

McCormick

Northwestern Engineering

MS and PhD degree Programs

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2010



... Preparing for Research, Teaching, and Practice

The Department of Civil and Environmental Engineering (CEE) at Northwestern University is a premier research and academic department, ranked among the top CEE departments in the nation. With 31 experienced faculty members, CEE provides graduate students with an exceptional range of opportunities to advance both their knowledge and careers in a scholarly community small enough to assure individual attention and effective mentoring.

CEE prepares students to become the next generation of leaders in civil and environmental engineering research, academic, corporate, and public service settings. We offer the Master of Science (MS) and Doctor of Philosophy (PhD) degrees in Civil and Environmental Engineering and in Theoretical and Applied Mechanics through Northwestern University's Graduate School. In addition, CEE offers the Master of Project Management (MPM) professional degree. Students work with their adviser to construct study plans suited to their unique interests. These include extensive options for courses outside civil and environmental engineering to address a wide variety of social, economic, and physical challenges of constructing and managing the industrial and public works infrastructure and to develop the skills necessary for success in research, teaching, and practice.

MS and PhD Degrees in Civil and Environmental Engineering ...

... Programs of Study

- ***Environmental engineering and science (EES)***
Area Coordinator, Prof Kimberly Gray – k-gray@northwestern.edu
Academic Coordinator – j-soule@northwestern.edu – for detailed EES brochure
- ***Geotechnics (GEO) and Environmental geotechnics (EGE)***
Area Coordinator, Prof Charles Dowding – c-dowding@northwestern.edu
Academic Coordinator – j-soule@northwestern.edu – for detailed GEO brochure
- ***Mechanics of materials and solids (MMS)***
Area Coordinator, Prof Yonggang Huang – y-huang@northwestern.edu
Academic Coordinator – j-soule@northwestern.edu – for detailed MMS brochure
- ***Structural engineering and materials (STR)***
Coordinator, Prof Yonggang Huang – y-huang@northwestern.edu
Academic Coordinator – j-soule@northwestern.edu – for detailed STR brochure
- ***Transportation systems analysis and planning (TRN)***
Area Coordinator, Prof Pablo Durango-Cohen – pdcc@northwestern.edu
Academic Coordinator – j-soule@northwestern.edu – for detailed TRN brochure

- **Project Management (PhD degree only)**

Prof Raymond Krizek – rjkrizek@northwestern.edu

Before you apply for the PhD degree in Civil and Environmental Engineering in the area of Project Management, please review the MPM program requirements at <http://mpm.northwestern.edu> to formulate your questions. Then feel free to email (please include your phone number) the MPM program's Director, Prof Raymond Krizek (rjkrizek@northwestern.edu) for discussion and details.

MS and PhD Degrees in Theoretical and Applied Mechanics ...

- **Theoretical and applied mechanics (TAM)**

Area Coordinator, Prof Horacio Espinosa – espinosa@northwestern.edu

Academic Coordinator – j-soule@northwestern.edu – for detailed TAM brochure

Master of Project Management ...

- **Master of Project Management (MPM)**

Director, Prof Raymond Krizek – rjkrizek@northwestern.edu

MPM is managed under the auspices of the Civil and Environmental Engineering Department, but is not part of the Northwestern University Graduate School. Therefore, do not apply to the Northwestern University Graduate School, rather go directly to the MPM website at <http://mpm.northwestern.edu> and apply directly to the program.

CEE Faculty by Program of Study

Environmental Engineering and Science

- **Neal E. Blair**, Professor; PhD, Stanford. Organic chemistry, biogeochemical transformations of carbon, evolution of organic carbon as particles move from exposed bedrock on land to ultimate burial at sea.
- **Mark M. Clark**, Clinical Professor; PhD, Johns Hopkins.
- **Joseph A. FitzPatrick**, Assoc Professor; PhD, Harvard. Appropriate water/wastewater treatment technologies, environmental engineering ethics, philosophy and design.
- **Jean-François Gaillard**, Assoc Professor; D.Sc., Université Denis Diderot–Paris VII. Environmental chemistry, environmental engineering, metal speciation.
- **Kimberly A. Gray**, Professor; PhD, Johns Hopkins. Environmental chemistry, catalysis, physicochemical processes, hazardous chemical treatment technology, environmental restoration.
- **Luisa A. Marcelino**, Research Asst Professor, PhD, University of Lisbon (degree *in absentia* through MIT). Symbiosis of coral-algae relationship, modeling of light transport in coral skeleton and coral tissue, physiological variation of coral tissue and algae biomass.
- **Aaron I. Packman**, Assoc Professor; PhD, Caltech. Environmental transport process, fluid mechanics, aquatic chemistry.
- **Yun Wang**, Asst Professor; PhD, Johns Hopkins. Interface of medical/environmental microbiology and geochemistry. link between reactions of bioactive small molecules with environmental constituents and their mode of action on microbial biofilm architecture and physiology.

Geotechnics and Environmental Geotechnics

- **Jose E. Andrade**, Asst Professor; PhD, Stanford. Developing multi-phase framework to model deformation-diffusion problems in porous media, computational inelasticity and finite element procedures.
- **Charles H. Dowding**, Professor; PhD, Illinois at Urbana-Champaign. Geotechnics, rock mechanics, construction and blasting vibrations, exploration decisions, TDR instrumentation.
- **Richard J. Finno**, Professor; PhD, Stanford. Geotechnical engineering, earth retaining structures, deep foundations, nondestructive evaluation of foundations.
- **Raymond J. Krizek**, Stanley F. Pepper Professor; PhD, Northwestern. Member, National Academy of Engineering. Geotechnical engineering, ground improvement.

Structural Engineering and Materials

- **Zdeněk P. Bažant**, Walter P. Murphy Professor; PhD, Czechoslovak Academy of Sciences. Member, National Academy of Engineering and Member, National Academy of Sciences. Solid mechanics; structural engineering; materials, especially fracture, damage, creep, stability, concrete, composites, geomaterials, and ice.
- **David J. Corr**, Clinical Associate Professor; PhD, University of California, Berkeley. Structural engineering and mechanics, structural sensing and diagnostics, forensic engineering, failure analysis, and performance of civil engineering materials.
- **Yonggang Huang**, Joseph Cummings Professor; PhD, Harvard. Machinability of carbon nanotube composites, micro/nanomechanics of smart materials, dynamic failure modes of marine composite materials under blast loading.
- **Hamlin M. Jennings**, Professor; PhD, Brown. Phase diagrams, kinetics, cement-based materials, modeling C-S-H, relationship to creep and shrinkage, rheology.
- **Surendra P. Shah**, Walter P. Murphy Professor; PhD, Cornell. Structural materials, composites, fracture of brittle materials, durability of high performance concrete, nondestructive evaluations.
- **Jeffrey J. Thomas**, Research Assoc Professor, PhD, Northwestern. Chemistry, microstructure, and hydration kinetics of cement-based materials, developing a new type of cement-based material for security walls called “Safety Concrete.”

Theoretical and Applied Mechanics / Mechanics of Materials and Solids

- **Jan D. Achenbach**, Walter P. Murphy Professor; PhD, Stanford. Member, National Academy of Engineering and Member, National Academy of Sciences. Solid mechanics, waves in solids, ultrasonics, nondestructive evaluation.
- **Oluwaseyi Balogun**, Asst Professor; PhD, Boston University. Materials characterization, nondestructive evaluation, elastic wave propagation, and ultrasonic and optical sensors.
- **Isaac M. Daniel**, Walter P. Murphy Professor; PhD, IIT. Processing and mechanics of composite materials, experimental mechanics, damage mechanics, nondestructive evaluation.
- **Leon M. Keer**, Professor; PhD, Minnesota. Member, National Academy of Engineering. Contact/fracture mechanics, elasticity.

- *Jianmin Qu*, Professor and Chair; Ph.D., Northwestern. Theoretical and applied mechanics including micromechanics of composites, interfacial fracture and adhesion, fatigue and creep damage in solder alloys, defects and transport in crystalline solids, thermomechanical reliability of microelectronic packaging, ultrasonic nondestructive evaluation of advanced engineering materials.
- *John W. Rudnicki*, Professor; Ph.D., Brown. Inelastic behavior, fracture and failure of solids, mechanics of earth faulting, coupling of fluid flow with deformation.

Transportation Systems Analysis and Planning

- *David Boyce*, Adjunct Professor, PhD, University of Pennsylvania. Key methodological issues related to metropolitan transportation and land use planning. Formulating, implementing, estimating, and validating large-scale, integrated models of travel behavior.
- *Pablo L. Durango-Cohen*, Asst Professor, PhD, CA—Berkeley. Infrastructure deterioration, production, operations, manufacturing and service management, adaptive control, management of civil infrastructure systems.
- *Frank S. Koppelman*, Professor Emeritus; PhD, MIT. Travel demand analysis, statistics, modeling, econometrics, forecasting.
- *Yu Nie*, Louis Berger Jr Asst Professor; PhD, CA—Berkeley. Network optimization, traffic flow theory/simulation.
- *Hani S. Mahmassani*, William A. Patterson Distinguished Chair in Transportation; PhD, MIT, multimodal transportation systems analysis, dynamics of user behavior and telematics, large-scale human infrastructure systems, and real-time operation of logistics and distribution systems.
- *Joseph L. Schofer*, Professor; PhD, Northwestern. Transportation evaluation, safety, market research, traveler behavior and benefits, policy analysis and planning.

Master of Project Management

- *Ahmad Hadavi*, Adjunct Professor, PhD, Northwestern, Assoc Director, Master of Project Management.
- *Raymond J. Krizek*, Stanley F. Pepper Professor; PhD, Northwestern. Member, National Academy of Engineering. Director, Master of Project Management program.

Northwestern University

Department of Civil & Environmental Engineering ...

... Admission Requirements and Supporting Materials

Applications and Supporting Materials are due in the CEE Department December 31, 2009

CEE graduate students come from throughout the world with degrees in a variety of fields including engineering, mathematics, the physical sciences, management, economics, and other social sciences. Admissions decisions are based on the overall academic picture presented through GRE exams and transcripts, as well as the equally weighted importance of the Statement of Purpose and Letters of Recommendation:

1. Transcripts

General guidelines:

- All applicants admitted to The Graduate School (TGS) must have earned a bachelor's degree from a regionally accredited institution or the international equivalent. The Graduate School accepts 3-year bachelor's degrees. Students may be considered for admission before finishing the undergraduate degree, but must have the degree in hand before matriculating at Northwestern University.
- One official transcript bearing the registrar's signature and/or the institution's seal is required from each post-secondary institution attended, including records for all courses taken whether or not within a degree program, grades received, and (if applicable) degree earned.

Details:

- If you are currently working toward a master's degree, please submit an official transcript of your undergraduate work.
- In addition, you must also submit a preliminary official transcript of all post-BS graduate work completed at the time of filing your application to Northwestern University. This preliminary transcript can be used for review purposes during the admissions process. However, if you are admitted, enrolling students must submit a final degree-awarding transcript as soon as it becomes available.
- We must also receive certification of Conferral of Degree, including the date each degree was conferred. This information may be included on the final transcript or on the diploma.

Note to International Applicants

Your academic records should provide a listing, year-by-year, of all post-secondary courses taken and the grade or marks received for each one. It is helpful to have the grading scale of the institution and your rank in class when such information is available. Do not submit secondary school records. Secondary school records will not be reviewed and will need to be discarded.

To be considered, all non-English documents must be accompanied by official English translations. The Graduate School accepts translations from the institution issuing the transcript, ATA certified translators, or from your consulate. You may find an ATA translator at the following web site: www.atanet.org. Plain translations, notarized translations, and translations done by someone other than a certified translator are not acceptable.

2. Letters of Recommendation

Letters of Recommendation are always read with great interest by the reviewing Faculty. Please select a minimum of 2 professors or supervisors familiar with your academic or professional work to be your recommenders. Ask each one to submit their Letter of Recommendation using one of these two methods:

- a. ELECTRONICALLY – while completing the online application, you will have the option to select to have your Letter of Recommendation submitted online. If you make that selection, the online application software will email each of your recommenders regarding your request for them to submit their Letter of Recommendation online. Recommenders may then submit letters online using standard word processing software. When your recommender submits his or her Letter of Recommendation online, the letter will be transmitted electronically for the Department of Civil and Environmental Engineering to access.
- b. BY PAPER – Letters of Recommendation submitted through regular or expedited postal service should be printed on official letterhead and contain the original signature of your recommenders. Your name and the name of the program to which you are applying should be included in each letter. Be sure to have your recommenders sign the sealed envelope across the envelope seal. Submit your unopened Letters of Recommendation along with your other Supporting Materials to: Northwestern University / ATTN -- Academic Coordinator / Dept of Civil & Environmental Engineering / 2145 N. Sheridan Road - Tech A236 / Evanston, IL 60208-3109.

3. Statement of Purpose

Your Statement of Purpose is your chance to be forthright and specific about the direction of your strong interests! Do you find your future shaping up for the exciting engineering job market, or is your passion for the academic world of research and teaching? Be as specific as possible about your qualifications and research interests. And last but not least, include why you have specific interest in NU's Civil and Environmental Engineering Department and/or a particular CEE professor's work.

Your Statement of Purpose may be submitted electronically as part of the online application. The statement should be about 1 page. Or, if you choose, you can submit your Statement of Purpose in your Supporting Materials packet. Be sure to include your Full Name, Date of Birth and the program to which you are applying under the title of "Statement of Purpose."

4. Graduate Record Examination (GRE) Scores

To be considered official ...

- ... Official GRE exams must be taken LESS than 5 years before your Fall Quarter of Entry, Fall 2010. For example, to be considered valid for Fall 2010 admission, GRE scores must be no older than September 1, 2005.
- ... GRE scores must be received directly from the Educational Testing Service (ETS) by using Northwestern University's Institution Code 1565 in your request to ETS for electronic score transmission – there is no department code. If your scores are not transmitted by way of this code, Northwestern University will not receive them. Notarized score reports cannot be accepted as official.

It is to your advantage ...

- ... to include a paper copy of your GRE score report in your Supporting Materials packet. The CEE Department can use your paper copy provisionally until your official scores are electronically transmitted by ETS to Northwestern University's official score-reporting website.

For your information, we include below the range of GRE and Cumulative Grade Point Average scores which CEE Faculty typically seek when evaluating a prospective student. Many students request this for their plans, so we include it here.

GRE – Verbal scores range from 630-800

GRE – Quantitative scores range from 700-800

GRE – Analytical (previous scoring) scores ranged from 720-800

GRE – Analytical writing ranged from 4.5-6.0

Cumulative Grade Point Average – 3.50- 4.00

5. International Applicants: Certification of Proficiency in English—TOEFL Scores

Much of your success in graduate study in the United States will rest on your ability to understand, read, write and speak English. If English is not your native language or has not been your Language of Instruction, evidence of English proficiency will be required.

International MS degree applicants – *TOEFL required*

- International applicants for the MS degree (*whose native language is not English or whose undergraduate degree is not from an accredited four-year institution where the Language of Instruction is English*), must submit a TOEFL score report (Test of English as a Foreign Language).

International PhD degree applicants – *TOEFL required*

- International applicants for the PhD degree (*whose native language is not English or whose MS degree is not from an accredited institution where the Language of Instruction is English*) must submit the TOEFL score.
- ***Special note: Those PhD applicants who have received a Speaking Score of at least 26 on the Spoken English component of the Internet-based TOEFL exam will be eligible for a possible Teaching Assistantship appointment.***

You may use 1 of these 3 methods to Certify your Proficiency in English.

- Method 1. Provide official scores for the TOEFL exam. An applicant must score 600 or higher on the paper-based TOEFL exam, or 250 or higher on the computer-based TOEFL exam, or 100 or higher on the internet-based TOEFL exam. The IELTS exam is also accepted as a certification of proficiency in English. An applicant must score 7 or higher on the IELTS.
- Method 2. If you provide official transcripts showing that you have earned an undergraduate degree (by Fall 2010) from an accredited four-year institution, where the Language of Instruction is English -- then your TOEFL requirement can be waived.
- Method 3. If you provide official transcripts showing that you have earned a graduate degree (by Fall 2010) from an accredited institution where the Language of Instruction is English -- then your TOEFL requirement can be waived.

To be considered official ...

- ... Official TOEFL exams must be taken LESS than 2 years before your Fall Quarter of Entry, Fall 2010. If you are applying for Fall 2010 entry, test scores must be no older than September 2008.
- ... TOEFL score reports must be electronically transmitted directly from the Educational Testing Service (ETS) to Northwestern University by using Northwestern University's Institution Code 1565 and Department Code 01 in your request to ETS for electronic score transmission. If your scores are not transmitted by way of these codes, Northwestern University will not receive them. Notarized score reports cannot be accepted as official.
- ... The IELTS score report is not electronically transmitted; so therefore should be mailed directly to the following: Northwestern University / Dept of Civil & Environmental Engineering / ATTN: Academic Coordinator / 2145 N. Sheridan Road / Tech #A236 / Evanston, IL 60208-3109.

It is to your advantage ...

- ... to include a paper copy of your TOEFL score report in your Supporting Materials packet. The CEE Department can use your paper copy provisionally until your official scores are transmitted by ETS to Northwestern University's official score-reporting website.

... Application Instructions

Northwestern University only accepts online application, so to apply online, please go to the official Northwestern University Graduate School Online Application which will be available after October 5, 2009. <https://app.applyyourself.com/?id=nwu-grad> Click "Create Account" to begin. You are free to add or change information in your application at any time until you feel that the application is ready for submission. When you are ready to submit, you will be prompted to pay the application fee of \$75 by credit card. Once the application is submitted, the applicant will not be able to make any changes on the application.

Answers to Frequently Asked Questions may be found at <http://www.tgs.northwestern.edu/admission/faq/>.

... Due Dates

Applications and Supporting Materials are due in the CEE Department December 31, 2009

All Applicants are asked to begin study in the Fall Quarter (approximately September 20th) of a given academic year. Sequentially-offered courses start in the Fall of each academic year, and it is advantageous to be present for the beginning of the sequence. In addition, all financial support packages begin in the Fall Quarter.

PhD Degree Applicants need to have a completed Online Application and Application Fee electronically submitted by December 31, 2009. In addition, all of your Supporting Materials need to be received by the CEE Department (at the address below) by December 31, 2009. If you submit them to The Graduate School, it will cause undue delay in entering your application into Faculty Review.

MS Degree Applicants need to have a completed Online Application and Application Fee electronically submitted by December 31, 2009. In addition, all of your Supporting Materials need to be received by the CEE Department (at the address below) by December 31, 2009. Faculty members seek to review their entire new cohort of MS degree and PhD degree students as a group, so that they can plan time, courses, and resources for a good mix of MS degree and PhD degree students.

... Types of Financial Support for PhD degree students

The Department of Civil and Environmental Engineering offers a substantial number of academic quarters of fellowship and assistantship support for outstanding PhD degree students. The table below shows an example of a typical year's financial aid offers:

| <u>Type of Support</u> | <u># of Quarters Offered</u> |
|-------------------------------|-------------------------------------|
| Cabell Fellowships | 9 |
| Murphy Fellowships | 45 |
| Minority Fellowships | 9 |
| Research Assistantships | 23 |
| Teaching Assistantships | 18 |



- ***Royal E. Cabell Fellowships:*** A highly competitive fellowship offered to the most qualified incoming PhD degree applicants in the *Robert R. McCormick School of Engineering and Applied Science* (McC). This fellowship is reserved for United States citizens and permanent residents pursuing a PhD degree. Minimum requirements for nomination are as follows: Cumulative Grade Point Average (GPA) of at least 3.80, Graduate Record Exam (GRE) verbal score of at least 600; quantitative score of at least 780, GRE analytical writing score at least 5.0. Tuition is paid by a University Scholarship; and a living expenses stipend is paid in monthly installments over the 9-month academic year.
- ***Walter P. Murphy Fellowships:*** A prestigious award for outstanding engineering students who are targeting PhD degree studies. Candidates can be United States citizens, permanent residents, or international students. Top GPA and GRE scores are required. Awards are allocated by McCormick and appointed by the department's fellowship committee. Tuition is paid by a University Scholarship; and a living expenses stipend is paid in monthly installments over the 9-month academic year.
- ***Research Assistantships:*** PhD degree students who are appointed Research Assistants are funded by sponsored research projects – Tuition is paid by the University, and a living expenses stipend is paid over the 9-month academic year. Selection as a Research Assistant (RA) is based on academic record, GRE scores, and the ability to contribute to a specific research project. Normally, an RA appointment requires at least a 12-hour per week commitment to the research project. RA positions are open to U.S. and international PhD degree applicants.

- ***Graduate Assistantships (also known as Teaching Assistantship):*** Graduate Assistants (GA) commit at least 12 hours per week to activities such as holding review sessions, grading papers, and meeting with students. GA positions are open to US and international PhD degree students – Tuition is paid by a University Scholarship, and a living expenses stipend is paid during the quarter in which the student is appointed as a GA. ***Please note:*** International PhD degree applicants (whose native language is not English or whose BS or MS degree is not from an accredited institution where the Language of Instruction is English) are required to show a proven ability to communicate effectively in English by submitting a Speaking Score of 26 on the Internet-based TOEFL. This will satisfy the language requirement for a Teaching Assistantship appointment.
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... Types of Financial Support for MS degree applicants

Please note that even though MS degree students are not currently funded by Northwestern University, we strongly encourage our MS degree applicants to view their MS degree studies as a personal investment toward a very satisfying and lucrative future, and, thus, seek funding through loans, part-time work opportunities, and fellowships targeted to the MS degree student.

The CEE Department continuously has many self-supported MS degree students who count their financial cost toward the MS degree as a vital investment in their marketability for the engineering job market!

For fellowship opportunities and information regarding student loans, visit the NU Office of Fellowships at www.northwestern.edu/fellowships and the NU Graduate Schools student loans information page at www.tgs.northwestern.edu/financialaid/studentloans

REMINDER

All Supporting Materials must arrive in the CEE Department by December 31, 2009.

You may direct your supporting materials through US Mail or expedited mail to: Northwestern University / Dept of Civil & Environmental Engineering / ATTN: Academic Coordinator / 2145 N. Sheridan Road / Tech #A236 / Evanston, IL 60208-3109.

Direct any questions to Janet Soule, Academic Coordinator for Civil and Environmental Engineering at j-soule@northwestern.edu and we will respond as quickly as possible, so that you may have a successful Application/ Admission experience!

It is the policy of Northwestern University not to discriminate against any individual on the basis of race, color, religion, national origin, sex, sexual orientation, marital status, age, disability, or veteran status in matters of admissions, employment, housing or services, or in the educational programs or activities that it operates, in accordance with civil rights legislation. Any alleged violations of this policy or question regarding the law with respect to nondiscrimination should be directed to Daniel Linzer, provost, Rebecca Crown Center, Evanston, Illinois 60201, phone (847) 491- 5117; Northwestern University reserves the right to change without notice any statement in this brochure concerning but not limited to, rules, policies, tuition, fees, curricula and courses.