

STUDENT HANDBOOK
Master of Engineering
Degree Program in
CIVIL & ENVIRONMENTAL
ENGINEERING
2009-2010



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It is the policy of Cornell University actively to support equality of education and employment opportunity. No person shall be denied admission to any educational program or activity or be denied employment on the basis of legally prohibited discrimination involving, but not limited to, such factors as race, color, creed, religion, national or ethnic origin, sex, age, or handicap. The University is committed to the maintenance of affirmative-action programs that will assure the continuation of such equality of opportunity. Sexual harassment is an act of discrimination and, as such, will not be tolerated. Inquiries concerning the application of Title IX may be referred to Cornell's Title IX coordinator at the Office Workforce Diversity, Equity and Life Quality, 160 Day Hall, Ithaca, New York 14853-2801 (Telephone: 607-255-3976).

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SECTION 1 INTRODUCTION

Welcome to Cornell University and, in particular, to the School of Civil and Environmental Engineering. We hope your year here will be an academically rich and personally rewarding experience. This handbook has been prepared to simplify the orientation and registration process of new candidates for the Master of Engineering degree in Civil and Environmental Engineering.

1.1 The School of Civil and Environmental Engineering (CEE)

The School has a strong educational tradition and a supportive alumni network. Ranked as one of the top civil and environmental engineering departments in the United States, the School currently consists of twenty-eight active faculty members and other individuals who serve as lecturers, senior research associates, and other staff. The CEE faculty and their particular specializations are listed in Appendix A. In addition, we have several thousand alumni who hold important positions in engineering, construction, research and development, manufacturing, sales, education, consulting, and government in the U.S. and around the world.

The faculty and other individuals responsible for administering the School include:

Director, School of Civil & Environ. Engr.: Phil Liu

Director of Administration: Joe Rowe, 220 Hollister, 255-0549

Administrative Assistant: Jeannette Little, 220 Hollister, 255-3690

Director of Graduate Studies: James J. Bisogni, Jr.

Chair, Master of Engineering Program: James J. Bisogni, Jr.

Chair, Master of Engineering Program in Engineering Management: Mark Turnquist

Graduate Program Coordinator: Tania Sharpsteen, 219 Hollister, 255-7560

Other Support Staff:

Administrative Assistant: Christine Day, 220 Hollister, 255-3438

Accounts Administrator: Debra Federation, 220 Hollister, 255-3684

Accounts Coordinator: Maureen Letteer, 220 Hollister, 255-6192

Building Coordinator: Paul Charles, B56 Hollister, 255-4201

1.2 The Master of Engineering Degree in Civil & Environmental Engineering

The Master of Engineering degree is a coursework and project-oriented graduate program. It requires thirty (30) credit hours consisting of coursework in the major and supporting areas, and a project. The Master of Engineering degree is normally completed in two semesters of intensive study, but for some students a third semester may be necessary.

Master of Engineering candidates in Civil and Environmental Engineering may elect to pursue one of the following majors:

- environmental engineering (with a specialty in one of the following tracks)
 - environmental processes
 - environmental and water resource systems engineering
 - environmental fluid mechanics and hydrology
- geotechnical engineering
- structural engineering
- transportation systems engineering

In addition to coursework in a chosen major or specialty, students will also take courses in one or more supporting areas. Supporting areas can be chosen from many disciplines, including any of the specialty areas within CEE, or in microbiology, historic preservation, operations research, computer science, economics, materials science, architecture, and engineering management, to name just a few.

The School of Civil and Environmental Engineering also offers a Master of Engineering degree in Engineering Management. That program is aimed at engineers who want to stay in a technical environment, but advance into managerial roles. Students learn to identify problems, analyze data, formulate models to understand these problems, and interpret the results of analyses for managerial action. A number of students in the MEng program in Engineering Management elect to take courses in management offered by CEE, the Johnson Graduate School of Management, or the School of Industrial and Labor Relations. Appendix C provides a short description of the program in Engineering Management and a list of typical electives. A separate handbook providing more details about the program is also available from the Graduate Program Coordinator.

1.2.1 Preparation

Students from all fields of engineering and the physical and natural sciences are welcome in the Master of Engineering programs offered by the CEE School. However, a student without adequate preparation may be required to take additional preparatory coursework, which will be determined by faculty in the student's chosen major. This preparatory work does not count toward the Master of Engineering graduation requirements. Any preparatory coursework that is required will be listed in a student's letter offering admission.

1.2.2 Major Program Requirements

A minimum of 30 credit hours of course and project work is required for the MEng degree in Civil & Environmental Engineering. This is typically the equivalent of ten 3-credit courses. Program requirements for each major concentration are given in Appendix D.

The information provided should help you develop a coursework proposal, but we encourage you to seek guidance from your advisor and other faculty members. Your advisor will work with you to develop a program consistent with your career goals and the intent of the MEng program.

SECTION 2 PLANNING and REGISTERING for the MEng (CEE) PROGRAM

Enrolling in the MEng program will take relatively little time for most of you. You will find the process a little more informal than undergraduate registration, with more freedom to change courses easily during the first three weeks of classes of each semester. The major steps in the process are described in the following sections.

Upon arrival, please see the CEE Graduate Program Coordinator (GPC) in 219 Hollister Hall. The Coordinator will provide you with up-to-date information, forms, the name of your advisor, and your office assignment.

2.1 Assignment of Advisor

You will have an advisor in your major area of concentration to help you design a program of study and generally to assist and advise you during your stay at Cornell. Advisor assignments are done within each major concentration area. You may also change your advisor with the permission of the faculty member whom you would like to have serve as your new advisor.

You should set up an appointment with your advisor shortly after arriving on campus. Please do not wait until the last couple of days before classes begin. The beginning of the semester is busy for everyone, and your advisor may also be responsible for a number of undergraduate and other graduate students. It is your responsibility to establish a relationship with your advisor, who must approve the MEng program that you propose, as well as any changes you may wish to make at a later date.

2.2 University Registration

Note that graduate registration at Cornell is a two-stage process. First, you must enroll as a student in the Graduate School and, second, you must enroll in courses. The former is on a fixed schedule, while the latter is accomplished on-line over the first three weeks of the semester.

New graduate students should register starting Monday, August 25 at Bartels Hall, from 8:30 to 3:00 pm. After August 25th, registration and ID card disbursement moves to the University Registrar's Office in B-7 Day Hall. Anyone registering after September 12 will have to pay a \$350 late fee. Every student must have a Cornell ID card and be registered with the University in order to enroll in courses.

NetID: You should have received your NetID and information from Cornell Information Technologies (CIT) over the summer. If you did not, please contact the CIT Office at HelpDesk@cornell.edu. E-mail messages are one of the most effective forms of communication. Please check your e-mail regularly in the event that your advisor, your professors, your colleagues, or the GPC need to get in contact with you.

Social Security Card Application: A representative of the Social Security Administration may be at Bartels Hall to help international students who are receiving any kind of financial support from Cornell apply for a U.S. Social Security Number (SSN). Bring your passport, visa documents, and a letter from the ISSO office. You may also apply for a SSN at the local SSA Office at 127 W. State Street. Once you obtain your SSN, take the card both to the GPC and to the University Registrar's Office, B-7 Day Hall, to update your Cornell record.

2.3 Course Registration

Graduate students must register for courses online. You will receive details about online course enrollment upon registering with the Graduate School. Courses may be **added** online until September 18th. They may be **dropped** online until October 9th.

Any changes in your course registration after the deadlines (i.e., adds/drops, credit hour changes) requires submission of a Course Enrollment Petition to the Graduate School. The petition must be signed by both your advisor and the instructor of the course. Petitions are not automatically approved and, in fact, Graduate School personnel have indicated that they will be much stricter in approving petitions. Check *Just the Facts* often after your course schedule is online to verify that all information is correct, and do not wait until the last minute to submit a Course Enrollment Petition.

2.4 Planning Your MEng Program

Please study the pertinent material in this handbook for both major concentration area courses and the appropriate courses outside the concentration area before seeing your advisor. It would be worthwhile to spend some time with the online course catalog (<http://www.cornell.edu/academics/courses.cfm>) to identify possible courses for both the Fall and Spring terms. There normally are a few changes in course offerings/time schedules made after the catalog copy is prepared. Final correct information will be posted and updated on the online course and time rosters.

Program planning is done with the aid of the MEng Proposal Form appropriate for a student's major (see Appendix D). You will fill this form out with the help of your advisor, who must also sign the form showing his/her approval of your program. Extra proposal forms can be obtained from the GPC.

Please note that except for seminars, which may be graded on an S/U basis, all courses that count towards the MEng degree must be taken for a letter grade (A-F). With approval of both your advisor and the MEng Chair, a maximum of two S/U-graded credit hours may be allowed, provided the seminars are "participatory" (requires more than just attending the class).

2.5 Approval of Your Course Program

After a "final" program of courses for the entire year is agreed upon with your advisor, please return the Proposal Form to the GPC by **September 18th**. It will then be forwarded the Chair of the Master of Engineering Program in Civil & Environmental Engineering for final approval. A copy of the approved program is returned to your faculty advisor. You may pick up a copy from your student mail folder in 220 Hollister. Original forms stay on file with the GPC.

2.6 Filing Your Course Program

You have approximately three (3) weeks after classes begin (until September 18, 2009) to enroll online for Fall 2009 classes. This time period allows you to sit in on an extra course or two, if you wish, for a couple of weeks to assist you in making up your mind about your exact program for the term.

2.7 Program Changes

Students often propose changes to their program at the start of their second semester that reflect changes in interests and/or course availability. All changes to your approved MEng program must take the form of a revised proposal. All revised proposal forms must be approved by your advisor and turned into the GPC. It is important that any changes in your program be approved promptly because the current version of your proposal form that is on file serves as a check list for determining compliance with graduation requirements. Program changes made after the Fall term to take effect in the Spring term should be submitted by February 5, 2010.

2.8 Petitions

Cornell University has a long-standing tradition of considering petitions from students relative to special situations or circumstances that could justify exceptions to the normal rules or requirements. The CEE MEng Committee – a committee consisting of one faculty representative from each major – considers most petitions; others must be submitted to the College Master of Engineering Committee for a decision. The College Committee may also review petitions that are submitted to the CEE MEng Committee that are not resolved to the satisfaction of the student. While we are not encouraging use of the petition route to get around requirements, we do want to point out the existence of this process. It gives everyone the opportunity of stating his/her case for special consideration, and therefore it is a very important part of the operational procedures for students attending Cornell University.

2.9 Financial Aid and Work Obligation

Financial Aid administered by the College or School can be in the form of fellowships or half-time assistantships. If you have the latter, you will be given eight hours per week of teaching assistant-related duties. MEng students typically serve as graders, hold office hours, prepare labs, etc. The faculty will make assistantship assignments during the first two weeks of classes.

2.10 Grade Requirements

The College requires a minimum grade point average of 2.50 for graduation from the Master of Engineering program. Students admitted on a Provisional Basis must achieve a 3.00 average during their first term in the MEng program to continue in the second term. Typical graduate student grade point averages are much higher than this. At Cornell decimal grade points are assigned to grades with (+) or (-), i.e., A+ = 4.3, A = 4, A- = 3.7, B+ = 3.3, etc.

A grade of less than C- in a course will result in no credit being granted toward satisfaction of the 30-hour minimum requirement. However, these courses are included in calculating grade point averages.

2.11 Facilities

Most of the facilities for the CEE School are housed in Hollister Hall, except for the large-scale infrastructure testing labs in the George Winter Lab (Thurston Hall). Each Master of Engineering student will have a workstation equipped with a computer in a room with other students participating on the same project. Additional computing facilities for all members of the Cornell community are located at numerous locations throughout the campus. Some of the closest sites for engineering students include Carpenter Hall (ACCEL on the 2nd floor), Upson Hall (B7), and Uris Library (Tower Room). The Engineering Library is in Carpenter Hall.

2.12 Room Assignments, Building Keys, and Mail Folders

Upon arrival, you will need to visit the GPC in 219 Hollister to get your office assignment. Entrance to the MEng offices is via your ID card. Your ID will also open outside doors to Hollister Hall and all student lounges in Hollister Hall.

Each student will be provided a folder bearing his or her name in the graduate student mail file located in the Main Office (220 Hollister). You should check your folder frequently, not only for incoming mail, but also for messages from the MEng Chair, your advisor, or other Cornell sources. This mail folder is provided for campus mail and notices. You should have your personal mail sent to your local residential address, not to Hollister Hall.

The bulletin board outside the GPC's office is specifically for announcements relative to CEE's graduate programs. You should get into the habit of checking this bulletin board. We try to keep it updated with program topics, seminar speaker announcements, Graduate School notices, and other important messages.

2.13 Job Placement

We are confident that the background you receive in your MEng program will be of great assistance to you in the job market. Employers have always been enthusiastic about Cornell graduates with MEng degrees.

The Engineering Co-op and Career Services Office (201 Carpenter Hall) offers an extensive recruitment program with many interviewers coming to campus each year. You should visit this office early in the fall term and take advantage of the excellent opportunities it offers. The University Career Services Office has a series of special lectures on how to approach the job market, how to prepare resumes, how to take interviews, etc. Announcements of these lectures and meetings will be posted throughout Hollister Hall.

Many opportunities also are available with private engineering companies, industries, and agencies that do not routinely interview on campuses because they are relatively small. Do not hesitate to ask faculty with whom you work for advice on jobs. Some of the faculty in your major area will have excellent connections to professional firms and will be happy to pass along notices they receive about jobs or to help you identify potential employers.

Job listings and descriptions are also posted on CEE's web site: www.cee.cornell.edu. There are many routes to explore in seeking the right engineering position; the key point to remember is that you must take the initiative.

Each spring, *Engineering News-Record* (ENR) publishes its ranked lists of the 500 largest engineering design firms and the 400 largest construction contractors in the U.S. These listings may give you some good ideas about potential employers. It should be pointed out that not all firms are included in ENR because the information is based on a voluntary response to a questionnaire.

2.14 Professional Registration

Engineers are licensed (by examination and experience) to practice engineering in each state of the U.S. and in most international jurisdictions. Registration is very important for civil engineers because they are responsible for public safety in much of their work. Virtually all authorities require a registered professional engineer to give final approval to all plans and specifications for engineering projects. If you hold an ABET-accredited undergraduate engineering degree, you are eligible to take Part I of the examination. Successful completion earns you the title “Intern Engineer” (often called Engineer-in-Training). Because Part I emphasizes theoretical knowledge, there is a comparative advantage in taking this exam while still in school. Success or failure of this examination has no bearing on your academic standing at Cornell or elsewhere.

Many MEng students will already have taken the Part I examination. If you qualify and have not taken the exam, you are encouraged to do so. The Undergraduate Programs and Student Services Office in 242 Carpenter Hall has application forms for the New York State Part I exam. You can also obtain information and an application from: www.op.nysed.gov/pefaq.htm. Historically, application deadlines have been November 1 for the Spring (April) exam and May 1 for the Fall (October) exam. The Student Chapter of ASCE usually coordinates the application process and sponsors review sessions for the Spring exam.

Part II of the examination can be taken after four years of suitable engineering experience beyond the accredited undergraduate degree. Successful completion of Part II will give you the title “Professional Engineer” in the state where you took the exam. Registration in other states usually can be obtained by reciprocity, rather than by taking additional examinations. There are a few exceptions to this general policy, such as the additional required experience and separate examinations after the P.E. for licensing as a structural or geotechnical engineer (S.E. or G.E.) in California.

2.15 Miscellaneous

The Graduate School will place a “hold” on your diploma if certification of your undergraduate degree has not been received (official final transcript showing date undergraduate degree was awarded). The Graduate School will also place a hold on your diploma if you have any outstanding debts with the university or have not returned library books. Please make sure all bursar charges and library fines are paid, all Graduate School paperwork has been processed, and all library books are returned at least one week before Commencement.

SECTION 3 PROFESSIONAL CONDUCT and SPECIAL NEEDS

3.1 Academic Integrity and Plagiarism

Absolute integrity is expected of every Cornell student in all academic undertakings. Integrity entails a firm adherence to values most essential to an academic community, including honesty with respect to the intellectual efforts of oneself and others. Both students and faculty at Cornell assume the responsibility of maintaining and furthering these values. However, a Cornell student's submission of work for academic credit indicates that the work is their own. All outside assistance should be acknowledged, and the student's academic position truthfully should be reported at all times. In addition, Cornell students have the right to expect academic integrity from each of their peers. It is plagiarism for anyone to represent another's work as their own. As stated in the University Code of Academic Integrity, "The maintenance of an atmosphere of academic honor ... is the responsibility of the student and faculty ..."

Gray areas sometimes exist when students study and work together. It is important that faculty make clear what is expected and that students understand what authorship citations an instructor expects. To become better acquainted with academic integrity responsibilities, each student should have a copy of the *Policy Notebook for Students, Faculty and Staff* (available in the Dean of Student's Office). Also, a copy of the "University Code of Academic Integrity" is included in the *Handbook of Engineering Students* available from the Engineering College's Office of Admissions and Undergraduate Programs located near the north entrance of Hollister Hall.

3.2 Persons With Special Needs

Cornell University is committed to assisting those persons with disabilities who have special needs. A brochure describing services for persons with disabilities may be obtained by writing to the Office of Workforce Diversity, Equity and Life Quality, Cornell University, 160 Day Hall, Ithaca, New York 14853-2801. Other questions or requests for special assistance also should be directed to that office.

APPENDIX A
SCHOOL OF CEE FACULTY AND THEIR INTERESTS
(does not include retired/emeritus faculty)

Wilkins Aquino, Assistant Professor (Ph.D. Illinois/Urbana-Champaign): constitutive modeling of reinforced concrete, advanced composites; nonlinear finite element analysis of solids and structures; durability of concrete; seismic rehabilitation; mass and heat transfer in concrete; large-scale testing.

James J. Bisogni, Jr., Associate Professor (Ph.D. Cornell): environmental engineering, biological wastewater treatment processes, aquatic chemistry, remediation of acid lakes.

Wilfried H. Brutsaert, NAE, The William L. Lewis Professor of Engineering (Ph.D. California/ Davis): hydrology, land surface processes, earth-atmosphere interactions, groundwater flow.

Paul G. Carr, P.E., Adjunct Associate Professor (Ph.D. Virginia Tech): construction engineering and management.

Edwin A. “Todd” Cowen, Associate Professor (Ph.D. Stanford): environmental fluid mechanics; mixing, transport, and air-sea processes; lake modeling; measurement technologies.

Peter J. Diamessis, Assistant Professor (Ph.D. California/San Diego): turbulence, mixing and internal waves in stratified flows; physical oceanography and limnology; spectral methods; parallel scientific computing.

Christopher J. Earls, P.E., Associate Professor (Ph.D. University of Minnesota): structural stability; computational structural and solid mechanics; behavior and design of metal structures.

Oliver H. Gao, Assistant Professor (Ph.D. California/Davis): transportation and air quality, systems engineering, statistical modeling.

James M. Gossett, Professor (Ph.D. Stanford): environmental engineering, water and waste treatment, microbiological phenomena and processes, treatment of contaminated groundwater.

Mircea D. Grigoriu, Professor (Ph.D. MIT): structural engineering, reliability, stochastic mechanics, random vibration, structural dynamics.

Kenneth C. Hover, P.E., Professor (Ph.D. Cornell): concrete design, construction, and materials behavior.

Anthony R. Ingraffea, P.E., The Dwight C. Baum Professor of Engineering and Director of the Cornell Fracture Group (Ph.D. Colorado): structural mechanics, fracture mechanics of rock and concrete.

P.S. Steve Koutsourelakis, Assistant Professor (Ph.D. Princeton): uncertainty modeling and analysis in engineering mechanics; problems in random heterogeneous materials, stochastic finite elements, multiscale analysis, and Bayesian inferencing.

Leonard W. Lion, Professor (Ph.D. Stanford): environmental engineering, fate and behavior of contaminants in aqueous systems.

Philip L-F. Liu, Professor (Ph.D. MIT): fluid mechanics, wave hydrodynamics, coastal engineering.

Daniel P. Loucks, NAE, Professor (Ph.D. Cornell): water resources and environmental management systems, interactive simulation modeling and decision support systems.

John Mbwana, Senior Research Associate (Ph.D. Cornell): transportation systems analysis & design, infrastructure decision support modeling, intelligent transportation systems, transportation engineering & planning.

Linda K. Nozick, Professor (Ph.D. Pennsylvania): systems engineering, transportation and logistics, engineering management.

Thomas D. O'Rourke, NAE, The Thomas R. Briggs Professor of Engineering (Ph.D. Illinois/Urbana-Champaign): geotechnical engineering, earthquake engineering, lifeline systems, underground technologies, and soil-structure interaction.

William D. Philpot, Associate Professor and Associate Director of CEE (Ph.D. Delaware): remote sensing, hydrologic optics, image processing, hyperspectral data analysis.

Ruth E. Richardson, Assistant Professor (Ph.D. California/Berkeley): bioenvironmental engineering, bioremediation, microbial ecology, assessing viability of environmental microbes.

Christine A. Shoemaker, Professor (Ph.D. Southern California): water resource and water quality systems; watershed modeling; groundwater contamination; optimization algorithms.

Jery R. Stedinger, Professor (Ph.D. Harvard): stochastic hydrology; water resource systems planning and operations; risk analysis and management.

Harry E. Stewart, P.E., Associate Professor (Ph.D. Massachusetts/Amherst): geotechnical engineering, dynamic behavior of soils, soil-structure interaction, field testing.

Charles H. Trautmann, P.E., C.P.G., Adjunct Associate Professor (Ph.D. Cornell): geotechnical engineering, engineering geology.

Mark A. Turnquist, Professor (Ph.D. MIT): transportation systems planning, analysis, and design; manufacturing logistics; engineering management.

Francis M. Vanek, Visiting Lecturer (Ph.D. Pennsylvania): energy, environment, and transportation.

Derek Warner, Assistant Professor (Ph.D. Johns Hopkins): computational solid mechanics, deformation and fracture mechanisms, nanostructured materials and thin films, dynamic failure and fragmentation, and massively parallel and multiscale computing.

Frank J. Wayno, Adjunct Associate Professor (Ph.D. Princeton): engineering management, project management and organizational change.

Monroe Weber-Shirk, Senior Lecturer/Research Associate (Ph.D. Cornell): hydraulics, instrumentation, sand filtration, software applications.

APPENDIX B 5 SEMESTER M.ENG./MBA PROGRAM

What is it?

A joint venture between the College of Engineering and the Johnson Graduate School of Management (JGSM) that allows students to acquire a Master of Engineering degree and an MBA degree in 5 semesters (usually based on Fall admission to the M.Eng. program). The dual-degree program consists of 75 credit hours, 30 of which comprise the regular two-semester M.Eng. program. For those admitted to the MBA program, the JGSM allows some (occasionally all) of these M.Eng. credits to be transferred to the MBA program, usually resulting in saving one semester's time over taking the M.Eng. and MBA degree programs separately.

What are the requirements?

Applicants must have already earned a baccalaureate degree in engineering, applied science, or equivalent from Cornell or elsewhere and be accepted for admission or presently enrolled in the M.Eng. program. **The two programs require separate application forms and review processes, and materials submitted to one program are not available to the other.** The JGSM places great emphasis on relevant work experience, and this will be taken into consideration when evaluating applications. All requirements of the Master of Engineering (CEE) program are to be completed. No credit toward the M.Eng. degree is allowed for coursework done outside Cornell. All requirements of the Master of Business Administration curriculum are to be completed. Coursework done outside Cornell normally will not be credited toward the MBA degree.

If you are interested in this program, do the following (the following dates are based on Fall enrollment):

- a. If you have been admitted to or are attending the M.Eng. program, formally apply to the Johnson Graduate School of Management by the second semester of your M.Eng. program at the latest. You must fill out a separate JGMS application form and pay their application fee. You should also notify your M.Eng. advisor of your intention to do the MBA program so your advisor can take this into consideration when planning your M.Eng. program schedule.
- b. If you have not already done so, apply to take the GMAT, which is required by JGSM, using January of your M.Eng. year as your last possible test date. Have the scores directed to JGSM

If you are admitted to the JGSM, your Master of Engineering degree will be awarded when all requirements of that degree are completed (usually after 2 semesters), and the Master of Business Administration degree will be awarded when all requirements of that degree are completed (usually after 3 more semesters). The two degrees can not be awarded simultaneously.

In general, financial aid is not awarded to those doing the MBA portion of the program except through the Knight Joint Degree Scholarship Program, which has very strict requirements. Information and an application to the Scholarship Program is available on the web at:

http://www.engineering.cornell.edu/student-services/orgspe/student-resources/fellowships-aid/upload/Knight_App.pdf (requires Adobe Acrobat). Questions about this Scholarship Program should be directed to the Office of Research and Graduate Studies, 222 Carpenter Hall, Cornell University, Ithaca, New York 14853 (607-255-7413; enr_grad@cornell.edu)

APPENDIX C ENGINEERING MANAGEMENT

The broad-based Master of Engineering program in Engineering Management attracts students from all engineering backgrounds. Many students in the Master of Engineering program in Civil and Environmental Engineering, as well as in many other MEng programs opt to take management courses as part of their program to help prepare for a professional career. And, every year one or two students who have applied to a CEE program opt to switch to a major in Engineering Management with a specialization in a CEE disciplinary field. Therefore, we have included brief details of the Engineering Management program and coursework in this handbook.

Master of Engineering in Engineering Management Program Requirements

Prior to matriculation in the program, a student must have taken at least one course in statistics at the level of ENGRD 2700, CEE 3040, or ECE 3100.

Required Courses:

- CEE 5900 – Project Management (Fall, 4 credits)
- CEE 5910 – Engineering Management Project (Fall or Spring, 4 credits)
- CEE 5930 – Engineering Management Methods (Fall, 4 credits)
- CEE 5970 – Risk Analysis and Management (Spring, 3 credits)

Two Engineering Management Focus courses from the following list:

- CEE 5240 – Applied Systems Engineering (Fall, 3 credits)
- CEE 5940 – Economic Methods for Eng. and Management (Fall, 4 credits)
- CEE 5970 – Risk Analysis and Management (Spring, 3 credits)
- CEE 6900 – Creativity, Innovation and Leadership (Spring, 3 credits)

One course in finance and/or accounting (many students take either NBA 5530 – Accounting and Financial Analysis for Engineers, ORIE 5150 – Economic Analysis of Engineering Systems, or NCC 5560 – Managerial Finance)

One course in individual and/or organizational behavior (many students take CEE 6900 – Creativity, Innovation and Leadership; NCC 5530 – Marketing Management; NCC 5540 – Mgmt. and Leading in Organizations; NBA 6630 – Managerial Decision Making; NBA 6660 – Negotiations; or ILROB 5200 – Organizational Behavior & Analysis)

Three specialization courses in either a disciplinary or functional area.

A disciplinary specialization will usually be in the same field as your undergraduate degree. Functional specializations can vary widely. *At least two of the three specialization courses must be technical in nature, and at least one of the three should be from Engineering.*

Students wishing more detailed information on the Master of Engineering Program in Engineering Management should see the GPC for a separate handbook and proposal form.

APPENDIX D
MAJOR PROGRAM REQUIREMENTS AND FORMS

Environmental Engineering
 Environmental Processes
 Environmental Fluid Mechanics & Hydrology
 Environmental & Water Resource Systems Engineering
Geotechnical Engineering
Structural Engineering
Transportation Systems Engineering

School of Civil & Environmental Engineering MEng Proposal Form – **EP / EFM-H / EWRS**
 (a new form must be submitted when changes are made)

NAME: _____ ADVISOR: _____ DATE: _____

Choose one of the following TRACKS: _____ Environmental Processes (EP)
 _____ Environmental Fluid Mechanics-Hydrology (EFM-H)
 _____ Environmental and Water Resource Systems (EWRS)

		Year		Year	Comments
		Cr.	Fall	Spr.	
PROJECT COURSES (3 or 6 credit projects available)					
CEE	Project	3			
CEE	Project	3			

		Cr.	Fall	Spr.	Comments
COURSES in TRACK (3 required)¹					

		Cr.	Fall	Spr.	Comments
ADDITIONAL ENVIRONMENTAL ENGINEERING COURSES (2 required)²					

		Cr.	Fall	Spr.	Comments
SUPPORTING ELECTIVES (3 or 4 required, depending on whether project is 3 or 6 credits)³					

		Cr.	Fall	Spr.	Comments
SEMINARS (Indicate if Participatory or Non-Participatory)⁴					
CEE 6020	Environmental Seminar				

		Cr.	Fall	Spr.	Comments
ALL OTHER COURSES					

Total Credits for all Fall & Spring Courses⁵ _____

TOTAL M.Eng. PROGRAM CREDIT HOURS: _____ (must equal or exceed 30)

APPROVALS: Advisor _____ Date: _____

MEng Chair _____ Date: _____

*** Course number will depend on the specific concentration you are in and occasionally the specific project. Please see the Graduate Program Coordinator to make sure you sign up for the correct class.

See notes. Updated proposals should identify what changes were made and why.

NOTES:

¹ The following table shows courses in each of the three possible tracks for the EP / EFM-H / EWRS Majors.

EP	EFM-H	EWRS
CEE 4510	CEE 4350	CEE 5930
CEE 4520	CEE 4360	CEE 5970
CEE 4530	CEE 6310	CEE 6200
CEE 4540	CEE 6320	CEE 6210
CEE 6530	CEE 6330	CEE 6230
CEE 6560	CEE 6340	CEE 6550
CEE 6570	CEE 6350	CEE 6650
CEE 6580	CEE 6360	
	CEE 6370	
	CEE 6550	
	MAE 6010	

- Students electing the Environmental Processes (EP) track are required to take CEE 6530, CEE 6560, and CEE 6570.
- Students electing the Environmental Fluid Mechanics and Hydrology (EFM-H) track are required to take CEE 6550 and two additional courses from the EFM-H column in the table.
- Students electing the Environmental and Water Resource Systems (EWRS) track are required to take CEE 5930 and two additional courses from the EWRS column in the table. At least CEE 5970 or CEE 6200 is strongly recommended.

² A student must take two additional courses from among all those listed in the table.

³ A student may select his or her supporting electives from engineering and non-engineering subject areas related to environmental engineering, including biology, chemistry, toxicology, law, policy, economics, operations research, computer science, engineering mathematics, systems engineering, and city and regional planning.

⁴ Credit for seminars count toward the MEng degree only if the format of the seminar is “participatory” (i.e. requires more than attendance). Students are expected to take CEE 6020 Environmental Seminar in the fall and CEE 6021, 6031 or 6051 in the spring.

⁵ No more than 20 credits per semester (MEng and non-MEng) may be taken except by petition to the College Master of Engineering Committee. All courses should be listed whether or not they count in the MEng program.

NAME: _____ ADVISOR: _____ DATE: _____

SUPPORTING AREA: _____

		Year		Year	Comments
		Cr.	Fall	Spr.	
PROJECT COURSES					
CEE 5041	Project	3	X		
CEE 5042	Project (continued)	3		X	

		Cr.	Fall	Spr.	Comments
MAJOR AREA ELECTIVES (5 required)¹					
CEE 7400	Engineering Behavior of Soils	3	X		

		Cr.	Fall	Spr.	Comments
SUPPORT ELECTIVES (2 required)²					

		Cr.	Fall	Spr.	Comments
ELECTIVE COURSE (1 required)³					
		3			

		Cr.	Fall	Spr.	Comments
SEMINARS (Indicate if Participatory or Non-Participatory)⁴					
CEE 6070	Civil Infrastructure Seminar	(1)	X		Non-participatory

		Cr.	Fall	Spr.	Comments
ALL OTHER COURSES					

Total Credits for all Fall & Spring Courses⁵ _____

TOTAL M.Eng. PROGRAM CREDIT HOURS: _____ (must equal or exceed 30)

APPROVALS: Advisor _____ Date: _____

MEng Chair _____ Date: _____

See notes. Updated proposals should identify what changes were made and why.

NOTES:

¹ CEE 7400, Engineering Behavior of Soils, is required if a student has not previously taken it or a similar graduate level course. Typical additional major courses in geotechnical engineering are drawn from the following list:

- CEE 6400 Foundation Engineering
- CEE 6410 Retaining Structures and Slopes
- CEE 6440 Environmental Site Remediation Engineering
- CEE 6720 Finite Element Analysis (highly recommended)
- CEE 7410 Rock Engineering
- CEE 7440 Advanced Foundation Engineering
- CEE 7450 Soil Dynamics
- CEE 7460 Embankment Dam Engineering

² Support areas may include any engineering or non-engineering subject area that can be reasonably justified as supporting the major area, a well-defined career objective, or plans for a PhD. Typical supporting areas include structural engineering, geology, civil infrastructure systems, and engineering management.

³ Elective course may be an additional course in the major or supporting area, or another course of interest. It may be a course in management. This course must be approved by a student's advisor and relate in some way to the student's academic program or career objectives.

⁴ Credit for seminars count toward the MEng degree only if the format of the seminar is "participatory" (i.e. requires more than attendance).

⁵ All courses should be listed whether or not they count in the MEng program. No more than 20 credits per semester (MEng and non-MEng) may be taken except by petition to the College Master of Engineering Committee.

NAME: _____ ADVISOR: _____ DATE: _____

SUPPORTING AREA: _____

A Minimum of two (2) project (p) courses must be taken
MAJOR AREA ELECTIVES (Minimum of 15 credits)¹

		Cr.	Fall	Spr	Comments
CEE 6720	Finite Element Analysis (<i>p</i>)	3	X		
TAM 6100	Methods of Applied Mathematics I	3	X		
CEE 3720	Intermediate Solid Mechanics	4	X		

SUPPORT ELECTIVES (Maximum of 6 credits)²

		Cr.	Fall	Spr	Comments

SEMINARS (Indicate if Participatory or Non-Participatory)³

		Cr.	Fall	Spr.	Comments
CEE 6070	Civil Infrastructure Seminar	(1)	X		Non-participatory

ALL OTHER COURSES

		Cr.	Fall	Spr.	Comments

Total Credits for all Fall & Spring Courses⁴ _____

TOTAL M.Eng. PROGRAM CREDIT HOURS: _____ (must equal or exceed 30)

APPROVALS: Advisor _____ Date _____

MEng Chair _____ Date _____

See notes on back. Updated proposals should identify what changes were made and why.

NOTES:

¹ CEE 6720, TAM 6100, and CEE 3720 are required courses to be taken in fall term.

Typical additional major courses in structural science are drawn from the following list:

CEE 6630: Solid Mechanics I (Fall)
CEE 4750/TAM 6550: Composite Materials (Spring)
CEE 6710: Structural Mechanics (Fall)
CEE 6075a: Stochastic Simulation Methods in Engin. And Bayesian Computation (Spring)
CEE6075b: Scientific Supercomputing (Spring)
CEE6290: Advanced Numerical Methods for Engineers (Fall)
CEE 6730: Design of Concrete Structures (Spring)
CEE 6750: Concrete Materials and Construction (Spring)
CEE 6780: Structural Dynamics and Earthquake Engineering (Spring)
CEE 7700: Engineering Fracture Mechanics (*p*) (Spring)
CEE 7750: Nonlinear Finite Element Analysis I (*p*) (Spring)
CEE 7790: Nonlinear Finite Element Analysis II (*p*) (Spring)
CEE 7710: Stochastic Mechanics in Science and Engineering (Fall)
CEE 7720: Random Vibrations
CEE 7770: Advanced Topics in Finite Element Analysis (Spring)
TAM 7680: Elastic Waves in Solids (Fall)
TAM 6110: Methods of Applied Mathematics II (Spring)
MSE 6020: Elasticity, Plasticity, and Fracture (Spring)
CEE 6760/TAM550/MAE-MSE/6550: Advanced Composite Materials (Spring)

² Support areas may include any engineering or non-engineering subject area that can be reasonably justified as supporting the major area, a well-defined career objective, or plans for a PhD. Typical supporting areas include theoretical and applied mechanics, applied mathematics, computer science, fluid mechanics, and engineering management.

³ Credit for seminars count toward the MEng degree only if the format of the seminar is “participatory” (i.e. requires more than attendance).

⁴ All courses should be listed whether or not they count in the MEng program. No more than 20 credits per semester (MEng and non-MEng) may be taken except by petition to the College Master of Engineering Committee.

NAME: _____ ADVISOR: _____ DATE: _____

		Year		Year	Comments
		Cr.	Fall	Spr.	
PROJECT COURSES (minimum of 3 credits)¹					
CEE 5061	Project (Fall)				
CEE 5062	Project (Spring)				

		Cr.	Fall	Spr.	Comments
TRANSPORTATION CORE COURSES (4 required)²					

		Cr.	Fall	Spr.	Comments
SUPPORTING ELECTIVES (5 required)³					

		Cr.	Fall	Spr.	Comments
SEMINARS (Indicate if Participatory or Non-Participatory)⁴					

		Cr.	Fall	Spr.	Comments
ALL OTHER COURSES					

Total Credits for all Fall & Spring Courses⁵ _____

TOTAL M.Eng. PROGRAM CREDIT HOURS: _____ (must equal or exceed 30)

APPROVALS: Advisor _____ Date _____

M.Eng. Chair _____ Date _____

See notes. Updated proposals should identify what changes were made and why.

NOTES:

¹ A project of at least 3 credits is required. In some cases, specific projects may be defined whose scope justifies more than 3 credits.

² Transportation Systems courses include CEE 4630 Future Transportation Technologies Systems, CEE 4640 Transportation Systems Design, CEE 6860 Civil Infrastructure Systems, CEE 6620 Urban Transportation Network Design & Anal., and CEE 6650 Environment/Energy and Transportation Planning. CEE 6065 Special Topics in Transportation can be used to pursue an independent study on a particular transportation topic if you and your advisor agree that this is appropriate. The selection of appropriate transportation core courses will depend on your background, and will be determined in discussion with your advisor.

³ Supporting electives should be selected from one or more related areas. Typical areas include Operations Research, Economics, City and Regional Planning, Johnson School of Management, and other areas of CEE. Some commonly chosen courses include:

AEM 4170 Decision Models for Small and Large Businesses
AEM 4320 Public Private Sector Economics Linkages
AEM 6330 Devolution, Privatization, & the New Public Management

CEE 5290 Heuristic Methods for Optimization
CEE 5900 Project Management
CEE 5970 Risk Analysis and Management
CEE 6930 Public Systems Modeling

CRP 5040 Urban Economics
CRP 5080 Introduction to Geographic Information Systems
CRP 5170 Economic Development
CRP 5190 Urban Theory and Spatial Development
CRP 5520 Land Use Planning
CRP 5840 Green Cities
CRP 6090 Urban and Regional Theory
CRP 6860 Planning for Sustainable Transportation

ECON 3540 Economics of Regulation
ECON 6090 Microeconomic Theory I

NBA 6410 Business Logistics and Management

ORIE 5300 Optimization I
ORIE 5310 Optimization II
ORIE 5510 Introduction to Stochastic Processes
ORIE 4580 Monte Carlo Simulation

⁴ Credit for seminars count toward the MEng degree only if the format of the seminar is “participatory” (i.e. requires more than attendance).

⁵ All courses should be listed whether or not they count in the MEng program. No more than 20 credits per semester (MEng and non-MEng) may be taken except by petition to the College Master of Engineering Committee.

APPENDIX E
Overall List of Selected CEE Courses

[Subject to change. Course descriptions, including courses in other departments, are available at:
<http://www.cornell.edu/academics/courses.cfm>]

FALL 2009

Master of Engineering Projects

CEE 5031	MEng Project: Environ. Fluid Mechanics & Hydrology
CEE 5041	MEng Project: Geotechnical Engineering
CEE 5051	MEng Project: Aquaclara: Sustainable H ₂ O Supply Project
CEE 5061	MEng Project: Transportation Systems Engineering
CEE 5071	MEng Project: Structural Engineering
CEE 5073	MEng Project: Civil Engineering Materials
CEE 5910	MEng Project: Engineering Management

Regular Courses

CEE 4510	Microbiology for Environmental Engineers
CEE 4530	Laboratory Research in Environmental Engineering
CEE 4540	Sustainable Small-Scale Water Supply
CEE 4630	Future Transportation, Technologies and Systems
CEE 4720	Introduction to Finite Element Methods
CEE 4770	Introduction to Composite Materials
CEE 4920	Engineers for a Sustainable World
CEE 5240	Applied Systems Engineering
CEE 5900	Project Management
CEE 5930	Engineering Management Methods: Data, Information, and Modeling
CEE 5950	Construction Planning & Operations
CEE 5980	Introduction to Decision Analysis
CEE 6100	Remote Sensing Fundamentals
CEE 6290	Advanced Numerical Methods for Engineers
CEE 6400	Foundation Engineering
CEE 6530	Water Chemistry for Environmental Engr.
CEE 6550	Transport, Mixing & Transformation in the Environment
CEE 6560	Physical/Chemical Processes
CEE 6620	Urban Transportation Network Design and Analysis
CEE 6710	Fundamentals of Structural Mechanics
CEE 6720	Introduction to Finite Element Methods
CEE 6730	Design of Concrete Structures
CEE 6930	Modeling Public Systems
CEE 7400	Engineering Behavior of Soils
CEE 7410	Rock Engineering
CEE 7700	Engineering Fracture Mechanics
CEE 7790	Advanced Behavior of Metal Structures

Seminars

CEE 6020	Seminar: Environment/Water Resource Systems
CEE 6060	Seminar: Transportation Systems Engineering
CEE 6070	Seminar: Civil Infrastructure (Structures/Geotech)

Special Topics and Other Courses

CEE 6015	Special Topics: Remote Sensing
CEE 6035	Special Topics: Hydraulics
CEE 6045	Special Topics: Geotechnical Engineering
CEE 6055	Special Topics: Environmental Engineering
CEE 6065	Special Topics: Transportation Systems Engineering
CEE 6075	Special Topics: Structural Engineering
CEE 6090	Special Topics: Environ. & Water Resource Systems
CEE 6095	Special Topics: Engineering Management

SPRING 2010

Master of Engineering Projects

CEE 5022	MEng Project: Environ. & Water Resource Systems Engr.
CEE 5032	MEng Project: Environ. Fluid Mechanics & Hydrology
CEE 5042	MEng Project: Geotechnical Engineering
CEE 5052	MEng Project: Aquaclara: Sustainable H ₂ O Supply Project
CEE 5062	MEng Project: Transportation Systems Engineering
CEE 5072	MEng Project: Structural Engineering
CEE 5074	MEng Project: Civil Engineering Materials
CEE 5920	MEng Project: Engineering Management

Regular Courses

CEE 4110	Remote Sensing: Resource Inventory Methods
CEE 4370	Experimental Methods in Fluid Mechanics
CEE 4410	Retaining Structures & Slopes
CEE 4640	Transportation Systems Design
CEE 4740	Design of Steel Structures
CEE 4781	LRFD-Based Engineering of Wood Structures
CEE 5252	Systems Analysis: Architecture, Behavior & Optimization
CEE 5900	Project Management
CEE 5970	Risk Analysis & Management
CEE 6150	Digital Image Processing
CEE 6200	Water Resources Systems Engineering
CEE 6300	Computational Fluid Dynamics for Environmental Flows
CEE 6310	Computational Simulation of Flow & Transport in the Environment
CEE 6320	Hydrology
CEE 6370	Environmental Methods in Fluid Dynamics
CEE 6410	Retaining Structures & Slopes
CEE 6570	Biological Processes
CEE 6580	Biodegradation and Biocatalysis
CEE 6650	Environment/Energy & Transportation Planning & Management
CEE 6750	Concrete Materials & Construction
CEE 6760	Advanced Composite Materials
CEE 6780	Structural Dynamics of Earthquake Engineering
CEE 6860	Civil Infrastructure Systems
CEE 6900	Creativity, Innovation & Leadership
CEE 7360	Turbulence & Turbulent Mixing in Environ. Stratified Flows
CEE 7450	Soil Dynamics
CEE 7750	Nonlinear Finite Element Analysis
CEE 7770	Computational Solid & Structural Mechanics

Seminars

CEE 6021	Seminar: Environment/Water Resource Systems
CEE 6030	Seminar: Environmental Fluid Mechanics & Hydrology
CEE 6051	Seminar: Environmental Quality Engineering
CEE 6060	Seminar: Transportation Systems Engineering
CEE 6070	Seminar: Civil Infrastructure
CEE 6080	Seminar: Engineering Systems & Management

Special Topics and Other Courses

CEE 6015	Special Topics: Remote Sensing
CEE 6035	Special Topics: Hydraulics
CEE 6045	Special Topics: Geotechnical Engineering
CEE 6055	Special Topics: Environmental Engineering
CEE 6065	Special Topics: Transportation Systems Engineering
CEE 6075	Special Topics: Structural Engineering
CEE 6090	Special Topics: Environ. & Water Resource Systems
CEE 6095	Special Topics: Engineering Management