Primavera, etc), transportation planning and traffic analysis software, and statistical analysis software. Software required for use in the Program courses has been adequate.

The faculty members mostly utilize the Blackboard system as a way of posting classnotes and homework problems for students' use. In addition, the IPRO office also maintains iGroup – a system for exchanging design details, project progress, review of CAD drawings among students and the professors teaching the IPRO project-based courses. These services have been adequate and working efficiently to support the Program.

The faculty access to their own project accounting and to Web-for Faculty server is done through IIT's Banner system. The system allows the faculty to review their project accounts and process purchasing for their research, and review their courses for the purpose of electronically submitting their grades for the students.

In addition to computer facilities in the Department, IIT also operates and maintains several other computer laboratories around the campus for use by students. Many of these facilities have extended operation hours.

<<Describe the laboratory equipment planning, acquisition, and maintenance processes and their adequacy>>

The CAEE Department prepares a periodic laboratory planning document. The document outlines the current facilities, their square footage area, upgrades and new equipment needs and cost. This document is submitted to the Dean of Armour College as an input to the College-wide laboratory planning report prepared by the Dean. The Departmental laboratory planning document is also presented to potential donors whenever gifts and donations are sought from donors.

The acquisition of equipment is done through several sources (as described later). The lab equipment acquisition is initiated by individual faculty members responsible for laboratories. The request is made to the Chair. Depending on the availability of the funds, the Chair and the CAEE staff prioritize and make the purchase or upgrade of the equipment. The request for maintenance of the equipment also follows a similar process.

Major resources to acquire, maintain and operate facilities and equipment are:

- University's support
- CAEE Department's budget (limited)
- CAEE Department's in-house technical support
- Active fundraising
- Proceeds from the laboratory fees charged to undergraduate tuition
- Equipment donations

The support needed for classroom and laboratory heating/ventilation and repair is provided by the university through the Facilities Department. The CAEE Department is charged through interdivisional accounts for these services. Generally, the university support has been adequate; and the Facilities Department has been prompt in answering calls for repairs.

Repair of laboratory and office equipment is primarily done through outside vendors using the CAEE Department's own funds. The Department's budget has been severely limited for these services. The fundraising effort has been effective to secure some funds for maintenance and operation of laboratory and office equipment. New acquisition of laboratory equipment has been achieved through funds from these efforts and also through equipment donated to the Department. Recent major donation for laboratory upgrade has been in the structures and materials and in the engineering graphics laboratories. The Lewis Construction Lab has an endowed fund whose proceeds are used for maintenance purposes.

<<Describe the type and number of support personnel available to install, maintain, and manage departmental hardware, software, and networks>>

The Program utilizes the services of the Office of Technology Services (OTS) to install, maintain, and manage Department hardware, software and network. The management of the CAEE Department CAD Laboratory and maintenance of the equipment and installation of the new equipment and software are done entirely by OTS through their budget. For all other computers (used by faculty, staff or teaching assistants), the installation of equipment and software and maintenance is done by OTS upon a request from CAEE Department. For these services, the CAEE Department pays from its own funds for the OTS services.

<<Describe the type and number of support personnel available to install, maintain, and manage laboratory equipment >>

The CAEE Department currently uses the services of two full-time technicians. These services are available to the Program in civil engineering. The installation of new equipment, maintenance of existing equipment and the management of the labs are done by these technicians. In certain cases, when outside expertise would be needed for any repair or maintenance of equipment, the Program hires outside venders to do the task.

- **Major Instructional and Laboratory Equipment**

  <<List major instructional and laboratory equipment and attach as Appendix C>>

Please see table in Appendix C.

CRITERION 8. SUPPORT

- **Program Budget Process and Sources of Financial Support**

  <<Describe the process used to establish the program budget and provide evidence of continuity of institutional support for the program>>

The process for budget determination is based on: (1) The previous year's expenditures; and (2) the estimates for the number of part-time faculty, TA positions, supplies, equipment repair, travel, etc. for the upcoming fiscal year. These estimates are made based on the faculty research activities, faculty professional development, and enrolment projection. The budget for the Civil Engineering Program is included in the overall budget of the CAEE Department. The Chair discusses the budget issues with the Dean of Armour College and submits the estimated budget in early March. Usually, the new proposed budget is about 10% more than the expenditure in the previous year. The university, however, has not complied with the budget needs of the Department. Substantial cuts have been made in travel, equipment repair, equipment purchase and supplies. The Department has been using its discretionary funds and proceeds from the laboratory fee charged to the undergraduate tuition to cover several necessary expenses in regard to upgrade of laboratories and other needs.

- **Sources of Financial Support**

  <<Describe the sources of financial support including both "hard" and "soft" monies>>

A major source of financial support for the Program is through the CAEE Departmental budget. This constitutes the only source of "hard" money for the Program. As described above, there have been limitations to this source due to budgetary restrictions.

Other sources, which constitute "soft" monies include:

- Departmental discretionary funds. These are funds from donations and proceeds from any short courses, and delivery of IPRO courses.

- Departmental research contracts. Usually the faculty member, who is involved in research, uses research funds for hiring research assistants, research associates, equipment purchases and research-related travel. The faculty member also receives a portion of the research funds spent on graduate student as rebate that can be spent at the discretion of the faculty member.

- **Adequacy of Budget**

  <<Describe the adequacy of the budget>>

Over the past six years, the undergraduate population of the Program has been on the rise. As a result, the Department has increased the number of courses offered every semester. This requires hiring additional adjunct instructors and teaching assistants. Thus, the adequacy of the budget has been a challenging issue for the Department. To overcome some of these challenges, the

Dean has provided additional funds through the College‘s discretionary funds. However, in general, the budget has not been adequate to keep up with the growth in the Program and the Department.

- **Support of Faculty Professional Development**

  <<Describe the adequacy of support for faculty professional development, how such activities are planned, and how they are supported>>

The support for faculty professional development has been very limited. The Budget allotted to the Department has only been enough to support about less than one travel per year and is reserved for the faculty on the tenure track. The Department has also provided a very limited matching support for the younger faculty for their research. The matching support has been in providing the faculty with a research assistant or a relief time for one course and has been paid through the Departmental budget. The Department does not pay for the professional dues of the faculty or their committee meeting attendance in the professional societies.

- **Support of Facilities and Equipment**

  <<Describe the sufficiency of resources to acquire, maintain, and operate facilities and equipment appropriate for the program>>

Resources to repair, maintain, and operate facilities and equipment are very limited and generally not sufficient to meet the Department’s needs. Some routine maintenance and repair cost are covered by the university through IIT’s Facilities Department. However, purchase of major equipment can only be done through capital development funds. The university sources for such funds have been very limited; and as such, the Department has to limit any equipment purchases to only those that are essential and needed to maintain the everyday operation of the Program and the Department.

- **Adequacy of Support Personnel and Institutional Services**

  <<Describe the adequacy of support personnel and institutional services necessary to meet program needs>>

Support Personnel – Currently there are three office staff members and two technicians employed by the Department. This staff member size is adequate and provides support for the administration and technical needs of the Program.

Institutional Services – The intuitional services available to the Department and Program include cleaning, minor repair and maintenance of offices and laboratories, security and safety, and assistance on issues related to life on campus. The Department and the Program also receive institutional support for fundraising activities, event organizations and placement. In general, these services have been adequate and meet the Program needs.

CRITERION 9. PROGRAM CRITERIA

<<Describe how the program satisfies any applicable Program Criteria. If already covered elsewhere in the Self-Study Report, provide appropriate references>>

The Program criteria is satisfied through proficiency in curriculum components as described below.

Proficiency in mathematics – The math and science requirements in the Civil Engineering Program follow the University's general education requirements for engineering students. The requirements for proficiency in mathematics are met through 14 credit hours of calculus and 4 credit hours of differential equations. Within the required 14 credit hours of calculus, Calculus I (5 credit hours) covers analytical geometry, functions and their graphs, limits and continuity, derivatives of algebraic, trigonometric and inverse trigonometric functions, applications of the derivatives, and introduction to integrals and their applications. Calculus II (5 credit hours) covers transcendental functions and their calculus, integration techniques, applications of the integral, indeterminate forms and improper integrals, polar coordinates, and numerical series expansions. Calculus III, Multivariate and vector calculus, (4 credit hours) covers analytic geometry in three-dimensional space, partial derivatives, multiple integrals, vector analysis and applications. The 4 credit hours in differential equations cover 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, and systems of linear differential equations.

The Civil Engineering Program also requires a 3-credit hour course in Engineering Systems Analysis. One-half of this course covers probability and statistics. Topics covered are theory of probability, random variables and distribution models, statistical methods of estimating mean values, standard deviation and other statistical parameters, testing validity of distribution models and regression and correlation analyses. All these topics are covered within the civil engineering areas. All example problems and homework assignments are related to civil engineering decision-making and design. The other half of the course covers applications of engineering and economics concepts, operation research and economics in civil engineering.

The Civil Engineering Program requires 11 credit hours of physics, which are all calculus-based. These include 4 credit hours of mechanics with topics including vectors and motions 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, and gravitation, oscillations and waves. Another 4 credit hours cover electromagnetism and optics with topics including simple harmonic motion, oscillations and waves, charge, electric field, Gauss' law and potential, capacitance resistance, simple AC and DC circuits, magnetic fields, Ampere's law, Faraday's law and induction, and Maxwell's equations and electromagnetic waves. The remaining 3 credit hours of physics cover 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.

The Civil Engineering Program requires 4 credit hours of general chemistry. Topics covered include foundations of chemistry, atoms and molecules, stoichiometry of chemical reactions, thermochemistry, properties of gases, states of matter, chemical solutions, and kinetics, molecular basis for chemical reactivity, atomic structure, periodicity and chemical bonding.

Proficiency in civil engineering – The Civil Engineering Program emphasizes in five areas. These are: construction engineering and management; geotechnical engineering; structural engineering; transportation engineering and civil-environmental engineering. In addition to these, the architectural engineering is also available to civil engineering students as a specialization area. Civil engineering courses required for all civil engineering students include engineering graphics (included in 6 credit hours of courses entitled: Introduction to the Profession); geodetic science (3 credit hours); engineering geology (3 credit hours), hydrology, fluid mechanics and hydraulics (6 credit hours), structural analysis (6 credit hours), soil mechanics (3 credit hours), engineering systems analysis (3 credit hours), materials of construction (3 credit hours), transportation engineering (3 credit hours), geotechnical foundation design (3 credit hours), steel and timber design (6 credit hours), concrete and foundation design (6 credit hours), construction methods and cost estimating (3 credit hours). Of the total of 137 credit hours required in the Civil Engineering Program, 15 credit hours are designated as technical electives (of which 3 credit hours must be a junior-level IPRO course). The technical elective credit hours allow students to obtain an area of professional specialization within one of the five areas as mentioned above (please refer to IIT's Undergraduate Bulletin for further information).

In addition, students must take 6 credit hours of IPRO project-based courses. Three of these six credit hours must be the senior-level capstone design course.

The civil engineering laboratory experience, in which data collection, interpretation and demonstration are required, is included in courses in geodetic science (surveying); hydraulics, materials of construction; soil mechanics; and the junior-level course in concrete design. The lab contents of these courses require conduct of the experiments, preparation of lab reports and presentation of data. The junior-level concrete design course requires designing and building a 9-ft reinforced concrete beam and testing it to destruction to investigate the overall flexural and shear behavior. In addition to these lab experiences, students are introduced to a large collection of stone and mineral samples as part of their engineering geology course. Computer lab experience is embodied in several courses. The course in construction methods and cost estimating uses the Department's laboratory in Construction Engineering and Management. Students use state-of-the-art cost-estimating software in a comprehensive project which requires full report preparation and presentation of the results. The engineering graphics courses are conducted entirely in the Department's CAD laboratory. Several other courses (such as structural analysis) are also conducted in the CAD laboratory.

Among the technical elective courses, a 3-credit hour course in structural modeling includes an extensive lab experience. Students build small-scale models of framed systems and test them in

the Structures and Material Laboratories to investigate structural behavior. Most other technical elective courses (including those in construction management, traffic and transportation engineering, structural dynamics and finite element methods) require use of software. Some of these courses are offered in the CAD laboratory.

Design Experience – Civil engineering design experience is included in the curriculum through the senior-level capstone design IPRO course and also through several civil engineering senior-level courses. In addition to providing a major design experience, the capstone design IPRO as well as the junior-level IPRO courses cover a variety of topics that educate students with teamwork, professional ethics and skills in preparing engineering documents and presentations. Examples of IPRO capstone design courses offered by Program are available for review at the time of ABET visit.

In addition to IPRO courses, the senior level courses in steel design, reinforced concrete design, and construction methods and cost estimating also require semester-long projects. Design projects require complete structural analysis and design of a building (usually a low-rise building); the construction course requires a complete cost estimating of a building. Samples of these projects are available in course material files in the Department.

Several technical elective courses also contain design projects. Examples of these courses include a 3-credit hour course in bridge design (in which students design a single or a two-span highway bridge).

Understanding professional practice – The importance of professional licensure, procedures on how to prepare technical reports, professional liabilities, close cooperation between design engineer, fabricator and construction engineer, and quality assurance procedures are discussed in several design courses as part of discussions on ethics. Sample articles related to the profession and ethics are distributed to the students for reading and class discussions. In addition, a major element of the IPRO experience requires a lecture on the professionalism, ethics and importance of teamwork effort. Issues related to procurement of work, bidding and construction contracts are discussed in the senior-level course on construction methods and cost estimating.

GENERAL CRITERIA FOR ADVANCED-LEVEL PROGRAMS

Accreditation of an advanced-level program is not being sought.

APPENDIX A – COURSE SYLLABI

CAE 100 –Introduction to Engineering I (Required)
Fall 2007

2006-08 Catalog Data: 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. (1-4-3)

Textbook:

Technical Drawing, I I ent ., Giesecke et. Al., Prentice Hall, 2000.
Problems Book**:** *Engineering Drawing Problems, Series I,* Giesecke et. Al., Prentice Hall

References:

Library of ANSI Standards

Coordinator: J. E. Novak, Senior Lecturer in Engineering Graphics, Civil and Architectural Engineering Department

Objectives: To create an understanding of engineering drawing as a means of communication, learn basic skills used to create drawings used in civil and architectural engineering according to ANSI standards.

Prerequisite by Topic: N/A

Topics:

1. Graphic language, standard lettering and line types (2 classes)
2. Scales and measurements (1 class)
3. Galvin Library orientation – GIS resources (1 class)
4. Tangencies, geometric constructions (1 class)
5. Shape description, multiview sketching (3 classes)
6. Sectioning and auxiliary views (1 class)
7. Pictorial representation – isometric and oblique (1 class)
8. Size description – dimensioning and tolerancing (1 class)
9. Threads, fasteners, and springs (1 class)
10. Design drawing project (2 classes)

(Classes are 1 hr. 45 min. long)

Computer Usage:
Students are introduced to GIS facilities of IIT.

Laboratory Projects:
Construction of drawings on preprinted and blank worksheets

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	100
Introductory Civil Engineering	
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain: Students will, after completing this course, be able to know how to properly construct an engineering drawing using traditional methods, have an understanding of ANSI standards as applied to standard parts, fasteners, materials, and principles of multiview and pictorial representation of engineering objects.

Assessment Measures:
1. Graded class assignments
2. Midterm and final exams
3.Analysis of comments and scores provided by students in course/instructor evaluations
4. Progress made by students throughout the semester

Relationship of Course to Program Outcome:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	X
h	Broad education	
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: J. Novak **Date:** August 2007

CAE 101 –Introduction to Engineering II (Required)
Spring 2008

2006-08 Catalog Data: 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. (1-4-3)

Textbook:
AutoCAD and its Applications – Basics, Shumaker & Madsen (Goodheart/Wilcox)

References:
None

Coordinator: J. E. Novak, Senior Lecturer in Engineering Graphics, Civil and Architectural Engineering Department

Objectives:
To assist students in learning how CAD is used in the design process and in understanding the theory behind CAD. This is done by introducing students to the most widely used engineering CAD software (AutoCAD), various hardware devices, and how they are used to effectively run a CAD workstation. It will also be required from students to learn the importance of sketching when designing a project.

Prerequisite by Topic:

Engineering graphics, ANSI standards

Topics:
Throughout the semester, students will work on various CAD projects. The overall contents of the course include:

Theory: A portion of each week's class will be devoted to the presentation and discussion of the subject matter. Each
student is expected to take comprehensive lecture notes, and read material as assigned.

Weekly Project: Are assigned from the textbook.

Examinations: . In addition to
drawing assignments, two exams are given, and count for one-half of the total grade.

All assignments are valued at 10 points except as noted, and are due at the beginning of the following class.

Computer Usage:
Students will work with AutoCAD throughout the semester. This course is conducted in the CAD Computer Laboratory.

Laboratory Projects:
Projects include complete CAD drawings per instruction in the textbook.

AutoCAD Final Design Project sketch(es) are drawn on 8.5" X 11.0" or 11.0" X 17.0" paper and presented to the Instructor for approval one week in advance of the due date. Once approved, sketches are returned to students and must be
returned to the Instructor with the Design Project Drawing when completed.

Design Project Drawing submission includes sketches and hard copy printouts showing the use of Layers/Levels, Line
Types, Dimensions and other features of the software.

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	100
Introductory Civil Engineering	
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will have the proficiency in computer-aided drawing and design. They will learn how to prepare drawings related to various designs in civil and architectural engineering using PC-based software. They will learn how to prepare details and present dimensions and other attributes applicable to drawings in civil and architectural engineering design.

Assessment Measures:
1. Graded class assignments
2. Midterm and final exams
3. Analysis of comments and scores provided by students in course/instructor evaluations
4. Students' Progress in the course throughout the semester.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	X
h	Broad education	
i	Recognize need for life-long learning	X
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: J. Novak **Date:** January 2008

CAE 105 – Geodetic Science (Required)
Fall 2007

2006-2008 Bulletin Data: Measurement of distances and angles. Theory of errors. Study of leveling, traversing, topographic mapping, route surveying, earthwork computation, photogrammetry, and boundary surveys. Practice in the use of tapes, levels, transits, and photogrammetric equipment. Corequisites: CAE 100. (2-2-3)

Textbook: Wolf, Paul R. and Ghilani, Charles D., *Elementary Surveying: An Introduction to Geomatics*, 10th Ed, New Jersey: Prentice Hall, 2002

Reference: None

Coordinator: Laurence Rohter, Adjunct Professor

Objectives: To introduce the civil engineering students to surveying and the theory of measurements in both plane and geodetic environments. The student must understand the concept that a measurement can never be perfect that rather allowance or tolerances must he established to define the accuracy of the measurement.

Prerequisites by topic:

1. Elementary trigonometry
2. Introduction to Engineering I (CAE 100)

Topics:

	Title	Class*
1.	Introduction to surveying	0.5
2.	Theory of measurements and of errors	1.5
3.	Field notes	1.0
4.	Vertical Position – Leveling	2.5
5.	Distance Measurement – Taping	1.0
6.	Distance Measurement – Electronic Distance Measurement (EDM)	1.0
7.	Angles & Direction Measurement – Angles, Bearings, Azimuths	1.0
8.	Angles & Direction Measurement – Compass	0.5
9.	Angles & Direction Measurement – Transit, Theodolite, and Total Station	1.0
10.	Horizontal Position – Traverse	0.5
11.	Horizontal Position – Traverse Methods	1.0
12.	Horizontal Position – Traverse Computations	1.0
13.	Horizontal Position – GPS	1.0
14.	Stadia & maps	1.5
15.	Topographic Maps	1.0
16.	Area, volume, vertical & horizontal curves	6.0
17.	Construction Survey	1.0
18.	Boundary Survey; Survey of Public Lands	2.0
19.	Photogrammetry; State Plane Coordinates	1.0

Computer Usage: Spreadsheets

Laboratory: The surveying laboratory is an integral part of this course and serves to reinforce the theory as described in the lecture portion. Below are the laboratory exercises given in this course:

1. *Introduction to Surveying Equipment and Field Notes* is an introduction to the basic equipment and record keeping used in surveying. The equipment reviewed during the lab includes tapes, levels, theodolite, total stations (electronic theodolite and electronic distance measurement), and associated equipment.
2. *Leveling Circuit* is used to determine the difference in heights, elevations, of objects using differential leveling.

3. *Horizontal Distance Measurement* will introduce the students to the use of a steel tape, electronic distance measurement, and associates equipment.
4. *Traversing* will introduce the students to the concept of determining the relative horizontal locations of points, stations, by use of a closed loop, traverse, of measurements.
5. *Angles & Direction Measurement* introduces the student to the used of the theodolite (the electronic theodolite is a component of the total station).
6. *Traversing by Angle* will teach the students to perform a traverse by measuring horizontal angles and horizontal distances.
7. *Traversing by Direction* is similar to the *Traversing by Angle* lab. The students will learn to perform three traverses: azimuth, bearings, and deflections.
8. *Area, Volumes, Inaccessible Heights* are to be determined using the equipment and procedures learned in previous labs.
9. *Topographic Survey and Mapping*
10. *Volumes by Cross-Sections*
11. *Horizontal Circular Curve and Offset Lines*

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	100
Introductory Civil Engineering	
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will know how to conduct land surveying, they understand levels, coordinates and data entry for mapping and terrain surveying.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared By: Laurence Rohter Date: September 2007

CAE 221 – Engineering Geology (Required)

Fall 2007

2006-08 Catalog Data: Geology and its relationship to civil engineering; minerals; 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 illustration. (3-0-3)

Textbook: A. E. Kehew, Geology for Engineers & Environmental Scientists, 1995

References: Terry R. West, Geology Applied to Engineering

Coordinator: J. Budiman, Associate Professor of Civil and Architectural Engineering

Objectives: To introduce students to the geologic features of the earth surface, formation of rock forming minerals, classification of rocks and soils, tectonic, hydrogeology.

Prerequisites by Topics: None

Topics:

1. Geology and its relationship to civil engineering (1 class)
2. Minerals (2 classes)
3. Igneous rocks, sedimentary rocks, metamorphic rocks (2 classes)
4. Engineering properties of the rocks (3 classes)
5. Rock weathering and soil deposits (3 classes)
6. Elements of soil mechanics (3 classes)
7. Structural geology (1 class)
8. Mass movement and Slope stability (3 classes)
9. Rivers (1 class)
10. Oceans and coasts (1 class)
11. Groundwater geology (3 classes)
12. Glacial processes and permafrost (2 classes)
13. Plate tectonic, volcanoes and earthquakes (3 classes)
14. Case histories (2 classes)

Each class is 75 minutes

Computer Usage: Not mandatory

Laboratory Projects:

1. Exercises to determine physical properties of rock minerals
2. Classification of rocks
3. Airphoto interpretation

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	100
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain:

Upon completion of this course, students will know about the process of rocks and soils formation, the characteristics and features of the surface and near surface of the earth along with the activities associated with the features. Students will recognize potential geologic problems and how to avoid them in planning, designing and constructing civil engineering structures.

Assessment Measures:

1. Students grade in homework problems, midterm and final examinations.
2. Comments by students in their course evaluation.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	
b1	Design and conduct experiments	X
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: J. Budiman Date: August 2007

CAE 301 Hydraulics & Hydrology (Required)
FALL 2007

2006-08 Catalog Data: Collection and distribution of water, Flow of fluids through orifices, weirs, and Venturiand orifice meters, Laminar and turbulent flows in Closed Conduits, Open channel flow. Model Analysis using the principles of Dimensional Analysis, Rainfall and runoff. Prerequisites – Concurrent enrollment in MATH 252 (2-3-3)

Textbook: Hydraulic Engineering
by Roberson, Cassidy, & Chaudhry
John Wiley & Sons, Second Edition 1997
Coordinator: A. Paintal, Adjunct Professor of Civil and Architectural Engineering

Objectives:

The main objective is to develop in the civil engineering student the ability to analyze any hydraulic and hydrology problem in a simple and logical manner and to apply in its solution a few well-understood principles of fluid mechanics and on their application to the solution of engineering problems

Prerequisites by Topic:

Physics – Applied Mechanics
Statics
Dynamics
Calculus

Topics:

Principles of Fluid Flow (2 classes)
Pipe Flow (3 classes)
Open Channel Flow (3 classes)
Hydraulic Power Conversion (2 classes)
Descriptive Hydrology (2 classes)
Quantitative Hydrology (2 classes)
Statistical Hydrology (1 class)

Each class is two 75-minute sessions

Computer Usage: Use of computer, particularly spread sheet, is encouraged

Laboratory Experiments:
Bernoulli and Momentum Equations
Pipe Flow
Open Channel Flow
Flow Measurements in Pipes & Channels

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	100*
Professional Level Civil Engineering	

* Includes design experience

Learning Outcomes & Expected knowledge Gain:

Upon successful completion of the course, the students will be able to solve simple pipe flow, open channel flow, pumps and rainfall-runoff problems

Assessment Measures:

Course Practices Required
Attend two-hour lecture/lab two times every week
Submit assigned Homework every week
Take three one-hour and the final examinations

Other Course Information

Attendance is mandatory
No late Homework
No makeup exams
Use Engineering Calculation paper for homework

Method of Evaluating Student Performance

Homework	10%	Grade	Score
Laboratory	10%	A	90 and above
Three one-hour tests @ 20%	60%	B	80 and above
Final Exam	20%	C	70 and above
		D	60 and above
		F	59 and below
Total	100%		

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	X
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: A. Paintal **Date:** Fall 2007

CAE 302 – Fluid Mechanics and Hydraulics (Required)
Spring 2008

2006-08 Catalog Data: Physical and thermodynamic Properties of Fluids, Fluid Statics, Continuity, Energy & Momentum Equations, Potential Flow, First & Second Laws of Thermodynamics, Dimensional Analysis, Boundary Layer Flow, Laminar & Turbulent Flows, Drag & Lift, Thermodynamic Cycles, Heat Transmission.
Prerequisites: MATH 252 (3-0-3)

Textbook: Engineering Fluid Mechanics
by John A. Roberson & Clayton T. Crowe
John Wiley & Sons, 6th Edition 1997

References: None

Coordinator: A. Paintal, Adjunct Professor of Civil and Architectural Engineering

Objectives:

The main objective is to develop in the civil and architectural engineering student the "feel" for flow patterns, pressure variations, continuity and momentum concepts, thermodynamic laws and cycles and shear stress in incompressible and compressible fluid flow.

Prerequisites by Topic:

Physics – Applied Mechanics
Statics
Dynamics
Calculus

Topics:

Physical & Thermodynamic Properties of Fluids (1 class)
Fluid Statics (1 class)
Continuity Equation (1 class)
Potential Flow (1 class)
Energy & Momentum Concepts (1.5 classes)
Laws of Thermodynamics (1.5 classes)
Dimensional Analysis (1 class)
Laminar & Turbulent Flows (1 class)
Boundary layer Theory (1 class)
Lift & Drag (1 class)
Thermodynamic Cycles (1.5 classes)
Heat Transmission (1 class)

Each class is two 75-minute sessions.

Computer Usage:

Use of computer, particularly spreadsheet, is encouraged

Laboratory Projects: None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	75
Introductory Civil Engineering	25
Professional Level Civil Engineering	

Learning Outcomes & Expected knowledge Gain:

Upon successful completion of the course, the students will develop a basic understanding of the fundamentals of fluid flow and thermodynamics.

Assessment Measures:

Course Practices Required
Attend class every week
Submit assigned Homework every week
Take two one-hour and the final examinations

Method of Evaluating Student Performance

Homework	15%	Grade	Score
		A	90 and above
Two one-hour tests @ 25%	50%	B	80 and above
Final Exam	35%	C	70 and above
		D	60 and above
Total	100%	F	59 and below

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b	Design and conduct experiments	
b	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: A. Paintal Date: January 2008

CAE 303 – Structural Design I (Required)
Fall 2007

2006-08 Catalog Data: 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) I

Textbook: Salmon and Johnson, *Steel structures*, 4th Edition, HarperCollins, 1996.

References: AISC LRFD Handbook

Coordinator: J. Shen, Associate Professor of Civil and Architectural Engineering

Objectives: To develop the background for design criteria, develop design process for steel and timber elements, understand the behavior and failure of structural members, understand loads and loads combinations for design.

Prerequisites by topic:
1. Strength of materials
2. General familiarity with structures
3. Bending moments and shear diagrams

Topics:
Structural design process, methods of structural design, loads and resistance, role of structural engineers in the society, professional ethics and quality assurance in structural design (3 classes)
Description of various types of loads, floor loads and structural member loads, load factors and load combination in LRFD (3 classes)
Properties of structural steel, steel shapes, use of AISC manual, section properties (3 classes)
Design of tension members, behavior analysis, net area, design process (5 classes)
Design of simple compression members, behavior analysis, buckling, design process (6 classes)
Design of simple connections, behavior analysis, bolted and riveted connections, welded connections, detailing and design process (4 classes)
Design of flexural members, behavior analysis, lateral buckling issues, shear and bending design, deflection issues (7 classes)
Introduction to frame connections (2 classes)
Timber as a material, timber design issues (4 classes)
Design of tension, compression and flexural members in timber construction (6 classes)
(Each class is 50 minutes)

Computer Usage:
1. Computers are used for structural analysis.
2. Use of Mathcad and Autocad is encouraged.

Laboratory Project: (1) Design of a truss roof system, (2) Ethics case studies and discussion

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	100*
Professional Level Civil Engineering	

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will know how to obtain design loads, design simple structural systems and their components using the relevant code requirements, prepare detailing, prepare specifications and calculation sheets for a design.

Assessment Measures:
Student grades in homework problems, midterm and final examinations.
Completeness of the required written report summarizing design calculations, specifications and details.
Student presentation and discussion of projects and ability to handle questions and comments raised by the class and the instructor.
Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b	Design and conduct experiments	
b	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	X
h	Broad education	X
i	Recognize need for life-long learning	X
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: J. Shen **Date:** August 2007

CAE 304 – Structural Analysis I (Required)
Fall 2007

2006-08 Catalog Data: 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. Prerequisite: MMAE 202, MATH 252 (3-0-3)

Textbook: *Structural Analysis* fourth ed. By R. C. Hibbler

References: *Structural Analysis* by R. Sack, *Mathcad 2000 Users Guide*

Coordinator: John O'Leary, Associate Professor of Civil and Architectural Engineering

Objectives: To develop in the student a fundamental set of skills, that are used in the analysis of statically determinate structures. The student will be able to determine the flow of internal forces and calculate deformations in various structural forms. The student's abilities at problem solving and critical thinking will be enhanced.

Prerequisites by Topic:
1. Vector calculus, differential equations, and linear algebra
2. The determination of reactions and resultant force systems in statically determinate structures
3. A basic background in strength of materials at the level of the prerequisite course MMAE 202.

Topics:
1. Beams and Frames (7 classes)
   - The physical concept of shear and bending moment diagrams
   - The differential equations of equilibrium for a beam
   - The construction of shear and bending moment diagrams
   - Pure bending and derivation of the flexure formula
   - The effect of shear and the associated approximation
   - The calculation of deflections by direct integration, the conjugate beam method and superposition
   - The virtual work of flexure and calculation of deflections by the unit dummy load method
2. Cables and Arches (5 classes)
   - Cables subjected to point loads
   - Cables subjected to a deck type distributed load
   - The differential equations of equilibrium for a cable
   - Design of arches
   - The analysis of hinged arches
3. Trusses (4 classes)
   - The structural concept of a plane truss
   - Approximate analysis
   - The analysis of trusses
   - Virtual work and calculation of deflections by the unit dummy load method
4. Virtual Work (6 classes)
   - Virtual work applied to rigid bodies
   - The principles of virtual and complementary virtual work
   - The unit dummy displacement method
   - The unit dummy load method
   - The application of virtual work to problems involving direct shear and torsion
5. Energy methods (8 classes)
   - The principle of minimum potential energy; Castigliano's first theorem
   - A review of column buckling and the use of energy methods in structural stability analysis
   - Engesser's first theorem and Castigliano's second theorem
   - The reciprocal theorems
   - The Mueller-Breslau approach in the construction of influence lines

Each class is 75 minutes.

Computer Usage: Simulations on Mathcad are presented in class and students are encouraged to use Mathcad on homework problems.

Laboratory Projects: This is a lecture course with no laboratory

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	100
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course each student should minimally be able to:

- Construct shear and bending moment diagrams for beams and simple frames
- Determine internal forces in cables, arches and trusses
- Determine deflections in each of the above named structural forms

Assessment Measures:

- Homework — 15% of the final grade
- Two mid term examinations — 50% of the final grade
- A comprehensive final examination — 35% of the final grade
- An assessment of a minimal level of knowledge
- Comments provided by students on their course evaluations
- The instructor submits a post course assessment report

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: J. R. O'Leary **Date:** September 2007

CAE 307 – Structural Design II (Required)
Spring 2008

2006-08 Catalog Data: 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, CAE 315 (2-3-3) (D) (D)

Textbook: "Reinforced Concrete Design", 3rd Ed., by K. Leet and Bernal, McGraw-Hill Book Co., 1997.
Building Code Requirements for Reinforced Concrete and Commentary, (ACI 318-99), American Concrete Institute, 1999.
"Laboratory Manual", CAE 307, Structural Design II.

References:

1. ASTM Standards in ACI 301, 318 and 349 ACI Publication SP-71 (84), American Concrete Institute, P.O. Box 19159, Redford Station, Detroit, MI.
2. "Concrete" by P. Kumar Mehta, and P.J.M. Monteiro, 2nd Ed., Prentice-Hall, 1993.
3. "Structural Analysis" by R.C. Hibbeler, rev. 3rd Ed., Prentice-Hall, Englewood Cliff, N.J., 1995.
4. "Concrete Technology" by A.S. Neville and J.J. Brooks Addison-Wesly Publisher, 1997.

Coordinator: Eduardo DeSantiago, Sr. Lecturer of Civil and Architectural Engineering

Objectives: This course is intended to provide students with understanding the material properties of concrete; design using reinforced concrete and behavior of reinforced concrete through laboratory experiments.

Prerequisites by topic:

4. Strength of materials and statics
5. Structural analysis
6. Analysis of flexural concrete members
7. Structural material behavior

Topics:

Lecture Topics

1. Review of Elementary Structural Analysis (3 classes)
2. Concrete and its Constituents (5 classes)
3. Properties of Hardened Concrete (4 classes)
4. Properties of Steel Reinforcement (4 classes)
5. Design of R/C Beams (6 classes)
6. Design of R/C Slabs (3 classes)
7. Design of R/C Columns (5 classes)

(Each class is 50 minutes)

Computer Usage:

Use of spreadsheet and computer graphics are encouraged for preparation of laboratory reports.

Laboratory Projects:

The laboratory experience in this course involves fabrication and testing of a 9-foot reinforced concrete beam. Specifically, the following topics are covered:

Cement and Cement Paste
Properties of Aggregates
Properties of Fresh and Hardened Concrete including the Design of Concrete Mixtures
The Flexural Strength of Reinforced Concrete Beams

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	40
Introductory Civil Engineering	60*
Professional Level Civil Engineering	

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will know how to obtain properties of concrete. They will know the process in mixing requirements for concrete and behavior of finished product. In addition, the students will learn about the design process in concrete. The laboratory experience enables students to learn about data collection and analysis and the behavior investigation of reinforced concrete beams.

Assessment Measures:
Student grades in homework problems, midterm and final examinations.
Completeness of the required written report summarizing findings in the laboratory and presentation of data compiled.
Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	X
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	X
h	Broad education	X
i	Recognize need for life-long learning	X
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: E. DeSantiago **Date:** January 2008

CAE 310 – Structural Analysis II (Required)
Spring 2008

2006-08 Catalog Data: 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 (2-3-3)

Textbook: *Structural Analysis* fourth ed. By R. C. Hibbler, *SAP 2000 Basic Analysis Reference and Tutorial Manual, Mathcad 2000 User's Guide*

References: *Structural Analysis* by R. Sack

Coordinator: John O'Leary, Associate Professor of Civil and Architectural Engineering

Objectives: To develop in the student an ability to solve small (two degrees or less) statically indeterminate problems using the method of consistent deformations. The student should also be able analysis larger structures by means of approximate methods. The student should gain knowledge of the theory for the direct stiffness method and its application via simple programming within *Mathcad 2000*.

Prerequisites by Topic:
1. Vector calculus, differential equations, and linear algebra
2. Basics computer operations including programming.
3. A background in the analysis of statically determinate structures at the level of the prerequisite course CAE 304.

Topics:
1. Statically Indeterminate Problems (6 classes)
   - The concept of structural indeterminacy
   - Approximate methods
   - Tubular frames and the beam approximation
   - X trusses; Gravity loads on rigid frames
   - The portal method and the cantilever method
2. Concepts in the Analysis of Indeterminate Structures (7 classes)
   - The force method; method of consistent deformations
   - Classical methods; Displacement method; Derivation of the two dimensional beam bending stiffness matrix
   - The slope deflection method
3. Introduction to the Direct Stiffness Method (8 classes)
   - Stiffness method; stiffness method applied to a two dimensional continuous beam; Assembly process
   - Multiple load cases; design of programs to implement the direct stiffness method
   - Outlining the steps in the analysis process; Coding of the process and Examples
   - Application of the direct stiffness to two dimensional frames
   - The difference between continuous beams and frames
   - The stiffness matrix; Rotational coordinate transformations and rotation matrices
   - Application of the direct stiffness method to two dimensional trusses and 3-dimensional frames
   - Derivation of the 3-D frame stiffness matrix; rotation matrices in three dimensions
4. Additional Topics Associated with the Direct Stiffness Method (9 classes)
   - Displacement boundary conditions; The big spring analogy; The direct approach
   - Structural symmetry; substructuring, matrix condensation and end releases
   - Transformations and constraint equations; concept of rotation of the global degrees of freedom; Boundary conditions on skewed surfaces; Linear multipoint; weld ; rigid offset and diaphragm constraints
   - Solution methods; LDLT decomposition; partial decomposition, Numerical errors; etc.

Computer Usage: A series of ten programs have developed by the instructor under the *Mathcad 2000* program. The number of subroutines as well as the complexity of the programs increases with complexity of the supporting theory. Students input the programs themselves, debug them and execute the programs on homework problems.

Laboratory Projects: This course has a weekly 150 minute laboratory. The laboratory takes place in a computer classroom.

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	100
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain: Upon completion of this course each student should minimally be able to:

- Determine internal forces in a two-degree statically indeterminate frame or truss by consistent deformations.
- Determine internal forces in more complex 2-D frames by means of approximate methods.
- Demonstrate an understanding of the fundamental theory behind matrix based structural analysis as well as its limitations.
- Develop models on SAP 2000 for a large number of structures.
- Avoid pitfalls normally associated with computer based analysis.

Assessment Measures:

- Homework/ Lab assignments 20% of the final grade
- Two mid term examinations 50% of the final grade
- A comprehensive final examination 30% of the final grade
- Comments provided by students on their course evaluations. The instructor submits a post course assessment report

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: J. R. O'Leary **Date:** January 2008

CAE 312 – Engineering Systems Analysis (Required)
Fall 2007

2006-08 Catalog Data: Application of engineering and economic concepts and analysis to civil engineering systems; practical applications of elementary probability and statistics; operation research and economics in civil engineering. Prerequisite: MATH 251. (3-0-3) I

Textbook: Fundamentals of Systems Engineering, Prentice Hall, 2001

Coordinators: Jamshid Mohammadi, Professor of Civil and Architectural Engineering

Objectives: To introduce the fundamental principles of economics, probability, statistics and system analysis to engineering students.

Prerequisites by Topic:
1. Knowledge of derivatives and integrals
2. General familiarity with the civil and architectural engineering profession

Topics:
1. System concepts (2 classes)
2. Engineering economics (2 classes)
3. Microeconomics (2 classes)
4. Linear programming (2 classes)
5. Network analysis (2 classes)
6. Decision making (2 classes)
7. Role of uncertainty in engineering decision-making and design, events and probabilities (2 classes)
8. Random variables and distribution models (4 classes)
9. Functions of random variables, applications in civil engineering (4 classes)
10. Analysis of engineering data, mean, standard deviation and error analysis (2 classes)
11. Confidence intervals, determination of sample size for an experiment, presentation of data (2 classes)
12. Regression and correlation analysis (2 classes)

Each class is 75 minutes

Computer Usage: Microsoft Excel for data analysis and plotting; use of MATHCAD is encouraged.

Laboratory Projects: None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	100
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will be able to understand how to apply the systems engineering concepts in civil engineering problem-solving involving economics, decision-making and design under uncertainties. They also learn how to evaluate alternatives in the planning stages of a project.

Assessment Measures:
1. Student grades in homework problems, midterm and final examinations.
2. Class participation in discussion sessions.

3. Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	X
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: J. Mohammadi **Date:** August 2007

CAE 315 – Materials of Construction (Required)
Fall 2007

2006-08 Catalog Data: Physical principles of elastic and plastic deformation of construction. Mechanical testing methods including tensile, compressive, toughness, creep and fatigue. Properties of concrete, wood, 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.. Prerequisites: MMAE 202, (2-3-3) I

Textbook:

1. "The science and technology of civil engineering materials," Young, Mindess, Gray and Bentur, Prentice Hall, 1998.
2. "Laboratory manual," : CAE 315, Materials of Construction.

References:

- Materials for civil and highway engineers, Derucher, Korfiatis and Ezeldin, 4th edition, Prentice Hall, 1998.
- Materials for civil and construction engineers, Mamlouk and Zaniewski, Addison-Wesley, 1999
- The testing of engineering materials, Davis, Troxell and Hauck, 4th edition, 1982.
- Civil Engineering Materials, Somayaji, Prentice Hall, 1995.
- Matrix algebra for engineers, Gere and Weaver, 2nd Edition, Brooks-Cole, 1983.

Coordinator: A. Longinow, Adjunct Professor of Civil and Architectural Engineering

Objectives:

This course is intended to provide students with understanding the properties of various materials used in construction and introduce students with the behavior of materials through laboratory experiments.

Prerequisites by topic:

8. Strength of materials
9. Statics

Topics:

<u>Lecture Topics</u>

Introduction
    Review of matrix algebra
Review of stress analysis
    The stress tensor
    Mohr's circle
Yielding and fracture under complex stress states
    Ductile and brittle failure
    Failure theories
Response of materials to stress
    Tension, Compression, bending, torsion, direct shear, hardness
Beam bending in the plastic region
Fatigue of metals
Creep of materials
Wood and timber
Portland cement concrete, Structural steel and Selection of structural materials

Computer Usage:

Use of spreadsheet and computer graphics are encouraged for preparation of laboratory reports.

Laboratory Projects:

Laboratory projects involve experiments on steel, concrete and wood
Steel experiments include: Tension, modulus of elasticity, compression, Charpy impact, Brinell or Rockwell hardness, fatigue and beam bending
Concrete experiments include: Compression, modulus of elasticity, tension (split cylinder) and modulus of rupture
Wood experiments include: compression parallel to grain, compression perpendicular to grain, bending, tension, and moisture contents

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	100
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will know how to obtain properties of various materials. They will know the overall behavior of structural members in tension, compression, fatigue and fracture. A major component of this course involves an effective writing through report-writing and presentation of technical materials.

Assessment Measures:
1. Student grades in homework problems, midterm and final examinations.
2. Completeness of the required written report summarizing findings in the laboratory and presentation of data compiled.
3. Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	X
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	X
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	
l	Major design experience	

Prepared by: A. Longinow **Date:** August 2007

CAE 323 – Soil Mechanics (Required)

Spring 2008

2006-2008 Bulletin: Physical and mechanical properties of soils, soil identification and testing, Principles of soil permeability and seepage, consolidation, failure theories, earth pressure, bearing capacity. Laboratory included. Prerequisites: MMAE 202, CAE301, (2-3-3) I.

Text book: B.M. Das, *Principles of Geotechnical Engineering*, PWS, 1998

Laboratory manual: J. E. Bowles, Engineering Properties of Soils and Their Measurement, McGraw Hill, 1992

References: Holtz and Kovacs, *Introduction to Geotechnical Engineering.* Prentice Hall, 1981
Liu and Evett, *Soil Properties. Testing, Measurement, and evaluation.* Prentice Hall, 2000

Coordinator: J. Budiman, Associate Professor of Civil and Architectural Engineering

Objectives: To introduce to students the basic elements of soil mechanics through theory and experiments

Prerequisites by Topic:

- Statics
- Hydraulics
- Strength of materials

Topics:

1. Introduction, Formation of Soils (1 class)
2. Subsurface Exploration, Soil Composition (2 classes)
3. Physical and Index Properties (3 classes)
4. Soil Classification, Compaction (3 classes)
5. Permeability and seepage (1 class)
6. Stresses in Soils/Effective Stress (3 classes)
7. Compressibility of Soil/Consolidation (2 classes)
8. Shear Strength of Soils (1 class)
9. Lateral Earth Pressure (2 classes)
10. Introduction to Slope Stability, Introduction to Shallow Foundation (2 classes)

(Each class is 75 minutes)

Computer Usage:
Reports by word processor and spread sheet software.

Laboratory Projects:
The following experiments are conducted. Full reports are required.

1 Specific Gravity Test
2 Atterberg Test
3 Sieve Analysis
4 Hydrometer Analysis
5 Compaction Test
6 California Bearing Ratio (CBR) Test
7 Relative Density Determination
8 In-situ Density Determination
9 Permeability Test

10	Seepage Analysis
11	Consolidation Test
12	Direct Shear Test
13	Unconfined Compression Test
14	Triaxial Test (demonstration)

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	100
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain:
Upon completion of the course, students are expected to know the physical properties of the soil and how to determine these properties in the laboratory as *in-situ*. They are expected to be able to estimate seepage flow, stress distribution and lateral earth pressures, compressibility and consolidation ,and shear strength of soils.

Assessment Measures:

1. Student grades in homework problems, midterm and final examinations.
2. Completeness of the required written report summarizing equipment used, test procedure, calculations and analysis of each experiment.
3. Student presentation of laboratory experiments.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	X
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: J. Budiman **Date**: January 2008

CAE 408 – Bridge and Structural Design (Elective)
Spring 2007

2006-2008 Catalog Data: Design of modern bridges and other structures of steel and reinforced concrete. Prerequisite: CAE 431 (2-3-3)

Textbook: AASHTO LRFD Bridge Code Specification, 1998

References: AREA Code, AISC Manual

Coordinator: Andy Longinow, Adjunct Professor of Civil and Architectural Engineering

Objectives: To develop the background for design criteria of bridges, develop design process for reinforced concrete and steel bridge superstructure, integration and use of AASHTO for design.

Prerequisites by Topic:
1. knowledge of concrete and reinforcement behavior
2. Structural steel behavior
3. Use of structural analysis computer software

Topics:
1. Various types of bridges, design issues, types of loading (3 classes)
2. Bridge loads of AASHTO and AREA, load combinations, load and strength factors (7 classes)
3. Bridge structural analysis and influence lines (5 classes)
4. Steel superstructure design (4 classes)
5. Concrete superstructure and deck design (6 classes)
6. Composite section design (6 classes)
7. Consideration for fatigue (4 classes)
8. AASHTO seismic analysis design requirements (6 classes)
9. Abutment, pier and foundation design (5 classes)
10. 10. Support design and detailing (2 classes)

Computer Usage: Computers are used for structural analysis. Students use programs for column analysis and interaction diagram. Use of MATHCAD is encouraged.

Laboratory Projects: Design of a multi-span highway bridge.

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will know how to obtain design loads for bridges, design bridge systems and their components using the AASHTO requirements, prepare detailing, specifications and calculation sheets for a design; and present detail drawings.

Assessment Measures:

1. Student grades in homework problems, midterm and final examinations.

2. Completeness of the required written report summarizing design calculations, specifications and details.
3. Student presentation of the design and ability to handle questions and comments raised by the class and the instructor.
4. Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	
h	Broad education	
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
i	Major design experience	X

Prepared by: J. Mohammadi **Date:** January 2007

CAE 410 – Introduction to Wind and Earthquake Engineering (Elective)
Fall Semester

2006-08 Catalog Data: 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. CAE 310 (3-0-3)

Textbook: A. Chopra, *Structural Dynamics*, 2nd Edition, Prentice Hall, 1998.

References: Class Notes

Coordinator: J. Shen, Associate Professor of Civil and Architectural Engineering

Objectives: To develop the background for design related issues involving dynamic loadings due to wind and earthquake ground motions. To introduce fundamental structural dynamics and its application in wind and earthquake engineering. To develop design process for wind and seismic loads using model building codes in the nation.

Prerequisites by topic:

Knowledge of basic strength of materials and Structural analysis
Knowledge of structural design for conventional loads

Topics:

Review of rigid-body dynamics (2 classes)
Introduction of structural dynamics (4 classes)
Dynamic effect of wind on various structures. (4 classes)
Design wind load (4 classes)
Earthquake ground motions (2 classes)
Seismic response of simple and more realistic structures (4 classes)
Seismic design loads using building codes (4 classes)
Conceptual design of structures to reduce seismic hazard. (4 classes)

(Each class is 50 minutes)

Computer Usage:
N/A

Laboratory Project:
None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:

Upon completion of this course, students will understand the concepts of wind and earthquake loads and their effect on structures. They will know how to obtain design wind and seismic loads using building codes. Students will also be prepared to continue on more advanced courses in wind and earthquake engineering.

Assessment Measures:

Student grades in homework problems, midterm and final examinations.
Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: J. Shen **Date:** August, 2007

CAE 415 – Pavement Design, Construction and Maintenance (Elective)
Spring Semester

2006-08 Catalog Data: 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. Prerequisites: CAE 419, CAE 323. (3-3-4)

Textbook:

Highway engineering, 6th edition, by P. Wright, 1996.

Reference:

Guide for design of pavement structures, AASHTO, 1993
Yoder and Witczak, *Principles of Pavement Design*

Coordinator: J. Budiman, Associate Professor of Civil and Architectural Engineering

Objectives: This course provides students with design background for rehabilitation, strengthening and maintenance of pavements. Issues pertinent to new design are also covered.

Prerequisites by Topic:

1. Basic transportation engineering
2. Basic soil mechanics

Topics:

1. Pavement types, basic engineering consideration, design factors, design process and design strategies, engineering construction in selected materials. (3 classes)
2 Stresses in flexible pavements; layered systems concepts, multilayer solutions, two-layer system, three-layer system, fundamental design concepts. (3 classes)
3 Stresses in rigid pavements; curvature and stresses caused by bending, relative stiffness of slabs, stresses due to wrapping, stresses due to warping, plain vs reinforced pavements, stresses in reinforcement, joints, dowel bars, tie bars, thickness design criteria, combined stress in pavements, influence charts and design charts. (3 classes)
4. Vehicle-pavement interaction, vehicle vibration, steady state of vibrations, random vibration, damping of vibration, data acquisition and reduction, experiments on vehicle-pavement interaction, transfer function, straightedge method. (3 classes)
5. Mathematical models for pavement systems; general equilibrium equations, force on boundary of a semi-infinite body, displacement along axis of a circular load, displacement on boundary surface, layered systems, systems with viscoelastic materials, modifications to layered systems, computer solutions for layered systems, finite element techniques for layered systems. (3 classes)
6. Pavement support conditions; basic physical properties, testing, analysis and optimization, non-destructive tests. (3 classes)
7. Design of flexible pavements; development of design methods, AASHO flexible-pavement design, multilayer elastic analysis, the asphalt institute design, national crushed stone association design, California method of design, minimum surface requirements. (6 classes)
8. Design of rigid pavements, development of design, design factor, load stresses, thickness design, jointing and reinforcement, load-transfer devices, continuously reinforced concrete pavements. (6 classes)
9. Construction procedure; subgrade structures, characteristics and constituents of soils, chemical composition, effect of moisture, grade finishing, joints, profile ingredients, mixing and place finishing. (3 classes)

Each class is 75 minutes

Computer Usage: Available software for pavement design is recommended.

Laboratory Projects:

1. Pavement drainage; drainage the pavements and roadsides, drainage in urban areas, channel and channel design, dikes, culverts types and design bridges types, hydraulic problems, clearance for vehicle, waterways, bridge loading.
2. Environmental effects on pavement systems, temperature of pavement systems, moisture, traction of pavement surface, regional differential settlement.
3. Rehabilitation and maintenance of pavements; flexible pavements distress, rigid pavement distress, methods of measuring conditions, present serviceability index, skid resistance, principles of maintenance, typical maintenance procedure, methods of evaluation, interpretations of data, overlay categories and design.

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will know how to obtain design loads for pavements, evaluate condition of a pavement, and identify damage issues. They will also learn how to design new pavements.

Assessment Measures:
Student grades in homework problems, midterm and final examinations.
Completeness of the required written report for the projects.
Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	X
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	X
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared By: J. Budiman **Date:** January 2008

CAE 416- Facility Design of Transportation Systems (Elective)
Spring 2008

2006-2008 Catalog Data: Design and analysis of facilities of transportation systems. Integration of system components and their interrelationships. Design of specific facilities: roadways, terminals, and other elements of railroads, airports, and harbors. Prerequisite: Senior standing or consent of the instructor. (3-0-3) I

Textbook: None**.**

References:

Illinois Department of Transportation Department Design Manual
Manual on Uniform Traffic Control Devices
AASHTO
AREMA manuals

Hoel, L.A., N.J. Garber, A.W. Sadek. 2007. Transportation Infrastructure Engineering- A Multi-Modal Integration, 1st Edition. Thomson-Nelson. ISBN: 0-534-95289-5.

Khisty, C.J., B.K. Lall. 2003. Transportation Engineering- An Introduction, 3rd Edition. Prentice-Hall. ISBN: 0-13-033560-6.

Coordinator: Donald Grabowski, Adjunct Assistant Professor of Civil and Architectural Engineering

Objectives: The course is designed around providing students with real life Design problems for various transportation facilities (highways, local roads, railroad etc.)

Prerequisites by Topic:
4. Knowledge of basic calculus
5. General familiarity with the civil engineering profession

Topics:
11. Highway vertical geometric design (2 class)
12. Highway horizontal geometric design (2 class)
13. Highway horizontal design tapers(1 classes)
14. Highway Right-of-way impacts (1 class)
15. Highway Quantities (1 class)
16. RR horizontal geometrics (1Class)
17. RR yard and turn-out geometric design (2 classes)
18. RR traffic anlysis (1 class)
19. RR vertical geometric design (2 classes)
20. RR quantities (1 class)

Computer Usage: Microsoft Excel for data analysis and plotting, some CADD, .

Laboratory Projects: None but group homework

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	

Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will get familiar with transportation engineering as a profession of civil engineering, understand fundamental principles of transportation economics, traffic engineering, safety, transportation planning, and engineering economics and project evaluation, as well as applying learned principles in transportation engineering problem-solving.

Assessment Measures:
1. Student grades in homework problems, midterm and final examinations.
2. Class participation in discussion sessions.
3. Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	X
h	Broad education	
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: Donald Grabowski **Date:** January 2008

CAE 417 – Railroad Engineering & Design (Elective)
Spring Semester

2006-08 Catalog Data: 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)

Textbook: William Hay, *Railroad Engineering*, 2nd Ed, John Wiley, NY, 1982.

Reference: None

Coordinator: C.J. Khisty, Professor Emeritus of Civil and Architectural Engineering

Objectives: This course is intended to offer students with the basic concepts in railroad engineering including design elements related to tracks, intersections, yards, and operation.

Prerequisites by Topic: General civil engineering knowledge at the senior level.

Topics:
1. History (3 classes)
2. Train operation (3 classes)
3. Train make-up (3 classes)
4. Design & analysis of railroad track (6 classes)
5. Vehicle track interaction (3 classes)
6. Performance of rail vehicles (3 classes)
7. Geometric layout and right-of-way (6 classes)
8. Switches and turnouts (3 classes)
9. Signals (3 classes)
10 Yards and capacity (3 classes)
11. Regulatory and policy aspects (3 classes)
12. Design project (6 classes)

(Each class is three 50-minute sessions)

Computer Usage: Package programs related to railroad design.

Laboratory Projects: None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:

Upon completion of this course, students will know the basic elements of railway design including geometric layouts, and design of tracks. In addition they will learn about vehicle behavior and vehicle-track interaction.

Assessment Measures:

Student grades in homework problems, midterm and final examinations.
Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: C.J. Khisty **Date:** January 2008

CAE 419 – Transportation Engineering and Design (Required)
Fall 2007

2006-08 Catalog Data: Highway functions, design controls and criteria, element of design, cross-section elements, local roads and streets, at-grade intersections, grade separations and interchanges, highway capacity analysis, and introduction to pavement management. (3-0-3) (D)

Textbook: Khisty, C.J. and B. Kent Lall. *Transportation Engineering, Second Edition*. Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1998. ISBN 0-13-157355-1

Reference(s):
1. *Manual on Uniform Traffic Control Devices for Streets and Highways*. Report FHWA-OP-01-011. U.S. Department of Transportation, Federal Highway Administration, Washington, D.C., 2000.
2. A Policy On Geometric Design of Highways and Streets, 4th Edition, American Association of State Highway and Transportation Officials, Washington, D.C., 2001.
3. Highway Capacity Manual 2000. Transportation Research Board, National Research Council, National Academy of Sciences, Washington, D.C., 2000. ISBN 0-309-06746-4
4. Institute of Transportation Engineers. *Traffic Engineering Handbook*, 5th Edition, 1999. ISBN 0-935403-32-9

Coordinator: Zongzhi Li, Assistant Professor of Civil and Architectural Engineering

Objectives: To impart the basic principles, concepts and models involving the broad field of transportation engineering.

Prerequisites by topic:
1. Knowledge of basic statistics for introduction
2. Newton's laws of motion, classical physics for highway engineering elements
3. Simple linear regression for traffic flow theory
4. Use of transportation engineering software for analyses and design in the highway capacity

Topics:
1. Introduction to Transportation Engineering (2 weeks)
   a. Transportation as a profession
   b. Transportation jargon/terminology
   c. Basic transportation statistics
   d. Travel characteristics in U.S., Travel modes , Highway functional classification
2. Highway Engineering elements (2 weeks)
   a. Driver characteristics
   b. Pedestrian characteristics
   c. Perception and reaction process
   d. Vehicle and Road characteristics
3. Traffic Flow Theory (1 week)
   a. Introduction
   b. Greenshield's model
4. Highway Capacity and Level of Service (2 weeks)
   a. Basic freeway segments
   b. Weaving areas
   c. Ramp junctions
5. Geometric Design of Highway Facilities (3 weeks)
   a. Highway design standards
6. Design hourly volume
7. Design speed
8. Design vehicle
9. Cross section elements
10. Design of the alignment
11. Traffic control devices and procedures (2 weeks)

a. Markings, signs, traffic signals, progression and Intersection control

12. Signalized Intersections (2 weeks)
    a. principles of signal timing
    b. level of service, capacity
    c. operational analysis

(Each week is two hours and forty minutes of instruction)

Computer Usage:

1. Calculators are used for problem solving
2. Use of Highway Capacity Software is encouraged

Laboratory Projects: None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:

Students will understand the basic principles of transportation engineering upon completion of the course. Further, they will be able to analyze traffic operations and design some highway facilities.

Assessment Measures:

1. Student grades in pop quizzes, midterm and final examinations.
2. Comments provided by students in their end-of-the-semester instructor/course evaluations

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	X
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: Z. Li **Date:** August 2007

CAE 420 – Dynamics of Structures (Elective)
Fall 2007

2006-08 Catalog Data: Description: 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)

Textbook: A. Chopra, *Structural Dynamics*, 2nd Edition, Prentice Hall, 1998.

References: Class Notes

Coordinator: J. Shen, Associate Professor of Civil and Architectural Engineering

Objectives: To present fundamentals in structural dynamics and further develop solid background for design related issues involving dynamic loadings due to wind and earthquake ground motions. To introduce fundamental structural dynamics and its application in wind and earthquake engineering. To develop sound engineering judgment in dealing with dynamic loadings in structural engineering practice.

Prerequisites by topic:

Knowledge of basic strength of materials and Structural analysis
Knowledge of basic differential equations

Topics:
1. Introduction of structural dynamics and review of rigid-body dynamics (2 classes)
2. Formulation of equation of motions in structural system (4 classes)
3. Single-Degree-of –Freedom (SDF) System – Free vibration (2 classes)
4. Dynamic responses of SDF to various applied loads (6 classes)
5. Multi-Degree-of-Freedom (MDF) System – Free vibration (2 classes)
6. Dynamic responses of MDF to various applied loads (4 classes)
7. Dynamic response of MDF to earthquake ground motions (4 classes)
8. Dynamics of structures in building codes. (4 classes)

(Each class is 50 minutes)

Computer Usage: Students use SAP-2000 to conduct linear and nonlinear dynamic analyses of multi-story buildings.

Laboratory Project: None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100

Learning Outcomes & Expected Knowledge Gain:

Upon completion of this course, students will have fundamentals in structural dynamics and be able to understand the concepts behind building codes for dealing with dynamic loads such as wind and earthquake loads and their effect on structures. They will know how to obtain design wind and seismic loads using building codes. Students will also be prepared to continue on more advanced courses in wind and earthquake engineering.

Assessment Measures:

Student grades in homework problems, midterm and final examinations.
Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Program Outcome	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: J. Shen **Date:** August, 2007

CAE 430 Probability Concepts in Civil Engineering (Elective)
Summer Semester

2006-08 Catalog Data: Introduction to probability, modeling, and identification of nondeterministic 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**)

Textbook: Fundamentals of Systems Engineering with economics, probability and statistics, Khity and Mohammadi, Prentice Hall, 2001

Reference: Probability concepts in engineering planning and design, Ang and Tang, Vol.I, John Wiley and Sons, 2005.

Coordinator: Jamshid Mohammadi, Professor of Civil and Architectural Engineering

Objectives: To develop the background for understanding nondeterministic problems, conducting design and decision-making under uncertainties, modeling random phenomena as relate to civil engineering problems.

Prerequisites by Topic:
1. Integrals and differential equation.
2. Knowledge of civil engineering common design and planning problems.

Topics:

1. Introduction: role of probability in engineering, uncertainties in real world data; examples of probabilistic problems in civil engineering; design and planning under uncertainty (3 classes).
2. Basic elements of probability theory: events, sample space; set theory; relations between events; probability; probability formulation (7 classes).
3. Random variables and distribution models: useful distribution models in civil engineering (6 classes).
4. Joint probability functions and correlated variables: functions of random variables, mean and variance of dependent variables, first order approximation, simulation methods (6 classes).
5. Role of statistics in civil engineering: estimation of mean and other parameters of a random variable, data analysis and display, time-history and frequency data, testing validity of distribution models, interval estimation, applications in civil engineering (6 classes).
6. Regression and correlation analysis: linear and nonlinear regression, correlation coefficient, non-parametric problems (6 classes).
7. Bayesian approach (4 classes)
8. Analysis of Variance (ANOVA): applications in civil engineering, hypothesis testing, types of error (7 classes).
9. Fault tree analysis (3 classes)

(Each class is 50 minutes)

Computer Usage:

Computers are used for statistical analysis. Students use programs for analysis of variance and Fourier transformation. Use of MATHCAD is encouraged.

Laboratory Projects:

None.

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	20
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	80

Learning Outcomes & Expected Knowledge Gain:

Upon completion of this course, students will know how to apply various probability and statistics methods to civil and/or architectural engineering problems; and learn how to analyze data and apply results in design and decision-making under uncertainty.

Assessment Measures:

1. Student grades in homework problems, midterm and final examinations.
2. Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	X
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: J. Mohammadi **Date:** June 2007

CAE 431 – Steel Design (Required)
Fall 2007

2006-08 Catalog Data: Design of steel beams, plate girders, and beam columns. Bolted and welded connections. Design of typical frame systems. Prerequisite: CAE 303, 310 (3-0-3) (D)

Textbook: Salmon, C. G. and Johnson, J. E., *Steel Structures*, Fourth Edition, Harper Collins, 1996

Reference: AISC, *Manual of Steel Construction, Load and Resistance Factor Design (LRFD)*, 1994

Coordinator: J. Shen, Associate Professor of Civil and Architectural Engineering

Objectives: To develop the background for integrated design of steel building systems, introduce major load-carrying systems in steel buildings for lateral and gravity loads, and develop design process for low- and medium-rise steel buildings using LRFD.

Prerequisites by topics:

1. Basic knowledge of steel member behavior and design
2. Structural analysis
3. Use of structural analysis computer programs

Topics:
(1) Review of steel member design Tension, beam, and column Member design versus structural design;
(2) Beams with Lateral Torsional Buckling
(3) Stability of steel beams and failure modes in beams
LRFD for beams and application in structures
Combined Bending and Compression (Beam-Column)
Theoretical and practical sides of the member under bending and compression
Factors affecting beam-column strength
LRFD for the member with rolled shapes and its application in frames
Moment-Resisting Frames (MRFs) in Steel Buildings

(4) Lateral load and gravity load carrying paths in steel buildings systems
(5) Behavior and design of MRF for wind and earthquake loads
(6) Serviceability and drift control in buildings with MRF
(7) Braced Frames (BFs) in Steel Buildings
Behavior and design of CBF and EBF for wind and earthquake loads
(8) Connections
Rigid, semi-rigid and simple connections in steel buildings
Composite beam and column

Computer Usage: Structural analysis programs such as SAP2000 are used in design projects.

Laboratory Project: Design of medium-rise steel buildings with MRF and BF

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will understand thoroughly behavior of basic steel members and their application in steel structures. Students will and be able to design steel framed buildings, using moment-resisting

frames and braced frames to resist wind, earthquake as well as gravity load.

Assessment Measures:
1. Student grades in homework problems, midterm and final examinations.
2. Comments provided by students in their end-of-the semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	X
h	Broad education	X
i	Recognize need for life-long learning	X
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: J. Shen **Date:** August 2007

CAE 432 – Concrete and Foundation Design (Required)
Spring 2008

2006-08 Catalog Data: Design of reinforced concrete building frames and continuous structures. Design of girders, slabs, columns, foundations and retaining walls. Prerequisite: CAE 307, CAE 310, CAE 315. (3-0-3) (D)

Textbook: Leet, *Reinforced Concrete Design*, 3rd Edition, McGraw Hill, 1997.

References: ACI 318 Code and Commentary
CRSI Handbook
PCA Notes on ACI 318

Coordinator: J. Mohammadi, Professor of Civil and Architectural Engineering

Objectives: To develop the background for design criteria, develop design process for reinforced concrete frame elements, integration and use of ACI 318 for design.

Prerequisites by topic:
1. Knowledge of concrete and reinforcing steel behavior
2. Structural analysis
3. Analysis of flexural concrete members
4. Analysis of concrete columns
5. Use of structural analysis computer software

Topics:
Review of concrete behavior, creep and shrinkage (2 classes)
Review of Strength of sections in bending and shear (4 classes)
Bond stress and development length (3 classes)
Serviceability (crack and deflection) control (3 classes)
Bracket, corbel and deep beam design (tie and strut method) (3 classes)
One-way slabs and continuous beams (3 classes)
Behavior and design of columns, length effect and bi-axial bending behavior (5 classes)
Two-way construction by direct design and equivalent design method (4 classes)
Torsion design of reinforced concrete sections (2 classes)
Retaining walls and footings (4 classes)
Seismic design requirements (3 classes)

(Each class is 50 minutes)

Computer Usage:
Computers are used for structural analysis.
Students use programs for column analysis and interaction diagram.
Use of Mathcad and Autocad is encouraged.

Laboratory Project: Design of a reinforced concrete structure

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will know how to obtain design loads, design structural systems and their components using ACI code requirements, prepare proper reinforcing bar detailing, prepare specifications and calculation sheets for a design; and present detail drawings.

Assessment Measures:
1. Student grades in homework problems, midterm and final examinations.
2. Completeness of the required written report summarizing design calculations, specifications and details.
3. Student presentation of the design and ability to handle questions and comments raised by the class and the instructor.
4. Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	X
h	Broad education	X
i	Recognize need for life-long learning	X
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: J. Mohammadi **Date:** January 2008

CAE 435 – Experimental Analysis of Structures (Elective)
Spring Semester 2008

2006-08 Catalog Data: 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 are 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 is emphasized.. Prerequisites: CE 304 and CE 310; or CE 350 and CE 351 (2-3-3).

Textbook:

"An Introduction To Error Analysis**"**, by John R. Taylor, 2nd Ed., University Science Books
"Structural Modeling And Experimental Techniques**"**, 2ND Ed., Sabnis and Harris, CRC Publishers

Reference:

Experimental Stress Analysis, by J.W. Dally and W.F. Riley, 3rd Edition, McGraw-Hill, 1991
Elementary Structural Analysis, by Norris, Wilbur and Utku, 3rd Edition, McGraw-Hill, 1976
Probability And Statistics For Engineers, by Schaeffer and McClave, PWS-Kent, 1990
Handbook On Experimental Mechanics, Edited by A.S. Kobayashi, Prentice-Hall, 1987
Data Reproduction And Error Analysis For The Physical Sciences, by P.R. Bevington and D.K. Robinson, Second Edition, McGraw-Hill Book Co., New York, NY, 1992

Coordinator: S.A. Guralnick, Professor Emeritus of Engineering

Objectives: To introduce undergraduate architectural and civil engineering students to experimental science applied to civil engineering structures. A beginning course for civil engineers interested in obtaining a basis for further study of this topic in graduate school

Prerequisites by Topic: Mechanics of solids; Structural analysis; and Structural design

Topics:
1. Mathematical preliminaries (1 class)
2. Purposes of model analysis (1 class)
3. Types of models (1 class)
4. Conceptual models (2 classes)
5. Deflections of beams and frames (2 classes)
6. Analysis of statically indeterminate beams and frames (3 classes)
7. Influence lines for statically determinate beams (2 classes)
8. Influence lines for statically indeterminate beams (3 classes)
9. Dimensional analysis and similitude (7 classes)
10. Indirect models (1 class)
11. Elements of stress analysis (2 classes)
12. Elements of photoelasticity (5 classes)

Computer Usage: Computer processing of laboratory data and Photoelasticity dat

Laboratory Projects:
1. Linear and angular measurement – The construction of scales and verniers
2. Numerical evaluation of integrals and the computer processing of laboratory data
3. Conceptual models and the structural design process
4. The construction of influence diagrams using distorted models and deformeters
5. Transformation of two-dimensional and three-dimensional stresses using Mohr's Circle
6. Photoelastic analysis of the stresses in structures

Term Projects:
1. Plexiglass models for bridge girders using vertical test frame – Compare influence lines with computer results
2. Brass wire models of VariableI- beams using deformeter – Compare influence lines with computer results

3. Long span folded plate roof conceptual models using paper or light cardboard
4. Long span cylindrical shell roof conceptual models using paper or light cardboard
5. Plaster-of-Paris flat plate floor systems – yield line theory comparisons
6. Long span truss roof system – conceptual models using ent e am or extruded polystyrene materials
7. Brass wire portal frame influence line models – comparison with an analytical method
8. Folded plate versus cylindrical shell conceptual models using cardboard material
9. Photoelastic study of short deep beams, bracket connections, and portal frames.
10. Analysis of stresses in multi-story frames using photoelasticity
11. Conceptual model study of flat plate, flat slab and 2-way slab
12. Influence lines for two-hinged arches using plexiglass and special deformeters,
14. Conceptual model analysis of 3-hinged, 2-hinged and fixed arches using cardboard, plexiglass or extruded polystyrene material

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100

Learning Outcomes & Expected Knowledge Gain: Upon completion of this course, students will have proficiency in investigating structural behavior through small model laboratory analysis. The course will also help student's ability to conduct laboratory analysis, compile data and generate reports on structural performance.

Assessment Measures: Student grades in homework problems, midterm and final examinations.
Completeness of the required written report summarizing all calculations, data acquired, analyzed and presented.
Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	X
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	X
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: S.A. Guralnick **Date:** January 2008

CAE436 – Design of Masonry and Timber structures (Elective)
Summer 2007

2006-08 Catalog Data: Design of unreinforced and reinforced masonry structural elements and structures. Serviceability and ultimate capacity design. Design of wood columns and bending members. Mechanical fasteners and connectors. Prerequisites: CAE 310, 307 0r 352 or consent of the instructor. (3-0-3) (D)

Textbook: 1. Masonry structures, behavior and design, by Drysdale, Hamid and L.R. Baker, Prentice Hall
2. ACI 530-95/530. 1-95 building code requirements for masonry structures
3. Wood Engineering, By G. Gurfinkel, Kendal/Hunt Publishing, Dubuque, IW
4. National Forest Products association, National Specification for wood construction; and design values for wood construction – NDS supplement, Washington, DC

Reference: None

Coordinator: Domingo Carreira, Adjunct Professor of Civil and Architectural Engineering

Objectives: To develop the background for design criteria, develop design process for unreinforced and reinforced masonry structures, integration and use of ACI 530 for design; understand detailing requirements for masonry structures; develop background in wood design criteria, understand detailing issues in wood construction and integrate the wood design specification..

Prerequisites by Topic:
Structural analysis; Knowledge of masonry and wood materials; Fundamentals of reinforced concrete design

Topics:
1. Contemporary masonry structures, building systems, types of masonry construction (unreinforced, reinforced and prestressed masonry)Introduction (2 classes).
2. Masonry materials, clay and concrete units, mortar, grout, reinforcement, connectors and shell angles (2 classes).
3. Structural elements, axial compression, flexure, flexural for out-of-plane bending, shear strength along mortar bed joints, in-plane tensile strength, axial compression and biaxial flexure (3 classes).
4. Reinforced beams, flexural behavior in design, bond and anchorage of reinforcement, shear design, effects of bond patterns, prestressed masonry beams (2 classes).
5. Flexural walls, design of resisting mechanisms, design of unreinforced walls, design of reinforced walls, arching (1 class).
6. Walls under axial load and out-of-plane flexure, design of walls under out-of-plane flexure, axial load-flexure interaction diagrams, effects of slenderness (1 class)
7. Columns and pilasters, coursing layout and effective section, design of reinforced and unreinforced columns, design of pilaster (2 classes).
8. Shear walls, function and layouts, failure modes of unreinforced and reinforced walls, effects of opening, flexural design of shear walls, shear design of shear walls (1 class).
9. Masonry veneer and cavity walls, masonry rain screen walls, shelf angle supports, structural design (2 classes).
10. Connectors, connections and joints, wall ties, anchors, fasteners, seismic separations, cracking control joints, expansion joints (2 classes).
11. Retaining walls, lateral earth pressure, brick retaining walls, concrete block retaining walls (2 classes).
12. Construction considerations and details, specifications, standards and inspections, workmanship and construction practices, construction procedures, placing the reinforcement, grouting methods (2 classes).
13. Wood columns, design and details, behavior and design equations, simple solid sawn columns, glue laminated columns, spaced and built-up columns (3 classes).
14. Wood bending members, bending behavior and design equations, lateral stability, prismatic bending members, non-prismatic members, biaxial bending, combined bending and axial load (3 classes).
15. Mechanical fasteners and connectors, nails and spikes, staples, wood screws, Hankinson formula, group actions of fasteners and connectors, timber connectors (2 class)

Each class is 75 minutes.

Computer Usage: Use of MATHCAD is encouraged

Laboratory Projects: None.

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will know how to obtain design loads, design structural systems and their components using relevant masonry codes, prepare proper detailing, prepare specifications and calculation sheets for reinforced and unreinforced masonry designs; prepare design calculations and specifications for wood beams and columns and understand wood connectors.

Assessment Measures:
1. Student grades in homework problems, midterm and final examinations.
2. Comments provided by students in their end-of-the-semester instructor/course evaluations.

Assessment Measures:
Student grades in homework problems, midterm and final examinations.
Completeness of the required written report summarizing all calculations, data acquired, analyzed and presented.
Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: D. Carreira **Date:** June 2007

CAE 439 - Introduction to Geographic Information Systems (Elective)
Summer 2008

2006-2008 Catalog Data: Geographic information system (GIS) technology allows databases which display and query information in new ways. This course will teach general GIS and GPS skills and concepts, useful to students and practitioners in a variety of disciplines. Emphasis is on engineering and architectural applications in a quickly evolving field. Students will complete a final GIS project relevant to their field of study. This hands-on class will use ESRI's latest Arc View and 3D visualization products, as well as GPS units.
Prerequisite: None (3-0-3)

Texts: GIS Fundamentals, A First Text on Geographic Information Systems, Bolstad, Eider Press, 2002
Learning ArcGIS9, ESRI, 2005

Coordinators: L. Rohter, Adjunct Professor of Civil and Architectural Engineering;
J. Dorr, GIS/Reference Librarian

Objectives: To introduce the fundamental principles of earth centered cataloging, statistics and system analysis to technology based students.

Prerequisites by Topic:
1. College Level math

Topics:

1) Introduction to GIS Concepts, ESRI's ArcExplorer; DDTI's Accuglobe basic tools
2) Working with vector data; symbology; layouts
3) Street data and geocoding; querying; event themes; regional data
4) Tabular data; joining tables; coordinate systems; projections, scale
5) Raster data and aerial imagery; DOQQs
6) Global positioning systems
7) Data collection and methodologys
8) Aerial analysis; 3D interpretation;
9) Introduction to ESRI's Arcview9
10) Spatial analysis
11) Network analysis; finding data on the web; Metadata
12) 3D modeling; TINs; Industry Applications
13) Internet mapping, future of GIS
14) Final Project presentations

Computer Usage: spreadsheet type data tools; large raster image manipulation; database organization; GIS applications;

Laboratory Projects: A GIS group project is given. Report and presentation are required.

Estimated Science/Design Content:
Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will be able to understand how to apply the GIS and GPS methods in various engineering and architectural applications.

Assessment Measures:
4. Student grades in homework problems, project, quizzes and examinations.
5. Class participation in discussion sessions.
6. Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	X
h	Broad education	X
i	Recognize need for life-long learning	X
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: L.Rohter & J. Mohammadi **Date:** May 2008

CAE 442 – Finite Element Methods in Framed Structures (Elective)
Spring 2008

2006-08 Catalog Data: 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)

Textbook: *Finite Element Modeling For Stress Analysis* by Robert D. Cook
SAP 2000 Basic Analysis Reference and Tutorial Manual
Mathcad 2000 User's Guide

References: *Concepts and Applications of Finite Element Analysis* by R. D. Cook, D. S. Malkus, and M. E. Plesha
Finite Element Procedures in Engineering Analysis by K. J. Bathe

Coordinator: John O'Leary, Associate Professor of Civil and Architectural Engineering

Objectives: To develop in the student a fundamental understanding of the direct stiffness method applied to one, two and three dimensional structures. To further instill in the students more advanced concepts associated with the direct stiffness method. To present the finite element based alternative to the derivation of a two- dimensional beam element. The student will consider problems involving structural stability, non-prismatic two-dimensional straight and curved beam members. The students will obtain an overview of two-dimensional elasticity. The students will consider application of the finite element method to two-dimensional elasticity via. The constant-stain triangle, the isoparametric triangle and the isoparametric quadrilateral elements. The student will also see the application of the finite element method to other two-dimensional field problems. Finally the students will be introduced to the theory of plates and its approximation by the finite element method. Application of the theory will be gained via. Simple programming within *Mathcad 2000*. The students will also learn how to employ the commercial software package *SAP 2000* in the solution of a number of more complex structures. Prerequisite: CAE 310 or equivalent (2-3-3).

Audience: This course is a technical elective for senior CAE students who constitute approximately a third of the total number of students, another third are CAE graduate students, and the final third are MMAE graduate students.

Prerequisites by Topic:
1. Vector calculus, differential equations, and linear algebra
2. Basics computer operations including programming.
3. A background in the analysis of structures to the level: of a course in advanced strength of materials, or structural analysis.

Topics:
1. A Review of the Direct Stiffness Method (3 classes)
   - The 2-D Frame Element; stiffness matrix; rotational coordinate transformations and rotation matrices; assembly process; coding of the process
   - The 2-D Truss Element
   - The 3-D Frame Element
   - Displacement boundary conditions; big spring analogy; direct approach
   - Structural symmetry
   - Substructuring, matrix condensation and end releases
   - Transformations and constraint equations; rotation of the global degrees of freedom; boundary conditions on skewed surfaces; linear multipoint constraints; weld constraint; rigid offset constraint; diaphragm constraint
   - Solution methods; LDLT decomposition; data management in the process; partial decomposition
   - Numerical errors
   - Common modeling mistakes

2. The Finite Element Method Applied to Beams in the Plane (3 classes)

- Simple beam element; derivation of membrane stiffness matrix; derivation of the bending stiffness matrix
- Stability and Buckling Analysis; derivation of the geometric stiffness matrix; P-delta method
- Polynomial Interpolation in 1-D
- Numerical Integration; Newton-Cotes method; Gauss quadrature
- Derivation of the isoparametric stiffness matrix for a non-prismatic beam
- The modern penalty based beam element; energy principles for beams with shear included; finite element formulation; shear lock and reduced integration
- Derivation of a Curved Beam Element; differential geometry of a curve
  Derivation of the equations of equilibrium and potential energy; finite element approximation; c ondensation of the internal node and rotation matrices; coding the element

3. An Introduction to the Theory of Linear Elasticity (3 classes)
   - Stress and equilibrium
   - Strain and kinematics
   - The constitutive equations
     Plane stress, plane strain and axisymmetric behavior
   - Navier's equations of elasticity
   - The principle of minimum potential energy
   - Failure Criteria; maximum stress theory; maximum distortional energy theory

4. The Finite Element Method Applied to Linear Elastic Solids (4 classes)
   - The general theory; derivation of the stiffness matrix and end force vector; inter-element compatibility, solution bounds and convergence
   - Interpolation functions in 2-D; square master elements; triangular master elements
   - Isoparametric plane elements
   - Coding for an isoparametric element
   - Interpolation functions in 3-D; cubic master elements
     Tetrahedron master elements

5. The Finite Element Method Applied to Linear Elastic Plates (2 classes)
   - An Overview of the Linear Elastic Theory of Plates; stress resultants and the differential equations of equilibrium; kinematics of plate deformation; energy formulations for plates
   - The Derivation of a Two Field Penalty Based Isoparametric Plate Finite Element

Each class is 150 minutes (three 50-minute sessions).

Computer Usage: A series of ten programs have developed by the instructor under the *Mathcad 2000* program. The number of subroutines as well as the complexity of the programs increases with complexity of the supporting theory. The students must input the programs themselves, debug them and execute the programs on a number of homework problems. The students purchase the SAP 2000 – Student Version CD. This CD contains the program, manuals and tutorials. The students work through tutorials and then employ the program on homework problems

Laboratory Projects: This course has a weekly 150 minute laboratory. The laboratory takes place in a computer classroom. Rather than projects these periods involve hands on instruction in the computer usage described above. Assessment is based upon assigned exercises.

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course each student should minimally be able to:

- The ability to understand the concept of a stiffness matrix.
- The ability to understand concepts such as: boundary conditions, structural symmetry, structural condensation, and multi-point constraints.
- The ability to understand concepts such as: one-dimensional interpolations, "iso" and "sub" parametric beam finite elements, quadrature, non-prismatic elements, curved beam elements, and structural stability
- The fundamental concepts of two-dimensional elasticity.
- The analysis of plane stress, plane strain, and axisymmetric problems via the finite element approximation.
- The fundamental concepts of plate analysis and the approximation via the finite element method.
- Develop models on SAP 2000 for a large number of structures.
- Avoid pitfalls normally associated with computer based analysis.

Assessment Measures:

- Homework/ Lab assignments 20% of the final grade
- Two mid term examinations 50% of the final grade
- A comprehensive final examination 30% of the final grade
- Comments provided by students on their course evaluations
  - The instructor submits a post course assessment report

Relationship of Course to Program Outcomes:

Outcome	Program Outcome	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	X
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: J. R. O'Leary **Date:** January 2008

CAE 457 – Geotechnical Foundation Design (Required)
Fall Semester 2007

2006-08 Catalog Data: Methods of subsoil exploration. Study of types 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)

Textbook: Donald P. Caduto, Foundation Design, Principles and Practices, Prentice Hall 2001.

Reference: Peck, Hanson and Thornburn, Foundation Engineering, Wiley, 1974.
Soil Mechanics, NAVFAC DM-7.1, Dept. of Navy.
Foundations and Earth Structures, NAVFAC DM-7.2 Dept. of Navy.
Principles of Foundation Engineering, by D.M. Das, 4th edition, 1999.

Coordinator: J. Budiman, Associate Professor of Civil and Architectural Engineering

Objectives: To introduce students with methods of design for various types of foundations including footings, mats, piles, caissons, etc.

Prerequisites by topic:
1. Introduction to soil mechanics
2. Hydraulics and hydrology

Topics:
1. Definition of subject and requirements of a satisfactory foundation (3 classes)
2. Subsurface exploration (3 classes)
3. Shallow Foundations (12 classes)
4. Deep foundations (15 classes)
5. Construction problems (3 classes)
6. Design of retaining walls (9 classes)
7. Foundations on difficult soils (3 classes)

Each class is 50 minutes

Computer Usage:

Software available with the textbook is used for foundation design.

Laboratory Projects:

None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:

Upon completion of this course, students will know how to identify the type of foundations needed for a structure. They will be proficient in recognizing the design attributes of each type of foundation and the procedures via which the design can be completed.

Assessment Measures:

Student grades in homework problems, midterm and final examinations.
Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	X
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: J. Budiman **Date:** August 2007

CAE 470 – Construction Methods and Estimating (Required)
Fall 2007

2006-08 Catalog Data: Description: 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. (2-3-3) (D)

Textbook: RS Means Building Construction Cost Data, current year edition
Plans and specifications of a current construction project in $10 mil range
Copies of ENR and Dodge reports given as handouts

References: RS Means Estimating Handbook, Hardbound edition

Coordinator: D. Arditi, Professor of Civil and Architectural Engineering

Objectives: To provide the student with estimating and construction knowledge and skills needed by a Design Professional in their practice. The course is designed as the introductory course for graduate students in the Construction Management sequence. It also is an elective Senior level course for construction track undergraduates for the same purpose. Students integrate writing and speaking skills into the course by the final exam being a business presentation of the Engineer's/Architect's line item estimate, as prepared by the student from the plans and specs of a real project.

Prerequisites by topic:
300 level courses involving construction design (structural or architectural), senior status

Topics:

a. Description of the project environment, one time nature construction projects and time metamorphosis of the project organization, discussion of contracting relationship in construction, management of chaos (1 class)

1. The life cycle of the construction project, parties in the project, types of estimates created and used by each (1 class)
2. Estimating methods, parametric estimates, use of industry work standards and standard databases (1class)
3. Performing takeoffs and count sheets, assemblies, and compilation of line item estimates (1class)
4. Electronic takeoff and estimate of one CSI division in project (1class)
5. Weekly lectures on construction methods and estimating issues for each of the 16 CSI divisions using the Means Manual. Covers tips such as use of Manufacturer's Reps (10 classes)

(Each class is once a week for 3 periods of 50 minutes each)

Computer Usage:
- Personal computers are used for compiling line item estimates using either a basic spreadsheet or the CD-ROM that students may purchase optionally with the Means Manual
- The computerized digitizers in the Construction Computer lab are used for taking off and estimating at least one CSI division of the course project.

Laboratory Project: Plans and specifications of a building project (office, store, school) in the $10Mil range are used in conjunction with the Means Cost Data Manual to prepare the Engineer's line item estimate. The students are required to make a business package and presentation of their estimate to the client.

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	

Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will know how to create estimates in all phases of design and construction but particularly how to assemble the Engineer's Estimate, use of industry standard work rates (Means Manual) in evaluating estimates and Change Orders. The Student will have a familiarity with electronic take-offs, and with giving a technical business presentation. The student should acquire a basic understanding of construction "means and methods" for following courses and/or to be used in the field. The students will gain a basic proficiency in using plans and specs.

Assessment Measures:
1. Student grades in homework problems and midterm examination.
2. Technical completeness of the Engineer's line item Estimate. (Final exam)
3. Student presentation and discussion of projects and ability to handle questions and comments raised by non-technical people and the instructor. (Final exam)
4. Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	X
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: R. Lemming **Date:** August 2007

CAE 471 – Construction Planning and Scheduling (Elective)
Spring Semester 2008

2006-08 Catalog Data: 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. Impacts of delay on precedence networks. Construction contract administration. Computer applications. Prerequisite: senior standing (3-0-3)

Textbook:

Callahan, M. T., D. G. Quackenbush, and J.E. Rowings (1992). Construction Project Scheduling. McGraw-Hill, NJ.

References: Marchman, David A. (1998). Construction Scheduling with Primavera Project Planner. Delmar Publishing Company, NY.

Coordinator: J. Shi, Associate Professor of Civil and Architectural Engineering

Objectives:

This course is intended to provide civil and architectural engineering students with the knowledge on the basic elements of construction site operations. In addition, the financial aspects of operation and control of construction equipment and materials, and construction delay consequences are taught to students.

Prerequisite by Topic:

General senior-level civil and architectural engineering knowledge

Topics:

1. Construction planning and scheduling methods (1 class)
2. Bar (Gantt) charts (1 class)
3. Critical path method – CPM (2 classes)
4. Arrow diagramming method (ADM) (1 class)
5. Precedence diagramming method (PDM) (1 class)
6. Program evaluation and review technique – PERT (2 classes)
7. Linear scheduling method – LSM (1 class)
8. Resource allocation and leveling (1 class)
9. Time-cost trade-off analysis (2 classes)
10. Schedule updating, compression (1 class)
11. Optimization, monitoring and control (1 class)
12. Computer applications (1 class)

(Each class is two 75-minute sessions)

Computer Usage:

The program Primavera is used in this course.

Laboratory Project:

A small bridge project is given to students as a group assignment (group of 2). Based on the given project information, students are required to identify detailed activities in the project and to determine activity data including duration, resource, and cost. Primavera Project Planner (P3) is required for scheduling the project. A written report is also required.

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:

After completing the course, students must:

- Have the knowledge of the popular construction planning and scheduling methods including bar charts, CPM, PERT, and LSM.
- Be able to use bar chart and CPM methods for scheduling and planning construction projects.
- Master basic CPM-related techniques such as resource allocation and leveling, cost analysis, time-cost trade-off analysis, updating schedule, and schedule optimization.
- Be proficient in using the Primavera Project Planner (P3) computer system for construction planning and scheduling.

Assessment Measures:

Student grades in homework problems and midterm examination
Comments provided by students in their midterm and end-of-the-semester instructor/course evaluations
Final examination results

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: J. Shi **Date:** January 2008

CAE 472 – Construction Site Operations (Elective)
Fall 2007

2006-08 Catalog Data: 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)

Textbook: None

References:

Handouts and reading materials are assigned.

Coordinator: A. Domel, Adjunct Associate Professor, Civil and Architectural Engineering

Prerequisite by Topics:

General civil and architectural engineering knowledge at the senior level.

Objectives: To introduce to students various methods of construction and construction productivities and safety.

Topics:

SAFETY – TOPIC 1
OS14A Act of 1970 & 1990; History of OSHA; Concrete Safety (Form work, Tilt-up Construction; Post-Tensioning; General); Masonry Safety (Limited Access Zone; Bracing during construction); Excavation (Shored excavation; Unshored excavation)

SAFETY – TOPIC 2
Electrical Requirements – (Subpart K); Demolition (OSHA Requirements; Problems); Excavation (Access; Soil placement)

TRAFFIC CONTROL
Manual of Uniform Traffic Control (MUTCD); Cost Estimating; Signs; Inspection of traffic control devices

OPEN WEB JOISTS
Examples; Types; Bearing Conditions; Installation; Bracing; Design parameters; Roof decks

CRANE OPERATIONS AND SAFE
Types; Mats; Operations; Material transportation; Cable/drums; Boom extension; Container Cranes/Ore Bridge; Cranes

FALL PROTECTION
Lanyards/harness; Tie offs; Trade requirements; Load requirements; Lines; Perimeter Cable

DISTRESS AND FAILURE OF STRUCTURES
Bridges; Shoring; Tanks; Masonry; Demolition Operations; Fire Damage; Adjacent Construction Activities; Soil Settlement

BUILDING SYSTEMS, One-way Joists; Flat Slabs; Flat Plate; Two-way Joists; Beam/Column

LAND DEVELOPMENT, Survey; Erosion control; Water Control; Site Development

CONSTRUCTION DOCUMENTATION
Pre-construction ; Construction ; Post-Construction ; Field Documentation

ADJACENT CONSTRUCTION AND RELATED ISSUES
Vibration Monitoring; Construction activities; Pre-Construction Survey; Foundation Movement

ROOFING SYSTEMS, EPDM; Modified Bitumen; Cedar/Slate/Composite; Standing Seam

SCAFFOLD/SHORING SYSTEMS, Shoring Systems; Scaffold Systems;

OTHER TOPICS, Soil Retaining Structures; Contract Documents; Air Supported Structures; and tanks

Computer Usage: None

Laboratory Project: None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:
After completing the course, students will have proficiency in all aspects of construction site operations and safety issues. Particularly, students will know the OSHA rules and regulations.

Assessment Measures: Student grades in homework problems and midterm examination
Comments provided by students in their midterm and end-of-the-semester instructor/course evaluations
Final examination results

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: A. Domel **Date:** August 2007

CAE 473 – Construction Contract Administration (Elective)
Spring 2008

2006-08 Catalog Data: 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)

Textbook: Clough, R.H. and Sears, G.A., *Construction Contracting*, Wiley, 1994.

References: Haltenhoff, C.E., *The CM Contracting System*, Prentice Hall, 1999.
Fisk, E.R., *Construction Project Administration*, Sixth Edition, Prentice Hall, 2000.
Nunnally, S.W., *Construction Methods and Management*, Prentice Hall, Fourth Edition, 1998.
Barrie, D.S. and Paulson, B.C., *Professional Construction Management*, Third Edition, McGraw-Hill, 1992.

Coordinator: D. Arditi, Professor of Civil and Architectural Engineering

Objectives:
This course is designed to provide the CAE student with the fundamentals of project administration. Students are presented with the necessary information to understand the administrative needs for a project prior to construction and throughout the duration of the project. The pre-construction discussion includes technical and economic feasibility, project documents, project delivery systems, bonding and bidding. The post-contract discussion includes contract administration, safety, and labor issues. Topics that are in the forefront of present day construction issues are also presented to provide students with timely information. These issues include but are not limited to alternative dispute resolution methods, claims management, partnering, value engineering, constructability reviews and the management of a typical construction company.

Prerequisite:
Senior standing

Topics:
1. Characteristics of the construction industry (3 classes)
2. Technical investigations, economic analysis, project delivery systems, constructability (3 classes)
3. The professional construction management project delivery system (3 classes)
4. The duties and responsibilities of the designer, preparation of the contract documents (3 classes)
5. Types of bidding, negotiation, partnering (6 classes)
6. Types of contracts, legal implications (6 classes)
7. Contract administration including payments, retainage, substantial and final completion, scheduling and time extensions, change orders, changed conditions, suspension of work, contract termination, and resolution of disputes (6 classes)
8. Bonding (3 classes)
9. Types of construction organizations including sole ownerships, partnerships and corporations, starting and operating a construction company, bankruptcy issues (6 classes)
10. Labor relations and labor laws (6 classes)

(Each class is 50 minutes)

Computer Usage:
Students use the Internet and word-processing for preparing their research papers.

Laboratory Projects:
Students are expected to prepare four research papers during the semester on topics including industrialized building systems, constructability reviews, web-based project management, and reasons for construction company failures.

Estimated Science/Design Content:

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100

Learning Outcomes & Expected Knowledge Gain:
Students are expected to learn the procedural aspects of the construction activity, including the duties and responsibilities of the parties involved in the construction project, and contract administration issues during the construction phase of a project.

Assessment Measures:
1. Student grades in mid-term and final exams.
2. Performance of the students in preparing four research papers.
3. Comments provided by students in their end-of-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	X
h	Broad education	X
i	Recognize need for life-long learning	X
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: D. Arditi **Date:** January 2008

CAE 482 – Hydraulic Design of Open Channel Systems (Elective)
Fall Semester

2006-08Catalog Data: Uniform flow design; backwater profiles in natural streams; gradually varied flow, practical problems; spatially varied flow; flow through nonprismatic and nonlinear channels; gradually varied unsteady flow; flood routing; numerical solutions of open channels. Prerequisite: CAE 301 or consent of instructor. (3-0-3) (D)

Textbook: N. H. Chaundry, *Open Channel Flow*, Prentice Hall, 1993.

Reference:
Henderson, F.M., *Open Channel Flow*, MacMillan, 1966.
Bakhmeteff, B.A., *Hydraulic of Open Channels*, McGraw Hill, 1932.
Brater, E. F. , & King, H.W., *Handbook of Hydraulic*, McGraw Hill, Latest Ed.
ent e Chow, *Open Channel Hydraulics*, McGraw Hill, 1959.
Sellin, R.H.J., *Flow in Channels*, Gordon and Breach, 1976.
Woodward & Posey, *Steady Flow in Open Channels*, Wiley 1976.
Bos, Replogle, & Clemmens, *Flows Measuring Flumes in Open Channel Systems*, Wiley 1984.

Coordinator: A. Paintal, Adjunct Professor of Civil and Architectural Engineering

Objectives: To provide civil engineering students with an understanding of the principles governing the flow of water in open channels and to present corresponding design methodologies.

Prerequisites by Topic:
Hydraulics and hydrology

Topics:
1. Open channel flow and its classification, geometric elements of channel sections, velocity distribution coefficients, effect of curvature and slope on pressure distribution.
2. Uniform flow formula, conveyance factor, section factor and hydraulic exponent for uniform flow, composite roughness, compound channel section, normal depth and its computation.
3. Energy concepts in open channel flow, total energy and specific energy, critical flow condition, regimes of flow, alternate depths, section factor and hydraulic exponent for critical flow.
4. Momentum principle in open channel flow, specific force, conjudate depths, hydraulic jump, computation of hydrodynamic forces.
5. Gradually varied flow, dynamic equation of gradually varied flow, characteristics and classification of flow profiles, methods of direct integration – Bresse's, Bakmeteff's, and Chow's methods.
6. Test No 1: Graphical and numerical methods of integration.
7. Direct step and standard step methods, standard step method for natural channels, delivery of canal for subcritical and supercritical flows.
8. Flow passing islands, channel transitions in subcritical flows.
9. Transition in supercritical (High Velocity) flow, high velocity flow in channel bends.
10. Hydraulic jump and its use in energy dissipation, control of hydraulic jump by sills, abrupt drop and abrupt rise in channel bed, hydraulic jump in sloping channels, stilling basins.
11. Spatially varied flow, dynamic equation of spatially varied flow with increasing and decreasing discharges, determination of critical flow section, numerical integration.
12. Test No. 2: Side weir, wash water troughs, side channel spillways.
13. Gradually varied unsteady flow, continuity and dynamic equations, uniformly progressive flow, monoclinal rising wave.
14. Numerical solution – Method of characteristics.
15. Rapidly varied unsteady flow, uniformly progressive flow, moving hydraulic jump, negative and positive surges, dam break problem.

Each topic is covered in a two 75-minute sessions.

Computer Usage: Use of available software in open channel design is encouraged.

Laboratory Projects: None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will know various types of open channels and their geometry. They will lean the underlying theory in open channel design, flow and total as well as specific energy. Students will also learn how to compile information needed for design, use design aids and apply them to design of open channel systems.

Assessment Measures:

Student grades in homework problems, midterm and final examinations.
Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	X
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Outcome

Prepared by: A. Paintal **Date:** August 2007

CAE 486 – Soil and Site Improvement (Elective)
Spring 2008

2006-08 Catalog Data: 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.

Textbook: Manfred R. Hausmann, *Engineering Principles of Ground Modification*, McGraw Hill, 1990.

Reference: Koerner, R.M., *Construction and Geotechnical Methods in Foundation Engineering*, McGraw-Hill, 1984.
Dewatering and Groundwater Control for Deep Excavations, TM 5-818-5, United States Army.

Coordinator: S. Gill, Adjunct Professor of Civil and Architectural Engineering

Objectives: Acquaint the student with the theory of seepage; enable him to design drainage systems; introduce him to construction methods designed to improve soil conditions.

Prerequisites by topic:
Basic soil mechanics

Topics:
1. Introduction: Course objectives, overview of technique (3 classes)
2. Dewatering: Basic principles of groundwater flow, well flow theory, trenches, pumping tests, piezometers, design of shallow and deep dewatering systems (6 classes)
3. Slurry Trench Cutoffs: Types and usages, construction techniques, stability and trench properties, design testing (3 classes)
4. Soil improvement by Preloading: Theory of consolidation, one dimensional and radial flow, design of preloads, vertical drains (6 classes)
5. Soil Grouting: Types and uses, injection techniques, properties of grouted soils, design; jet grouting (3 classes)
6. Reinforcement of Soils: Reinforced soils, types of reinforcement, design soil nailing, stone nailing, stone columns, vibroflotation (6 classes)
7. Compaction Methods: Replacement and in-situ, dynamic methods, heavy tamping , blasting (6 classes)
8. Geotextiles and Fabrics: Types and uses, design for drainage, design for reinforcement (6 classes)
9. Admixtures for stabilization, lime columns, thermal treatment, freezing, electro-osmosis (6 classes)

(Each class is 50 minutes)

Computer Usage: None

Laboratory Projects: None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will have proficiency in all aspects of soil and site improvement including ground water flow, stability of trenches, soil grouting, compaction and soil stability and treatment.

Assessment Measures:
Student grades in homework problems, midterm and final examinations.
Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	X
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: S. Gill **Date:** January 2008

Junior-Level IPRO – Interprofessional Project Course (Required)
Fall 2007 & Spring 2008

2006-08 Catalog Data: Interprofessional project courses 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 to 10 students from sophomore through graduate level and from all disciplines, who can broadly contribute to a project effort. (1-6-3)

The course number is as follows (Note: "xxx" represents the course designation number that is assigned to each project team):
IPRO297-xxx (sophomore standing)
IPRO397-xxx (junior standing)
IPRO497-xxx (senior standing)
IPRO597-xxx (graduate standing)

This is a required course. Students must complete at least two Interprofessional project courses. (six cr. Hrs. total).

Textbook: None. Resource materials related to teambuilding, project management and communications are provided

References: None

Coordinator: Thomas Jacobius, Director, Interprofessional Studies and the IPRO Program (Note: IPRO courses in the architectural engineering program are offered by professors from the Department of Civil and Architectural Engineering)

Goals:

Objective I [First Semester IPRO I Experience]: When engaged in a multiprofessional team project, the student will be able to work effectively as a member of the team and thereby:

1. Contribute basic disciplinary [technical] expertise and skills to the project
2. Successfully apply basic project management principles in the completion of tasks
3. Recognize ethical issues as they arise during the course of the project
4. Communicate effectively through appropriate verbal, written, and visual formats
5. Search and organize information as needed.

Objective II [Second Semester IPRO II Experience]: When engaged in a multiprofessional team project, the student will be able to work effectively as a leader of the team, i.e., in mutually shared leadership roles and thereby

1. Synthesize broad disciplinary [technical] expertise and skills with contributions from other disciplines/professions
2. Successfully apply advanced project management principles in the completion of tasks
3. Resolve ethical issues in the completion of the project
4. Coordinate and assess verbal, written, and visual communications, and modify as needed
5. Evaluate information as needed

Prerequisites by topic: None. Minimum of sophomore level standing

Topics:
The IPRO Program prepares students for the practical challenges they will face in a changing workplace by emulating a cross-functional team environment. The program engages multidisciplinary teams of students in semester-long projects based on *real-world* topics from sponsors that reflect the diversity of the workplace: corporations, entrepreneurial ventures, non-profit organizations, government agencies, and university researchers. Teams may include students from all academic levels (sophomore through graduate school), and across IIT's professional programs (engineering, science, business, law, psychology, design, and architecture). Integration of both vertical (bridging academic levels) and horizontal (bridging professional programs) dimensions within a project team experience is distinctive in higher education today. Through this program, students have the opportunity to develop a unique portfolio of real-world experiences that will help focus their academic efforts to career directions that best fit their aptitude and interest. The grading, deliverables and assessment process are designed to emulate the

type of project responsibilities, cross-functional collaboration experience and team process evaluation that professionals encounter during their careers.

The range of real-world topics offered as a focus for about 60 projects each year mirrors the workplace and the expertise of IIT faculty. Projects have been organized by sponsoring organizations and faculty from all academic programs. Topics have been completed in the following broad categories: community and public service, fieldwork and operations analysis, global issues, applying advanced technologies and new frontiers. Specific topics have included usability testing of advanced pagers, internet search engine design, renewable energy system technology, web site evaluation and design, medical imaging technology, alternative fuel vehicle design and competition, guitar string manufacturing and marketing analysis, window solar awning design, digital Braille watch design, etc. etc. A special set of entrepreneurial projects (EnPROs) are focused to creating a business plan in addition to meeting all requirements and objectives of an IPRO project course. Refer also to http://ipro.iit.edu for additional examples.

Schedule:
1. First Formal Weekly Meeting Time is Tuesdays 3:15 to 4:30 pm (75 minutes)
2. Second Formal Weekly Meeting Time is determined by individual faculty and students enrolled in each IPRO course section. Minimum of 75 minutes.
3. Additional time is devoted to small group meetings as needed.

Computer Usage:
Depending on the project, students use a variety of software for engineering analysis. They are required to develop a web site for the project.

Laboratory Project: Semester-ling interdisciplinary project as described in each IPRO course.

Samples of IPRO projects offered by the Civil and Architectural Engineering Department are listed below:

- Post-occupancy issues in building design
- Planning and design of a pedestrian bridge crossing over State street on IIT campus
- ASCE Bridge Building Contest
- Public participation in transportation planning and design
- An investigation of collapse of the World Trade Center
- Seismic design requirements for buildings in northern Illinois

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain: Upon completion of this course, students will develop several skills including teamwork in an interdisciplinary project, ability to coordinate and implement engineering knowledge in a single project. They learn about ethics. Furthermore, they learn how to acquire needed information to complete a "real-world" project.

Assessment Measures:

- Students' performance throughout the semester
- Completeness of the required report summarizing design calculations, specifications and details.
- Student presentation of the design and ability to handle questions during the IPRO presentation day.
- Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Program Outcome	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	X
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	X
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	X
h	Broad education	X
i	Recognize need for life-long learning	X
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: J. Mohammadi **Date:** January 2008

Senior-Level IPRO – Capstone Design (Required)
Fall 2007 & Spring 2008

2006-08 Catalog Data: Interprofessional project courses 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 to 10 students from sophomore through graduate level and from all disciplines, who can broadly contribute to a project effort. (1-6-3)

IPRO – Capstone Design Course – This senior-level design course covers a comprehensive design experience including structural design, foundation design, mechanical systems and elevator design, lighting and acoustics design, traffic flow analysis around the building, project scheduling and cost estimating.

Project given in Fall 2007 & Spring 2008 – Develop a design for a large scale parking garage that can accommodate about 500 cars. The objective of this project is to develop a design that goes beyond the standard parking systems used today. Rather, the attempt is to have a design which is more representative of "parking garages of future." And as such, such features as quick handling of incoming and outgoing cars, efficiency in storage and aesthetics are considered in design.

The building will be completely self-sufficient and will have to incorporate the architecture of the various buildings on campus. The design could have separate entrance and exit ramp towers, ramps incorporated with parking, or the futuristic design may be automated. An automated system will include a vehicle elevator of lift system to move the vehicle so the driver does not have to. The structure could be built with reinforced concrete or steel.

As a minimum, the project requires: (1) architectural design and selection of the type of structure to be used (steel or concrete); (2) structural analysis and design including proportioning typical girders, columns and foundations and a check of pertinent serviceability requirements (deflection, cracking, and floor and/or roof vibration); (3) Mechanical (elevators, escalators, people movers) design; (4) study of traffic flow around the building; (5) Accessibility; (6) Accessibility based on Americans with Disability Act; and (7) an estimate of the building cost.

Textbook: None. Resource materials related to teambuilding, project management and communications are provided.

References: The Capstone Course requires the following reference materials: Chicago Building Code,ASHRAE documents, Document pertinent to electric and illumination and acoustic design, International Building Code, Means Handbook, AISC, ACI and other design documents.

Coordinator: J. Mohammadi, A. Megri, J. Shen D. Arditi and J. Budiman from CAEE Department and T. Jacobius, from Interprofessional Studies and the IPRO Program.

Objectives: Provide students with a significant and comprehensive capstone design experience utilizing various materials learned in previous courses.

Prerequisites by topic: Minimum of senior level standing

Topics: The design project for the Fall 2007 & Spring 2008 course contained the following topics:

Week 1: Introduction of the project and identification of the Tasks
Week 2: Development of architectural design, selection of structure types and approval by the client
Week 3: Building envelope design, start of structural analysis
Week 3: Structural analysis and design
Week 4: Structural design (continued), foundation design completed
Week 5: Design of mechanical systems (elevators, escalators, etc.); structural wind/seismic load design
Week 6: Mechanical system design continued – Architectural and structural design finalized
Week 7: Mechanical system design completed
Week 8: Progress report presentation
Week 9: Electrical design initiated – traffic flow study started.

Week 10: Building serviceability reviews
Week 11: Electrical design completed – traffic flow study completed
Week 12: Overall design review and evaluation
Week 13: Cost estimating and bill of materials
Week 14: Cost estimating finalized; begin preparation of presentation materials
Week 15: Final report and presentation

Computer Usage: Depending on the project, students use a variety of software for engineering analysis. They are required to develop a web site for the project.

Laboratory Project: Semester-ling capstone design project as described above.

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:
Upon completion of this course, students will develop the silks to apply various subject areas within the architectural engineering profession in a "real-world" design project.

Assessment Measures:
- Students' performance throughout the semester
- Completeness of the required report summarizing design calculations, specifications and details.
- Student presentation of the design and ability to handle questions during the IPRO day.
- Comments provided by students in their end-of-the-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	X
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	X
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	X
h	Broad education	X
i	Recognize need for life-long learning	X
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: J. Mohammadi **Date:** August 2007

ENVE 310 – Introduction to Environmental Engineering (Elective)
Fall 2008

2006-2008 Catalog Data: Application of engineering principles to identify and control environmental pollution. Focus will be on the design of engineering systems to meet environmental standards. Topics include environmental resource management and methods for environmental quality control including identification of pollution sources, effects, and controls. (3-0-3)

Textbook: Introduction to Environmental Engineering, Fourth Edition, Mackenzie Davis & David Cornwell, McGraw-Hill

References: Introduction to Environmental Engineering and Science, Third Edition, Masters and Ela, Prentice Hall

Instructor: K. Noll, Professor of Environmental Engineering

Course Objectives:
- Provide a basis for analyzing and understanding issues that relate to environmental resource management and degradation of environmental quality.
- Special attention will be given to such topics as water and air quality, solid and hazardous waste management, and resource recovery.
- Allow students to acquire proficiency in applying engineering principles to the design of engineering systems for the treatment and remediation of environmental problems.
- Environmental engineering has come to be a comprehensive discipline encompassing many specialties including chemical and biological analytical tools that will be integrated into the course for application to the environmental design technologies that will be presented for pollution control.

Prerequisite:
Junior or senior standing.

Topics:
Lecture topics for each weak of the semester
1. Introduction
2. Environmental regulations
3. Materials and Energy balance
4. Water Treatment
5. Water Quality Management
6. Wastewater Treatment
7. Wastewater Treatment
8. Midterm Exam
9. Air Resources Engineering
10. Air Pollution Meteorology
11. Air Pollution Control
12. Solid Waste Management
13. Hazardous Waste Management
14. Hazardous Waste control
15. Pollution Minimization/Prevention/Climate Change/Sustainability Practices
16. Final Exam

(Each week is equivalent to two 75 minute lectures)

Computer Usage:
Students use the Internet, spreadsheets and word-processing for preparing homework solutions.

Laboratory Projects:

None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	40
Introductory Civil Engineering	60*
Professional Level Civil Engineering	

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain:
Students are expected to learn and acquire proficiency in applying engineering principles to the design of engineering systems for the treatment and remediation of environmental problems. Additionally, they will become aware of the latest developments in water/wastewater/air pollution/solid and hazardous waste treatment technology and control.

Assessment Measures:
4. Student grades in mid-term and final exams.
5. Performance of the students in solving design problems through homework assignments.
6. Comments provided by students in their end-of-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	X
h	Broad education	
i	Recognize need for life-long learning	X
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: K. Noll **Date:** June 2008

ENVE 404 – Water and Wastewater Engineering (Elective)
Spring 2008

2006-2008 Catalog Data: 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: Fluid mechanics and junior standing. (3-0-3)

Textbook: Water Supply and Pollution Control, Viessman and Hammer, Prentice Hall, 2006
References: Physicochemical Processes for Water Quality Control, W. Weber, Wiley-Interscience
Wastewater Engineering, Metcalf and Eddy, McGraw Hill
Theory and Practice of Water and Wastewater Treatment, Ronald Droste, John Wiley & Sons, Inc., 1997.

Instructor: K. Pagilla, Professor of Environmental Engineering

Course Objectives:
- Examine principles and processes involved in water and wastewater treatment
- Analysis of unit process design in water and wastewater treatment
- Review of current developments in water and wastewater treatment
- Conduct laboratory demonstrations of water/wastewater/sludge treatment

Student Learning Objectives:
- Ability to analyze and design unit operations and processes for drinking water treatment
- Ability to analyze and design unit operations and processes for wastewater treatment
- Ability to analyze and design sludge treatment processes

Prerequisite:
Fluid mechanics and junior or senior standing.

Topics:
11. Course introduction and water/wastewater treatment broad overview
12. Water and wastewater sources and quantities
13. Water quality principles
14. Physical treatment processes principles and design (2 weeks))
15. Chemical treatment processes principles and design (3 weeks + laboratory session)
16. Biological treatment processes principles and design (3 weeks + laboratory session)
17. Sludge processing and treatment principles and design
18. Advanced wastewater treatment developments

(Each week is equivalent to three 50 minute lectures)

Computer Usage:
Students use the Internet, spreadsheets and word-processing for preparing homework solutions.

Laboratory Projects:
Students conduct two experiments during the semester in a group setting to familiarize with the use of laboratory analytical equipment, lab scale chemical water treatment process, and lab scale biological wastewater treatment process

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	

Introductory Civil Engineering	
Professional Level Civil Engineering	100*

* Includes design experience

Learning Outcomes & Expected Knowledge Gain:
Students are expected to learn the principles and design of unit operations and processes in water and wastewater treatment engineering. Additionally, they will become aware of the latest developments in water and wastewater treatment technology.

Assessment Measures:
7. Student grades in mid-term and final exams.
8. Performance of the students in solving design problems through homework assignments.
9. Comments provided by students in their end-of-semester instructor/course evaluations.

Relationship of Course to Program Outcomes:

Outcome	Program Outcome	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	X
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	X
h	Broad education	
i	Recognize need for life-long learning	X
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: K. Pagilla **Date:** May 2008

ENVE 426- Environmental Tools for Engineers (Elective)
Fall 2007

2006-2008 Catalog Data: Descriptive statistics and graphics, probability distributions, random sampling, independence, significance tests, designs of experiments, regression, time series analysis, statistical process control, and introduction to multivariate analysis. Prerequisite: Junior standing (3-0-3)

Textbook: Applied Statistics and Probability for Engineers by Douglas Montgomery and George Runger. Fourth Edition

References: None.

Instructor: D.J. Moschandreas, Professor of Environmental Engineering

Course Objectives:
Leverage on the engineer's knowledge of how things work with the statistician's inclination to assess why they do not work and

1. deduce information from existing data
2. collect data smartly (design experiments)
3. predict information (perform linear regression analysis and ANOVA)
4. interpret statistical findings of research and application data

Topics

Date	Chapters	Topics
1. 8/23	READ chapter 1 & chapter 6	1. Class Administration & Objectives; 2. Descriptive statistics
2. 8/30	2.1-2.6; 3.1 -3.4 & HOs or Slides	1. Probability Concepts 2. Joint probability concepts
3. 9/6	3.5-6 & 3.9, 4.1-3	Selected Probability Distributions
4. 9/13	4.5-, 4.10 & 4.11 HOs[1]	Sampling Distributions and review. Plot data vs. probability distributions
5. 9/20	7.2, & 8.1-6	1. Central limit theorem ; 2. Confidence interval
6. 9/27	9.1-9.5, 10.1-10.5 *READ* 10.6-7 (Opt)	Hypothesis testing Statistical Inference for 1- and 2-samples
7. 10/1	Mid Term (followed by break)	One hour and 15 minutes
8 10/25	12.1-5	Multiple linear Regression
9. 11/1	13.1-3 & HOs	1. Experimental Design 2.Analysis of Variance
10.11/8	13..4 & 14.2-4	Completely Randomized Design & two-factor factorial experiments
11. 11/15	14.5-7	2^k factorial design
11/22	**THANKSGIVING**	
12 11/29		Non-parametric Statistics
13 12/6		Contingency LCR: Catch-up; Review; Q&A
12/11-14	**Final Exam**	**Location to be announced**

Computer Usage: Students use Microsoft Excel or SPSS or any software package that the student or the IIT computer center has available for use. This is not a class for computers; computers are tools that reduce the time used for analysis and increase time for students to understand and interpret their data and analysis.

Laboratory Projects: None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	10
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	90

Learning Outcomes and Expected Knowledge Gain:
Upon completion of this course, students will learn the basic principles of probability theory and applied statistics in environmental engineering problems. They lean using software in conducting various common methods of statistical analysis including data analysis, ANOVA, population comparison, interval estimation, etc.

Assessment Measures:

1. Student grades in mid-term and final examinations
2. Homework problem grades
3. Class participation

Relationship of Course to Program Outcomes

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	(Statistical) Design of experiments	X
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	X
h	Broad education	
i	Recognize need for life-long learning	X
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: D. J. Moschandreas **Date:** June 2008

ENVE 463-Introduction to Air Pollution Control (Elective)
Spring 2008

2006-2008 Catalog Data: Air pollution sources and characterization 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)

Textbook: Air Pollution Control Engineering by Noel De Nevers; Second Edition

References: None

Instructor: D.J. Moschandreas, Professor of Environmental Engineering

Course Objectives:

1. Understand the difference between regulatory controls and engineering control
2. Understand the rationale for controlling air pollution and therefore the link between air pollution and reducing public health and protecting natural resources
3. Understand the factors that determine ambient pollutant concentrations from a stationary source emitting pollutants
4. Understand and design controls to reduce the downwind concentrations of subject pollutants

Topics:

Date	Topic(s)	Reference
1/23	Introduction to Air Pollution Control Eng	Chapter I and Handouts[1]
1/28	Continue with above topics	Chapter I and Hand outs
1/30	Air Pollution Effects on Public Health & Environment	Chapter II and Hand outs
2/4	Continue with above topics	Chapter II and Handouts
2/6	Air Pollution Laws and Regulation and Air Pollution Control Philosophy & Federal Legislature and Regulatory Trends	Chapter III and Hand outs
2/11	Continue with above topics	Chapter III and Handouts
2/13	Air Pollution Measurements, Emission Estimates	Chapter IV and Hand outs
2/18	Continue with above topics	Chapter IV and Hand outs
2/20	Meteorology for Air Pollution Control Engineers	Chapter V and Hand outs
2/25	Continue with above topics	Chapter V and Hand outs
2/27	Air Pollutant Concentration Models A	Chapter VI and Hand outs
3/3	Air Pollutant Concentration Models B	Chapter VI and Hand outs
3/5	Air Pollutant Concentration Models C	Chapter VI and Hand outs
3/10	Air Pollutant Concentration Models D	Chapter VI and Hand outs
3/13	**Midterm Examination**	
3/17; 3/19	**Spring Break**	
3/24	Particle Characteristics and Control Gravitational and Cyclone Control Devices	Chapter VIII, Chapter IX and Hand Outs
3/26	Continue with above Topics	Chapter VIII, Chapter IX and Hand Outs
3/31	Electrostatic Precipitators and Wet Scrubbing for Particles	Chapter IX and Hand outs
4/2	Continue with above Topics	Chapter IX and Hand outs
4/7	Fabric Filters and Cartridge Filters	Chapter IX and Hand outs
4/9	Continue with above topics	Chapter IX and Hand outs
4/14	Inorganic Gaseous Control - Absorption	Chapter IX and Hand outs
4/16	Continue with above topics	Chapter IX and Hand outs
4/21	VOCs: Characteristics and Control-Adsorption Controls	Chapter X and Hand outs
4/23	Continue with above topics	Chapter X and Hand outs

4/28	Combustion Control Devices and Biofiltration	Chapter VII and Hand Outs
4/30	Continue with above topics	Chapter VII and Hand Outs
5/5	Control of Air Pollution from Mobile Sources and Carbon Dioxide Control Processes	Chapter XIII and Hand Outs
5/7	Continue with above topics	Chapter XIII and Hand Outs
Week of 5/13	**Final Examination**	

Laboratory Projects: None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	15
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	85*

* Includes Design Experience

Learning Outcomes & Expected Knowledge Gain: Students will understand the difference between regulatory controls and engineering control; the rationale for controlling air pollution and therefore the link between air pollution and reducing public health and protecting natural resources; he factors that determine ambient pollutant concentrations from a stationary source emitting pollutants; and design controls to reduce the downwind concentrations of subject pollutant.

Assessment Measures:

4. Student grades in mid-term and final examinations
5. Homework problem grades
6. Class participation
7.

Relationship of Course to Program Outcomes

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	(Statistical) Design of experiments	X
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	X
g	Communicate effectively	X
h	Broad education	
i	Recognize need for life-long learning	X
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: D. J. Moschandreas **Date:** June 2008

ENVE 485 –Industrial Ecology (Elective)
Fall 2007

2006-08 Catalog Data: Industrial Ecology is an interdisciplinary field involving technology (science and engineering), public policy and regulatory issues, and business administration. Within that framework the overall goal of this course is to promote creative and comprehensive problem solving in the application of Industrial Ecology. This course is co-listed with EM 507. (3-0-3)

Textbook: Course notes and selected readings from current literature.

References: None

Coordinator: P.R. Anderson, Associate Professor of Environmental Engineering, Civil, Architectural, and Environmental Engineering Department; J.P. Kusz, Adjunct Professor, Stuart School of Business.

Objectives: Introduce students to the philosophy of Industrial Ecology. Introduce tools of Industrial Ecology and provide examples and opportunities to explore and apply those tools. These tools include Industrial Metabolism, Input-Output Analysis, Life Cycle Assessment, Accounting, and Design for the Environment.

Prerequisite by Topic: None.
Topics:

1. Industrial Ecology
2. Natural Capital
3. Energy and Industrial Ecology
4. Life Cycle Assessment
5. Design for Environment
6. Private, Public, & Industrial Initiatives

Computer Usage:
There is no formal computer usage in the class; students use computers for word processing, graphics, presentations, and research.

Laboratory Projects:
Product disassembly project including life cycle assessment and design for environment components.

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	100

Learning Outcomes & Expected Knowledge Gain: Upon successful completion of this course a student should be able to:

1. Describe how natural ecological cycles can be used as models for industry, especially in terms of the flow of energy and materials. The description should include limitations of this analogy. The student should be able to describe the roles of producers, consumers, and scavengers, and provide an example of an industry analog for each.
2. Discuss how corporate disciplines (Marketing, Accounting, Engineering, Production, and Sales) might work together and what efforts each might undertake to affect a Design for the Environment (DFE). Briefly

explain how DFE is a systems-oriented approach for designing more ecologically and economically sustainable product systems.

3. Define the concept of "unintended consequences", provide several examples, and briefly discuss strategies that could be used to prevent the consequences.
4. Explain the role of an Environmental Management System (EMS) in the field of Industrial Ecology. Address the benefits (internal and external) of having an EMS and the barriers that could get in the way of the EMS.
5. Describe environmental management accounting (EMA) and the major differences between EMA and traditional accounting. Explain the benefits of adopting an EMA approach.
6. Describe how market-based elements can be integrated into regulatory programs. Provide at least one example and explain how policies need to be adapted to social, economic, and political issues.
7. Define an ecological footprint assessment, including the advantages and disadvantages of conducting such an assessment from the perspective of Industrial Ecology.
8. Describe the links between the U.S. energy policy and the U.S. response to global warming. Discuss the most important issues the U.S. has to deal with while addressing these issues.
9. Explain the purpose of a life-cycle assessment (LCA), including the differences between a comprehensive and a streamlined assessment.

Assessment Measures:
Graded critical reading assignments; individual and team projects (including team assessment); final exam; and course participation.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	-
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	X
e	Identify, formulate, and solve engineering problems	-
f	Understand professional and ethical responsibility	X
g	Communicate effectively	X
h	Broad education	X
i	Recognize need for life-long learning	X
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	X

Prepared by: P.R. Anderson **Date:** May 2008

MMAE 201 – Mechanics of Solids I (Required)
Fall 2007

2006-08 Catalog Data: Free body diagrams. Equilibrium of a particle, a system of particles, and 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 123. Corequisite: MATH 152. (3-0-3)

Textbooks: R. C. Hibbeler, *Engineering Mechanics: Statics & Dynamics*, 9th Edition, Prentice Hall

References: None

Coordinators: Benxin Wu, Assistant Professor, MMAE Department

Objectives:

1. Become familiar with the basic steps in solving an engineering problem relating to equilibrium. To be able to reduce a problem from its physical description to a model (particle or a rigid body) to which equations of equilibrium can be applied. The drawing of a free body diagrams is considered essential to this procedure.
2. To be able to use equations of equilibrium relating to a particle in two and three dimensional spaces.
3. To be able to use equations of equilibrium relating to a rigid body in two and three dimensional spaces.
4. To be able to reduce system of forces acting on a rigid body to s simplest form.
5. To be able to find the resultants of an internal forces.
6. To be able to compute coordinates of a center of gravity.
7. To be able to compute moment of inertia of an area.

Prerequisites by Topics:

Elementary mechanics
Elementary calculus

Topics:

1. Introduction (1 class)
2. Free body diagrams (3 classes)
3. Distributed and concentrated forces (2 classes)
3. Equilibrium, particle and rigid body equilibrium (7 classes)
4. Equilibrium in 3-diemnsional systems (4 classes)
5. Properties of cross sections, centroid, area, moment of inertia (7 classes)
6. Friction problems (2 classes)
7. Internal forces in bars, axial forces (2 classes)
8. Analysis of beams, reactions, internal forces (6 classes)
9. Analysis of shafts, reactions and internal forces (4 classes)
10. Axially-loaded members, stress and strain definitions, stress-strain relation (7 classes)

Each class is 50 minutes

Computer usage: None

Laboratory Projects: None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	100
Introductory Civil Engineering	
Professional Level Civil Engineering	

* Includes Design Experience

Learning Outcome & Expected Knowledge Gain:

Upon completion of this course, students will be able to construct free body diagrams, correctly identify reactions, apply equations of equilibrium and solve for all unknown forces. In additions, students will learn how to find cross sectional properties, apply appropriate friction force equations and analyze simple bar, beam and shaft systems for internal forces.

Assessment Methods:

Students' performance in quizzes and exams

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	X
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: MMAE Department Staff **Date:** January 2008

MMAE 202 – Mechanics of Solids II (Required)
Spring 2008

2006-2008 Catalog Data: Stress and strain relations, mechanical properties. Axially loaded members. Torsion of circular shafts. Plane stress and strain, Mohrs circle, stress transformation. Elementary bending theory, normal and shear stresses in beams, beam deflection. Combined loading. Prerequisites: MMAE 201. Corequisite: MMAE 271. (3-0-3)

Textbooks: R. C. Hibbeler, *Mechanics of Materials*, 1999, 4th edition, Prentice Hall

Coordinators: MMAE Department Faculty

Objectives:

This course is intended to provide a basic understanding of the relationship between loadings, stresses, strains and deflections. Students learn to properly select and size structures and machine elements.

Prerequisites by Topics:
Statics
Calculus and some background in differential equations

Topics:

1. Axially loaded members (2 classes)
2. Hooke's law (3 classes)
3. Thin-walled pressure vessels (5 classes)
4. Torsion of circular shafts (3 classes)
5. Shear and bending moment diagrams (3 classes)
6. Bending stresses in beams (4 classes)
7. Shear stresses in beams (3 classes)
8. Deflection of beans (5 classes)
9. Statically indeterminate beams, shafts and bars (4 classes)
10. Plane stress, plane strain, Mohr's circle (6 classes)
11. Compound stresses (2 classes)
12. Yield criteria and application to design (4 classes)
13. Combined axial, bending shear and/or torsional loading (3 classes)

Each class is 50 minutes

Computer Usage:
None

Laboratory Projects:

None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	100
Introductory Civil Engineering	
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain:

Students will lean the topics in strength of materials. They will be able to draw shear and bending moment diagrams, recognize stresses and analyze beams and machine elements for internal forces and stresses. In addition, students will be able to compute deformations including beam deflection.

Assessment Methods:

Students' performance in homework problems and examinations.

Relationship of Course to Program Outcomes:

Outcome	Description	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	X
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: MMAE Department Staff **Date:** January 2008

MMAE 305 – Dynamics (Required)
Spring 2008

2006-08 Catalog Data: Kinematics of particles. Kinetics of particles. Newton's law of motion, energy; momentum. Systems of particles. Kinematics of rigid bodies. Plane motion of rigid bodies: forces and accelerations, energy, momentum. Prerequisites: MMAE 201. Corequisite: MATH 252. (3-0-3)

Textbooks: R.C. Hibbeler, Engineering Mechanics: Dynamics, 8th Ed

References: None

Coordinator: Kevin Maede, MMAE Department

Objectives:

This course is designed to provide the necessary background in kinematics, kinetics, energy principles and momentum principles needed in subsequent engineering courses. It also helps students develop the ability to visualize physical configurations and construct a meaningful mathematical model.

Prerequisites by Topics:

Statics
Mathematics through calculus and some background in differential equations

Topics:

1. Introduction (1 class)
2. Kinematics of a particle (3 classes)
3. Kinetics of a particle (4 classes)
4. Work and Energy (3 classes)
5. Impulse and Momentum (3 classes)
6. Planar kinematics of a Rigid Body (3 classes)
7. Planar kinetics of a rigid Body (3 classes)
8. Work and Energy relations of a R.B. (4 classes)
9. Linear and Angular Momentum of a R.B. (3 classes)
10. Vibrations (3 classes)

Each class is 75 minutes

Computer usage: None

Laboratory Projects: None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	
Humanities/Social Sciences	
Basic Engineering	100
Introductory Civil Engineering	
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain:

Students will learn the necessary background in kinematics, kinetics, energy principles and momentum principles. They will develop the ability to recognize and visualize physical configurations and construct a meaningful model for use in engineering analysis.

Assessment Methods:

Students' performance in quizzes and examinations.

Relationship of Course to ABET Outcomes:

Outcome	Program Outcome	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	X
c	Design system, component, or process to meet needs	X
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: MMAE Department Staff **Date:** January 2008

MATH 151 – Calculus I (Required)
Fall 2007

2006-2008 Catalog Data: Analytic geometry. Functions and their graphs. Limits and continuity. Derivatives of algebraic, trigonometric functions. Applications of the derivative. Introduction to integrals and their applications. Prerequisite: Placement. (4-1-5) (C)

Textbook: Stewart, Calculus, 4th Ed., Brooks/Cole

References: MAPLE Software

Coordinator: Faculty from Department of Applied Mathematics

Objectives:

- Ability to calculate limits of simple functions, particularly rational functions.
- Ability to state the definition of derivative, and to use the definition to calculate derivatives of simple functions.
- Knowledge of the formulas for the derivatives of x^r, (r rational) and the trigonometric functions, and the formulas for the derivatives of sums, products, quotients and composites of functions.
- Ability to use differentiation formulas to calculate the derivatives of combinations of rational and trigonometric functions.
- Ability to calculate derivatives of functions defined implicitly.
- Ability to reverse the differentiation process to find antiderivatives.
- Ability to use differential calculus to solve related rate and optimization problems, and to sketch graphs of functions.
- Ability to express the definite integral as the limit of a sum.
- Ability to apply the fundamental theorem of calculus to evaluate definite integrals.
- Ability to use integral calculus to solve problems involving e.g., areas, volumes, work, fluid pressure, etc.

Prerequisites by Topic: Must pass departmental Pre-calculus exam

Topics:

Functions and Models
Tangents and Velocity
Limits
Limit Rules
Continuity
Tangents, Rates
Derivatives
Differentiation Formulas
Rates of Change
Derivatives of Trig Functions
Chain rule
Implicit Differentiation
Derivatives of Inv. Trig. Fcns
Higher Derivatives
Related Rates
Linear Approx./Differentials
Maxima and Minima
Mean Value Theorem
Derivatives and Graphs
Optimization
Newton's Method
Antiderivatives
Areas and Distances
The Definite Integral
Fundamental Theorem
Indefinite Integrals
Substitution
Applications of Integration

Schedule**:** Four 50 minute lectures per week , One 75 minute MAPLE computer lab per week

Computer usage: MAPLE

Laboratory Project: N/A

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	100
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain:

1. Students will understand and be able to apply the concept of limit, continuity, differentiation, and integration (all single variable).
2. Students will learn to distinguish between definitions and theorems and will be able to use them appropriately.
3. Students will know and be able to apply laws/formulas to evaluate limits, derivatives, and (some) integrals.
4. Students will interpret the basic calculus concepts from both algebraic and geometric viewpoints.
5. Students will be able to use calculus in basic applications, including related rate problems, linear approximation, curve sketching, optimization, Newton's method, volume and area.
6. Students will use Maple for visualization and calculating exact and approximate solutions to problems.
7. Students will do a writing project.

Assessment Methods:

Students' performance in quizzes and examinations.

Relationship of Course to ABET Outcomes:

Outcome	Program Outcome	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: Michael Pelsmajer and Dave Maslanka **Date:** October 2007

MATH 152 – Calculus II (Required)
Spring 2008

2006-2008 Catalog Data: 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) I

Textbook: Stewart, Calculus, 4th Ed., Brooks/Cole

References: MAPLE Software

Coordinator: Faculty from Department of Applied Mathematics

Objectives:

- Ability to state the definition of e, the definitions of the exponential and logarithm functions, and the formulas for their derivatives.
- Ability to calculate antiderivatives using techniques such as integration by parts, partial fractions, and trigonometric substitution.
- Ability to use L'Hopital's rule to calculate derivatives.
- Ability to solve simple first order differential equations, and to apply these techniques to solve problems involving growth and decay.
- Ability to utilize parametric equations to study curves.
- Ability to use polar coordinates in graphing, finding areas, etc.
- Ability to determine convergence properties of infinite series.
- Ability to find intervals of convergence of power series, and to find derivatives of integrals of power series.
- Ability to find Taylor Series representations of functions and intervals of convergence.
- Ability to do calculations and solve equations involving Complex Numbers.

Prerequisites by Topic: MATH 151 topics

Topics:

Transcendental Functions
Inverse Functions & Their Derivatives
The Natural Logarithm Function
General Logarithmic & Exponential Functions
Integrals Yielding the Inverse Trig Functions, Indeterminate Forms & L'Hopital's Rule

Techniques of Integration
Integration by Parts, Trigonometric Integrals
Trigonometric Substitution, Partial Fractions, Improper Integrals

Differential Equations
Modeling with Differential Equations, Direction Fields & Euler's Method
First Order Separable Equations, Exponential Growth & Decay
The Logistic Equation, First Order Linear Equations

Parametric Equations & Polar Coordinates
Curves Defined by Parametric Equations
Tangents, Areas & Arclength with Parametrized Curves
Graphing in Polar Coordinates
Tangents, Areas & Arclength in Polar Coordinates

Infinite Series
Limits of Sequences of Numbers
Infinite Series, the Integral Test Comparison Tests
Comparison Tests, Alternating Series
Absolute Convergence, Ratio & Root Tests
Power Series & Applications, Taylor & Maclaurin Series, Taylor Polynomials, and complex Numbers

Computer usage: MAPLE

Laboratory Project: N/A

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	100
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain:

1. The student should acquire a sound understanding of the common transcendental functions.
2. The student should become proficient in the basic techniques of integration for the evaluation of definite, indefinite, and improper integrals.
3. The student should learn to solve first-order separable and linear differential equations with initial values.
4. The student should learn parametric curves and polar curves and their calculus.
5. The student should learn infinite series, power series and Taylor polynomial and series, and their convergence properties.
6. The student should be able to utilize the computer algebra system Maple to explore mathematical concepts, illustrate them graphically, and solve problems numerically or symbolically.
7. The student should become a more effective communicator by developing his/her technical writing skills in the preparation of several Maple lab reports.

Assessment Methods: Students' performance in quizzes and examinations.

Relationship of Course to ABET Outcomes:

Outcome	Program Outcome	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: Xiaofan Li and Dave Maslanka **Date:** October 2007

MATH 251 – Multivariate and Vector Analysis (Required)
Fall 2007

2006-2008 Catalog Data: Analytic geometry in three-dimensional space. Partial derivatives. Multiple integrals. Vector analysis. Applications. Prerequisite: MATH 152 or MATH 162. (4-0-4)

Textbook: Stewart, *Calculus*, 5th ed., Brooks/Cole

References: None

Coordinator: Faculty from Department of Applied Mathematics

Objectives:

- Ability to work with three-dimensional space and the I, j, k basis vectors and to solve problems in three dimensional geometry by utilizing vectors and vector-algebraic concepts.
- Ability to locate points in 3-space using the Cartesian, cylindrical and spherical coordinate systems.
- Ability to describe the path, velocity, and acceleration of a moving body in terms of vector-valued functions and to apply the derivative and integral operators on space curves in order to characterize the length, curvature and torsion of a smooth curve.
- Ability to extend the notion of differentiability is extended to functions of several variables, and how partial derivative and the directional derivative can be interpreted as rates of change.
- Ability to utilize partial differentiation in solving optimization problems. Ability to solve constrained maxima/minima problems using the method of Lagrange multipliers.
- Ability to extend the definition of the definite integral from one-dimensional to an n-dimensional space.
- Ability to describe double and triple integrals in Cartesian and curvilinear coordinates. Ability to apply double and triple integrals to find the mass, center of mass, moments of inertia, and surface area of a solid.
- Ability to work with vector-valued functions of several variables and to compute line and surface integrals.
- Ability to utilize the theorems of Green, Gauss, and Stokes, in solving classical physical problems.

Prerequisites by Topic: MATH 152 topics

Topics:

Vectors and Analytic Geometry in Space

Vectors in the Plane
Cartesian (Rectangular) Coordinates and Vectors in Space, Dot Products; Cross Products
Lines and Planes in Space, Cylinders and Quadric Surfaces; Cylindrical and Spherical Coordinates
Vector-Valued Functions and Motion in Space, Vector-Valued Functions and Space Curves
Arc Length and the Unit Tangent Vector T

Multivariate functions and Partial Derivatives

Functions of Several Variables, Limits and Continuity
Partial Derivatives, Differentiability, Linearization, and Differentials, The Chain Rule
Partial Derivatives, Gradient Vectors, and Tangent Planes
Directional Derivatives, Gradient Vectors, and Tangent Planes
Extreme Values and Saddle Points, Lagrange Multipliers, Taylor's Formula

Multiple Integrals

Double Integrals; Areas, Moments, and Centers of Mass, Double Integrals in Polar Form
Triple Integrals in Rectangular Coordinates, Masses and Moments in Three Dimensions
Triple Integrals in Cylindrical and Spherical Coordinates; Substitutions in Multiple Integrals

Integration in Vector Field

Line Integrals; Vector Fields, Work, Circulation, and Flux
Path Independence, Potential Functions, and Conservative Fields, Green's Theorem in the Plane
Integrals, Parametrized Surfaces, Stoke's Theorem, Divergence Theorem and a Unified Theory

Computer usage: None

Laboratory Project: N/A

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	100
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain:

1. Students will learn to solve problems in three-dimensional space by utilizing vectors and vector-algebraic concepts. This includes representation in Cartesian, cylindrical and spherical coordinates.
2. Students will be able to describe the path, velocity and acceleration of a moving body in terms of vector-valued functions, and to apply the derivative and integral operators on space curves in order to characterize the length, curvature and torsion of a smooth curve.
3. Students will learn to extend the notion of continuity and differentiability to functions of several variables, and be able to interpret partial and directional derivatives as rates of change.
4. Students will be able to use partial differentiation to solve optimization problems. This includes being able to solve constrained optimization problems via Lagrange multipliers.
5. Students will learn to extend the notion of a definite integral from a one-dimensional to an n-dimensional space, and be able to describe and evaluate double and triple integrals in Cartesian and curvilinear coordinates.
6. Students will be able to work with vector-valued functions of several variables (i.e., vector fields) and be able to compute line and surface integrals.
7. Students will be able to use the theorems of Green, Stokes, and Gauss to solve classical physics problems.

Assessment Methods: Students' performance in quizzes and examinations.

Relationship of Course to ABET Outcomes:

Outcome	Program Outcome	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: Andre Adler and Greg Fasshauer **Date:** October 2007

MATH 252 – Introduction to Differential Equations (Required)
Spring 2008

2006-2008 Catalog Data: 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)

Textbook: Zill, Differential Equations, 7th Ed., Thomson Learning

References: None

Coordinator: Faculty from Department of Applied Mathematics

Objectives:

- Ability to classify and solve first order DE's and IVP's of various types: especially separable, exact, linear, and others reducible to them (homogeneous, Bernoulli, etc.)
- Ability to solve higher order linear DE's and IVP's having constant coefficients, via the methods of undetermined coefficients and variation of parameters.
- Ability to obtain power series solutions (about regular points) of second order linear DE'S having variable coefficients.
- Ability to manipulate Laplace transforms and to solve linear IVP's using them.
- Ability to solve systems of first order linear DE's.
- Ability to solve a variety of physical problems modeled by first order and linear second order IVP's.

Prerequisites by Topic: MATH 251 topics

Topics:

Linear Equation of Higher Order
Initial – Value and Boundary-Value Problems; Linear Dependence and Linear Independence
Solutions of Linear Equations; Homogeneous Linear Equations with Constant Coefficients
Undetermined Coefficients; Variation of Parameters

Applications
Free Undamped Motion; Free Damped Motion; Driven Motion

Power Series Solution
Review of Power Series; Power Series Solutions; Solutions About Ordinary Points

Laplace Transforms
Laplace Transform; Inverse Transforms
Translations Theorems & Derivatives of a Transform;
Transforms of Derivatives, Integrals, and Periodic Functions
Applications; Systems of Linear Equations

Introduction to Matrices
Basic Definitions and Theory
Gaussian and Gauss-Jordan; Elimination Method; The Eigenvalue Problem

Systems of Linear First-Order Differential Equations
Preliminary Theory; Homogeneous Linear Systems; Distinct Real Eigenvalues; Repeated Eigenvalues
Complex Eigenvalues; Variation of Parameters

Schedule**:** Three 75-minute lectures per week

Computer usage: None

Laboratory Project: N/A

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	100
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain:

1. Students will be able to classify and solve first-order DEs and IVPs of various types: especially separable, exact, linear, and others reducible to them.
2. Students will be able to solver higher-order linear DEs and IVPs having constant coefficients via the method of undetermined coefficients and variation of parameter.
3. Students will be able to obtain power series solutions (about regular points) of second-order linear DEs having variable coefficients.
4. Students will be able to manipulate Laplace transforms and to solve linear IVPs using them.
5. Students will be able to solve systems of first-order linear DEs.
6. Students will be able to solve a variety of physical problems modeled by first-order and linear second-order IVPs.

Assessment Methods: Students' performance in quizzes and examinations.

Relationship of Course to ABET Outcomes:

Outcome	Program Outcome	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: Andre Adler and Warren Edelstein **Date:** October 2007

PHYS 123 – Mechanics (Required)
Spring 2008

2006-2008 Catalog Data: 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. Corequisite: MATH 149, MATH 151, or MATH 161 (3-3-4)

Textbook: "Physics for Engineers and Scientists," Third Edition, Ohanion & Markert
Physics Division General Physics Laboratory Manual

References: None

Coordinator: H. A. Rubin, Professor of Physics, Department of Biological, Chemical and Physical Sciences

Objectives:
The purpose of the laboratory is to familiarize the student with the physical phenomena being studied, and to teach techniques in experimental observation and data analysis.

Prerequisites by Topic:
- Calculus
- Analytic geometry, functions, limits, derivatives

Topics:

1. Vectors and motion in one, two, and three dimensions
2. Newton's Laws
3. Particle dynamics
4. Work and energy.
5. Conservation laws and collisions
6. Rotational kinematics and dynamics
7. Angular momentum and equilibrium of rigid bodies
8. Simple harmonic motion
9. Gravitation

Schedule**:** Meets in either two 75-minute or three 50-minute lecture sessions per week. The laboratory meets for 3-hour sessions on alternate weeks, alternating with recitations conducted by the class lecturer.

Computer usage: None

Laboratory Project:
Physical phenomena being studied in the lab. Techniques in experimental observation and data analysis are covered in the laboratory.

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	100
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	

Learning Objectives and Expected Knowledge Gain:

This course contributes 1/8 of a year of basic science and a laboratory experience. Upon completion of this course students will have proficiency in science and proficiency in collecting and analyzing data.

Assessment Methods: Students' performance in quizzes and examinations.

Relationship of Course to ABET Outcomes:

Outcome	Program Outcome	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: H. A. Rubin **Date:** April 2008

PHYS 221 – Electromagnetism and Optics (Required)
Fall 2001

Oscillations and waves. Charge, electric field, Gauss's 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. Prerequisite: PHYS 123; Corequisite: MATH 152 or MATH 162 (3-3-4)

Textbook:

"Physics for Engineers and Scientists," Third Edition, Ohanion & Markert
Physics Division General Physics Laboratory Manual

References: None

Coordinator: H. A. Rubin, Professor of Physics, Department of Biological, Chemical and Physical Sciences

Objectives:

The purpose of the laboratory is to familiarize the student with the physical phenomena being studied, and to teach techniques in experimental observation and data analysis.

Prerequisites by Topic:

- Calculus
- Mechanics
- Integration, numerical series, power series expansion

Topics:

1. Oscillations and waves
2. Charge, electric field, Gauss's Law and potential
3. Capacitance, resistance, simple a/c and d/c circuits
4. Magnetic fields, Ampere's Law, Faraday's Law, induction
5. Maxwell's Equations, electromagnetic waves, and light
6. Reflection and refraction, lenses

Schedule**:** Meets in either two 75-minute or three 50-minute lecture sessions per week. The laboratory meets for 3-hour sessions on alternate weeks, alternating with recitations conducted by the class lecturer.

Computer usage: None

Laboratory Project: Same as topics covered in the course. Physical phenomena being studied in the lab. Techniques in experimental observation and data analysis are covered in the laboratory.

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	100
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	

Learning Objectives and Expected Knowledge Gain:

This course contributes 1/8 of a year of basic science and a laboratory experience. Upon completion of this course students will have proficiency in science and proficiency in collecting and analyzing data.

Assessment Methods: Students' performance in quizzes and examinations.

Relationship of Course to ABET Outcomes:

Outcome	Program Outcome	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: H.A. Rubin **Date:** April 2008

PHYS 224 – General Physics III (Required)
Spring 2008

Temperature, first and second laws of thermodynamics, kinetic theory and entropy. Interference and diffraction, gratings and spectra. Special theory of relativity. Light and quantum physics, wave nature of matter, structure of the hydrogen atom. Atomic physics, solid-state physics, nuclear physics, and elementary particles. Prerequisite: PHYS; 221; Corequisite: MATH 251 or MATH 252 (3-0-3)

Textbook: "Physics for Engineers and Scientists," Third Edition, Ohanion & Markert
Physics Division General Physics Laboratory Manual

References: None

Coordinator: H. A. Rubin, Professor of Physics, Department of Biological, Chemical and Physical Sciences

Objectives:

To develop knowledge needed in principles of thermodynamics, energy and entropy; light and quantum physics and principles of nuclear, atomic and solid-state physics.

Prerequisites by Topic:

- Analytical geometry, partial derivatives, multiple integrands
- Electromagnetism
- Optics

Topics:

1. Temperature
2. First and second laws of thermodynamics
3. Kinetic theory
4. Entropy
5. Interference and diffraction, gratings and spectra
6. Special theory of relativity
7. Light and quantum physics, wave nature of matter, structure of the hydrogen atom
8. Atomic physics, solid-state physics, nuclear physics, and elementary particles

Schedule**:** Meets in either two 75-minute or three 50-minute lecture sessions per week.

Computer usage:

None

Laboratory Project:

None

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	100
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	

Learning Objectives and Expected Knowledge Gain:

This course contributes 3/32 of a year of basic science. Upon completion of this course students will have proficiency in science.

Assessment Methods: Students' performance in quizzes and examinations.

Relationship of Course to ABET Outcomes:

Outcome	Program Outcome	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	
k	Use techniques, skills, and tools in engineering practice	X
l	Major design experience	

Prepared by: H. A. Rubin **Date:** April 2008

CHEM 124 Principles of Chemistry I (Required)
Fall 2007

2006-08 Catalog Data: Foundations of Chemistry; atoms and molecules, stoichiometry of chemical reactions, thermochemistry, properties of gases, states of matter, chemical solutions, and kinetics,. Molecular basis of chemical reactivity; atomic structure, periodicity, chemical bonding. (3-3-4)(C)

Textbook: Chemistry: The Molecular Nature of Matter and Changes, Martin S. Silberberg, McGraw-Hill, Inc. 5th Edition, 2008.

Principles of Chemistry Laboratory Manual, Illinois Institute of Technology; Supplies: Scientific calculator, Safety Glasses or goggles for the Laboratory.

References: None

Coordinator: Rong Wang and Peter Johnson, Department of Biological, Chemical and Physical Sciences

Objectives:

Emphasis is placed on developing and understanding important principles and concepts of the atomic world and on utilizing this understanding to solve specific problems based on those principles using well-organized approaches. Memorizing equations and descriptive facts are de-emphasized. Students gain a fundamental knowledge of molecular structure and how it relates to macroscopic properties of materials used in engineering science and medicine.

Prerequisites by Topic:

Basic and elementary chemistry

Topics:

1. CHAP1 Tools of Chemistry
2. CHAP2 Atoms Molecules Ions
3. CHAP3 Chemical Reactions, Chemical Equations, Solutions
4. CHAP4 Chemical Reactions, Mass Relationships
5. The Gaseous State
6. CHAP6, Thermochemistry
7. CHAP7, Quantum Theory
8. CHAP8, Periodic Relationships
9. CHAP9 Chemical Bonding 1
10. CHAP10 Chemical Bonding 2
11. CHAP13 Chemical Kinetics: Topics
12. CHAP18 Chemistry in the Atmosphere
13. Chemistry in Context, Introduction
14. Chemistry in Context, Projects

Computer usage: None

Laboratory Project:

1.Safety Instructions & Training 2.Separation by Paper chromatography 3. Estimation of Avogadro's Number 4. Titration: Analysis of Vinegar 5.Alcohol Abuse 6. Synthesis of Alum from an Aluminum Can 7.Gas Laws: Determination of 0 Kelvin 8. Analysis of an Aluminum-Zinc Alloy 9. Specific heat of metals 10.Enthalpy Change

in Chemical Reactions 11.Emmission Spectra(Experiment Bunsen) 12. Study Assignment: Writing Lewis Structures.

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	100
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	

Learning Objectives and Expected Knowledge Gain:

Students will learn the basic chemistry principles and foundations needed at a college level course for engineering students; they will learn the lab skills needed for chemistry experiments. Students will have proficiency in a basic science, development of laboratory/investigative skills and strengthening of problem solving ability.

Assessment Methods: Students' performance in quizzes and examinations.

Relationship of Course to ABET Outcomes:

Outcome	Program Outcome	Status
a	Apply knowledge of math, engineering, science	X
b1	Design and conduct experiments	X
b2	Analyze and interpret data	
c	Design system, component, or process to meet needs	
d	Function on multi-disciplinary teams	
e	Identify, formulate, and solve engineering problems	X
f	Understand professional and ethical responsibility	
g	Communicate effectively	
h	Broad education	
i	Recognize need for life-long learning	
j	Knowledge of contemporary issues	
k	Use techniques, skills, and tools in engineering practice	
l	Major design experience	

Prepared by: Rong Wang **Date:** April 2008

CS105 – Introduction to Computer Programming I (Required)
Fall 2007

2006-08 Catalog Data: 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)

Textbook: Roberge/Bauer/Smith, *Engaged Learning for Programming in C++: A Laboratory Course,* Jones and Bartlett Publishers, 2nd Edition, ©2001, ISBN-0763714232

References: Deitel/Deitel, *C++ How To Program*, Prentice-Hall, Inc., 3rd Edition, ©2001, ISBN-01308957171

Coordinator: Matthew Bauer, Senior Lecturer, Department of Computer Science

Objectives:
Students should be able to:

- Analyze and explain the behavior of simple programs involving the following fundamental programming constructs: assignment, I/O (including file I/O), selection, iteration, functions
- Write a program that uses each of the following fundamental programming constructs: assignment, I/O (including file I/O), selection, iteration, functions
- Break a problem into logical pieces that can be solved (programmed) independently.
- Develop, and analyze, algorithms for solving simple problems.
- Use a suitable programming language, and development environment, to implement, test, and debug algorithms for solving simple problems.
- Write programs that use each of the following data structures (and describe how they are represented in memory): strings, arrays, and class libraries including strings and vectors

Prerequisite by Topic: N/A

Topics:

Major Topics Covered in Course

1. Development Environment, C++ Program Elements	3 hours
2. Data Types, Expressions, Basic I/O, Data Type Conversion, Library Functions, Strings (introduction)	3 hours
3. Selection	6 hours
4. Stream File I/O, Output Manipulators	4 hours
5. Iteration	8 hours
6. Functions (scope, pass by reference, overloading)	3 hours
7. Arrays, Vector Class	9 hours
8. Project	5 hours
Quiz #1, Midterm Exam, Quiz #2	4 hours
Final Exam	-
	45 hours

Computer Usage:
See course topics

Laboratory Projects:

- 9 labs (1-2 labs each week, each lab contains multiple programming assignments, some with shells, and analysis work)

    - Programming using a Development Environment; C++ Program Elements I; C++ Program Elements II; Selection; File I/O and Streams; Iteration I; Iteration II; Functions I; Arrays and Using the Vector Class
- 1 procedural programming project (individual, 3 weeks, requiring at least 5 functions and use of class libraries, design and implementation)

Estimated CSAB Category Content in Credit Hours:

	CORE	ADVANCED		CORE	ADVANCED
Data Structures	.3		Computer Organization and Architecture	0	
Algorithms	.3		Concepts of Programming Languages	1	
Software Design	.3				

Contribution to Meeting Curriculum Areas

Curriculum Area	Percentage
Basic Science & Math	100
Humanities/Social Sciences	
Basic Engineering	
Introductory Civil Engineering	
Professional Level Civil Engineering	

Learning Outcomes & Expected Knowledge Gain:

Social and Ethical Issues – Please list the topics that address the social and ethical implications of computing covered in all course sections. Estimate the class time spent on each topic. In what ways are the students in this course graded on their understanding of these topics (e.g., test questions, essays, oral presentations, and so forth)?

- Legitimate Code Re-Use, 1 hour, procedural programming project

Theoretical Foundations – Please list the types of theoretical material covered, and estimate the time devoted to such coverage in contact (lecture and lab) hours.

- none

Problem Analysis – Please describe the problem analysis experiences common to all course sections.
Most labs include problem solving with pseudo-code component, or debugging code segments, or determine program output.

Solution Design – Please describe the design experiences common to all course sections.

- 1 procedural programming project (individual, 3 weeks, requiring at least 5 functions and use of class libraries, design and implementation)

Other Course Information:

- **Additional Suggested Course Assignments**
    - 2 programming quizzes (50 minutes each in lab)
    - 1 midterm exam (100 minutes, around 70% programming)
    - 1 final exam (120 minutes, around 70% programming)
- Planned Course Enhancements
    - Change catalog description to include objected-oriented approach. (Summer 2002)
    - Change to “objects-first” approach. (Fall 2002)
    - Stress problem solving, algorithms, and design more than programming language. (Fall 2002)

Prepared by: CS Department Staff **Date:** August 2007

APPENDIX B – FACULTY RESUMES

(Limit 2 pages each)

Paul R. Anderson

Name and Academic Rank
Paul R. Anderson, Associate Professor of Environmental Engineering

Degrees
University of Washington, Seattle, WA; Ph.D. (1988) Civil Engineering.
University of California, San Diego, CA; M.S. (1977) Engineering Sciences.
Purdue University, West Lafayette, IN.; B.S. (1974) Engineering

Current Appointment
Associate Professor, Environmental Engineering

Other related experience
August, 1986 – August, 1987: Instructor, Pritzker Department of Environmental Engineering, Illinois Institute of Technology.
August, 1987 – June, 1992: Assistant Professor, Pritzker Department of Environmental Engineering, Illinois Institute of Technology.

March, 1977 – October, 1977: Process Specialist, Water and Wastewater, Dearborn Environmental Engineers, Lake Zurich, IL.
October, 1977 – February, 1979: Application Engineer, Reverse Osmosis Products, Culligan USA, Northbrook, IL.
February, 1979 – May, 1980: Environmental Engineer, Procon, Inc., Des Plaines, IL.
Current: Adjunct faculty in Environmental Management Program, Illinois Institute of Technology

Consulting, patents
"Process and material for adsorbing metal contaminants from water and wastewater", with M. Benjamin and M. Edwards; patent applied for May, 1988; pending.

State(s) in which registered
Registered Professional Engineer, State of Washington, Number 0613.

Principal publications of last five years

Lee, S.; Anderson, P.R.; Bunker, G.B.; Karanfil, C. (2004) "EXAFS study of Zn sorption mechanisms on montmorillonite" *Environ. Sci. Technol.* Vol. 38, No. 20:5426-5432..

Ayyildiz, O.; Anderson, P.R.; Peters, R.W. (2005) "Laboratory batch experiments of the combined effects of ultrasound and air stripping in removing CCl_4 and 1,1,1-TCA from water" *J. Hazardous Materials* Vol. B120:149-156.

Fan, H.J.; Anderson, P.R. (2005) "Copper and cadmium removal by Mn oxide-coated granular activated carbon" in *Separation and Purification Technology* Vol 45: 61–67.

Lee, S.; Anderson, P.R. (2005) "EXAFS study of Zn sorption mechanisms on hydrous ferric oxide over extended reaction time" *J. Colloid Interface Science* Vol. 286:82-89.

Ayyildiz, O.; Peters, R.W.; Anderson, P.R. (2007) "Sonolytic degradation of halogenated organic compounds in groundwater: Mass transfer effects" *Ultrasonics Sonochemistry* 14:163–172.

Parameswaran, P.; Anderson, P.R. (2007) “Biosolids mineralization in an anaerobic-aerobic combined reactor system” *Water Research* Vol. 41:2739-2747.

Professional societies
American Chemical Society; Association Environmental Engineering and Science Professors; American Water Works Association

Honors and awards
None

Institutional and professional service in the last five years
Institutional Services: Main Campus faculty council, University faculty council, undergraduate studies committee,
Professional Services: Journal reviewer for numerous journals (Environ. Sci. Technol.; ASCE; Water Research; J. Col. Int. Sci.). Proposal Reviewer for numerous agencies (USDA, USEPA, ILDNR). Society of Wetland Scientists Program Chair 2001 conference.

Research or Scholarly Activity Percentage:
Research (MS and PhD students): 30%
Proposal and Publication preparation: 30%

CAEE Program Percentage:
Teaching Courses (Environmental Eng): 30%
Other administrative duties (departmental, college, and university committees): 10%

David Arditi

Name & Rank

David Arditi, Professor

Degrees:
PhD, Specialty: Construction Management, Loughborough University, UK, 1973
MS, Specialty: Construction Engineering, Middle East Technical University, Turkey, 1968
MS, Specialty: Civil Engineering, Middle East Technical University, Turkey, 1967

Current Appointment:
Professor, Civil Architectural and Environmental Engineering

Other Related Experience:
Assistant Professor and Head of the Division of Construction Strategy, Middle East Technical University, Turkey, 1975-1981.

Consulting:
(1) Chugach McKinley, Arlington, VA.; (2) Primera Engineering, Chicago, IL.; (3) SACI Associates, Mount Prospect, IL. With Perkins and Will, Chicago, IL.; (4) Ministry of Public Works, Hong Kong.

Professional License or Certification:
None

Publications (Selected Papers in the Last 5 years):
A total of 32 refereed journal papers and 13 refereed conference papers in the five-year period 2003-2007. Journal papers published only in the two-year period 2006-2007 are presented below:

Algarni, A.M., Arditi, D. and Polat, G., Build-Operate-Transfer (BOT) in Infrastructure Projects in the United States, *Journal of Construction Engineering and Management*, ASCE, Vol. 133, No. 10, October 2007, pp: 728-735.

Arditi, D., Lee, D.-E. and Polat G., Fatal Accidents in Nighttime vs. Daytime Highway Construction Work Zones, *Journal of Safety Research*, Vol. 38, No. 4, 2007, pp: 399-405.

Gunhan, S. and Arditi, D., Budgeting Owner's Construction Contingency, *Journal of Construction Engineering and Management*, ASCE, Vol. 133, No. 7, July 2007, pp: 492-497.

Gunhan, S., Arditi, D. and Doyle, J., Avoiding Change Orders in Public School Construction, *Journal of Professional Issues in Engineering Education and Practice*, Vol. 133, No. 1, January 2007, pp: 67-73.

Polat, G., Arditi, D. and Mungen, U., A Simulation-Based Decision Support System for Economical Supply Chain Management of Rebar, *Journal of Construction Engineering and Management*, ASCE, Vol. 133, No. 1, January 2007, pp: 29-39.

Tokdemir, O.B., Arditi, D. and Balcik, C., ALISS: Advanced Linear Scheduling System, *Construction Management and Economics*, Vol. 24, No. 12, December 2006, pp: 1253-1267.

Polat, G., Arditi, D., Ballard, G. and Mungen, U., Economics of On-Site vs. Off-Site Fabrication of Rebar, *Construction Management and Economics*, Vo. 24, No. 11, November 2006, pp: 1185-1198.

Gunhan, S. and Arditi, D., Methods of Entry into the International Construction Market, *Yapi*, No. 299, October 2006, pp: 82-85 (in Turkish).

Dogan, S.Z., Arditi, D. and Gunaydin, H.M., Determining Attribute Weights in a CBR Model for Early Cost Prediction of Structural Systems, *Journal of Construction Engineering and Management*, ASCE, Vol. 132, No. 10, October 2006, pp: 1092-1098.

Poku, S. and Arditi, D., Construction Scheduling and Progress Control Using Geographical Information Systems, *Journal of Computing in Civil Engineering*, ASCE, Vol. 20, No. 5, September/October 2006, pp: 351-360.

Bolukbasi, M.M., Arditi, D. and Mohammadi, J., Optimum Rehabilitation Schedule of Steel Highway Bridges, *Structure and Infrastructure Engineering*, Vol. 2, No. 2, June 2006, pp: 141-152.

Kale, S. and Arditi, D., Diffusion of ISO 9000 Certification in the Precast Concrete Industry, *Construction Management and Economics*, Vol. 24, No. 5, May 2006, pp: 485-495.

Lee, D.-E. and Arditi, D., Automated Statistical Analysis in Stochastic Project Scheduling Simulation, *Journal of Construction Engineering and Management*, ASCE, Vol. 132, No. 3, March 2006, pp: 268-277.

Bolukbasi, M.M., Arditi, D. and Mohammadi, J., Deterioration of Reconstructed Bridge Decks, *Structure and Infrastructure Engineering*, Vol. 2, No. 1, March 2006, pp: 23-31.

Arditi, D. and Pattanakitchamroon, T., Selecting a Delay Analysis Method in Resolving Construction Claims, *International Journal of Project Management*, Vol. 24, No. 2, February 2006, pp: 145-155.

Lee, D.-E. and Arditi, D., Total Quality Performance of Design/Build Firms Using Quality Function Deployment, *Journal of Construction Engineering and Management*, ASCE, Vol. 132, No. 1, January 2006, pp: 49-57.

Professional Societies:

ASCE, American Society of Civil Engineers (Member of Construction Management Committee)
PMI, Project Management Institute
CMAA, Construction Management Association of America (Member of the Board, Chicago Chapter)
AACEI, Association for the Advancement of Cost Engineering International

Honors and Awards:

Scholarship Committee Chair of the CMAA Chicago Chapter that received award for outstanding student activities, 2006.

Outstanding Service Award, Department of Civil and Architectural Engineering, IIT, October 13, 2006.

Ranked fourth out of a total of 517 contributing authors to the ASCE *Journal of Construction Engrg and Management* in the period 1997-2002, per study published in June 2004 in this journal.

Institutional and Professional Service:

Director, Construction Engineering and Management Program in the CAEE Department
Member of the Editorial Board:

- *International Journal of Project Management*; Elsevier Science Ltd., Oxford, UK; 1988 to date.
- *Engineering Construction and Architectural Management*; Emerald, Bradford, UK; 1999 to date.
- *Construction Management and Economics*, Taylor & Francis Ltd., London, U.K; 2000 to date.
- *International Journal for Intelligent Buildings*, Earthscan, London, UK; 2007 to date.
- *Automation in Construction*, Elsevier, Oxford, UK, 2007 to date.
- *International Journal of Project Organization and Management*, InderScience Pub., 2007 to date.
- *Journal of Civil Engineering Science and Technology*, Petra Christian U., Indonesia; 1999 to date.

Research or Scholarly Activity Percentage:

Research (MS and PhD students): 20%
Proposal and Publication preparation: 30%

CAEE Program Percentage:

CE&M Program Director: 10%
Teaching Courses (CAE 473, CAE 574, CAE 575, CAE 577): 30%
Other administrative duties (departmental, college, and university committees): 10%

Jeffrey Budiman

Name & Rank
Jeffrey Budiman, Associate Professor

Degrees:
Ph.D., Civil Engineering, University of Colorado at Boulder, 1985
M.S., Civil Engineering, Illinois Institute of Technology, 1981
B.S., Civil Engineering, Bandung Institute of Technology, Indonesia, 1977

Current Appointment:
Associate Professor, Civil Architectural and Environmental Engineering

Other Related Experience:
1985-1986, Staff Civil Engineer, Converse Consultants, Inc. NJ.
1980-1981, Teaching Assistant, Illinois Institute of Technology
1977-1979, Site Civil Engineer, CV Garuda, responsible for the completion of several concrete bridges, construction of fishing pier, office buildings in Indonesia.
1976-1977, Teaching Assistant, Bandung Institute of Technology, Indonesia.

Consulting:
1986-present, independent consultant in geotechnical engineering
1985-1986, Geotechnical Engineer, Converse Consultants, Inc., Caldwell, New Jersey

Professional License or Certification:
Illinois

Publications:

Selected Papers (Last 5 years):

None

Professional Societies:
ASCE, ASTM, ISSMFE, SEM, EERI, Reviewer for ASTM,ASCE, TRB, and reviewer for NSF proposals

Honors and Awards:
None

Institutional and Professional Service:
Coordinator, Geotechnical and Geoenvironmental Engineering Programs.
Department Representative to college committee on promotion and tenure.
Member, Department Research and Laboratory Committee.
Faculty Advisor, IIT Student Chapter, American Society of Civil Engineers (1987-present
Member, Undergraduate Studies Committee (1987-present). Reviewing undergraduate applications for reinstatement, responding and/or resolving problems brought to the committee.
Department Liaison for Library

Research or Scholarly Activity Percentage:
Research (MS and PhD students): 20%
Proposal and Publication preparation: 5%

CAEE Program Percentage:
Geotechincal Engineering Program Director: 5%
Teaching Courses (CAE 221, CAE 323, CAE 566, IPRO): 50%
Other administrative duties (departmental, college, and university committees): 10%
Student Chapter ASCE: 10%

Eduardo DeSantiago

Name & Rank
Eduardo De Santiago, Senior Lecturer

Degrees:
PhD, Specialty: Structural Eng., Stanford University, 1996
MS, Specialty: Structural Eng., Stanford University, 1992
BS, Specialty: Structural Eng.., Illinois Institute of Technology, 1991

Current Appointment:
Senior Lecturer, Civil, Architectural and Environmental Engineering

Other Related Experience:
Software Engineer, Parametric Technology Corp., 1996-1997

Consulting, Patents, etc.:
Clarin Seating, 2004-2006
MacDonaugh Associates, 2002

Professional License or Certification:
Professional Engineer, Illinois

Publications:
Selected Papers (Lat 5 years):
Tyrus, J.M., Gosz, M., and De Santiago, E., "A Local Finite Element Implementation for Imposing Periodic Boundary Conditions on Composite Micromechanical Models", International Journal of Solids and Structures, Vol 44, 2007, pp 2972-2989.

Tyrus, J.M., Gosz, M., and De Santiago, E., "Micromechanical Modeling of Composites: A Local Approach to Imposing Periodic Boundary Conditions", 2006 ASME International Mechanical Engineering Congress and Exposition, November 2006, Chicago, IL.

Ravindranath, V., Gosz, M., De Santiago, E., Drummond, J., and Mostovoy, S., "Effect of Cyclic Loading and Environmental Aging on the Fracture Toughness of Dental Resin Composite", Journal of Biomedical Materials Research: Part B Applied Biomaterials, Vol 80B, Issue 1, 2006, pp 226-235.

De Santiago, E., Mohammadi, J., and Al-Baijat, H., "Analysis of Horizontally Curved Bridges Using Simple Finite Element Models", Practice Periodical on Structural Design and Construction, ASCE, Vol. 10, No.1, pp. 18-21, February, 2005.

Gosz, M., De Santiago, E., Ravindranath, V., and Drummond, J., "Effect of Cyclic Loading and Environmental Aging on the Fracture Toughness of Restorative Dental Restorative Dental Composites", Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Washington, D.C., November, 2003.

Professional Societies:
Affiliate Member, Precast Prestressed Concrete Institute (1999-present).
Member, American Society of Civil Engineers (1999-2006).
Member, Structural Engineers Association of Illinois (1999-2006)
Member, American Association of Engineering Educators (1998-2001)

Honors and Awards:
Professor of the Year, ASCE IIT student chapter (2008)

Institutional and Professional Service:
Vice-Chair, Emerging Computing Technology Committee, ASCE, 2003-2006.

Research or Scholarly Activity Percentage:
Research (MS and PhD students), 20%
Proposal and Publication preparation, 10%

CAEE Program Percentage:
Teaching Courses: CAE 307 (Reinf. Conc. Design), CAE 503 (Advanced Structural Theory), CAE 530 (Advanced Finite Element), Capstone IPRO: 60%
Other committee and university duties (Open House presentations, ABET assessment, Minority Retention, etc.): 10%

Zongzhi Li

Name & Rank
Zongzhi Li, Assistant Professor

Degrees:
Ph.D., Specialty: Transportation and Infrastructural Systems Engineering, Purdue University, 2003
M.S.I.E, Specialty: Operations Research, Purdue University, 2002
M.S.C.E., Specialty: Transportation and Infrastructural Systems Engineering, Purdue University, 2000

Current Appointment:
Assistant Professor, Department of Civil, Architectural and Environmental Engineering

Other Related Experience:
Researcher, University of Wisconsin, Madison, Wisconsin, 2003-2004
Research Assistant, Purdue University, West Lafayette, Indiana, 1998-2003
Highway Planner and Engineer, Xinjiang Depart. Of Transportation, Urumqi, Xinjiang, China, 1992-1997

Consulting, Patents, etc.:
American Society of Civil Engineers, 2006, 2007, 2008
Federal Highway Administration, 2006- present
Galvin Mobility Initiative, 2007- present
Illinois Center for Transportation/Illinois Department of Transportation, 2006- present
Joint Transportation Research Program/Purdue University, 2007- present
Midwestern Regional University Transportation Center, University of Wisconsin, 2006- present

Professional License or Certification:
EI, Wisconsin

Publications:

Book Chapters:

Li, Z., S. Labi, K.C. Sinha. 2002. Highway Asset Management. *Civil Engineering Handbook, 2nd Edition*, 66-1 to 66-34. CRC Press LLC, Boca Raton, FL.

K.C. Sinha, Z. Li. 2000. Intelligent Transportation Systems. *McGraw-Hill Encyclopedia of Science and Technology, 9th Edition*, 222-226. McGraw-Hill, New York, NY.

Selected Papers (Lat 5 years):

Rodriguez, M.M., S. Labi, Z. Li. 2006. Enhanced Bridge Replacement Cost Models for Indiana's Bridge Management System. *Transportation Research Record* **1958**, 13-23.

Li, Z., M. Puyan. 2006. A Stochastic Optimization Model for Highway Project Selection and Programming under Budget Uncertainty. *Proceedings of the 9th International Conference on Applications of Advanced Technology in Transportation*, 74-80.

Li, Z., K.C. Sinha. 2006. Application of Shackle's Model for Highway Project Evaluation under Uncertainty. *Proceedings of the 9th International Conference on Applications of Advanced Technology in Transportation*, 67-73.

Li, Z., K.C. Sinha. 2004. A Methodology for Multicriteria Decision Making in Highway Asset Management. *Transportation Research Record* **1885**, 79-87.

Li, Z., K.C. Sinha, S. Labi. 2004. A Disaggregated Approach for the Computation of Network-Level Highway User Cost. *The 2nd European Pavement and Asset Management Conf*. Berlin, Germany.

Professional Societies:
Member, American Statistics Association, Since 2006Member, American Railway Engineering and Maintenance-of-Way Association (AREMA), Since 2005Member, ASCE, Since 2004
Member, American Society of Civil Engineers, Since 2004
Member, Institute for Operations Research and the Management Sciences, Since 2000
Member, Institute of Transportation Engineers, Since 1998

Honors and Awards:
Co-Chair, Program Committee, the 42nd Annual Institute of Transportation Engineers Midwestern District Conference, Chicago, IL, 2008
Member, Scientific Committee, the 10th International Conference on Applications of Advance Technology in Transportation, Athens, Greece, 2008
Member and Secretary, Transportation Asset Management Committee, Transportation Research Board of the U.S. National Academies, Since 2007
IIT Representative, U.S. DOT Region 5 University Transportation Center (Serving the Great Lakes Area, Based at Purdue University), Since 2007
Founding Member, IIT Center for Work Zone Safety, 2006
Member, AREMA National Committee on Education and Training, Since 2005
Charley V. Wootan Award for the Best Master's Thesis in Transportation Policy and Planning Research in 2000, U.S. Council of University Transportation Centers, 2001
IRF Fellowship, International Road Federation, 1998

Institutional and Professional Service:
Technical paper reviewer for the following journals: IEEE Intelligent Transportation Systems Society, TRB Journal of Transportation Research Record, ASCE Journal of Transportation Engineering, ASCE Journal of Infrastructure Systems, Journal of Computer-Aided Civil and Infrastructure Engineering, Journal of Automation in Construction

Research or Scholarly Activity Percentage:
Research (MS and PhD students), 40%
Proposal and Publication preparation, 20%

CAEE Program Percentage:
Teaching Courses: CAE 419 (Introduction to Transportation Engineering), CAE 544 (Urban Transportation Planning), CAE545 (Traffic Operations and Flow Theory), CAE 555 (Transportation Systems Evaluation), CAE568 (Transportation Asset Management), CAE580 (Intelligent Transportation Systems), 30%
Other administrative duties (Directing the Transportation Engineering Program, Infrastructural Engineering and Management Program, etc.): 10%

Ahmed C. Megri

Name & Rank
Ahmed C. Megri, Senior Lecturer

Degrees:

Ph.D. in Heat Transfer and Energy in Building Engineering (INSA at Lyon, France), from 1989 to 1993,
Master in Heat Transfer and Energy in Building Engineering (INSA at Lyon, France), from 1988 to1989,
Engineer in Building Services Engineering (IGCC, Algeria), from 1983 to1987,
HDR "Habilitation of Supervising Research" Candidate, prepared at Concordia University, Department of Building, Civil and Environmental Engineering, and Illinois Institute of Technology, from 1993 to 2002.

Current Appointment:
Assistant Professor, Civil and Architectural Engineering

Other Related Experience:

Temporary Assistant Professor in Building Engineering Studies at ESIGEC (School of Engineering of Chambéry, France), for two years,
Post-doctoral fellow in the Department of Building, Civil and Environmental Engineering, Concordia University,
Part time instructor at Concordia University**,**
Lab Instructor for Technical Equipment in Building Laboratory at INSA (Lyon),
Tutor for the Civil Engineering Department at IGCC.

Consulting, Patents, etc.:

Responses of disabled persons to thermal environments **(**ASHRAE project RP-885),
Contribution of vehicle emissions from an attached garage to residential indoor air pollution levels (National Research Consul, Health Canada),
Off-hour accelerated ventilation (Contract with CETIAT Centre, CIAT, ABB-VIM societies, and LEPTAB Laboratory),
COMIS project (Annex 23 of International Energy Agency),
Evaluation of plastic waste used as insulation in the foundation of the building (Contract with GFC and Claude Bernard University),
Thermal comfort and indoor air quality in the aircraft,
Zonal Model (annex 35 of International Energy Agency),
Impact of day lighting on the energy conservation and comfort in office buildings (French Agency for high education and research, collaboration between ESIGEC (France) and Concordia University (Canada)).

Professional License or Certification:
None

Selected Publications

A.C. Megri, M. E. Snyder, C. Béghein, "Management of Fire Protection and Air Contamination from Man-made Threat of High-Rise and High-Visibility Buildings", ASCE Journal of Arch Engineering**.**

A.C. Megri, "A Learning Machine Approach for Predicting Thermal Comfort Indices", ASCE Journal of Architectural Engineering.

Professional Societies (Current Membership):
ASCE, ASHRAE, AQME, CEBQ

Honors and Awards:

Prize of Excellency in the "GALA ENERGIA" in the category of "Research and Development", given by the AQME "Quebec Association of Energy" in Canada, 1998.
First position "Department of Building Services and Civil Engineering", in Constantine (Algeria), 1987.
First position of the National Engineering Exam (Algeria), 1987

Institutional and Professional Service:

Undergraduate Studies Committee (university and departmental)
ARCE Search Committee (departmental

Research or Scholarly Activity Percentage:
Research (MS and PhD students), 30%
Proposal and Publication preparation, 5%

CAEE Program Percentage:
Teaching Courses and Course Development (CAE 309, 334, 422, 425, CAE464IPRO) : 50%
University Service, 10%
Professional Service, 5%

Jamshid Mohammadi

Name & Rank
Jamshid Mohammadi, Professor

Degrees:
PhD, Specialty: Structural Eng., University of Illinois at Urbana-Champaign, 1980
MS, Specialty: Structural Eng., University of Illinois at Urbana-Champaign, 1977
MS, Specialty: Civil Eng., University of Tehran, Iran, 1973

Current Appointment:
Professor and Chairman, Civil, Architectural and Environmental Engineering

Other Related Experience:
Engineer (Structures,) Infotech Engineers, 1973-1975
Engineer, Sargent and Lundy, Structural Analytical Division, 1985-1987
Engineer (Structures), Systems & Electronics, Inc, 1979 – 2005

Consulting, Patents, etc.:
Wiss Janney Elstner Associates, 1987-1991
Dearborn Engineering Corporation, 2000-2007
Metropolitan Water Reclamation of District of Greater Chicago
MWH, Chicago, 2003
Research Cooperation, Los Andes University, Colombia, 2007-date
Research Cooperation, University Pontificia Javeriana, Colombia, 2008-date
Research Cooperation, University Technology Malaysia, 1996-1999

Professional License or Certification:
Professional Engineer, Illinois
Civil Engineer, California
Licensed Structural Engineer, Illinois

Publications:
Books:
Fundamentals of Systems Engineering, with economics, probability and statistics, J. Khisty, J. Mohammadi, Prentice Hall, 2001.

Building an International Community of Structural Engineers, S.K. Ghosh and J. Mohammadi, Published by the American Society of Civil Engineers, New York, NY, 1996.

NDT Methods Applied to Fatigue Reliability Assessment of Structures (J. Mohammadi, editor), American Society of Civil Engineers, 2004.

Selected Papers (Lat 5 years):
Iwankiw, N. and Mohammadi, J., "Elastic in-plane stiffness for a circular cut reduced beam section (RBS)," *Engineering Journal*, AISC, Vol. 41, No. 1, p. 23-36, 1st Quarter, 2004.
Boloukbasi, M., Arditi, D., and Mohammadi, J., "Deterioration of reconstructed bridge decks," Journal of *Structure and Infrastructure Engineering*, Vo. 2, No. 2, March 2006, p. 23-31.
Bolukbasi, M., Mohammadi, J., and Arditi, D., "Estimating the future condition of highway bridge components using national bridge inventory (NBI) data," *Practice Periodical in Structural Design and Construction*, Vol. 9, No. 1, 2004.

DeSantiago, E., Mohammadi, J., and Albaijat, H.O., "Analysis of horizontally curved bridges using simple finite element models," *Practice Periodical in structural design and construction*, Vol. 10, No. 1, 2005.
Braun, J., and Mohammadi, J., "Structural monitoring as a non-destructive test method in fatigue reliability assessment of aging aircraft," *in Non-destructive test (NDT) methods applied to fracture reliability assessment of structures* (J. Mohammadi, editor), ASCE, 2004.
Mohammadi, J., Guralnick, S., and Polepeddi, R., "Use of stress range data in fatigue reliability assessment of highway bridges," in *Non-destructive test (NDT) methods applied to fracture reliability assessment of structures* (J. Mohammadi, editor), ASCE, 2004.
Son, J., and Mohammadi, J., "A review of non-destructive test methods in bridges," in *Non-destructive test (NDT) methods applied to fracture reliability assessment of structures* (J. Mohammadi, editor), ASCE, 2004.
Mohammadi, J., "An overview of non-destructive test methods in fatigue and fracture reliability assessment," in *Non-destructive test (NDT) methods applied to fracture reliability assessment of structures* (J. Mohammadi, editor), ASCE, 2004.
Khudeira, S., and Mohammadi, J., "Assessment of Potential Seismic Damage to Residential Unreinforced Masonry Buildings in Northern Illinois," Practice Periodical on Structural Design and Construction, Vol. 11, No. 2, May 2006.

Professional Societies:
Member, American Society of Civil Engineers.
Member, Earthquake Engineering Research Institute.
Member, American Society for Engineering Education (1987-2001).
Member, American Concrete Institute (1987-2001)
Member, Structural Engineers Association of Illinois (1991-2001)

Honors and Awards:
Teaching and Service Award, ASCE Student Chapter, IIT, 2007

Institutional and Professional Service:
Chairman of the department
Editor, *Practice Periodical on Structural Design and Construction*, ASCE, 2005-date.

Research or Scholarly Activity Percentage:
Research (MS and PhD students), 10%
Proposal and Publication preparation, 10%

CAEE Program Percentage:
Department Chair: 50%
Teaching Courses: CAE 432 (Reinf. Conc. Design), CAE 312 (Systems Eng.), Capstone IPRO: 20%
Other administrative duties (Board of Advisors meeting arrangement, award program arrangement, industry-university fund-raising meetings, resource development, ABET assessment and report preparation, etc.): 10%

Demetrios Moschandreas

Name & Rank
Demetrios J. Moschandreas, Professor

Degrees

Stetson University	BS	Physics	1966
University of Kentucky	MS	Mathematical Statistics	1968
University of Cincinnati	MS	Physics	1970
University of Cincinnati	PhD	Physics	1972

Current Appointment
Professor, and Associate Chairman and Director of the Environmental engineering Program

Other Related Experience:

1972-1980	GEOMET Technologies. From entry level to Research Director
1980-1992	IIR Research Institute (IITRI) Research Director and Chief Scientist
1992-present	IIT, Professor of Environmental Engineering
	1999-2001 Deputy Director, Institute for Science, Law and Technology, IIT

Consulting

World Health Organization (WHO)	1974-1994
Environmental Protection Agency (EPA) Indoor Air Quality Program	1977-1986
Governments of Greece, Italy and European Union	Intermittently since 1975
Private Research Organizations, legal firms and consultants	Intermittently since 1992

Professional License or Certification: None

Publications: Books (last 5 years)
Indoor Air Sciences" Editors: Molhave, L. G. D. Moschandreas and G. Tucker 2007. Glossary of Indoor Air Sciences. Espoo, Finland, ISBN 978 – 952 – 92 – 3364 – 0

Publications: Selected Peer Reviewed Papers (last 5 years)

1. Exposure and Risk Estimates Associated with Drinking Water in Arizona. Sofuoglu, S.C., M.D. Lebwitz, M.K. O'Rourke, G.L. Robinson, M. Dellarco and D.J. Moschandreas. *J. American Water Works Assocation Vol 95, 7.pp 67-79.2003*
2. The Link between Symptoms of Office Building Occupants and In-office Air Pollution: The Indoor. Air Pollution Index. Sofuoglu, S.C., and D.J. Moschandreas. *Indoor Air* **13**, 332-343. 2003
3. What Indices of Indoor Air Pollution can—and can't—Do. A commentary. D.J. Moschandreas and S.C. Sofuoglu. *Indoor Air.***13**, pp.375-376. 2003
4. Time and Space Uniformity of Indoor Bacteria Concentrations in Chicago Area Residences. D.J. Moschadreas, K.R. Pagilla, and L.V. Storino. *Aerosol Science and Technology*, **37,** 899-906, 2003.
5. Knowledge-based and Statistically Modeled Relationships between Residential Moisture Damage and Occupant Reported Health Symptoms. Haverinen U, Vahteristo M, Moschandreas D, Husman T, Nevalainen A, Pekkanen J. *Atmospheric Environment* **37,** 4, 577- 585, 2003.
6. Estimating effects of moisture damage repairs on student's health—a long term intervention study. Ulla Haverinen-Shaughnessy, J. Pekkanene, A. Nevalainen, D. Moschandreas, T. Hussman. *Journal of Exposure Analysis and Environmental Epidemiology* **14** pp.58-64. 2004
7. The Indoor Environmental Index and Its Relationship with Symptoms of Office Building Occupants. Moschandreas, DJ and Sofuoglu,S.. *J of Air and Waste Management Association.* November 2004.
8. Occurrence and Characteristics of Moisture Damage in Residential Buildings as a Function of Occupant and Engineer Observations. Ulla Haverinen-Shaughnessy, J. Pekkanene , A. Nevalainen, J. Hallo-aho, J. Koivisto, D. Moschandreas. *Indoor and Build Environment*. 2005. 14:133-140

9. Risk Uncertainty Matters — an Engineer's View. Moschandreas. 2005. D.J. and S. Karuchit. *Int. Journal of Risk Assessment Methodologies.* 2005. 2, 167-192
10. Modeling Spatial Variation of Brominates Trihalomethane in the Water Distribution System. 2006. Chaib, E.. and DJ Moschandreas. *J of Environmental Science and Health,* **41,** 2447-2465.2006
11. Modeling Brominated Trihalomethane Compounds in Drinking Water at the Treatment Plant. 2006. Chaib, E.. and DJ Moschandreas. *J of Environmental Science and Health, Part A.* **41,** 2429-2445.
12. A Preliminary Study on the Association between Ventilation Rates in Classrooms and Student Performance. 2006. Shaughnessy, R. U. Haverinen-Shaughnessy, A. Nevalainen, D.J. Moschandreas. *Indoor Air*. 16, 465-468. December 2006
13. Validation of the Indoor Environmental Index and its Ability to Assess in-Office Environmental Quality.2006. Moschandreas, D.J. SH Yoon and D. Damirev. *Building Research Information.***34,**(5) 483-495.2006
14. A combined system of chilled ceiling, displacement ventilation and desiccant dehumidification. Hao, H, G. Zhang, Y Chen, S Zou, and D. Moschandreas. *Building and Environment.* 2006. *4***2** (9) pp: 3298- 3308
15. Validation of the Indoor Environmental Quality Conceptual Model. 2006. D.J. Moschandreas. S-H. Yoon and D. Demirev. *Building Research & Information*. **34. (**5), 483-495.
16. Thermal Comfort Investigation in Classrooms in Subtropics. 2007. Zhang, G, C. Zheng, W. Yang,Q Zhang and D. J. Moschandreas.J. Indoor and Built Environment. **15** No.2, 148-158.
17. Moschandreas, DJ and RM Nuanual. 2008 Do Certified Buildings perform Better than Similar Conventional Buildings? *International Journal of Environmental Sustainable Development.* In press.
18. Chaib, E. and DJ Moschandreas. 2008 Modeling Daily variation of trihalomethane compounds in drinking water system, Houston, Texas. *J of Hazardous Materials,* **151,** 662-668

Professional Societies:
American Society of Heating ventilating and Air Conditioning Engineers (ASHRAE)
International Society of Indoor Air Quality and Climate
International Society of Exposure Analysis

Honors and Awards:
2008 Bruce Padwall Lecture at the Dept. of Civil Engineering at the City College of New York

2008 Editor, Journal of the Human-Environment System

Institutional and Professional Service:
Associate Chairman of the department

Research or Scholarly Activity Percentage:
Research (MS and PhD students), 25 %
Proposal and Publication preparation, 15%

CAEE Program Percentage:
Associate Department Chair: 15%
Teaching Courses: 45% [EnvE 426 (Statistics), EnvE 575 (Risk Assessment), EnvE 570 (Air Pollution Transport and Fate), EnvE 426 (Air Pollution Controls), EnvE 528 (Environmental Models) and EnvE 509 (Problems in Environmental Organic Chemistry)]

Ralph T. Muehleisen

Name & Rank
Ralph T. Muehleisen, Assistant Professor

Degrees:
PhD, Acoustics., Penn State University, 1996
BS, Electrical and Computer Engineering, University of Wisconsin-Madison, 1989

Current Appointment:
Assistant Professor, Civil and Architectural Engineering

Other Related Experience:
1998-2003, Assistant Professor, Civil, Environmental, and Architectural Engr. , University of Colorado
ASEE/ONR Postdoctoral Fellow, Naval Postgraduate School, 1996-1997
Postdoctoral Scholar, Penn State Applied Research Lab, 1995-1996

Consulting, Patents, etc.:
2005-Present, Acoustics in LEED for Schools Consultant and Presenter of Acoustics to USGBC
2000-Present, Principal Consultant at Muehleisen Consulting
2003, Acoustical Consultant to Shen Milsom Wilke, Denver Office

Professional License or Certification:
Professional Engineer, Illinois

Selected Publications

R. T. Muehleisen, "Sound recordings from the 2007 emergence of Brood XIII cicada (A)," *Proceedings of Meetings on Acoustics –154th Meeting Acoustical Society of America,* vol. 2, p. 010001, 2008.

R. T. Muehleisen and C. W. Beamer IV. "Steady-state acoustic radiosity for the prediction of sound pressure levels in diffuse enclosures." *Submitted to Journal of the Acoustical Society of America, 2007.*

R. T. Muehleisen, "A comparison of the acoustic requirements in LEED for Schools and ANSI 12.60," in *Proceedings of NOISECON 07*, 2007, pp. 1-10.

R. T. Muehleisen and C. W. Beamer IV, "Steady-State Diffuse Acoustic Radiosity for Sound Level Prediction in Rooms," *Building Integration Solutions, Proceedings of the 2006 Architectural Engineering National Conference*, pp. 21-28, 2006.

R. T. Muehleisen, "Use of the Monte Carlo method for uncertainty analysis of acoustic models and measurements.," in *Proceedings of NOISECON 05*, 2005, p. nc05_148.

R. T. Muehleisen, C. W. Beamer IV, and B. D. Tinianov, "Measurements and empirical model of the acoustic properties of reticulated vitreous carbon," *Journal of the Acoustical Society of America*, vol. 117, pp. 536-544, 2005.

R. T. Muehleisen and C. W. Beamer IV, "Application of acoustic radiosity methods to noise propagation within buildings," in *Proceedings of NOISECON 05*, 2005, p. nc05_146.

R. T. Muehleisen, C. W. Beamer IV, B. D. Tinianov, and D. S. Hougland, "Acoustic and Illumination Design of Conference Rooms," *Building Integration Solutions, Proceedings of the 2003 Architectural Engineering National Conference*, pp. 1-5, 2003.

R. T. Muehleisen, "Effects of common indoor air pollutants on the speed of sound," *Acoustic Research Letters Online*, vol. 3, pp. 118-123, 2002.

R. T. Muehleisen and C. W. Beamer IV, "Comparison of errors in the three- and four-microphone methods used in the measurement of the acoustic properties of porous materials," *Acoustic Research Letters Online*, vol. 3, pp. 112-117, 2002.

R. T. Muehleisen and D. C. Swanson, "Modal coupling in acoustic waveguides: planar discontinuities," *Applied Acoustics*, vol. 63, pp. 1375-1392, 2002.

R. T. Muehleisen and A. A. Atchley, "Fundamental modes of a constricted annular resonator: Theory and measurement," *Journal of the Acoustical Society of America*, vol. 109, pp. 480-487, 2001.

A. Atchley, B. Carter, R. T. Muehleisen, and H. T. Lin, "Annular Thermoacoustic Engines," *Nonlinear Acoustics at the Turn of the Century: ISNA 15*, pp. 227-230, 2000 2000.

Professional Societies (Current Membership):
Acoustical Society of America (ASA), Institute of Noise Control Engineers (INCE), Society of Building Science Educators (SBSE), American Institute of Steel Construction (AISC), Audio Engineering Society (AES), ASCE, AEI, ASTM, ASEE, ASHRAE, IEEE, Chicago Chapter of the USGBC

Honors and Awards:
2000 CAEE Department Service Award
1996 ASEE/ONR Postdoctoral Fellowship
1992 ASA "Outstanding Presentation by a Young Professional in Noise"

Institutional and Professional Service:
CAEE Committees: Grad and Undergrad Assessment, Architectural Engineering, Research and Lab
IIT/College Committees: Graduate Studies, Library, IPRO, Dean Search, Architecture Program Review
ASA: Associate Editor for Proceedings of Meetings on Acoustics (POMA)
ASA: Technical Committee Member for Architectural Acoustics, Noise, Physical Acoustics, Education
ASA: Chair of Green Building Acoustics Subcommittee
INCE: Chair of the Student Activities Committee of INCE
Journal Reviewer: J. Acoust. Soc. Am (JASA)., JASA Electronics Letters, POMA, Noise Ctrl Engr J.
NSF Proposal Reviewer: NSF CMMI, NSF CMS, NSF Applied Math, US CRDF,

Research or Scholarly Activity Percentage:
Research (MS and PhD students), 30%
Proposal and Publication preparation, 5%
Teaching Courses and Course Development: 45%
University Service, 10%
Professional Service, 10%

Kenneth E. Noll

Name & Rank
KENNETH E. NOLL, PH.D., P.E.
Professor of Environmental Engineering

Degrees:
Michigan Technological University, Houghton, MI, B.S. Civil Engineering 1959
University of Wisconsin, Madison, WI, Graduate Studies in Meteorology 1960
University of Washington, Seattle, WA, M.S. Civil Engineering 1966
University of Washington, Seattle, WA, Ph.D. Civil Engineering 1969

Current Appointment:
Professor, Department of Civil, Architectural and Environmental Engineering

Other Related Experience:
Chairman Department of Environmental Engineering, 1990-1995.
Director of USEPA Research Center- Industrial Waste Elimination, 1990-1992.
Professor and Director of Env Health Sciences, School of Public Health, U. of Michigan, 1989-1990.
Director, U.S. Environmental Protection Agency Area Training Center, 1978-1990.
Associate Professor and Professor of Environmental Engineering, The University of Tennessee, 1970-1975.
Chairman, Knox County Air Pollution Control Board, 1972-1975.
Air Sanitation Engineer, California Air Resources Board, 1963-1970.
Meteorologist, U.S. Air Force, 1959-1963.

Professional License or Certification:
Professional Engineer, Illinois
Civil Engineer, California

Publications:
Books:

A. Books

1. Noll, K.E. and J. Duncan (Editors), *Industrial Air Pollution Control*, Ann Arbor Science Publishers, 343 pp., June 1973.
2. Noll, K.E., J.Duncan and W.T. Davis (Editors), *Air Pollution Control and Industrial Energy Production*, Ann Arbor Science Publishers, 367 pp., June 1975.
3. Noll, K.E. and W.T. Davis (Editors), *Power Generation: Air Pollution Monitoring and Control*, Ann Arbor Science, 555 pp., June 1976.
4. Noll, K.E. and T. Miller, *Air Monitoring Survey Design*, Ann Arbor Science, 296 pp., January 1977.
5. Noll, K.E., C.N. Haas, C. Schmidt and P. Kodukula, *Recovery, Recycle and Reuse of Industrial Waste*, Lewis Publishers, Inc., January, 1985.
6. Noll, K.E., V. Gounaris and W-S. Hou, *Adsorption Technology for Air and Water Pollution Control*, Lewis Publishers, October, 1991.
7. Noll, K. E., *Fundamentals of Air Quality Systems*, *Design of Air Pollution Control Devices*, American Academy of Environmental Engineers, 1999.

Selected Papers (Last 5 years):

Vardar, N., & Noll, K. E., *Atmospheric PAH Concentrations in Fine and Coarse Particles,* Environmental Monitoring and Assessment, 87, 81-92,2003.

Lestari, P., Oskouie, A., Noll, K. E., *Size Distribution and Dry Depoosition of Particulate Mass, Sulfate, and Nitrate in an Urban Area.* Atm. Enviroment, 37, 2507-2516, 2003.

Vardar, N., Tasdemir, Y., Odabasi, M., and Noll, K. E., *Characterization of Atmospheric Concentrations and Partitioning of PAH in Chicago Atmosphere,* Sci. Tot. Environ, 2004.

Noll, K., Aluko, O., *Changes in Large Particle Size Distribution Due to Dry Deposition Processes,* Journal of Aerosol Science, 37 , 1797-1808, 2006.

Aluko, O., Noll, K., *Deposition and Suspension of Large Airborne Particles*, Aerosol Science and Technology, 40, 503-513, 2006.

Rashmawi, K., Oskouie, A, Noll, K., *Development and Evaluation of a Copolymer for Removal of Taste and Odor Causing Compounds from Lake Michigan Water,* J. of Envr. Eng, Accepted 2007.

Professional Societies:
Air Pollution Control Association
American Association for Aerosol Research
American Society of Civil Engineers

Honors and Awards:
(None in the last 5 years)

Research or Scholarly Activity Percentage:
Research (MS and PhD students), 25%
Proposal and Publication preparation, 10%

CAEE Program Percentage: 65%
Teaching Courses: ENVE 310 (Intro to Envr Eng), ENVE 463 (Intro to Air pollution Control), ENVE 580 (Hazardous Waste Engineering), ENVE 578 (Gas Cleaning of Gases), ENVE 570 (Air Pollution Meteorology)

James E. Novak

Name & Rank
James E. Novak, Senior Lecturer

Degrees:
M.S., Engineering Graphics, Illinois Institute of Technology, 1971
B.S., Engineering Graphics, Illinois Institute of Technology, 1967

Current Appointment:
Senior Lecturer and Director, Engineering Graphics Division,
Civil, Architectural and Environmental Engineering Department

Other Related Experience:
Engineering Designer, R. J. Tennes & Co., Chicago, summers, 1970-1977
Technical Illustrator, Chicago White Sox, 1971-1980

Consulting, Patents, etc.:
Various mechanical design and illustration projects in support of research at IIT, IIT Research Institute, and private industry since 1968.

Publications:
Books:
Technical Drawing, 13th ed., co-author, Prentice Hall, 2009
Engineering Graphics, 8th ed., co-author, Prentice Hall, 2004
Modern Graphics Communication, 3rd ed., co-author, Prentice Hall, 2004
Basic Technical Drawing, 8th ed., co-author, Glencoe-McGraw Hill, 2004

Professional Societies:
Member, American Society for Engineering Education
Member, Illinois Drafting Educators Association

Honors and Awards:
None in past five years

Institutional and Professional Service:
Director of the Engineering Graphics Division
Service on several departmental and university committees
Chair, Career and Technical Education Advisory Council, Kelly High School, Chicago

CAEE Program Percentage:
Administrative duties: 10%
Teaching courses: 90%

CAE 100 (Intro. To the Profession I), CAE 101 (Intro. To the Profession II),
EG 105 (Eng. Graphics & Design), EG 225 (Eng. Graphics for non-Engrs.),
EG 305 (Adv. Eng. Graphics & Design), EG 306 (Engr. Descriptive Geometry),
EG 325 (Adv. EG for non-Engrs.), EG 329 (Graphic Representation non-Engrs.),
EG 405 (Mechanical Design Graphics), EG 406 (Technical & Pictorial Illustration),
EG 419 (Computer Graphics in Engrg.), EG 425 (Computer Graphics non-Engr.)

John R. O'Leary

Name & Rank
John R. O'Leary, Associate Professor

Degrees:
PhD, Engineering Mechanics; University of Texas (Austin), 1981.
MS, Civil Engineering, Illinois Institute of Technology, 1974.
BS, Mechanical Engineering, Illinois Institute of Technology, 1974.

Current Appointment:
Associate Professor and Associate Chairman,
Civil, Architectural and Environmental Engineering Department

Other Related Experience:
1986-1987, Fluid Dynamics International, Senior Consultant , Evanston, IL
1977-1980, Tracor Aerospace Co., Engineering Scientist, Austin, TX
1971-1974, Sargent and Lundy Engineers, Engineering Analyst, Chicago, IL
1970-1971, Hendrickson Co., Stress Analyst, Lyons, IL
1969-1970, USI-Clearing, Design Drafter, Clearing, IL

Consulting, Patents, etc.:
UNDP (New York / Lucknow)
Sargent and Lundy
Finkl Steel Co.
Acme Steel Co.
Intek Steel Co.
Inland Steel Co.
American Association of Railroads
The Institute for Gas Technology
Hitachi
Commonwealth Edison
Primera Engineers
Nutech Engineers
Stimsonite
Molex
Also served in the capacity of expert to a number of law firms.

Publications:
None

Professional Societies:
Currently none, Was active in ASCE for several years.

Honors and Awards:
None in past five years

Institutional and Professional Service:
Departmental Committees:
Admissions – Chair
University Committees:
Undergraduate Studies
Task committee on financial aid and billing

ROTC liaison
ROTC review panels
Admissions liaison
CAMRAS/NEXT Scholarship selection
Admission's faculty committee for application review

Faculty Council:
Faculty advisory committee to the National Commission
Elections subcommittee – chair
Computing subcommittee

Faculty Advisor:
Student Leadership Council
Society of American Military Engineers
Latinos Involved in Further Education (LIFE)
Tau Beta Pi
Alpha Epsilon Pi

Research or Scholarly Activity Percentage:
Research (MS and PhD students), 5%
Proposal and Publication preparation, 5%

CAEE Program Percentage:
Administrative duties (associate chair): 30%
Teaching courses (CAE 304, 310, 442, 503): 50%
Other (Committee meetings, UG Committee chair, etc.):10%

Krishna Pagilla

Name & Rank
Krishna Pagilla, Professor

Degrees:

Dec 1994	Ph.D., Environmental Engineering, University of California, Berkeley, CA
May 1989	M.S., Environmental Engineering, University of Oklahoma, Norman, OK
June 1987	B.E., Civil Engineering, Osmania University, Hyderabad, India

Current Appointment:
Professor, Environmental Engineering

Other Related Experience:

1995-07	Assistant Professor and Associate Professor, Chemical and Environmental Engineering Department, Illinois Institute of Technology, Chicago, Illinois.
1990-94	Environmental Engineer, County of Sacramento Regional Sanitation District, Sacramento, California.
1989-90	Graduate Research Assistant, Department of Civil and Environmental Engineering, University of California, Berkeley, California.

Graduate Teaching and Research Assistant, Civil Engineering and Environmental Science Department, University of Oklahoma, Norman, Oklahoma.

Consulting, Patents, etc.:
Metropolitan Water Reclamation of Greater Chicago

Professional License or Certification:
Professional Engineer, Illinois
Civil Engineer, California

Publications:
1. Su, Y., Makinia, J., and Pagilla, K.R. (2008) The Maximum Specific Growth Rate of Autotrophs – A Critical Design Parameter for Biological Nutrient Removal WWTPs, Water Env. Res., **80(4)**, 355-366.
2. Stark, B. C., Urgun-Demirtas, M., and Pagilla, K.R. (2007) Role of Hemoglobin in Improving Biodegradation of Aromatic Contaminants Under Hypoxic Conditions, J. Molecular Microbiol. Biotechnol., **15**, in press.
3. Urgun-Demirtas, M., Sattayatewa, C., and Pagilla, K.R. (2008) Bioavailability of Dissolved Organic Nitrogen in Effluents, Water Env. Res., **80**, in press.
4. Baek, S.H., and Pagilla, K.R. (2008) Simultaneous Nitrification and Denitrification in Aerobic Membrane Bioreactor, Water Env. Res., **80(2)**, 109-117.

5. Chandrasekaran, P. and Pagilla, K.R. (2007) High Ammonium Centrate Treatment in a Membrane Bioreactor, Water Env. Res., **79**(11), 2352-2362.

6. Urgun-Demirtas, M., Stark, B.C., and Pagilla, K.R. (2006) Comparison of 2-Chlorobenzoic Acid Biodegradation in a Membrane Bioreactor by Untransformed and Recombinant *B. cepacia*, Water Res., **40**, 3123-3130.
7. Urgun-Demirtas, M., Stark, B.C., and Pagilla, K.R. (2006) Use of Genetically Engineered Microorganisms (GEMs) for the Bioremediation of Contaminants, Crit. Rev. Biotechnol., **26**, 145-164.

8. Dogan, I., Pagilla, K.R., Webster, D.A., Stark, B.C. (2006) Expression of *Vitreoscilla* Hemoglobin in *Gordonia amarae* Enhances Biosurfactant Production, J. Ind. Microbiol. Biotechnol., **33**, pp. 693-700.
9. Pagilla, K.R., Urgun-Demirtas, M., and Ramani, R. (2006) Low Effluent Nutrient Technologies for Wastewater Treatment, Water Sci. Tech., **53**(3), 165-172.
10. Baek, S. and Pagilla, K.R. (2006) Anaerobic and Aerobic Membrane Bioreactors for Dilute Municipal Wastewater Treatment, Water Environ. Res., **78**(2), 133-140.

Professional Societies:
Editor, AEESP's Environmental Unit Processes Manual, Biological Processes Section
Faculty Advisor, Engineers Without Borders –USA, IIT Student Chapter; Haiti Outreach-IIT; and Water Environment Federation-IIT
Member, Board of Editorial Review, Water Environment Research
Teachers Workshop, Water Environment Federation Technical Exposition and Conference, ACS
WEF (Program Committee; Chair , Municipal Wastewater Symposia – 1999-2002)
IWA, Program Committee, Leading Edge Technology Conference, LET 2008 and 2009

Honors and Awards (past 5 years):
2008, Outstanding Student Organization Advisor Award, Illinois Institute of Technology

Institutional and Professional Service:
Haiti Outreach Program (IIT Chapter)
CAEE Commencement Event Laison to IIT's Communication and Marketing
CAEE Lab Safety Representative
Various university-wide committees

Research or Scholarly Activity Percentage:
Research (MS and PhD students), 40%
Proposal and Publication preparation, 20%

CAEE Program Percentage:
Teaching Courses (ENVE 404, IPRO, Graduate Courses in environmental engineering): 30%
Other:10%

Jie Hua (Jay) Shen

Name and Rank

J. Jay Shen, Associate Professor

Degrees:
Ph.D., Specialty: Structural Eng., University of California at Berkeley, 1993
MS, Specialty: Structural Eng., Chinese Academy of Sciences, 1984

Current Appointment:
Associate Professor, Civil, Architectural and Environmental Engineering

Other Related Experience:
Structural Engineer, Institute of Structural and Materials, Beijing China, 1982-1986
Research Engineer, Earthquake Engineering Research Center, University of California, Richmond, California, 1990 – 1993
Visiting Professor, University of California, 2002

Consulting, Patents, etc.:
California Department of Transportation, 1993 – 1995
American Iron and Steel Institute, 1995-1996
Lewis + Middle Brook and Associates, 2000-2001
American Institute of Steel Construction, 2005-2006
Turn Key Design Services, 2004-2006
Forefront Structural Engineers, Inc. 2007 – date

Professional License or Certification:
Civil Engineer, California
Licensed Structural Engineer, Illinois

Publications:
Book:

Selected Papers (Last 5 years):
Akbas, B., Nadar, M., and Shen, J., "A Methodology to Estimate Earthquake Induced Worst Failure Probability of Inelastic Systems," Structural Engineering and Mechanics, Vol. 28, No. 3 (2008)

Akbas, B. and Shen, J., "Modeling of Nonlinear Behavior of Double-Angle Shear Connections," Journal of Engineering and Natural Sciences, Vol.2, pp.83-101 (2006).

Akbas, B., Shen, J., and Temiz, H., "Identifying the Hysteretic Energy Demand and Distribution in Regular Steel Frames", the International Journal of Steel and Composite Structures, *Vol. 6, No. 6 (2006).*

Sutchiewcharn, N., Shen, J. and Akbas, B., "Seismic Design Issues of the Panel Zone in Special Moment Frames with Deep-Column Sections," 100th Anniversary Earthquake Conference Commemorating the 1906 San Francisco Earthquake, San Francisco, USA, April 18-22, 2006..

Akbas, B., Nadar, M., and Shen, J. "Statistical Evaluation of Hysteretic Energy Demand in Single Degree of Freedom Systems", Journal of Engineering and Environmental Sciences, 2004.

Akbas, B. and Shen, J. "Seismic behavior of steel buildings with combined rigid and semi-rigid frames", Journal of Engineering and Environmental Sciences *Vol.27, No.4, pp.253-264, 2003.*

Akbas, B. and Shen, J. “Earthquake Resistant Design and Energy Concepts,” Technical Journal, Turkish Chamber of Civil Engineers, Volume 14, No.2, April 2003.

Professional Societies:
Member, American Society of Civil Engineers.
Member, Earthquake Engineering Research Institute.
Member, American Institute of Steel Construction.

Honors and Awards:
(None in the last 5 years)

Institutional and Professional Service:
Campus Tenure and Promotion Committee (2006-2008)

Research or Scholarly Activity Percentage:
Research (MS and PhD students), 50%
Proposal and Publication preparation, 10%

CAEE Program Percentage:
Teaching Courses (40%): CAE 303 (Structural Design I), CAE 420 (Structural Dynamics), CAE 431 (Steel Structures), CAE 525 (Advanced Steel and Composite Structures).

Jonathan Shi

Name & Rank
Jonathan Shi, Professor

Degrees:
PhD, Specialty: Construction engineering & management, University of Alberta, 1995
MS, Specialty: Construction management, Wuhan University, China, 1985
MS, Specialty: Hydraulic construction, Wuhan University, China, 1982

Current Appointment:
Professor, Civil, Architectural and Environmental Engineering

Other Related Experience:
1/1999 – 8/1999 , Associate Professor, City University of Hong Kong.
8./1995 – 12/1998, Assistant Professor, City University of Hong Kong.
9/1992 – 8/1995, Research Associate, University of Alberta, Canada.
5/1985 – 8/1992, Lecturer, Wuhan University, China.

Consulting, Patents, etc.:
Detail Technologies, Michigan, 2007-2009
Stay Alert Safety Services, NC, 2007-2009

Professional License or Certification:
Professional Engineer, Hong Kong

Publications: Selected Papers (Lat 5 years):

Shi, J., D. Lee, and E. Kuruku (2008). "Task-based modeling method for business process automation", *International Journal of Automation in Construction*, 17(5). 633-640.

S.X. Zeng, **J. Shi**, b, G.X. Lou (2007). "A synergetic model for implementing an integrated management system: an empirical study in China", *Journal of Cleaner Production*, Volume 15, Issue 18. 1760-1767.

Zhang, H., Tam, C.M, Li, H, **Shi, J.J** (2006). "Particle swarm optimization-supported simulation for construction operations", *ASCE Journal of Construction Engineering and Management*, Volume 132, Issue 12. 1267-1274.

Rujirayanyong, T and **J. Shi** (2006). "Project-Oriented Data Warehouse for Construction", *International Journal of Automation in Construction, 15(6)*. 800-807.

Lee and **J. Shi** (2006). "A construction business automation system (CBAS)." *ASCE Journal of Construction Engineering and Management*, 132(1). 88-96.

Arditi, D., M. Ayrancioglu, and **J. Shi** (2005). "Worker safety issues in night-time highway construction." *Engineering, Construction and Architectural Management*, 12(5), 487-501.

Jiang, G. and **J. Shi** (2005). "Exact algorithm for solving project scheduling problems under multiple resource constraints." *ASCE Journal of Construction Engineering and Management. 131(9)*, 986-992.

Zeng, S.X., P. Tian, and **J Shi** (2005). "Implementing integration of ISO 9001 and ISO 14001 for Construction." *Managerial Auditing Journal, 20(4), 394-407.*

Shi, J. H. Li, and H Zhang (2005). "Two resource rules for modeling human decisions in simulation." *International Journal of Project Management, 23(2),* 97-107.

Arditi, D., M.A. Ayrancioglu, and **J. Shi** (2004). "Effectiveness of safety vests in nighttime highway construction." *ASCE, Journal of Transportation Engineering*, 130(6). 725-732.

Shi, J. (2004) "Clustering technique for evaluating and validating neural network performance." *ASCE Journal of Computing in Civil Engineering,16(2).* Discussion by M. Marzouk and O. Moselhi. Closure by J. Shi. 183-184.

Shi, J. and D. Halpin (2003). "Enterprise resource planning for construction business management." *ASCE Journal of Construction Engineering and Management, 129(2). 214-221.*

Shi, J. (2003). "Simulation self-diagnosis." *Automation in Construction, an International Research Journal.* Elsevier Science. *12(4), July 2003, Pages 419-430.*

Zhang, H, C.M. Tam, and **J. Shi** (2003). "Application of fuzzy logic to simulation for construction operations." *ASCE Journal of Computing in Civil Engineering, 17(1).* 38-45.

Professional Societies:
Member, Hong Kong Institution of Engineers (HKIE)
Member, American Society of Civil Engineers (ASCE)
Member, Construction Management Association of America (CMAA)

Honors and Awards:
(None in the last 5 years)

Institutional and Professional Service:
Director of Center for Work Zone Safety and Mobility (CWZSM)
Session Chair – Construction Safety, Project Planning, Construction Research Congress (CRC), ASCE, May 6-8, 2007. Grand Bahama Island, Bahamas.
Session Chair – Enterprise-level IT, CRC, ASCE, April 5-7, 2005, San Diego, California.
International Scientific Committee, The International Symposium on Advancement of Construction Management and Real Estate., October 30 – November 2, 2005, Hangzhou, P.R.China.
Organizing Committee, 2nd Int Conf on Construction in the 21st Century, Dec 10-12, 2003 Hong Kong.
Organizing Committee, Implementing IT to Obtain a Competitive Advantage in the 21st Century (INCITE 2000), January 17-18, 2000. Hong Kong.
Committee member, Construction Research Council, ASCE
Committee member, Computing in Construction, ASCE, Chicago Chapter, CMAA
Panelist and reviewer, National Science Foundation (NSF)
Editorial Board, Journal of Construction Research & International Journal of Construction Management
Peer Reviewer for many academic journals

Research or Scholarly Activity Percentage:
Research (MS and PhD students), 20%
Proposal and Publication preparation, 20%

CAEE Program Percentage:
Teaching Courses: CAE 471 (Construction planning and scheduling), CAE 571 (Advanced project planning.), CAE 572 (Construction Accounting), CAE573 (Computer applications): 50%
Other professional services: 10%

Mark Snyder

Name & Rank
Mark E. Snyder, Senior Lecturer

Degrees:
MS Civil Engineering, Specialty: Arch Eng., Illinois Institute of Technology, 2005
PhD Applied Physics, Texas Tech University, 1988
MS Physics, Creighton University, 1979
BS Physics, Creighton University, 1977

Current Appointment:
Senior Lecturer, Department of Civil, Architectural and Environmental Engineering

Other Related Experience:
Research Professor Dept of Civil/Arch Eng. Illinois Institute of Technology 2005-2008
Chairman/Professor of Aerospace Studies at Illinois Institute of Technology 1999-2002
Adjunct faculty Florida Institute of Technology, Dept of Space Technology 1989-1991
Lieutenant Colonel United States Air Force retired. 1981-2002

- Lead 20 officers testing B-2 and other stealth weapons systems effectiveness against enemy air defense systems
- Radiation diagnostician for the last two underground nuclear tests in the United States
- DoD interface to DOE design of Jupiter the world's largest x-ray simulator
- Satellite alert officer on the United States Atomic Energy Detection System monitoring test ban treaties
- Performed engineering testing of remote sensing systems used to assess weapons proliferation concerns

Consulting, Patents, etc.
None

Professional Licensure or Certification:
None

Publications:
None

Selected Papers (Last 5 Years):
Snyder, M. "Quantifying Changes In Freshman Learning And Study Strategies By Developing Professional Skills" (to be published 2008)
Megri, A.C., Snyder, M., Musy, M., "Building Zonal Thermal and Airflow modeling" International Journal of Ventilation, Vol 4, No. 2, pages 177-188 2005.

Professional Societies:
ASCE

Honors and Awards:
IIT Teaching Grant for Innovative Faculty (Fall/Spring '07/08)

Institutional and Professional Service:
Advisor for Architectural Engineering students.

Research or Scholarly Activity Percentage:
Research (Engineering Education and Work Zone Safety) 25%

CAEE Program Percentage:
Advisor: (5%)

Teaching Courses: CAE 100/101 (Introduction to the Profession), CAE 383 (Electrical Engineering), CAE 309 (Thermodynamics and Heat Transfer): 70%

Sidney A. Guralnick (Faculty Emeritus)

Name & Rank

Sidney A. Guralnick, Professor-Emeritus

Degrees

PhD,	Specialty: Struct. Eng.,	Cornell Univ.	1958
MS,	Specialty: Struct. Eng.,	Cornell Univ.	1955
BS,	Specialty: Civil Eng.,	Drexel Univ.	1952

Current Appointment

Perlstein Distinguished Professor of Engineering – Emeritus

Other Related Experience

Structural Design Engineer, ARCO, 1952

Structural Design Engineer, T. H. McKaig Associates, 1955

Development Engineer, PCA, 1960 – 1961 (on leave from IIT)

Consulting, Patents, Etc.

U.S. Army, Corps of Engineers (1960 – 62)

Fenestra Corp. (1957 – 58)

Principe-Dana Corp. (1957 – 58)

Institute of Gas Technology (1961 – present)

IIT Research Institute (1961 – present)

Metropolitan Sanitary District of Greater Chicago (1975 – 1990)

Motion Transmitting Device, Patent No. 3745840 issued: July, 1973

Professional License of Certification

Illinois (SE) and Pennsylvania (PE)

Selected Papers (Last 5 years)

Guralnick, S. A. and Gunawan, L., "Strengthening of Reinforced Concrete Bridge Columns with FRP Wrap", Practice Periodical on Structural Design and Construction, ASCE, Nov. 2006.

Guralnick, S. A., Bao, S., and Erber, T., "Piezomagnetism and Fatigue: II, Journal of Physics D: Applied Physics, in press.

Guralnick, S. A. and Gunawan, L., "Design of Concrete Members Subjected to Triaxial Compression", Practice Periodical on Structural Design and Construction, ASCE, in press.

Guralnick, S. A. and Mohammadi, J., " A Probabilistic Model to Simulate the Origin and Inception of Fatigue Failure in Metals, under review.

Professional Societies

Fellow, American Society of Civil Engineers

Member, American Concrete Institute

Member, Society of Experimental Mechanics

Member, Structural Engineers Association of Illinois

Honorary Society Member of Chi Epsilon, Sigma Xsi, Tau Beta Pi

Honors and Awards (Past Five Years)

Fellow of the ASCE

Civil Engineer of the Year Award of the Illinois Section of the ASCE

Lifetime Achievement Award of the ASCE

Life Member of the ASCE

Institutional and Professional Service

Director of the Structural Engineering Laboratories of the CAEE Department

Research and Scholarly Activity Percentage

Research (MS & PhD students) 20%

Proposal and Publication Preparation 20%

CAEE Program Percentage

Teaching Courses: CAE 315 (Materials of Engineering), CAE 435 (Model Analysis of Structures), CAE 520 (Buckling Strength of Structures), CAE 522 (Experimental Analysis of Structures), CAE 560 (Plastic Analysis of Structures) 40%

Advising graduate student 10%

Other administrative duties (supervising technician and directing the work of the structural engineering labs)

C. Jotin Khisty (Faculty Emeritus)

Name & Rank

a. Jotin Khisty, Professor Emeritus

Degrees:

Ph.D., Civil Engineering, Transportation Systems Engineering. Minors: Urban Economics, City Planning, & Urban Geography. The Ohio State University, Columbus, Ohio, 1977.
M.C.P., City and Community Planning, University of Cincinnati, Cincinnati, Ohio, 1973.
M.S.C.E., Civil Engineering, Traffic Engineering, University of Cincinnati, Cincinnati, Ohio, 1970.

Current Appointment:

Professor Emeritus, CAEE Department
Teaching assignment: CAE 312 and Graduate level transportation engineering courses

Other Related Experience:

Professor, Dept. of Civil Engg., Washington State University, Pullman, WA., 1978-90
Principal Planner and Transportation Engineer in Metropolitan Planning Organizations in Cincinnati, Columbus, and Toledo, Ohio, 1971-1977
Deputy Director of Technical Education, Ministry of Education, Government of India, 1965-69
Assistant Professor in various government institutions and universities in India, 1957-65
Civil Engineer, Dept. of Public Works, Government of India, 1948-57

Consulting, Patents, etc.

City of Chicago
Government of India
Urban Transportation Center, University of Illinois, Chicago

Professional Licensure or Certification:

OH, WA

Publications:

Khisty, C. J., and Mohammadi, J., 2001, Fundamentals of Systems Engineering with Economics, Probability, and Statistics, Prentice Hall, Inc., Upper Saddle River, NJ. 475 pages. ISBN 0-13-010649-6.
Khisty, C. J., and Lall, B. K., 1998. Transportation Engineering: An Introduction, 2nd. Edition, Prentice Hall, Inc., Upper Saddle River, NJ. ISBN-0-13-157355-1. 720 pages.

Professional Societies:

Member and University liaison, TRB, National Academy of Science and Engineering, Washington, DC.
Life Member, Institute of Transportation Engineers, USA.
Life Member, American Society of Civil Engineers, USA.
Member, American Planning Association, USA.
Member, International Association of Systems Science, USA.
Member, American Society of Engineering Education, USA.
Member, United Kingdom Systems Society, UK.

Honors and Awards:

None

Institutional and Professional Service:

N/A

Research or Scholarly Activity Percentage:
N/A

CAEE Program Percentage:
N/A

Domingo Carreira (Part-time Faculty)

Name & Rank
Domingo Carreira, Adjunct Professor

Degrees:
M.S. Architecture, University of Havana, 1956
M.S. Architecture, University of Madrid, Spain, 1970
MSCE, Illinois Institute of Technology, 1974
PhD, Illinois Institute of Technology, 1983

Current Appointment:
Free-lance Structural Engineer, Chicago, IL
Part-time Faculty, Civil, Architectural and Environmental Engineering Department, IIT
Teaching assignment: CAE 436 and CAE 518, CAE 551

Other Related Experience:
Packer Engineering, Inc., Naperville, Illinois, director of Civil Engineering, 1989-1992.
Sargent & Lundy, Chicago, Illinois, Senior Structural Specialist, 1970-1989.
Instituto E. Torroja de la Construccion y del Cemento, Madrid, Spain, 1969-1970.
Ministry of Construction, Havana, Cuba, 1961-1968
National Plantification Agency, Havana, Cuba, 1957-1960.
Saenz, Canico y Martin Engineers, Havana, Cuba, 1956

Consulting, Patents, etc.
Consultant to several Chicago area firms since 1993.

Professional Licensure or Certification:
Illinois, Indiana and Wisconsin (PE), Illinois (SE), Registered Architect (Wisconsin), FAIA

Publications:
Presentations in ACI conferences.

Professional Societies:
ASCE, ACI

Honors and Awards:
Fellow, American Concrete Institute **Institutional and Professional Service:**

Research or Scholarly Activity Percentage:
N/A

CAEE Program Percentage:
N/A

August W. Domel (Part-time Faculty)

Name & Rank
August W. Domel, Adjunct Professor

Degrees:
JD, General Law, Loyola University, 1992
PhD, Specialty: Structural Engineering, University of Illinois at Chicago, Illinois, 1988
MSCE, Specialty: Civil Engineering, Illinois Institute of Technology, Illinois, 1985
BSCE, Specialty: Civil Engineering, Bradley University, Illinois, 1982

Current Appointment:
Principal Engineer, Engineering Systems Inc., Aurora, Illinois – 1995 to Present
Adjunct Professor, Civil Architectural and Environmental Engineering Department
(Teaching assignment: CAE 472, CAE 570)

Other Related Experience:
Adjunct Professor, Architecture Department, Judson University, Elgin, Illinois – 2001 to Present
Structural Engineer, Gouwens Engineering, Elmhurst, Illinois – 1994
Senior Structural Engineer, Portland Cement Association, Skokie, Illinois – 1989 to 1994
Structural Engineer, Packer Engineering, Naperville, Illinois – 1988
Civil Engineer, Bridge Division, City of Chicago, Chicago, Illinois – 1982 – 1987

Consulting:
Structures Specialist, State of Illinois Urban Search and Rescue Team
Consultant, State of Illinois Terrorism Task Force

Professional License or Certification:
Licensed Engineer: Illinois, Indiana, Iowa, Kansas, Washington, Louisiana, Michigan, Minnesota, Missouri, New York, Ohio, Texas, Nebraska & Ohio.
Licensed Attorney: Illinois
Others:

- Certified ATC 45 Trainer – Safety Evaluation of Buildings After Windstorms and Floods, sponsored by Applied Technology Council and National Council of Structural Engineers Associations
- Safety Assessment Program Evaluator Trainer for California Office of Emergency Services
- Disaster Service Worker for California Office of Emergency Services Safety Assessment Program
- FEMA Urban Search and Rescue Structural Specialist Training sponsored by Structural Engineers Association of New York
- Standardized Emergency Management System sponsored by California Office of Emergency Services
- Emergency Building Assessment – Post-earthquake Safety Evaluation of Buildings, ATC-20 sponsored by Applied Technology Council
- Supported and Suspended Scaffold User sponsored by Construction Safety Council

Presentations (Last 5 years):

1. “Post Flood and Wind Safety Evaluation of Buildings”

Course Instructor, Disaster Response Training Seminar for Architects and Engineers Emergency Response Task Force, Rhode Island State Building Commissioner's Office, and Rhode Island State Emergency Management Agency, Lincoln, RI, July 2007.

2. "Emergency Response Engineering"

University of Illinois American Society of Civil Engineers, Champaign, IL, October 2006.

3. "Planning and Procedures for Post-Disaster Structural Evaluations"

Course Instructor for seminars at:
Structural Engineers Association of Illinois, Bloomington, IL, April 2003.
Structural Engineers Association of Utah, Salt Lake City, UT, October 2003.
Delaware Valley Association of Structural Engineers, Philadelphia, October 2003.
Structural Engineers Association of Vermont, Randolph, VT, November 2003.
Structural Engineers Association of Illinois, Chicago, IL, January 2004.
Structural Engineers Association of Arizona, Phoenix, AZ, April 2004.
Structural Engineering Association of Rhode Island, Warwick, RI, June 2004.
Structural Engineers Association of Montana, Helena, MT, November 2004.

Professional Societies:
SEAOI, Structural Engineers Association of Illinois.
NCSEA, National Council of Structural Engineers

Honors and Awards:
2002 ASCE New York State Council Outstanding Civil Engineering Achievement Award – "World Trade Center Disaster Site Recovery"

Research or Scholarly Activity Percentage:
N/A

CAEE Program Percentage:
N/A

Safdar Gill (Part-time Faculty)

Name & Rank

Safdar Gill, Adjunct Professor

Degrees:

Ph.D. in Civil Engineering, Northwestern University, 1970.
Master of Science in Civil Engineering, Northwestern University, 1962.
Bachelor of Science in Civil Engineering (with honors), Punjab University, Pakistan, 1956.
Diploma in Statistics, Punjab University, Pakistan, 1964.

Current Appointment:

Geotechnical Engineer, Ground Engineering Consultants, Inc. (1992-present)
Part-time Faculty, Civil, Architectural and Environmental Engineering Department, IIT
Teaching assignment: CAE 457 and CAE 486

Other Related Experience:

Teaching: One year (part-time) at Northwestern University
One year (part-time) at University of Illinois, Chicago

Consulting, Patents, etc.

Government of Punjab & West Pakistan: 1954-1961, 1963-1965
Greeley and Hanson, Engineers (1962-1963, 1965-1967)
STS Consultants Ltd. (1970-1992)
Patents: None

Professional Licensure or Certification:

Professional Engineer: Illinois, Michigan, Wisconsin, Iowa, Kentucky, New York, District of Columbia, Virginia, Maryland, and New York.
Structural Engineer: Illinois
Chartered Civil Engineer: United Kingdom

Publications:

None in the past 5 years

Professional Societies:

American Society of Civil Engineers, Fellow
Institution of Civil Engineers, London, Fellow
British Geotechnical Society
International Society of Rock Mechanics
International Society of Soil Mechanics & Foundation Engineering
Society of Sigma XI
Structural Engineers Association of Illinois, Member & Director

Honors and Awards:

Member, Editorial Board, Journal of Geotechnical and Geo-environmental Engineering

Institutional and Professional Service:

N/A

Research or Scholarly Activity Percentage:
N/A

CAEE Program Percentage:
N/A

Donald Grabowski (Part-time Faculty)

Name and Rank
Donald Grabowski, Adjunct Assistant Professor

Degrees:
BS, Specialty: Civil Eng., Illinois Institute of Technology, 1990

Current Appointment:
Adjunct Professor, Civil, Architectural and Environmental Engineering

Other Related Experience:
Chief Traffic Engineer City of Chicago department of Transportation, 2001-2006

Consulting, Patents, etc.:
HDR engineering, 1989-1997
HDR engineering, 2006-present

Professional License or Certification:
Professional Engineer, Illinois

Publications:
Books:

N/A

Selected Papers (Lat 5 years):

N/A

Professional Societies:
Member, American Society of Civil Engineers.

Honors and Awards:
(None in the last 5 years)

Institutional and Professional Service:
N/A

Research or Scholarly Activity Percentage:
N/A

CAEE Program Percentage:
Teaching Courses: CAE 419 (Intro to Transportation), CAE 416 (Transportation Facility Design)
Board of Advisors meeting arrangement, award program arrangement, industry-university fund-raising meetings, resource development, ABET assessment and report preparation, etc.)

Jamshid Jahedi (Part-time Faculty)

Name & Rank
Jamshid Jahedi, Adjunct Professor

Degrees:
Illinois Institute of Technology, Chicago, IL, Ph.D., Civil Engineering, Dec. 1987
M.S., Civil Engineering (Structures), May 1981
National University of Iran, Tehran, Iran, M. Architecture, Aug. 1977

Current Appointment:
Dome Engineers, President, Clarendon Hills, IL, 1992-date
Part-time Faculty, Civil, Architectural and Environmental Engineering Department, IIT
Teaching assignment: CAE 468 and CAE 469

Other Related Experience:
Padia Consulting Architects, Tehran, Iran, 1967-1979
Sargent & Lundy, Chicago, IL,1984-1987
R.T. Patterson Co., Inc., Highland, Indiana, 1988-1992

Consulting, Patents, etc.
Superior Engineering Corp (Indiana), Primera Engineers (Chicago, IL), Ambitech Engineers (Downers Grove, IL)
HOH Engineers (Chicago), Raytheon Engineers (Downers Grove, IL)

Professional Licensure or Certification:
Illinois, Indiana and Wisconsin (PE), Illinois (SE), Registered Architect (Wisconsin), FAIA

Publications:
None

Professional Societies:
ASCE, National Society of Professional Engineers, SEAOI, AIA

Honors and Awards:
None

Institutional and Professional Service:
N/A

Research or Scholarly Activity Percentage:
N/A

CAEE Program Percentage:
N/A

Arthur Kurzydlo (Part-time Faculty)

Name & Rank
Arthur S. Kurzydlo, Adjunct Professor

Degrees:
Ph.D. Illinois Institute of Technology, Chicago, Structural Engineering, 1992
M.S. Illinois Institute of Technology, Chicago, Geotechnical Engineering, 1989
M.S. Technical University of Krakow, Structural Engineering, 1981
B.S. Technical University of Krakow, Civil Engineering, 1980

Current Appointment:
Vice President and Chief Engineer, Dearborn Engineering Corporation, Chicago, 1996-date
Part-time Faculty, Civil, Architectural and Environmental Engineering Department

Oher Related Experience:
Senior Engineer, Conestoga Rovers and Associates, Chicago, 1993-1996
Project Engineer, K & S Testing and Engineering, Highland, Indiana, 1989-1993
Project Engineer, Wang Engineering, Rolling Meadows, Illinois, 1987-1989
Staff Engineer, H.W. Lochner, Chicago, 1985-1987

Consulting, Patents, etc.:
N/A

Professional License or Certification:
Structural Engineer licensed in Illinois
Professional Engineer licensed in Illinois, Indiana, Wisconsin, Michigan and Iowa
Also PE licensed in Indiana, Wisconsin, Michigan and Iowa

Publications:
Campisi, J.S. and Kurzydlo, A.S. "Technical Feasibility and Economics of Former MGP Site Remediation", *GTI Conference*, Orlando, Florida, 2005
Campisi, J.S. and Kurzydlo, A.S. "Innovative Engineered Barrier System for Closure of an Auto Salvage Facility in Northeastern Illinois", *AEHS Conference*, San Diego, California, 2006
Kurzydlo, A.S. and Campisi, J.S. "Mold – A Structural Engineer's Perspective", *ASCE Practice Periodical on Structural Design and Construction*, American Society of Civil Engineers, Volume 12, Number 2, May 2007

Professional Societies:
Structural Engineers Association of Illinois (SEAOI)
American Society of Civil Engineers (ASCE)
Tau Beta Pi – National Engineering Honor Society
Chi Epsilon – National Civil Engineers Honor Society

Honors and Awards:
Caterpillar Inc., East Peoria Plant, Silver Award for Environmental Prevention
United States Achievement Academy United States National Collegiate Award Winner

Institutional and Professional Service:
N/A

Research or Scholarly Activity Percentage:
N/A

CAEE Program Percentage:
N/A

Ray Lemming (Part-time Faculty)

Name & Rank
Raymond M. Lemming, Adjunct Professor

Degrees:
- Juris Doctor, Chicago-Kent College of Law, 1996. (Special Certificate in International Law)
- Master of Business Administration (Organizational Management), Central Michigan University, 1977.
- Bachelor of Science in Civil Engineering, Illinois Institute of Technology (Structural Engineering), 1987.
- Bachelor of Science in Psychology (Organizational Psychometrics), University of Dayton, OH, 1975.

Current Appointment:
Construction Claim Administrator, Metropolitan Water Reclamation og Greater Chicago, 1998-date
Part-time Faculty, Civil Architectural and Environmental Engineering Department

Other Related Experience:
35 years experience in heavy infrastructure Construction Management, Project Controls, and construction claims. Some of recent experiences are:
As Chief Engineer of CNA Surety –

Reviewed technical issues for 22 attorney staff, traveled with staff attorneys to inspect project sites.
Participated in dispute resolution meetings, advised on use and management of technical consultants.
Responsible for completion of projects by management or recontracting.
Participated in numerous ADR proceedings, both mediation and arbitration.
Managed consultants for $48mil of litigation on the Detroit Airport terminal.
Managed financing negotiations, debt buyout with banking syndicates, and defaults on largest steel fabricator in North America.
Resolved performance and payment bond claims on construction projects for approximately 150-250 contractors per year. Claims ranged from minimal to multi-million dollar amounts.
Responsible for retaining and managing attorneys and consultants in the investigation and litigation associated with surety bond claims.
Implemented use of Lexis and Internet in surety claims operation.
Represented Surety Claims section on various corporate committees involving computer systems development and operations.
Performed construction feasibility planning, constructability analysis, and developed Engineer's Schedule on the new Inchon Locks and Seoul Korea barge canal.
Conducted construction planning and scheduling for $500 Mil Shoreline Protection Project, City of Chicago.
Prepared Engineers Schedule, reviewed bid documents, and performed bid analysis for South Water shoreline protection project in Michigan City IN.
Performed construction planning, constructability analysis, and Engineer's Schedule for replacement of roof and interior rehab of Jardine Water Treatment Plant, Chicago. This is the worlds largest water treatment plant/building.
Performed constructability analysis, value engineering, alternative design and construction options, and formulated Construction Management Plans for U.S. Army Corps of Engineers, Nashville District, for Kentucky Locks on the Tennessee River.
Conducted construction management/project controls training in El Salvador for the project managers of CEL, the national power authority. Advised senior management of control of project management.
Conducted constructability/schedule analyses of the Maheshwar Hydroelectric Project in central India and Dhamwari Sunda Hydro Project in northern India.

Performed constructability analysis and provided schedules and construction plans to U.S. Army Corps of Engineer, Louisville District, for Union Town, Newburgh, and Cannelton Lock Projects on the Ohio River.

Consulting:

b. CNA Surety, Chicago, IL; (2) Argonne National Laboratories, Chicago, IL.; (3) Foran Glennon Palandech & Ponzi PC, Chicago, IL.

Professional License or Certification:
Professional Engineer – State of Illinois
Licensed Attorney – State of Illinois

Publications:
Selected Papers (Last 5 years):
There is one paper in the last 5 years that I am listed on as a co-author with Jonathan Shi.

Professional Societies:
ABA, American Bar Association, Construction Division
Underground Construction Association of Chicago, (Groundhogs)

Institutional and Professional Service:
I consider my 17 years of part-time teaching as the best contribution I can make to my alma mater IIT

Research or Scholarly Activity Percentage:
N/A

CAEE Program Percentage:
N/A

Ali Oskouie (Part-time Faculty)

Name and Rank
Ali K. Oskouie; Adjunct Professor

Degrees:
PhD, Specialty: Environmental Eng., Illinois Institute of Technology, 1996
MSE, Specialty: Water Resources-Hydraulics., University of Michigan, Ann Arbor, 1990
BSc, Specialty: Civil Eng., University of Tabriz, Iran 1986

Current Appointment:
Metropolitan Water Reclamation District of Greater Chicago, Scientist, 2001-Present
Part-time faculty, Civil, Architectural and Environmental Engineering Department
(Teaching assignment: CAE 584, Storm water management)

Other Related Experience:
Postdoctoral Fellow, IIT and American Air-Liquide, 1996-1997

Consulting, Patents, etc.:
Amherst Process Instrument, Consultant, 1992-1996.
American Air-Liquide, Postdoctoral fellow, 1996-1997
Apparatus for Generating Odor Upon Electronic Signal Demand , U.S. Patent #6,548,025 (2003).
Apparatus for Generating Odor Upon Electronic Signal Demand,U.S. Patent #6,004,516 (1999).

Publications:
Books:
Solutions Manual for Fundamental of Air Quality Systems (*Design of Air Pollution Control Devices*), American Academy of Environmental Engineers. Noll K.E., Suadee, W., Oskouie A. (1999).

Selected Papers (Last 5 years):
Oskouie A., Lordi D., Granato T., Lanyon R. Plant Specific Correlations to Predict the Total VOC Emissions from Wastewater Treatment Plants (in press), 2008
Rashmawi K., Oskouie A., Noll. K. E. Development of a Copolymer for Removal of Taste-and-Odor causing Compounds from Lake Michigan Water. *In press), ASCE, J. of Environmental Engineering*, 2008.

Oskouie, A., Lordi, D. T., Sawyer, B., Lanyon, R. Comment on " Locating and Quantifying PCB Sources in Chicago: Receptor Modeling and Field Sampling" Environ. Sci Technol, 37 (24): 5837 (2003)
Lestari, P., Oskouie, A., Noll K. E. Size Distribution and Dry Deposition of Particulate Mass, Sulfate and Nitrate in an Urban Area," *Atmospheric Environmen*t, 37 (2003) 2507-2516.

Professional Societies:
Member, Water Environment Federation (WEF)
Member, American Association for Aerosol Research (AAAR)

Honors and Awards:
Marquis's Who's who in Science and Engineering, Who's Who in America, Who's Who in the World

Institutional and Professional Service:
Coordinator of Water Treatment Program at IIT- 1997-2000
Member of Peer-review Board for:

- Environment Research Foundation (2001-present)
- Environmental Science and Technology (2003-present)
- ASCE, J, of Environmental Engineering (2003-present)
- J. Atmospheric Environment (2004-present)
- J. of Air &Waste Management Association (2004)
- J. of Aerosol Science and Technology (2005-present)

Chair (session) of AIChE World Congress on Numerical Simulation of Fluid/Particle Flow Systems (2006)
Co-editor of fluid-particle interactions symposiums (American Institute of Chemical Engineers, AIChE, (1999)

Research or Scholarly Activity Percentage:
N/A

CAEE Program Percentage:
N/A

Amreek Paintal (Part-time Faculty)

Name & Rank
Amreek Paintal, Adjunct Professor

Degrees:
PhD, Specialty: Hydromechanics. University of Minnesota, 1969
ME, Specialty: Hydraulics. University of Roorkee, Roorkee, U.P., India, 1962
BE, Specialty: Civil Engineering. University of Roorkee, U.P., India, 1961
B.Sc., Specialty: Physics, Chemistry, & Mathematics. Agra University, Agra, U.P., India, 1958

Current Appointment:
Supervising Civil Engineer, Metropiltan Water Reclamation of Greater Chicago (2000-date)
Part-time faculty, CAEE Department, Illinois Institute of Technology
Teaching assignment: CAE 301 (Hydraulics & Hydrology, CAE 302 (Fluid Mechanics & Hydraulics)

Other Related Experience:
Assoc Professor, (1971-73), Assist Professor, (1969-71), West Virginia Inst of Tech, Montgomery, WV

Consulting, Patents, etc.:
Principal Civil Engineer (1980 to 2000)
Senior Civil Engineer (1973 to 1980)
Metropolitan Water Reclamation District of Greater Chicago, Chicago, Illinois

Professional License or Certification:
Professional Engineer, Illinois
Professional Engineer, West Virginia
Board Certified Environmental Engineer, American Academy of Environmental Engineers
Certified Professional Hydrologist, American Institute of Hydrology

Publications:
(None in the last 5 years)

Professional Societies:
Member, American Society of Civil Engineers
Member, American Geophysical Union
Member, American Association for Advancement of Science
Member, International Association of Hydraulic Research

Honors and Awards:
(None in the last 5 years)

Institutional and Professional Service:
N/A

Research or Scholarly Activity Percentage:
N/A

CAEE Program Percentage:
N/A

P. S. Sriraj (Part-time Faculty)

Name & Rank
P.S. Sriraj, Adjunct Associate Professor

Degrees:
PhD, Specialty: Transportation, Illinois Institute of Technology, Chicago, IL 1999
MS, Specialty: Civil Engineering, Illinois Institute of Technology, Chicago, IL, 1995
MS, Specialty: Physics, Birla Institute of Technology, Pilani, India
BS, Specialty: Civil Engineering, Birla Institute of Technology, Pilani, India

Current Appointment:
Adjunct Associate Professor, Civil, Architectural and Environmental Engineering 2003-current

Other Related Experience:
Research Assistant Professor and Senior Associate, Urban Transportation Center, University of Illinois, Chicago, 1999-date

Teaching Assistant, Civil, Architectural and Environmental Engineering, Illinois Institute of Technology, Chicago, Illinois, 1995-1999

Consulting, Patents, etc.:
None

Professional License or Certification:
None

Publications:

Sriraj, P.S., Minor, M., and Thakuriah, P., "Spatial decision support system for low-income families: a relocation tool for the Chicago land region," Transportation Research Record, TRB, 2006.

Fruin, G., and Sriraj, P.S., "An environmental justice approach to evaluate the equitable distribution of a transit capital improvement program," Transportation Research Record, TRB, 2005.

Thakuriah, P., Sriraj, P.S., et al, "Activity and travel related changes of job access transportation service users: analysis of a user survey, Transportation Research Record, TRB, 2005.

Metaxatos, P., Sriraj, P.S., et al, "Effects of whistle-blowing bans on accidents at gated rail-highway crossings: the Northeastern Illinois experience," Journal of Transportation Research Forum, 2004.

Professional Societies:
Transportation Research Board
(Various committees within TRB)

Honors and Awards:
TRB outstanding paper award, 2006
Best Practice Award, Transportation Planning Council, ITE, 1999.

Institutional and Professional Service:
Member, Committee on Environmental Justice, TRB

Member Committee on Socio-Economic Factors in Transportation, TRB
Friend, Committee on Asset Management, TRB

Research or Scholarly Activity Percentage:
N/A

CAEE Program Percentage:
Teaching Courses: CAE 546 (Public Transportation Systems)
CAE 547 (Advanced Traffic Engineering),
Students' thesis committees at IIT

Laurence Rohter (Part-time Faculty)

Name & Rank
Laurence Rohter, Adjunct Professor

Degrees:
MSCE, Specialty: Transportation, Georgia Institute of Technology, Atlanta,Georgia, 1974
BS, Specialty: Civil Engineering, Illinois Institute of Technology, Chicago, Illinois, 1971

Current Appointment:
Adjunct Professor, Civil, Architectural and Environmental Engineering 2003-current

Other Related Experience:
Associate Adjunct Professor, University of Notre Dame, South Bend , IN 2003
Adjunct Assistant Professor, Illinois Institute of Technology, Chicago, IL 1987-1989

IIT Research Institute, (Senior Science Advisor 1999-2003, Science Advisor 1991-1999,
Senior Engineer,1984-1991, Research Engineer 1979-1984,) Chicago IL
Regional Transportation Authority, (Staff Advisor) 1975-1979, Chicago, IL
Chicago Transit Authority, (Special Projects Engineer) Chicago IL 1974-1975
City of Chicago Public Works (Civil Engineer) Chicago, IL 1972-1973
US Environmental Protection Agency, Chicago IL, 1971
Cooperative Engineering (US Steel, Illinois Central RR, Milwaukee Railroad) 1967-1970

Consulting, Patents, etc.:
MiJack (Intermodal) Products, Hazel Crest, Illinois 2006-present
Omnicom Engineering, York, England 2003-2006

Professional License or Certification:
Professional Engineer, Illinois, Georgia (inactive)

Publications:
Books:
User, Operational and Research Protocol Manuals for IITRI Railroad Simulators

Selected Papers (Last 5 years):

Visualization to Solve Problems in Freight Transportation,
Laurence Rohter, P.E. Illinois Institute of Technology; Chicago, with Rolf Schmitt & Rainer Dronzek, for TR News 2007September, *and for Transportation Research Board Annual Meeting January, 2008.* Washington DC

MINDING THE GAP, Using Ground Based Rotating Lidar for 3d Viewing and Measuring,
Laurence Rohter, P.E. Illinois Institute of Technology; Chicago, USA
(corresponding author) with Ray State, & Stirling Kimkeran, *for TRB 5th International Visualization in Transportation Symposium and Workshop,* October, 2006 Denver Colorado

Automated Shipping Container Transportation System Design
For Chicago Laurence Rohter P.E. Civil and Architectural Engineering, Illinois Institute of Technology
(Corresponding Author) with Bruce Dahnke, Carliss Jackson, Ariel Iris, & Gerald Rawling *for METRANS National Freight Conference February, 2006* Long Beach California

Custom 3D Markers for ESRI's ArcScene and ArcGlobe
Laurence Rohter, Illinois Institute of Technology with John Dorr, *for ESRI Wisconsin User Group November Annual Conference November 2005* Green Bay, WI

Ground Based Raster Imagery -- The Next Big Thing
Laurence Rohter, Illinois Institute of Technology with Antonio
Callado *for Illinois GIS Association 2005 FALL CONFERENCE November 2005,* Lisle IL

Automated Shipping Container Transportation System Design
Laurence Rohter, Ill. Inst of Tech with Carliss Jackson *For Transport Chicago June 2005* Chicago IL

UK Rail Network Achieves Geospatial Integration
Laurence Rohter , Ill. Inst of Tech, Chicago Illinois, with Stirling Kimkeran *for 61st Annual Meeting of the Institute of Navigation, June, 2005* Cambridge Mass

Professional Societies:
Full Member of Transportation Research Board Committee Visualization in Transportation TRB/ABJ95
Member, Illinois GIS Association
Steering Committee, Transport Chicago

Honors and Awards:
Commitment to Excellence Award, IIT Research Institute, 1984, for RALES Construction (the Railroad Analyzer and Locomotive Evaluator/Simulator)

T.J. Watson Fellow 1971-1972

Institutional and Professional Service:
Co Principal Investigator (with IIT College of Architecture) 2006-2008 “Truck Parking”
Thesis Advising for IIT College of Architecture

Research or Scholarly Activity Percentage:
Research, Proposal and Publication preparation, 10%

CAEE Program Percentage:
Teaching Courses: CAE105 (Geodetic Science), CAE 539 (Introduction to Geographic Information Systems), IPRO497 (Interdisciplinary Projects -- Transportation) 90%
Other administrative duties (Engineering Graphics Lab support, GIS Lab support and relocation): 10%

APPENDIX C – LABORATORY EQUIPMENT

The following table provides a summary of major laboratory equipment along with the square footage area of each laboratory.

Laboratory (Building and Room Number)	Purpose of Laboratory, Including Courses Taught	Adequacy for Instruction	Number of Student Stations	List of Equipment	Area (Sq. ft.)
Construction Engineering and Management Lab AM 220A, B and C	To provide computer facilities for course work and research in construction management. CAE 462, CAE 470, CAE 471	Adequate	15	Four workstations and a full-slab digitizers. The latest version of Autocad, Primavera and Timberline software The workstations are connected by a local area network (LAN) to a fast HP 1000 printer. HP scanner, and an HP color plotter.	1152
Geotechnical Engineering Lab AM 120	To provide equipment & instrumentation for experimental investigation of mechanical & hydraulic properties of soils & rocks CAE 323	Adequate	8	True triaxial cell Resonant column Hollow cylinder shear MTS dynamic loading machine Corbonated rock compatibility testing unit Soil vapor extraction unit Track model testing bed Transmissivity testing unit Large direct shear apparatus Conventional triaxial units Loading machine for creep test on geosynthetics Rock jaw-crusher Field dilatometer testing unit	2075
Material testing Lab AM 119	Same as above, except glass, steel aluminum, wood, plastics, ceramics are tested. CAE 315	Adequate	8	An 800,000 lbs. capacity Riehle universal testing machine 3 computer-controlled MTS Model 810 Hydraulic Material Test System of 50,000 lbs. capacity, 60,000 lbs. capacity and 400,000 lbs. capacity universal testing machines A Tinius Olsen Charpy Impact Tester A Tinius Olsen Brinell Hardness Testing Machine A 20’X20’ steel horizontal testing frame for beam to column connection investigations under cyclic loading.	1728
Concrete Lab AM 116	Used in conjunction with Material Testing Lab for	Adequate	8	Equipment for the fabrication and testing of members and/or assemblages up to 32’ in length and 18’ in width.	2304

	investigation of properties of concrete structures CAE 307			Various forms and molds and a bin and batch unit for sand and gravel. Two concrete mixers and a concrete vibrator. A Dillon Lo-Capacity (10,000 lbs.) Tensile Testing Machine. A Riehle Universal Testing Machine of 300,000 lbs. capacity. Two double-sided bench clusters, which accommodates sixteen students per laboratory period.	
Structural Models Lab AM 117	To provide equipment & instrumentation for experimental investigation of small scale structures. CAE 435	Adequate	8	Machine for the fabrication of test specimens, Fixtures and jigs. Image processing equipment Two 24' x 24' bays of space devoted to various test beds and testing apparatus. A computer-controlled MTS Model 810 Hydraulic Material Test System of 25,000 lbs. capacity (for fatigue testing).	1392
Surveying Equipment Room AM 003	Performing measurements of distances, angles, leveling, transversing CAE 105	Needs upgrading	8	Total Stations. Levels. Standard equipment for traditional surveying.	60
Transportation Engineering Lab AM 102	To provide computer programs solving problems in traffic engineering, transportation planning system management. CAE 419	Adequate	4	A variety of software used in transportation and traffic engineering. Computers, printers and scanner	576
Engineering Graphics Lab MB 402, 403, 413 & 414	To provide drawing and CAD experience to engineering students. CAE 100, EG 105, CAE 439 (GIS Course)	Adequate	32	CAD/GIS/GPS workstations Traditional drafting boards	4480
CAD Lab AM 218	To provide hardware and software for computer-aided drafting and design CAE 101, CAE 368, CAE 369	Adequate	32	Workstations (Dell computers) Audiovisual equipment Printers	1008
Environmental	To teach undergraduate	Adequate	16	Standard lab equipment (DO meters, pH meters, stirrers,	1,600

Engineering Lab AM 210 & PH 218	students with environmental unit processes and analytical methods ENVE 404			sterilizers, water baths, ovens, spectrophotometers, titrimeters, etc.) Analytical instruments (UV-VIS spectrophotometer, compound microscope with digital imaging, fluorometer, atomic absorption spectrophotometer, & organic carbon analyzer)	

APPENDIX D – INSTITUTIONAL SUMMARY

The Institution

Illinois Institute of Technology
Chief Executive Officer: John L. Anderson, *President*

Type of Control

Illinois Institute of Technology is an independent non-sectarian, co-educational, urban university. It is governed by a board of trustees drawn from diverse groups representing the public interest.

History of Institution

Armour Institute opened in 1893; the institute offered professional courses in engineering, chemistry, architecture and library science. IIT was created in 1940 by the merger of Armour Institute with Lewis Institute (est. 1895), a West Side Chicago college that offered liberal arts as well as science and engineering courses. The Institute of Design, founded in 1937, merged with IIT in 1949.

In 1969, IIT became one of the few technology-based universities with a law school when the Chicago Kent College of Law, founded in 1887, became an integral part of the university. Stuart School of Business was added in 1969, with a gift from the estate of Lewis Institute alumnus and Chicago financier Harold Leonard Stuart. The school became the Stuart School of Business in 1999. Midwest College of Engineering, founded in 1967, joined the university in 1986, forming the nucleus for IIT's west suburban campus.

Today, IIT is a private, Ph.D.-granting university with programs in engineering, science, psychology, architecture, business, design and law. It is one of the 16 institutions that comprise the Association of Independent Technological Universities (AITU).

Student Body

Please see included tables. The IIT student body is exceptionally diverse; students are drawn from all 50 states of the USA, and from over 90 nations.

Admissions Process

Students may be admitted directly into an engineering major or as “undeclared engineering”. Admission decisions are based on academic performance, standardized test scores, teacher/counselor recommendations and evidence of promise to succeed, which includes co-curricular activities, interests and hobbies, and personal maturity.

Students must have attended an accredited high school (although we do accept home schooled students) and have completed a minimum of 16 units of high school work and a minimum of 3½ units of mathematics that must include 2 units of algebra through pre-calculus, 1 unit of geometry and ½ unit of trigonometry. Calculus is strongly

recommended but not required. Additionally, students must have completed 2 units of laboratory science (preferably physics and chemistry). Students are encouraged to take an additional laboratory science. Additional requirements include 4 units of English, and 2 units of History or Social Studies.

It is expected that students select a rigorous high school program that includes AP, IB or honors courses when they are available at the student's school. Students are encouraged to take college courses to supplement their education while they are enrolled in high school.

Students with unweighted grade point averages greater or equal to 3.0 and ACT test scores greater or equal to 24 math and 24 composite, or SAT scores greater or equal to 1150 may be admitted without a faculty committee review. Students who fall below these floors are generally denied admission, but may be, on an individual basis, selected for admission by a faculty review committee.

IIT recognizes and grants credit for students who have satisfactory scores for Advanced Placement or International Baccalaureate examinations. IIT also will grant transfer credit for college course work taken while a student was in high school provided a grade of "C" or above was earned.

IIT does not have an "upper division" per se. Students admitted as "Undeclared Engineering" are subject to the same requirements as all other admits. They are expected to declare a major by the end of the first year of study.

The Office of Educational Services is responsible for verifying all courses transferred from other colleges. Transfer applicants must be in good academic standing at their previous colleges to be considered for admission to IIT. Applicants with less than 30 hours of transferable college course work must submit high school transcripts and SAT or ACT scores as part of their application. Admission is based upon a cumulative GPA and individual grades in all classes that apply to the selected major. A minimum cumulative GPA of 3.0 is expected for transfer consideration. However, a transfer applicant who has special circumstances will be reviewed by a faculty committee.

Transfer credit is granted only for courses completed at schools listed in *Transfer Credit Practices of Designated Educational Institutions, American Association of Collegiate Registrars and Admissions Officers*. For engineering students, transfer credit for the equivalent of engineering and professional electives is given only for courses completed at schools accredited by the EAC of ABET.

Transfer credit is granted on a course equivalency basis, i.e., the nature, content, level and prerequisites of the course must be comparable to those offered at IIT. Students may transfer a maximum of 68 applicable credits from a 2-year college. Transfer students must complete their last 45 credits at IIT with at least 50% of the course work at the 300 and 400 level in their major discipline. Transfer credit will be accepted for courses completed with the equivalent of a grade of "C" or better.

Joint programs with specific articulation agreements have been established with Benedictine University, DePaul University, Dominican University, University of St. Francis, Elmhurst College, and Wheaton College. Depending on the specific partner

institution, students may receive a degree in Aerospace Engineering, Architectural Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, or Mechanical Engineering and a Bachelor's degree in an approved discipline from their host school. Students are considered full-time at their host institution while completing requirements for both degrees. Admission into the Joint Program at another institution does not guarantee admission to IIT. Students must meet IIT admission requirements. Grades of "D" are acceptable for transfer credit for general education courses only. Programs of study have been produced for all engineering curricula available at each specific partner institution.

Regional or Institutional Accreditation

Illinois Institute of Technology has had continuous accreditation from the North Central Association of Colleges and Schools since 1941; the last accreditation visit was in 2006.

Personnel and Policies

(a) Promotion and tenure policies

Tenure track and tenured ranks are: assistant professor, associate professor, and professor. Decisions on promotion and tenure are, by authority of the Board of Trustees, vested in the President of the university. For each candidate, the Provost is expected to make recommendations to the President based on consideration of university needs, plans, and resources, and on the recommendations submitted by the following faculty committees and individuals:

1. the Academic Unit Committee on Promotion and Tenure (AUCOPT);
2. the Campus Committee on Promotion and Tenure (CAMCOPT);
3. the University Committee on Promotion and Tenure (UCOPT); and
4. the head of the academic unit and, in the case of a college with departments, the dean of the candidate's department.

The recommendations of the faculty committees as to any candidate are the result of the consideration of the portfolio of the candidate and any additional information or recommendations provided at the request of the committees by appropriate persons, including the candidate, professional peers from outside IIT, fellow faculty members, the Provost, the academic unit head, and students.

Evaluation of candidates for tenure appointments and for promotions to the rank of professor are based on clearly defined standards of academic quality. Inasmuch as there may be significant differences in the spirit and traditions of the individual disciplines comprising IIT, standards may vary from one profession to another. While each academic unit is expected to formulate its own standards and guidelines for the evaluation of its faculty, the following criteria are common to all academic units: performance in teaching, advising and the promotion of student learning; scholarly activities appropriate to the discipline; and service to the university, the profession, and the community at large. The

standards are drafted by the unit's Committee on Promotion and Tenure, and academic unit heads supply copies of these standards with any amendments and revisions to the Provost for approval. A copy of the appropriate set of standards is given to each faculty member by the Office of the Provost at the time of the faculty member's initial appointment.

(b) The process used to determine faculty salaries

The available salary adjustment funds are allocated to the deans by the provost. In Armour College of Engineering the dean meets with the department heads who propose a distribution of these funds to their faculty according to the faculty activities and evaluations for the preceding year, and the needs of the departments/programs. The proposed adjustments are approved by the provost.

(c) Faculty Workload

The official workload for a full-time faculty member is 9 contact hours or equivalent per semester over a 2 semester academic year. This requirement can be met through: teaching of regularly scheduled courses; advising either or both undergraduate and graduate students; serving as research mentor for undergraduate or graduate students with a project, thesis, or dissertation outcome with the general rule that ten student credit hours is equivalent to one contact hour; developing new or redesigning existing courses and/or laboratories; or teaching courses with a large enrollment or highly intensive laboratory or project component.

Other activities that carry equivalent teaching credit include: serving as chair or associate chair of academic units, acting in other defined administrative roles within academic units, or providing extensive committee service for the academic unit, college, or university. In general, research funds can be used to reduce a faculty member's teaching load with the general guideline that approximately one month of academic year salary is equivalent to two contact hours.

In addition, varying contact hour credit is given in certain special cases such as teaching a course for the first time, teaching a distance learning course, or supervising seminar courses.

Untenured faculty members on the tenure track are provided with a minimum credit per academic year of six contact hours reduction in their teaching loads and may receive up to twelve contact hours of reduced teaching at the discretion of their academic unit head.

(d) Supervision of Part-time Faculty

Part-time faculty are hired by the academic units after an interview process and evaluated on a semester-by-semester basis by the unit head or a designee. Student teaching evaluations identical to those used for full-time faculty are conducted for each course

taught by a part-time faculty member. These evaluations, along with other inputs, are used by the unit head to determine the teaching performance of part-time faculty. On occasion, the academic unit head or a designee will attend one or more classes taught by part-time instructors to evaluate their performance directly. The course outline and textbook selection is made by the cognizant full-time faculty member who normally teaches the specific course.

(e) Faculty Benefits

Faculty benefits include: mandatory individual and family health insurance program (Blue Cross/Blue Shield); life and permanent disability insurance; university matched 503(b) retirement program; optional dental insurance; and a tuition remission program for family members of the faculty. Faculty are eligible to apply for sabbatical leave after each 6 years of service.

Educational Unit

Administration and Mission

The Armour College of Engineering is one of eight academic units that comprise the educational core of Illinois Institute of Technology. These units are: Armour College of Engineering, The College of Science and Letters, The Institute of Psychology, The Institute of Design, The College of Architecture, The Stuart School of Business, The Center for Professional Development, and Chicago Kent College of Law.

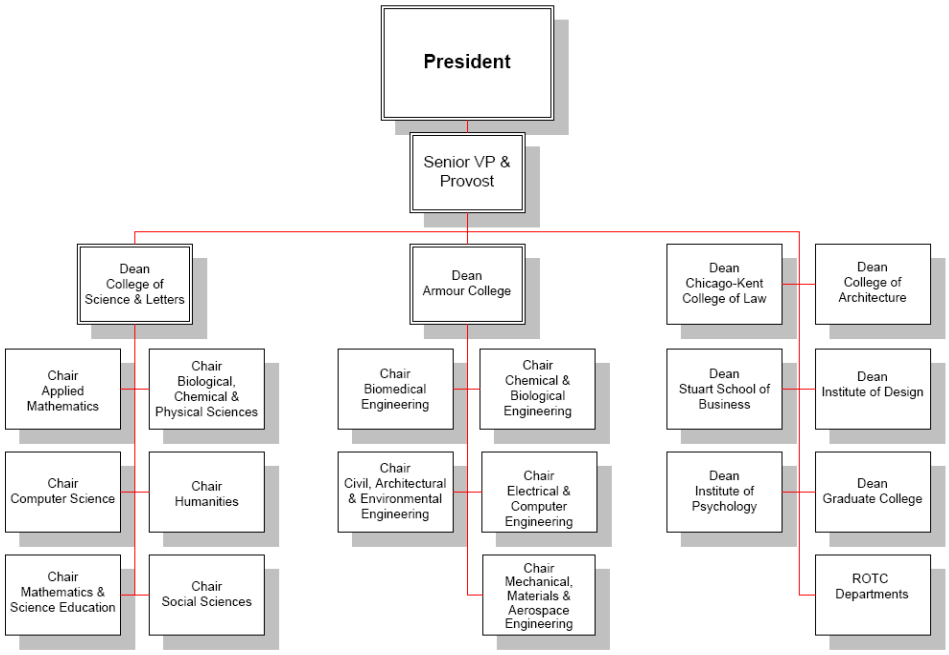
Administrative Heads - Engineering

Head, Title	Unit
Vacant, Dean	Armour College of Engineering
Vincent Turitto, Chair	Biomedical Engineering
Jai Prakash, Acting Chair	Chemical and Biological Engineering
Jamshid Mohammadi, Chair	Civil, Architectural and Environmental Engineering
Mohammad Shahidepour, Chair	Electrical and Computer Engineering
Jamal Yagoobi, Chair	Mechanical, Materials and Aerospace Engineering

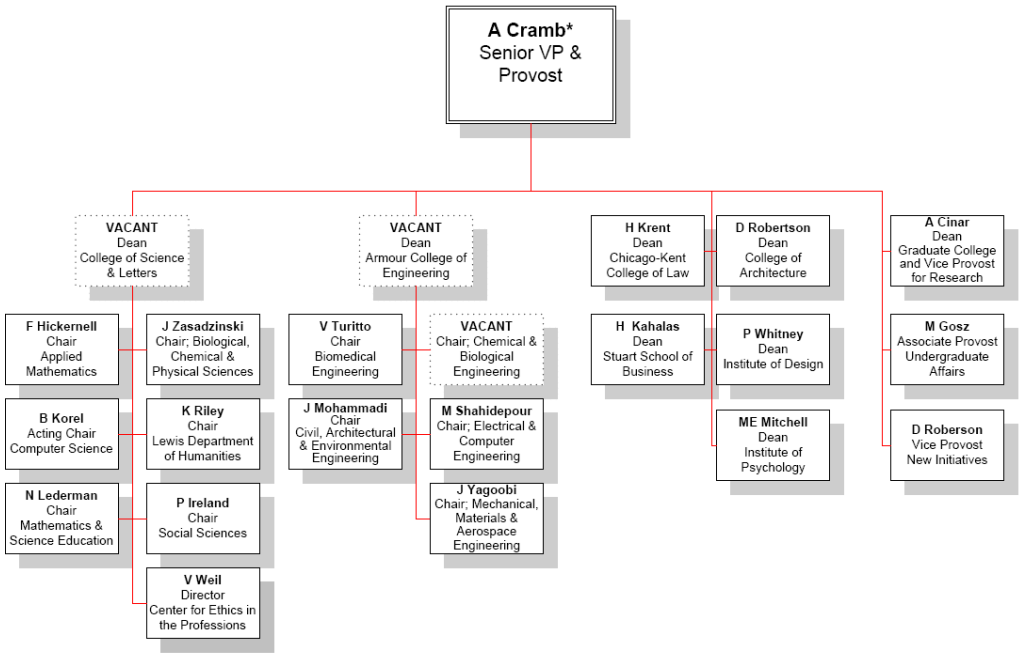
Position of Engineering Educational Programs in the Organization

The Dean of the Armour College of Engineering reports to the Provost, who is the Chief Academic Officer and Senior Vice President. The office of Provost is currently vacant. See attached organizational chart

Academic Organizational Structure



University Academic Structure



*Active beginning August 2008

Updated June 12, 2008

Page 2

Mission Statement

The mission of the engineering unit at the undergraduate level is to offer Bachelor of Science programs in the main engineering disciplines that are recognized by the profession for their quality. Specifically, the purposes of these programs are to:

Prepare individuals for rewarding careers in the engineering profession and for advanced study at graduate level.
Equip their graduates with the potential to maintain currency in their fields.

Credit Unit

One semester credit hour represents one class hour or three laboratory hours per week. One academic year represents 30 weeks of classes, exclusive of final examinations.

Instructional Modes

Non-traditional modes of instruction are not employed in the undergraduate engineering programs as a general rule.

Grade-Point Average and Graduation Requirements

A four point grading scale is used, with "A" =4, "B" = 3, "C"= 2, "D" = 1 and "E" (fail) = 0. A grade point average of 2.0 cumulative and a 2.0 average in courses designated as major courses is required to graduate.

The Office of Educational Services is responsible for certifying that an individual student has satisfied the prescribed curriculum for a Bachelor of Science degree in engineering. When necessary, the associate chair of the individual engineering department provides assistance in the verification process.

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. Engineering students who have completed at least 60 semester hours (including applicable transfer credit) will receive an audit from the Office of Educational Services. After receiving their first audit, students may request periodic updates. Faculty advisors have access to the same database of student information that is used by the Office of Educational Services.

After a student submits an application for graduation, a graduation audit is completed and a letter, which indicates the remaining requirements for the degree, is sent to the student. The final audit is completed when the grades for the semester are recorded and, if all requirements are completed, the degree is awarded.

Academic Supporting Units

The Department of Applied Mathematics teaches required courses in calculus and differential equations. The department head is Dr. F. Hickernell.
The Department of Biological, Chemical and Physical Sciences teaches required courses in Physics, Biology and Chemistry. The department head is Dr. J. Zasadzinski.
The Department of Computer Science teaches required courses in computer science. The department head is Dr. B. Korel.

Non-Academic Supporting Units

The Academic Resource Center (ARC)

The ARC supports many required undergraduate courses in mathematics, physics, and chemistry, and many lower division engineering courses.

The ARC hires 22-30 tutors a semester, depending on how many hours each tutor works. For tutors to work in the ARC, they must be a rising junior or senior, with a 3.5 GPA in the major they wish to tutor. Tutors are recruited by faculty referral, current tutor recommendations, advertising in *IIT Today*, or by running GPA reports of students by major and year. After students turn in a faculty letter of recommendation and application, they interview with both the director and a subject-specific tutor, who asks them to answer questions in a mock-tutoring session that are representative of the questions we get in the ARC.

In addition to one-on-one and group tutoring, the ARC also runs examination reviews by student or professor request. This past school year, the ARC ran review sessions in PHYS 123 and 221, as well as MMAE305 and MMAE320. During the fall 2008 semester, the ARC had 4,000 visits.

There is one permanent staff member:

Dr. Elizabeth Lyons, Director, Academic resource Center (2007)

Education: MFA in Creative Writing, Purdue University, 2006
BA in English, College of Charleston, 2003

Prior Employment History:
Assistant Director, Academic Resource Center (2006-2007)
Graduate Instructor, Purdue University, 2003-2006
Writing Lab Coordinator and Tutor, Purdue University, 2004-2006

IIT Writing Center

Individual assistance for writing assignments is available in the IIT Writing Center, which provides guidance with assignments in engineering, science, and technical communication courses as well as courses in the humanities (literature, history, art & architecture history, philosophy) and social sciences.

One-on-one instruction focuses on the specific needs of the individual student. Typically, a student takes a project or paper assignment to the Writing Center, where a tutor assists with the writing process:

by helping to interpret the goals and requirements of the assignment

by guiding the processes of information gathering, analyzing, evaluating, synthesizing, organizing, and documenting

by helping to address "local" issues such as grammar, punctuation, spelling, conventions of typing, etc.

The Writing Center is opened four days a week, Monday through Thursday, with a typical daily schedule of 9:30 AM to 3:30 pm on Mondays and Wednesdays, and 10:00 am to 5:00 pm on Tuesdays and Thursdays. Weekly student sign-up sheets were posted on the faculty offices of 232 and 233, allowing visitors to make their own appointments. Most appointment lasted from one half to one hour. Students may bring in any form of writing, from an undergraduate first-year composition assignment to a PhD project.

The total number of Spring 2008 visitors was 98. Non-native speakers totaled 67, native English speakers 31. Undergraduates totaled 69 and graduates 29. Total tutoring sessions numbered 236. More that one third (31 of 98 total) of the students were native English Speakers.

There is one permanent staff member:

James Dabbert, Director, IIT Writing Center, 1997-2008
Senior Lecturer, Lewis Department of Humanities, Illinois Institute of Technology, 2000-2007

Education: B.A., English, Indiana University, Bloomington, Indiana, 1967
M.S., Linguistics, Indiana University, Bloomington, Indiana, 1977

Prior Appointments:
Instructor, Lewis Department of Humanities, Illinois Institute of Technology, 1989-2000

Office of Technology Services (OTS)

Main Campus Infrastructure

(a) Academic Buildings

From 2006 to 2008, OTS has upgraded technology at Engineering 1 (E1), Stuart, Metals, Siegel Hall, Life Sciences, Perlstein, and Crown Hall buildings. These recent upgrades include:

Fiber connection into the buildings
Fiber raiser between floors
New teledata closets
New network switches
Infrastructure for Distance Learning
A/V equipped classrooms/labs
Full wireless coverage
Replacement of CAT3 cables with CAT6 cables
UPS in teledata

Engineering and computer science classroom and lab work activities are usually conducted in the following buildings: Stuart, E1, Alumni Hall, and Siegel Hall, each of which benefited from these upgrades.

(b) Classrooms

IIT offers three levels of technology enhanced classrooms:
Basic A/V classroom, which is equipped with a network connection, a projector and screen, an ELMO and a VHS/DVD deck. All components are controlled through a single Crestron Control Panel on the instructor's desk.
Distance Learning Classroom has all the equipment of a basic A/V classroom, plus one or two video cameras, instructor and student microphones, plasma TV monitor, connections to broadcasting and digitizing devices for TV and/or Internet delivery. These classrooms also broadcast via television and the Internet.
Video Conferencing Classroom, which is similar to Distance Learning Classroom but also allows for real-time collaboration with a remote classroom location.

In addition, a PC Classroom is an OTS computer lab that is equipped with a PC and projector for the instructor and individual computers for each student. This arrangement provides students with a hands-on learning experience.

The following buildings are equipped with technology-enhanced learning classrooms:

Stuart Building:
8 basic A/V classrooms

8 distance learning classrooms (2 of which are videoconferencing classrooms)
4 PC classrooms

E1:
14 basic A/V classrooms
3 distance learning classrooms
1 PC classroom

Alumni Hall:
2 basic A/V classrooms
1 PC classroom

Siegel Hall:
1 basic A/V classrooms
2 PC classrooms

(c) OTS Computer Labs:

OTS operates 12 labs in the Main Campus. The Stuart Building, E1, Alumni Hall and Siegel Hall computer labs were the focus of technology upgrades in 2006-2007 or are scheduled for upgrades within the next year. The Engineering and computer science student community usually use the labs in the following buildings:

The E1 building computer lab in room 029 has 21 workstations.
E1 029:
Equipped with basic A/V System in Summer 2006.
The 21 PCs that were refreshed in 2007 are due to be refreshed in Summer 2010.

The Stuart Building has four computer labs, with a total of 109 workstations.
Stuart 112J:
Equipped with basic A/V System in Summer 2006.
The 46 PCs were refreshed in 2005 are due to be refreshed Summer 2008.
Stuart 112E:
Equipped with basic A/V System in Summer 2007.
The 22 PCs that were refreshed in 2006 are due to be refreshed in Summer 2009
Stuart 112F:
Equipped with basic A/V System in Summer 2007.
The 22 PCs that were refreshed in 2006 are due to be refreshed in Summer 2009.
Stuart 112X: (An open work area)
The 19 PCs that were refreshed in 2006 are due to be refreshed in Summer 2009, with the addition of 4 new workstations.

Alumni Hall has one computer lab with 29 workstations:
Alumni 218:
The 29 PCs that were refreshed in 2007 are due to be refreshed Summer 2010.

Siegel Hall has two computer labs with 52 workstations:
Siegel 237:
The 31 PCs that were refreshed in 2006 are due to be refreshed Summer 2009.
Siegel 236:
The 21 PCs that were refreshed in 2007 are due to be refreshed Summer 2010.

The MTTC Night Owl Lab, opened in February 2006:
The 50 laptops are due to be refreshed Summer 2008.

(d) Software

OTS PC labs offer 81 current software titles that specifically address engineering students' needs, and 49 titles that are geared toward Computer Science students. These titles are reviewed every semester by the IIT Software Committee, and are updated after thorough testing for compatibility with existing lab hardware/software.

(e) Distance Learning

IIT Online provides technology and procedural training for all new distance learning faculty. This is primarily utilized in Masters and certificate programs and will not be described here.

(F) Blackboard

Since 2003, the number of courses utilizing the Blackboard course management system has increased six fold. The Blackboard system hosts a website for every course offered at IIT and serves as a portal to IIT Online streaming media, which can be accessed by students in both online and live course sections. Instructors post notes, lectures and assignments on the course page, which also features a discussion board and chat room.

In Fall 2008, 161 of the 579 (27.8%) Engineering courses use the Blackboard management system.

Each Fall, OTS conducts group Blackboard training for new professors. New professors arriving in Spring and Summer are offered either group or individual Blackboard training. Advanced Blackboard training sessions are also available for faculty currently using the system.

OTS operates under the direction of:

Ophir Trigalo, Chief Information Officer, 2003 – 2008

Education: M.B.A. Information Systems, Tel Aviv University, 1990
B.A. Economics and Statistics, Ben Gurion University, 1983

Prior appointments
Vice President for Information Services, Depaul University, 1997-2003
Director of Information Services, SMG Marketing Group Inc., Chicago, Illinois, 1991 –1997

University Libraries

IIT libraries provide access to an extensive collection of print and digital resources in support of the institution's academic disciplines including architecture, design, engineering, computer science, business, and law. There are six libraries at IIT located on four campuses. The Paul V. Galvin Library serves as the main library for the Illinois Institute of Technology and provides primary support for all programs in the fields of engineering and computer science. The Downtown Campus Library serves IIT's Chicago-Kent College of Law and the Stuart Graduate School of Business. Branch and departmental libraries include the Graham Resource Center serving the College of Architecture, the Louis W. Biegler Library on IIT's Rice Campus, the Center for the Study of Ethics in the Professions Library, and the National Center for Food Safety and Technology Library.

Collections
Collectively, the libraries' collections consist of over 1.8 million volumes, including books, journals, videos, DVDs, maps, microform, and government documents. In addition, the libraries provide 24/7 access to a broad range of digital resources including over 100 online databases, more than 24,000 full-text scholarly journal titles, and over 7,000 full text e-book titles in computer science and technology related fields.

A founding member of the Consortium of Academic and Research Libraries in Illinois (CARLI), IIT libraries also provide access to more than 32 million library items from 75 additional academic libraries statewide. Along with extensive resource sharing, IIT's membership in CARLI enables IIT libraries to develop partnerships with over 140 Illinois libraries and take advantage of innovations in teaching, research, technology, and services as well as opportunities to enhance its collections. In 2007, IIT libraries were awarded several cooperative collection development grants in conjunction with other Illinois university libraries that have been used to enrich the libraries collections particular in the fields of science and technology. These specialized areas include "Applied Mathematics in Support of Homeland Security", "Computer Science Mathematics and Computer Algorithms", "Internet Telephony and Computer Crimes Investigation", and a collection partnership in Green Manufacturing Technology.

While the Galvin Library supports the university's core curriculum and all subject disciplines, IIT branch and departmental libraries also provide specialized collections of resources that directly and indirectly support science, technology, and engineering. In addition to its rapidly growing architecture collection, the library also contains materials of interest to those in related engineering fields. The Ethics Center Library has a growing collection of materials on practical and professional ethics including items related to ethical issues and activities in areas across the disciplines including computer science, engineering, and the sciences, as well as items addressing cross disciplinary issues relating to the professions such as confidentiality, conflicts of interest, and professional concerns such as self-regulation and continuing education. The Ethics Center Library also maintains the most comprehensive online collection of codes of ethics in the world as well as a variety of print and online resources, including the "NanoEthicsBank", an online, annotated bibliography of materials developed by IIT's Center for the Study of Ethics in the Professions, that includes reports, regulatory documents, codes of ethics, research and development, and other resources related to nanotechnology and nanoparticles.

IIT libraries are actively engaged in the ongoing assessment of the quality and currency of its print and digital collections in order to meet the increasing demand of the growing student population as well as support emerging curriculum needs. In 2004 and 2006, the Galvin Library participated in LibQUAL, a library service and quality assessment process, in order to evaluate faculty, staff, and student satisfaction with IIT libraries' collections, services, and facilities, as well as to monitor the impact changes made in response to the 2004 assessment had on current user satisfaction.

As a result of the assessment and additional collection analysis that identified potential areas requiring additional attention, the IIT libraries began an initiative to review and reconstitute its core monograph collections which includes five-year goals for the development of the print and online collections. In response to user assessment, the book acquisitions funding formula for the main library was also redesigned to increase expenditure in various disciplines such as the basic sciences and mathematics in order to more adequately support programs that are part of the undergraduate core curriculum.

Due to the renewed focus on the collections and the significant increase in funding allocated for monograph acquisitions, the Galvin Library's print collection has substantially improved over the last five years particularly in the areas of science, technology, and engineering. The number of computer science titles purchased in FY2007 was almost twice the amount purchased in FY2003. The number of titles purchased overall in the fields of science, technology, and engineering in FY2007 was three times the amount purchased in FY2003.

IIT libraries also created new collection development policies to foster the development of more contemporary monograph collections and shift away from a focus heavily weighted towards the development of traditional programs to also include new disciplines as well. With additional support from the university and this new direction, Galvin Library was able to build foundation collections to support IIT's new Biomedical

Engineering program. To identify the unique collection needs across the disciplines, all libraries also employ an active departmental liaison program, staffed with subject specialists having skills unique to each program, and these liaisons consult with faculty on resources that will contribute to the development of library collections in support of their curriculum.

IIT libraries also have undertaken a comprehensive review of current print journal subscriptions, resulting in a transition at the main library from a primarily print-based journal collection of a few thousand titles to a primarily online journal collection of over 24,000 full-text titles, 8,400 of which are in the sciences and technology. These titles not only include individual subscriptions but also include multiple titles provided through publisher "bundles" including ACM, ACS, ASCE, ASME, and IEEE. Online database access has also shifted from providing numerous small, lower quality services to selecting the "best of class" in each discipline, resulting in subscriptions to INSPEC, CSA Technology Research Database, COMPENDEX, Web of Science, and SciFinder Scholar. In 2007, the SIAM Locus Journal Archive, Institute of Mathematics Statistics Journals, and Wiley Interscience Electronic Journals were also added to the collection of electronic resources available to the IIT community.

Services/Innovative Technology

IIT libraries are particularly well known for their use of innovative technology to support student learning and effective teaching. The libraries were among the first in the country to implement an electronic reserves system; web-based document delivery for interlibrary loan; remote access to a diverse collection of digital resources; wireless networking; and a laptop loaner program. The libraries provide ongoing support for digital resources and information technology through a long-term commitment of library personnel, technology, and technological expertise which contributes to the development and expansion of resources and information technology centered services unique to libraries and the communities they serve. In addition to financial support provided by the university, IIT libraries – particularly Galvin Library – have received several state and federal grants in support of library technology initiatives and continue to seek additional funding for the development of emerging technologies and technology-based services to better serve the changing needs and expectations of its users for less traditional methodologies of information access, retrieval, and dissemination.

IIT libraries also continue to offer innovative services that use new technologies to facilitate communication between students and librarians. Along with in-person consultations, Galvin Library offers access to reference librarians through email and instant messaging which has become a popular and efficient way of getting expert assistance quickly. In 2007, over 18% of Galvin Library's total reference transactions occurred electronically through IM or email contact. The Galvin Library also introduced a library blog in 2007 to keep library users informed of new resources, collections, and services available to them as they become available.

Over the last several years, the libraries have also significantly increased public computing resources in response to user demand. The Galvin Library, in particular, has

experienced a significant growth in on-site use of library resources over the past several years and has continued to add additional public workstations to meet this demand as illustrated by the estimated 20% increase in public workstation logins at the main library between 2006 and 2007. Annual visitors to the Galvin Library was over 205,000 in 2007 which represents a 48% increase over the 139,000 total visitors in 2003.

Instruction

Emerging technologies have also been employed by IIT libraries to promote innovative and interactive instruction in support of the curriculum. The Library Learning Center (LLC), a state-of-the-art learning resource center on the lower level of the Galvin Library that opened in 2000, continues to foster a highly adaptable and collaborative teaching and interactive learning environment by employing the latest information resources and technology. The LLC is used extensively for traditional bibliographic and library skills instruction on the main campus as well as increasingly more collaborative, problem-based information literacy instruction that focuses on developing skills that will more fully support students' academic growth as well as their long-term professional development.

This collaborative instruction approach, in which librarians work with faculty to create contextual, course-specific assignments and instruction materials, was developed to fill a need for students in engineering programs to possess *information literacy skills* that are developed in the classroom, improved through their research, and then continued on into the profession.

Galvin Library's role in this development within the academic environment is to provide resources that will aid and services that will instruct students in identifying, locating and effectively using information. The senior engineering librarian, as well as other subject specialists in engineering and the sciences, present instruction in library resources during Introduction to the Profession (ITP) classes that are mandated for all students in the engineering disciplines and for other classes upon request. ITP classes expose students to concepts that are part of the training necessary to acquire information literacy skills that will lead them through their early formative academic years, and create an acknowledgement of the need to engage in life-long research and learning in their profession. In addition, a regular variety of library workshops are offered that expand upon ITP classes and are more specific in the content presented, such as patents, standards and technical reports. These sessions are attended by both graduate and undergraduate students alike.

In Fall 2007, a new structure for collaborative or blended instruction was put into practice for CAEE classes. Librarians worked with faculty in designing three assignments weeks apart and with library instruction in between that were context specific to course materials and therefore more meaningful to the student. Assessment showed that the students agreed the instruction was effective in improving the quality of their research and assignments. Additional collaborative opportunities in other courses will be pursued by librarians and further assessment of library instruction will be conducted.

IIT Libraries operate under the direction of:

Christopher Stewart, Dean of Libraries, 2006 - 2008

Education: BA, Political Science, University of Illinois at Chicago, 1989
MLS, Dominican University, 1995
MBA, Illinois Institute of Technology, 2004
Ed.D, University of Pennsylvania (expected, 2009)

Prior Appointments
2004-2006, Acting Dean of Libraries, Illinois Institute of Technology
2002-2004, Associate Dean of Libraries, Illinois Institute of Technology
2000-2002, Associate Dean for Library Technology, Illinois Institute of Technology
1999-2000, Associate Dean for Network Services, Paul V. Galvin Library, IIT
1998-1999, Assistant Dean for Network Services, Paul V. Galvin Library, IIT
1995-1998, Network Services Manager, Paul V. Galvin Library, IIT

Career Management Center

The Career Management Center (CMC) at Illinois Institute of Technology serves the critical function of providing the linkage between students and graduates with local, national and international employers. The CMC's mission is to engage students and alumni to develop and practice lifelong career management skills to realize their career goals. Students are strongly encouraged to register with the CMC during their freshman year in order to begin developing their careers as soon as possible. The CMC also seeks to develop lasting partnerships with employers by providing employers with the opportunity to participate in key programs to identify, and hire skilled and technically prepared individuals. The Director of CMC is Bruce Mueller, and CMC has a professional staff of eight.

CMC Programs

Career Fairs: IIT Career Fairs are open to all local, national and international employers seeking quality hires from all disciplines. The Illinois Institute of Technology is a prime institution targeted by many employers. The Career Management Center sponsors two Career Fairs each school year.

On-Campus Interviewing: On-Campus Interviewing (OCI) is a program allowing employers can use to interview and hire IIT graduates, alumni, and undergraduates seeking full-time, co-op or internship positions on IIT's campuses. The Career Management Center holds OCI during the fall and spring semesters. The fall session runs from mid-September through early December and the Spring session runs from mid-February through early May.

Job Listings: Employers may post job listings on the CMC's eRecruiting website.

Resume Development: CMC provides workshops and one-on-one advising on resume writing throughout the year. Students and alumni may post their resumes on eRecruiting, where they are made available to potential employers.

Cooperative Education & Internship Programs: CMC provides monitoring and administrative services for students in approved Cooperative Education & Internship positions. Assistance in obtaining Curricular Practical Training (CPT) Work Authorization for these positions is also provided to international students by the CMC in partnership with International Center.

Tracking Reports: CMC tracks graduating students' progress in finding employment or enrollment in post-graduate programs, and provides a regular summary report to the academic units.

Web Site: CMC maintains a comprehensive web site with online resources for students, alumni and employers at www.cmc.iit.edu

Professional Development Programs & Workshops: CMC provides several programs and workshops to help students develop professionally. The programs include one-on-one career advising with a Career Counselor who specializes in the student's field, mock interviews, and resume and cover letter critiques. Workshops include the Getting a Job three-part series, Making a Positive First Impression, Marketing Yourself Effectively and Transitioning from Student to Professional, Etiquette Lunches or Dinners, and Dress for Success.

The CMC operates under the direction of:

Bruce A. Mueller, Executive Director, Career Management Center, 2006-2008, Chief People Officer, IIT (2007-2008)

Education: BBA (1968), MBA (1974)

Prior Appointments

ACS-Managing Director, Global Human Resources Outsourcing (2002-2005)
Motorola-Corporate Vice President, Human Resources Infrastructure and Technology (1983-2003)

The Interprofessional Projects (IPRO) Program Office

The IPRO Program Office is responsible for administering and coordinating all aspects of The IIT Interprofessional Projects (IPRO) Program. This office was established in 1995 in order to plan for and eventually implement the general education requirement that all undergraduates complete two interprofessional project courses in order to graduate, with each course representing three credit hours. There are two prominent functions that achieve this result:

1. Since the interprofessional course, by design, encompasses all professional disciplines and programs, the IPRO Program Office has the responsibility to coordinate and integrate faculty, sponsors and students in order to identify, organize, promote, implement and assess approximately 90 IPRO project course sections (i.e., project teams) each year so that our students can fulfill their interprofessional project requirement. This serves on the order of 1,000 students each year (producing on the order of 3,000 credit-hours), with an average team size of eleven students from any level (sophomore through graduate) and any discipline and professional program at IIT, although the vast majority of students have junior or senior standing. The disciplines involved across all IPRO course sections encompass all undergraduate degree programs: applied mathematics, architecture, business, computer science, engineering (aerospace, architectural, biological, biomedical, chemical, civil, computer, electrical, environmental, materials, mechanical), the sciences (biology, chemistry, physics), humanities (internet communication, journalism, technical communication), industrial technology and management, information technology and management, math and science education, psychology and social sciences (political science, public administration). Graduate students may also participate and receive credit toward their degrees, depending on their field of study, including, in addition to those previously mentioned, law, design, and food safety and technology.
2. Since the purpose of the interprofessional course is to provide students with experiences that emulate the workplace, an important aspect of the IPRO Program is the involvement of workplace organizations that identify viable “real world” complex topics, and provide financial support and professional advice to our IPRO teams throughout the semester. One-third of projects are currently sponsored, with a long-term goal of achieving two-thirds sponsorship, although many projects already benefit from informal collaboration with a range of business, non-profit, entrepreneurial and public sector organizations.

The roles and responsibilities of The IPRO Program Office are thus summarized as follows:

- Facilitate review and implementation of policies and procedures that define the learning objectives and govern the fulfillment of the two-IPRO project course general education requirement.
- Implement and maintain an efficient and effective system for creating, delivering and assessing project courses consistent with the learning objectives established for an interprofessional project experience.
- Develop and maintain sponsor relationships that are compatible with our faculty expertise and offer interesting and challenging learning experiences for our students, and that provide financial resources to help support the costs of coordinating and delivering the interprofessional project experience in a professional manner.

- Manage an operating budget and various grant and unrestricted donation accounts that support the delivery of the interprofessional course.
- Organize various events that support the learning objectives, including workshops (e.g., teambuilding, communication, project management, ethical decision-making, business planning).
- Organize and participate in various events that support the development and advancement of the interprofessional curriculum, including faculty orientation sessions, faculty development workshops and other education conference opportunities that help to promote information exchange between IIT faculty and colleagues at other institutions, particularly in the field of team project based learning modalities.
- Participate in open houses for prospective students and organize presentations and conferences related to interprofessional education (e.g., Best Practices of Interdisciplinary Team Project Programs, presentations to sponsors and trustees)
- Coordinate the end-of-semester IPRO Projects Day Conference (held three times each year) that provides a venue for all IPRO teams to present their work via formal oral presentations and interactive exhibits, and includes a judging process (with working professionals, faculty members and graduate students) that is linked to assessment of learning objectives, and offers a showcase event for IIT alumni, trustees, sponsors, employers, high school and junior high school students, parents of IIT students and prospective students, and the general public.
- Support the information needs of and be responsive to the Interprofessional Studies Committee, a committee established via the University Faculty Council to provide academic oversight of the IPRO course.
- Coordinate the IPRO proposal review process each semester that leads to the review of candidate IPRO projects for the subsequent semester, with on the order of half of the IPRO projects continuing and half new each semester.
- Identify and encourage the use of best practices by IPRO instructors that have value in enhancing the effectiveness of IPRO teams (e.g., peer evaluation, grading guidelines (team performance and individual performance on the team).
- Encourage academic units and faculty to collaborate across disciplines and programs, recognize innovative approaches and support scholarship, publication and presentation at national conferences.
- Encourage graduate students to participate on interprofessional project teams and seek ways to adapt the IPRO course model to support graduate research and commercialization activities across professional boundaries and build competency of graduate students to team teach and teach in teams.
- Integrate and coordinate the process for students to enroll in interprofessional courses as part of the regular course registration schedule and provide timely information about IPRO course topics at http://ipro.iit.edu, giving particular attention to constraints that help to control the size of the team and the mix of students from various disciplines on a team.
- Provide a syllabus template that offers a generic framework and semester schedule for IPRO instructors to use in planning and implementing an IPRO project course.
- Coordinate IPRO team tools that facilitate communication and recordkeeping, including http://igroups.iit.edu and http://iknow.iit.edu.

- Coordinate the submittal and review of deliverables by IPRO teams, including: project plan, code of ethics, mid-term review, web site (optional), final oral presentation, exhibit/poster, abstract, final report and team work product.
- Coordinate surveys and evaluation tools that provide feedback to the IPRO Program Office from students, faculty, sponsors and alumni.
- Provide IPRO stipends to support the assignment of IIT faculty members in serving as an IPRO instructor as part of their regular teaching load, support part-time IPRO instructors who offer specialized expertise and capacity and support IPRO team expenses on an as-needed basis.
- Coordinate with IIT's director of entrepreneurship and the Jules F. Knapp Entrepreneurship Center to encourage student and faculty ideas for Entrepreneurial IPRO (EnPRO) projects that meet all of the requirements of a typical interprofessional project and encompass venture development and opportunity analysis that can lead to a business plan, prototype and user testing.
- Coordinate with the IIT Leadership Academy in delivering various teambuilding and leadership seminars and workshops.
- The IPRO Program Office is supported as follows: Director of Interprofessional Studies and The IPRO Program (full time), Associate Provost for Undergraduate Affairs (20%), IPRO Administrative Assistant/Coordinator (full time) and part-time graduate and undergraduate students.

Thomas M. Jacobius, Director, Interprofessional Studies & The IPRO Program, 2000-2008

Education: BS, Mechanical Engineering, IIT, 1971
MBA, Northwestern University, 1978

Prior appointments:

1995-2000 Director, Industrial Liaison & Technology Transfer; Co-Director, The IIT Interprofessional Projects (IPRO) Program, IIT.
1991-1995 Director, Office of Research Admin and Office of IP Management, IIT.
1989-1991 Director, Office of Intellectual Property Management and Director, Technology Commercialization Center, IIT Research Institute and Illinois Institute of Technology.
1988-1989 Program Manager, Rail Simulation & Training Group, IIT Research Institute.
1983-1988 Sr Bus Analyst, Market Rsch & Tech Assessment Group, IIT Research Institute.
1980-1982 Bus Analyst, Market Rsch & Tech Assessment Group, IIT Research Institute.

Table D-1. Programs Offered by the Educational Unit - Undergraduate

Program Title[1]	Modes Offered[2]				Nominal Years to Complete	Administrative Head	Administrative Unit or Units (e.g. Dept.) Exercising Budgetary Control	Submitted for Evaluation[3]		Offered, Not Submitted for Evaluation[4]	
	Day	Cooperative Education	Off Campus	Alternate Mode				Now Accredited.	Not Now Accredited	Now Accredited	Not Now Accredited
Aerospace Engineering (B.S.)	X				4	Jamal Yagoobi	Mechanical, Materials and Aerospace Engineering	X			
Architectural Engineering (B.S.)	X				4	Jamshid Mohammadi	Civil, Architectural and Environmental Engineering	X			
Biomedical Engineering (B.S.)	X				4	Vincent Turitto	Biomedical Engineering		X		
Chemical Engineering (B.S.)	X				4	Jai Prakash	Chemical and Biological Engineering	X			
Civil Engineering (B.S.)	X				4	Jamshid Mohammadi	Civil, Architectural and Environmental Engineering	X			
Computer Engineering (B.S.)	X				4	Mohammad Shahidehpour	Electrical and Computer Engineering	X			
Electrical Engineering (B.S.)	X				4	Mohammad Shahidehpour	Electrical and Computer Engineering	X			

Table D-1. Programs Offered by the Educational Unit – Undergraduate (Cont.)

Program Title[1]	Modes Offered[2]				Nominal Years to Complete	Administrative Head	Administrative Unit or Units (e.g. Dept.) Exercising Budgetary Control	Submitted for Evaluation[3]		Offered, Not Submitted for Evaluation[4]	
	Day	Cooperative Education	Off Campus	Alternate Mode				Now Accredited.	Not Now Accredited	Now Accredited	Not Now Accredited
Engineering Management (B.S.)	X				4	Jamshid Mohammadi	Civil and Architectural Engineering				X
Material Science and Engineering (B.S.)	X				4	Jamal Yagoobi	Mechanical, Materials and Aerospace Engineering	X			
Mechanical Engineering (B.S.)	X				4	Jamal Yagoobi	Mechanical, Materials and Aerospace Engineering	X			

Table D-1. Programs Offered by the Educational Unit – Graduate

Program Title[1]	Modes Offered[2]				Nominal Years to Complete	Administrative Head	Administrative Unit or Units (e.g. Dept.) Exercising Budgetary Control	Submitted for Evaluation[3]		Offered, Not Submitted for Evaluation[4]	
	Day	Cooperative Education	Off Campus	Alternate Mode				Now Accredited.	Not Now Accredited	Now Accredited	Not Now Accredited
Architectural Engineering (M.S.)	X				2	Jamshid Mohammadi	Civil, Architectural and Environmental Engineering				X
Biological Engineering (M.S.)	X				2	Jai Prakash	Chemical and Biological Engineering				X
Biomedical Engineering (Ph.D.)	X				4	Vincent Turitto	Biomedical Engineering				X
Biomedical Imaging and Signals (M.S.)	X				2	Vincent Turitto	Biomedical Engineering				X
Chemical Engineering (M.S.)					2	Jai Prakash	Chemical and Biological Engineering				X
Chemical Engineering (Ph.D.)	X				4	Jai Prakash	Chemical and Biological Engineering				X
Civil Engineering (M.S.)	X				2	Jamshid Mohammadi	Civil, Architectural and Environmental Engineering				X

Table D-1. Programs Offered by the Educational Unit – Graduate (Cont.)

Program Title[1]	Modes Offered[2]				Nominal Years to Complete	Administrative Head	Administrative Unit or Units (e.g. Dept.) Exercising Budgetary Control	Submitted for Evaluation[3]		Offered, Not Submitted for Evaluation[4]	
	Day	Cooperative Education	Off Campus	Alternate Mode				Now Accredited.	Not Now Accredited	Now Accredited	Not Now Accredited
Civil Engineering (Ph.D.)	X				4	Jamshid Mohammadi	Civil, Architectural and Environmental Engineering				X
Computer Engineering (M.S.)	X				2	Mohammad Shahidehpour	Electrical and Computer Engineering				X
Computer Engineering (Ph.D.)	X				4	Mohammad Shahidehpour	Electrical and Computer Engineering				X
Computer Engineering and Electrical Engineering (M.S.)	X				2	Mohammad Shahidehpour	Electrical and Computer Engineering				X
Computer Science and Chemical Engineering (M.S.)	X				2	Jai Prakash	Chemical and Biological Engineering				X
Computer Systems Engineering (M.S.)	X				2	Mohammad Shahidehpour	Electrical and Computer Engineering				X

Table D-1. Programs Offered by the Educational Unit – Graduate (Cont.)

Program Title[1]	Modes Offered[2]				Nominal Years to Complete	Administrative Head	Administrative Unit or Units (e.g. Dept.) Exercising Budgetary Control	Submitted for Evaluation[3]		Offered, Not Submitted for Evaluation[4]	
	Day	Cooperative Education	Off Campus	Alternate Mode				Now Accredited.	Not Now Accredited	Now Accredited	Not Now Accredited
Computer Systems Engineering (M.S.)	X				2	Mohammad Shahidehpour	Electrical and Computer Engineering				X
Construction Engineering and Management (M.S.)	X				2	Jamshid Mohammadi	Civil, Architectural and Environmental Engineering				X
Electrical and Computer Engineering (M.S.)	X				2	Mohammad Shahidehpour	Electrical and Computer Engineering				X
Electrical Engineering (M.S.)	X				2	Mohammad Shahidehpour	Electrical and Compute Engineering				X
Electrical Engineering (Ph.D.)	X				4	Mohammad Shahidehpour	Electrical and Compute Engineering				X
Electricity Markets (M.S.)	X				2	Mohammad Shahidehpour	Electrical and Computer Engineering				X

Table D-1. Programs Offered by the Educational Unit – Graduate (Cont.)

Program Title[1]	Modes Offered[2]				Nominal Years to Complete	Administrative Head	Administrative Unit or Units (e.g. Dept.) Exercising Budgetary Control	Submitted for Evaluation[3]		Offered, Not Submitted for Evaluation[4]	
	Day	Cooperative Education	Off Campus	Alternate Mode				Now Accredited.	Not Now Accredited	Now Accredited	Not Now Accredited
Environmental Engineering (M.S.)	X				2	Jamshid Mohammadi	Civil, Architectural and Environmental Engineering				X
Environmental Engineering (Ph.D.)	X				4	Jamshid Mohammadi	Civil, Architectural and Environmental Engineering				X
Food Process Engineering (M.S.)	X				2	Jai Prakash	Chemical and Biological Engineering				X
Gas Engineering (M.S.)	X				2	Jai Prakash	Chemical and Biological Engineering				X
Geoenvironmental Engineering (M.S.)	X				2	Jamshid Mohammadi	Civil, Architectural and Environmental Engineering				X
Geotechnical Engineering (M.S.)	X				2	Jamshid Mohammadi	Civil, Architectural and Environmental Engineering				X

Table D-1. Programs Offered by the Educational Unit – Graduate (Cont.)

Program Title[1]	Modes Offered[2]				Nominal Years to Complete	Administrative Head	Administrative Unit or Units (e.g. Dept.) Exercising Budgetary Control	Submitted for Evaluation[3]		Offered, Not Submitted for Evaluation[4]	
	Day	Cooperative Education	Off Campus	Alternate Mode				Now Accredited.	Not Now Accredited	Now Accredited	Not Now Accredited
Manufacturing Engineering (M.S.)	X				2	Jamal Yagoobi	Mechanical, Materials and Aerospace Engineering				X
Materials Science and Engineering (M.S.)	X				2	Jamal Yagoobi	Mechanical, Materials and Aerospace Engineering				X
Materials Science and Engineering (Ph.D.)	X				4	Jamal Yagoobi	Mechanical, Materials and Aerospace Engineering				X
Mechanical and Aerospace Engineering (M.S.)	X				2	Jamal Yagoobi	Mechanical, Materials and Aerospace Engineering				X
Mechanical and Aerospace Engineering (Ph.D.)	X				4	Jamal Yagoobi	Mechanical, Materials and Aerospace Engineering				X
Network Engineering (M.S.)	X				2	Mohammad Shahidehpour	Electrical and Computer Engineering				X

Table D-1. Programs Offered by the Educational Unit – Graduate (Cont.)

Program Title[1]	Modes Offered[2]				Nominal Years to Complete	Administrative Head	Administrative Unit or Units (e.g. Dept.) Exercising Budgetary Control	Submitted for Evaluation[3]		Offered, Not Submitted for Evaluation[4]	
	Day	Cooperative Education	Off Campus	Alternate Mode				Now Accredited.	Not Now Accredited	Now Accredited	Not Now Accredited
Power Engineering (M.S.)	X				2	Mohammad Shahidehpour	Electrical and Computer Engineering				X
Public Works Administration (M.S.)	X				2	Jamshid Mohammadi	Civil, Architectural and Environmental Engineering				X
Structural Engineering (M.S.)	X				2	Jamshid Mohammadi	Civil, Architectural and Environmental Engineering				X
Telecommunication and Software Engineering (M.S.)	X				2	Mohammad Shahidehpour	Electrical and Computer Engineering				X
Transportation Engineering and Planning (M.S.)	X				2	Jamshid Mohammadi	Civil, Architectural and Environmental Engineering				X
VLSI and Microelectronics (M.S.)	X				2	Mohammad Shahidehpour	Electrical and Computer EngineerinXg				X

Table D-2. Degrees Awarded and Transcript Designations by Educational Unit

Undergraduate Degrees

Program Title[1]	Modes Offered[2]				Name of Degree Awarded[3]	Designation on Transcript[4]
	Day	Co-op	Off Campus	Alternative Mode		
Aerospace Engineering	X				Bachelor of Science	B.S. in Aerospace Engineering
Architectural Engineering	X				Bachelor of Science	B.S. in Architectural Engineering
Biomedical Engineering	X				Bachelor of Science	B.S. in Biomedical Engineering
Chemical Engineering	X				Bachelor of Science	B.S. in Chemical Engineering
Civil Engineering	X				Bachelor of Science	B.S. in Civil Engineering
Computer Engineering	X				Bachelor of Science	B.S. in Computer Engineering
Electrical Engineering	X				Bachelor of Science	B.S. in Electrical Engineering
Engineering Management	X				Bachelor of Science	B.S. in Engineering Management
Materials Engineering	X				Bachelor of Science	B.S. in Materials Engineering
Mechanical Engineering	X				Bachelor of Science	B.S. in Mechanical Engineering

Table D-2. Degrees Awarded and Transcript Designations by Educational Unit

Graduate Degrees

Program Title[1]	Modes Offered[2]				Name of Degree Awarded[3]	Designation on Transcript[4]
	Day	Co-op	Off Campus	Alternative Mode		
Aerospace Engineering	X				Master of Science	M.S. in Aerospace Engineering
Aerospace Engineering	X				Ph.D.	Ph.D. in Aerospace Engineering
Architectural Engineering	X				Master of Science	M.S. in Architectural Engineering
Architectural Engineering	X				Ph.D.	Ph.D. in Architectural Engineering
Biomedical Engineering	X				Ph.D.	Ph.D. in Biomedical Engineering
Biological Engineering	X				Master of Science	M.S. in Biological Engineering
Chemical Engineering	X				Master of Science	M.S. in Chemical Engineering
Chemical Engineering	X				Ph.D.	Ph.D. in Chemical Engineering
Civil Engineering	X				M.S.	M.S. in Civil Engineering
Civil Engineering	X				Ph.D.	Ph.D. in Civil Engineering
Computer Engineering	X				M.S.	MS in Computer Engineering
Computer Engineering	X				Ph.D.	Ph.D. in Computer Engineering
Computer Engineering and Electrical Engineering	X				M.S.	M.S. in Computer Engineering and Electrical Engineering
Computer Science and Chemical Engineering	X				M.S.	MS in Computer Science and Chemical Engineering

Table D-2. Degrees Awarded and Transcript Designations by Educational Unit

Graduate Degrees (Cont.)

Computer Systems Engineering	X				M.S.	MS in Computer Systems Engineering
Construction Engineering and Management	X				M.S.	MS in Construction Engineering and Management
Electrical and Computer Engineering	X				M.S.	MS in Computer Engineering
Electrical Engineering	X				M.S.	MS in Electrical Engineering
Electrical Engineering	X				Ph.D.	Ph.D. in Electrical Engineering
Electricity Markets	X				M.S.	MS in Electricity Markets
Environmental Engineering	X				M.S.	MS in Environmental Engineering
Environmental Engineering	X				Ph.D.	Ph.D. in Environmental Engineering
Food Process Engineering	X				M.S.	MS in Food Process Engineering
Gas Engineering	X				M.S.	MS in Gas Engineering
Geoenvironmental Engineering (M.S.)	X				M.S.	MS in Geotechnical Engineering
Geotechnical Engineering	X				M.S.	MS in Geotechnical Engineering
Manufacturing Engineering	X				M.S.	MS in Manufacturing Engineering
Materials Science and Engineering	X				M.S.	MS in Materials Science and Engineering

Table D-2. Degrees Awarded and Transcript Designations by Educational Unit

Graduate Degrees (Cont.)

Materials Science and Engineering	X				Ph.D.	Ph.D. in Materials Science and Engineering
Mechanical and Aerospace Engineering	X				M.S.	MS in Mechanical and Aerospace Engineering
Mechanical and Aerospace Engineering	X				Ph.D.	Mechanical and Aerospace Engineering
Network Engineering	X				M.S.	MS in Network Engineering
Power Engineering	X				M.S.	MS of Power Engineering
Public Works Administration	X				M.S.	MS in Public Works Administration
Structural Engineering	X				M.S.	MS in Structural Engineering
Telecommunication and Software Engineering	X				M.S.	MS in Telecommunication and Software Engineering
Transportation Engineering and Planning (M.S.)	X				M.S.	MS in Transportation Engineering and Planning
VLSI and Microelectronics	X				M.S.	MS in VLSI and Microelectronics

Table D-3. Support Expenditures

Armour College Total

Fiscal Year	2006-2007[1]	2007-2008[2]	2008-2009[3]
Expenditure Category			
Operations (not including staff)[4]	902,426	937,245	368,929
Travel[5]	155,282	194,733	174,600
Equipment[6]	617,175	947,674	740,706
(a) Institutional Funds	70,618	90,064	162,700
(b) Grants and Gifts[7]	950,498	857,610	779,976
Graduate Teaching Assistants	392,989	696,042	534,513
Part-time Assistance[8] (other than teaching)	62,911	81,423	74,042
Faculty Salaries	7,475,081	7,794,908	8,092,786

Biomedical Engineering

Fiscal Year	2006-2007[1]	2007-2008[2]	2008-2009[3]
Expenditure Category			
Operations (not including staff)[4]	47,455	58,191	48,254
Travel[5]	13,280	18,889	16,000
Equipment[6]	4,479	261,154	13,000
(a) Institutional Funds	4,479	13,000	13,000
(b) Grants and Gifts[7]	0	248,154	0
Graduate Teaching Assistants	14,500	27,015	32,000
Part-time Assistance[8] (other than teaching)	7,480	13,820	8,000
Faculty Salaries	858,102	993,923	1,162,585

Civil, Architectural and Environmental Engineering

Fiscal Year	2006-2007[1]	2007-2008[2]	2008-2009[3]
Expenditure Category			
Operations (not including staff)[4]	87,928	75,346	29,084
Travel[5]	12,211	17,355	14,700
Equipment[6]	38,391	58,770	49,397
(a) Institutional Funds	27,407	25,159	27,100
(b) Grants and Gifts[7]	10,984	33,611	22,297
Graduate Teaching Assistants	82,554	62,100	63,000
Part-time Assistance[8] (other than teaching)	840	2,640	7,000
Faculty Salaries	807,287	1,038,459	937,369

Notes:

Fiscal Year 2007-2008 numbers were taken as of 6/5/08.

Fiscal Year 2008-2009 are estimated.

Benefits are not included in any Faculty Salaries totals.

Table D-3. Support Expenditures (Cont.)

Chemical and Biological Engineering

Fiscal Year	2006-2007[1]	2007-2008[2]	2008-2009[3]
Expenditure Category			
Operations (not including staff)[4]	170,695	131,656	39,500
Travel[5]	29,475	31,698	30,500
Equipment[6]	26,291	406,140	218,075
(a) Institutional Funds	6,281	10,000	10,000
(b) Grants and Gifts[7]	20,010	396,140	208,075
Graduate Teaching Assistants	73,696	76,376	85,000
Part-time Assistance[8] (other than teaching)	10,870	20,335	14,000
Faculty Salaries	1,846,063	1,273,103	1,400,735

Electrical and Computer Engineering

Fiscal Year	2006-2007[1]	2007-2008[2]	2008-2009[3]
Expenditure Category			
Operations (not including staff)[4]	287,918	403,327	68,552
Travel[5]	21,495	39,348	30,400
Equipment[6]	137,157	159,961	177,859
(a) Institutional Funds	25,200	25,200	54,500
(b) Grants and Gifts[7]	111,957	134,761	123,359
Graduate Teaching Assistants	221,539	258,373	198,513
Part-time Assistance[8] (other than teaching)	13,934	16,014	7,400
Faculty Salaries	1,733,428	1,882,254	2,225,980

Mechanical, Materials and Aerospace Engineering

Fiscal Year	2006-2007[1]	2007-2008[2]	2008-2009[3]
Expenditure Category			
Operations (not including staff)[4]	217,161	160,824	53,487
Travel[5]	43,416	61,345	52,300
Equipment[6]	410,857	61,649	282,375
(a) Institutional Funds	7,251	16,705	58,100
(b) Grants and Gifts[7]	807,547	44,944	426,245
Graduate Teaching Assistants	135,881	111,354	110,000
Part-time Assistance[8] (other than teaching)	22,808	17,834	20,642
Faculty Salaries	1,852,638	2,188,594	1,933,327

Notes:

Fiscal Year 2007-2008 numbers were taken as of 6/5/08.

Fiscal Year 2008-2009 are estimated.

Benefits are not included in any Faculty Salaries totals.

Table D-4. Personnel and Students
Armour College of Engineering
Fall 2007

	Headcount		FTE	Ratio to Faculty
	FT	PT		
Executive	1		1	0.01
Faculty (tenure-track)	63		63	0.62
Graduate Assistants		240	80	0.79
Office/Clerical Employees	10		10	0.10
Other Faculty (excluding Student Assistants)	13	31	23	0.23
Professional	13		13	0.13
Research Assistants	21		21	0.21
Technicians/Specialists	7		7	0.07
Administrative	15		15	0.15
Undergraduate Student Enrollment*	1091	75	1171	11.55
Graduate Student Enrollment	737	484	1021	10.08

**Includes all classes (freshmen, sophomore, junior, senior, etc)*

FTE calculation:
Undergraduate=Hours/15
Graduate=Hours/9

Table D-4. Personnel and Students
Biomedical Engineering
Fall 2007

	Headcount		FTE	Ratio to Faculty
	FT	PT		
Faculty (tenure-track)	9		9	0.68
Graduate Assistants		31	10	0.78
Other Faculty (excluding Student Assistants)	3	1	3	0.25
Professional	1		1	0.08
Research Assistants	2		2	0.15
Technicians/Specialists	1		1	0.08
Administrative	1		1	0.08
Undergraduate Student Enrollment*	125	2	133	9.99
Graduate Student Enrollment	17	18	24	1.78

**Includes all classes (freshmen, sophomore, junior, senior, etc)*

FTE calculation:
Undergraduate=Hours/15
Graduate=Hours/9

Table D-4. Personnel and Students
Chemical and Biological Engineering
Fall 2007

	Headcount		FTE	Ratio to Faculty
	FT	PT		
Faculty (tenure-track)	14		14	0.64
Graduate Assistants		54	18	0.82
Office/Clerical Employees	2		2	0.09
Other Faculty (excluding Student Assistants)	4	3	5	0.23
Professional	3		3	0.14
Research Assistants	11		11	0.50
Technicians/Specialists	2		2	0.09
Administrative	3		3	0.14
Undergraduate Student Enrollment*	98	5	104	4.72
Graduate Student Enrollment	100	61	123	5.57

**Includes all classes (freshmen, sophomore, junior, senior, etc)*

FTE calculation:

Undergraduate=Hours/15
Graduate=Hours/9

Table D-4. Personnel and Students
Civil, Architectural and Environmental Engineering
Fall 2007

	Headcount		FTE	Ratio to Faculty
	FT	PT		
Faculty (tenure-track)	7		7	0.41
Graduate Assistants		37	12	0.73
Office/Clerical Employees	3		3	0.18
Other Faculty (excluding Student Assistants)	3	15	8	0.47
Professional	1		1	0.06
Technicians/Specialists	1		1	0.06
Administrative	2		2	0.12
Undergraduate Student Enrollment*	213	15	230	13.55
Graduate Student Enrollment	80	126	145	8.52

**Includes all classes (freshmen, sophomore, junior, senior, etc)*

FTE calculation:
Undergraduate=Hours/15
Graduate=Hours/9

Table D-4. Personnel and Students
Electrical and Computer Engineering
Fall 2007

	Headcount		FTE	Ratio to Faculty
	FT	PT		
Faculty (tenure-track)	19		19	0.78
Graduate Assistants		69	23	0.95
Office/Clerical Employees	1		1	0.04
Other Faculty (excluding Student Assistants)	2	4	3	0.14
Professional	3		3	0.12
Research Assistants	2		2	0.08
Technicians/Specialists	1		1	0.04
Administrative	2		2	0.08
Undergraduate Student Enrollment*	300	31	326	13.39
Graduate Student Enrollment	416	201	566	23.27

**Includes all classes (freshmen, sophomore, junior, senior, etc)*

FTE calculation:

Undergraduate=Hours/15
Graduate=Hours/9

Table D-4. Personnel and Students
Mechanical, Materials and Aerospace Engineering
Fall 2007

	Headcount		FTE	Ratio to Faculty
	FT	PT		
Faculty (tenure-track)	14		14	0.57
Graduate Assistants		49	16	0.66
Office/Clerical Employees	3		3	0.12
Other Faculty (excluding Student Assistants)	1	8	4	0.15
Professional	3		3	0.12
Research Assistants	5		5	0.20
Technicians/Specialists	2		2	0.08
Administrative	7		7	0.28
Undergraduate Student Enrollment*	355	22	377	15.30
Graduate Student Enrollment	124	78	164	6.64

**Includes all classes (freshmen, sophomore, junior, senior, etc)*

FTE calculation:
Undergraduate=Hours/15
Graduate=Hours/9

Table D-5. Program Enrollment and Degree Data

Armour College of Engineering

	Enrollment counts in Fall of AY	Undergraduate Enrollment by Class						Total Undergrad	Total Grad**†	Degrees Conferred Between July 1 and June 31 Of Academic Year			
		1st	2nd	3rd	4th	5th	Other*			Bachelor	Master†	Doctor	Other
CURRENT	FT	291	257	222	260	52	39	1121	735	231	319	25	
2007-8*	PT		3	11	21	19	8	62	402				
1	FT	287	217	199	252	50	24	1029	626	235	274	34	
2006-7	PT	1	4	6	22	22	20	75	399				
2	FT	245	210	204	215	44	26	944	602	195	285	26	
2005-6	PT	2	4	8	24	18	9	65	342				
3	FT	231	219	180	191	54	19	894	502	207	279	35	
2004-5	PT	1	6	13	27	20	18	85	420				
4	FT	249	190	148	215	55	6	863	574	214	293	28	
2003-4	PT	3	7	29	37	20		96	330				
5	FT	232	155	185	218	37	6	833	562	207	239	21	
2002-3	PT	7	9	35	42	33	1	127	344				

Give official fall term enrollment figures (head count) for the current and preceding five academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.

FT--full time
PT--part time

Other Class includes one-year visiting, foreign exchange, joint program post-baccalaureate visiting and special students.

*Degrees conferred as of June 10, 2008
**Includes Master's and Doctoral degrees
†Includes Master of Computer Science/Master of Chemical Engineering dual degree

Table D-5. Program Enrollment and Degree Data

Aerospace Engineering

	Enrollment counts in Fall of AY	Undergraduate Enrollment by Class						Total Undergrad	Total Grad	Degrees Conferred Between July 1 and June 31 Of Academic Year			
		1st	2nd	3rd	4th	5th	Other*			Bachelor	Master	Doctor	Other
CURRENT	FT	40	28	30	33	5	3	139	107	25	25	55	3
2007-8*	PT				2	1	2	5	52				
1	FT	45	32	27	35	4	2	145	94	26	26	44	1
2006-7	PT					1	4	5	57				
2	FT	38	36	31	20	4	2	131	106	16	16	54	
2005-6	PT		1	1			3	5	38				
3	FT	40	34	17	24	6	1	122	83	17	17	46	4
2004-5	PT			2		1	4	7	51				
4	FT	46	21	18	20	6	2	113	88	16	16	41	1
2003-4	PT		1	2	1			4	39				
5	FT	31	25	21	19	2		98	70	12	12	44	4
2002-3	PT	4	1	1	1			7	42				

Give official fall term enrollment figures (head count) for the current and preceding five academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.

FT--full time
PT--part time

*Degree conferred as of June 10, 2008

Table D-5. Program Enrollment and Degree Data

Architectural Engineering

	Enrollment counts in Fall of AY	Undergraduate Enrollment by Class						Total Undergrad	Total Grad**	Degrees Conferred Between July 1 and June 31 Of Academic Year			
		1st	2nd	3rd	4th	5th	Other*			Bachelor	Master	Doctor	Other
CURRENT	FT	28	21	14	12	4	6	85	5	7	3		
2007-8*	PT					2		2	8				
1	FT	23	12	9	10	2	1	57	4	7	5		
2006-7	PT				1	1	2	4	5				
2	FT	11	11	11	7	1	2	43	5	2	2		
2005-6	PT				1	1		2	3				
3	FT	11	11	12	6		2	42		5	3		
2004-5	PT					1		1	3				
4	FT	9	14	10	5	2		40	2	8			
2003-4	PT	1		1	2	1		5	1				
5	FT	12	7	5	12	2	1	39		9			
2002-3	PT		2		1			3	2				

Give official fall term enrollment figures (head count) for the current and preceding five academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.

FT--full time
PT--part time

*Degree conferred as of June 10, 2008
**Includes Master's and Doctoral degrees

Table D-5. Program Enrollment and Degree Data

Biomedical Engineering

	Enrollment counts in Fall of AY	Undergraduate Enrollment by Class						Total Undergrad	Total Grad**	Degrees Conferred Between July 1 and June 31 Of Academic Year			
		1st	2nd	3rd	4th	5th	Other*			Bachelor	Master	Doctor	Other
CURRENT	FT	24	36	26	31	6	2	125	17	26		8	
2007-8*	PT			1				1	18				
1	FT	45	23	30	33	3	1	135	19	27		4	
2006-7	PT				1			1	16				
2	FT	31	27	28	30	3	2	121	12	21		2	
2005-6	PT	1	1			1		3	18				
3	FT	29	36	26	11			102	15			1	
2004-5	PT							0	13				
4	FT	26	28	9	1		1	65	19				
2003-4	PT				1			1	4				
5	FT	34	5	1				40	18				
2002-3	PT							0					

Give official fall term enrollment figures (head count) for the current and preceding five academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.

FT--full time
PT--part time

*Degree conferred as of June 10, 2008
**Includes Master's and Doctoral degrees

Table D-5. Program Enrollment and Degree Data

Chemical Engineering

	Enrollment counts in Fall of AY	Undergraduate Enrollment by Class						Total Undergrad	Total Grad***	Degrees Conferred Between July 1 and June 31 Of Academic Year			
		1st	2nd	3rd	4th	5th	Other*			Bachelor	Master**	Doctor	Other
CURRENT 2007-8*	FT	26	19	21	21	10	3	100	80	17	20	3	
	PT			1	3	1		5	37				
1 2006-7	FT	18	20	15	26	12	4	95	59	22	28	11	
	PT	1			2	2	3	8	57				
2 2005-6	FT	19	14	16	29	4	5	87	89	17	35	7	
	PT	1			1	3		5	36				
3 2004-5	FT	10	14	20	20	3		67	74	17	34	7	
	PT			1	6		2	9	70				
4 2003-4	FT	20	12	16	20	6	1	75	110	25	46	15	
	PT	1			3	3		7	44				
5 2002-3	FT	16	18	18	26	7	1	86	114	25	22	5	
	PT			2	4	3	1	10	41				

Give official fall term enrollment figures (head count) for the current and preceding five academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.

FT--full time
PT--part time

*Degree conferred as of June 10, 2008
**Includes Master of Science in Computer Science/Master of Chemical Engineering dual degree
***Includes Master's and Doctoral degrees; includes Master of Science in Computer Science/Master of Chemical Engineering dual degree

Table D-5. Program Enrollment and Degree Data

Civil Engineering

	Enrollment counts in Fall of AY	Undergraduate Enrollment by Class						Total Undergrad	Total Grad**	Degrees Conferred Between July 1 and June 31 Of Academic Year			
		1st	2nd	3rd	4th	5th	Other*			Bachelor	Master	Doctor	Other
CURRENT	FT	21	27	27	32	10	6	123	30	31	7	2	
2007-8*	PT			2	5	2		9	19				
1	FT	22	23	22	32	12	1	112	30	35	6	1	
2006-7	PT		2	3	3	7	1	16	18				
2	FT	25	19	24	30	6	2	106	18	16	5	1	
2005-6	PT			2	2	2	2	8	11				
3	FT	13	17	17	16	5	1	69	12	13	1	2	
2004-5	PT	1		2	1	2	6	12	21				
4	FT	13	14	10	19	5		61	18	19	5	5	
2003-4	PT			2	1	2		5	21				
5	FT	9	4	17	17	1	1	49	32	17	4	4	
2002-3	PT	1		3	1	4		9	23				

Give official fall term enrollment figures (head count) for the current and preceding five academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.

FT--full time
PT--part time

*Degree conferred as of June 10, 2008
**Includes Master's and Doctoral degrees

Table D-5. Program Enrollment and Degree Data

Computer Engineering

	Enrollment counts in Fall of AY	Undergraduate Enrollment by Class						Total Undergrad	Total Grad***	Degrees Conferred Between July 1 and June 31 Of Academic Year			
		1st	2nd	3rd	4th	5th	Other*			Bachelor	Master**	Doctor	Other
CURRENT 2007-8*	FT	45	29	14	18	6		112	69	23	49		
	PT			1		2	2	5	55				
1 2006-7	FT	45	19	19	26	4	1	114	61	26	45	4	
	PT		1	1		1	2	5	40				
2 2005-6	FT	29	31	15	31	6	1	113	54	31	35		
	PT				2	1	1	4	34				
3 2004-5	FT	43	26	33	38	12	1	153	58	55	34	1	
	PT				3	6		9	31				
4 2003-4	FT	39	42	28	58	19		186	47	52	31		
	PT			3	5	6		14	35				
5 2002-3	FT	52	41	52	69	11	1	226	69	58	44		
	PT		1	8	6	7		22	35				

Give official fall term enrollment figures (head count) for the current and preceding five academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.

FT--full time
PT--part time

Other Class includes one-year visiting, foreign exchange, joint program post-baccalaureate visiting and special students.

*Degree conferred as of June 10, 2008
**Includes Master of Electrical and Computer Engineering
***Includes Master's and Doctoral degrees; includes Master of Electrical and Computer Engineering

Table D-5. Program Enrollment and Degree Data

Electrical Engineering

	Enrollment counts in Fall of AY	Undergraduate Enrollment by Class						Total Undergrad	Total Grad***	Degrees Conferred Between July 1 and June 31 Of Academic Year			
		1st	2nd	3rd	4th	5th	Other*			Bachelor	Master**	Doctor	Other
CURRENT 2007-8*	FT	25	36	40	71	8	9	189	352	57	143	8	
	PT		2	2	8	5	1	18	119				
1 2006-7	FT	26	35	44	50	7	7	169	301	44	121	10	
	PT		1		7	6	3	17	112				
2 2005-6	FT	36	39	40	36	13	6	170	264	52	110	14	
	PT		2	3	9	7	2	23	110				
3 2004-5	FT	39	41	27	55	15	6	183	215	64	108	15	
	PT		4	6	8	4	2	24	126				
4 2003-4	FT	39	26	36	58	7	1	167	228	52	98	3	
	PT	1	2	17	10	4		34	106				
5 2002-3	FT	33	32	44	39	8		156	211	43	90	5	
	PT		2	14	14	12		42	111				

Give official fall term enrollment figures (head count) for the current and preceding five academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.

FT--full time
PT--part time

Other Class includes one-year visiting, foreign exchange, joint program post-baccalaureate visiting and special students.

*Degree conferred as of June 10, 2008
**Includes Master of Electrical and Computer Engineering
***Includes Master's and Doctoral degrees; includes Master of Electrical and Computer Engineering

Table D-5. Program Enrollment and Degree Data

Materials Science and Engineering

	Enrollment counts in Fall of AY	Undergraduate Enrollment by Class						Total Undergrad	Total Grad	Degrees Conferred Between July 1 and June 31 Of Academic Year			
		1st	2nd	3rd	4th	5th	Other*			Bachelor	Master	Doctor	Other
CURRENT 2007-8*	FT	5	6	6	6	1	3	27		5	5		
	PT			1		1		2					
1 2006-7	FT	6	3	2	7		1	19		7	4	2	
	PT				1			1					
2 2005-6	FT	1	1	5	1	2		10		8	5	1	
	PT			1				1					
3 2004-5	FT	2	2	1	5	4	1	15		6	4	1	
	PT			1		1		2					
4 2003-4	FT												
	PT												
5 2002-3	FT												
	PT												

Give official fall term enrollment figures (head count) for the current and preceding five academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.

FT--full time
PT--part time

*Degree conferred as of June 10, 2008

Table D-5. Program Enrollment and Degree Data

Mechanical Engineering

	Enrollment counts in Fall of AY	Undergraduate Enrollment by Class						Total Undergrad	Total Grad	Degrees Conferred Between July 1 and June 31 Of Academic Year			
		1st	2nd	3rd	4th	5th	Other*			Bachelor	Master	Doctor	Other
CURRENT	FT	54	48	44	36	2	8	192	107	38	55	3	
2007-8*	PT		1	3	3	4	3	14	52				
1	FT	42	46	30	31	7	4	160	94	35	44	1	
2006-7	PT			2	7	3	5	17	57				
2	FT	42	24	28	29	4	6	133	106	28	54		
2005-6	PT			1	8	2	1	12	38				
3	FT	29	22	26	14	7	6	104	83	27	46	4	
2004-5	PT		2	1	9	4	4	20	51				
4	FT	31	26	13	26	7	1	104	88	34	41	1	
2003-4	PT		4	4	13	4		25	39				
5	FT	28	12	24	28	4	2	98	70	36	44	4	
2002-3	PT	1	3	7	15	5		31	42				

Give official fall term enrollment figures (head count) for the current and preceding five academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.

FT--full time
PT--part time

*Degree conferred as of June 10, 2008

Table D-6. Faculty 9-Month Salary Data
For Academic Year 2007-2008

Department	Rank	Number	High	Mean	Low
Biomedical Engineering	Assistant Professor	5	$77,443	$75,279	$71,050
	Associate Professor	5	$88,518	$77,349	$48,347
	Lecturer	1	$54,671	$54,671	$54,671
	Professor	2	$157,671	$114,127	$70,583
Chemical and Biological Engineering	Assistant Professor	2	$77,761	$75,297	$72,833
	Associate Professor	5	$98,700	$86,176	$77,236
	Lecturer	1	$63,355	$63,355	$63,355
	Professor	13	$153,450	$102,594	$73,196
Civil, Architectural and Environmental Engineering	Assistant Professor	3	$76,482	$72,675	$68,549
	Associate Professor	4	$76,381	$71,642	$67,384
	Lecturer	3	$67,821	$61,251	$55,931
	Professor	6	$112,063	$100,214	$84,137
Electrical and Computer Engineering	Assistant Professor	10	$88,000	$83,951	$80,800
	Associate Professor	4	$102,692	$90,217	$84,076
	Lecturer	1	$53,000	$53,000	$53,000
	Professor	7	$143,514	$112,980	$88,344
Mechanical, Materials and Aerospace Engineering	Assistant Professor	4	$83,894	$79,172	$75,000
	Associate Professor	9	$97,795	$87,743	$77,041
	Lecturer	1	$36,828	$36,828	$36,828
	Professor	8	$154,195	$111,867	$89,661

Salary figures do not include salary portions assigned to administrative duties.