Class Schedule - Fall 2018

Civil and Environmental Engineering

Civil and Environmental Engineering
Head of Department: Benito Marinas
Department Office: 1114 Newmark Civil Engineering Laboratory, 205 North Mathews Avenue, Urbana
Phone: 217-333-6961
www.cee.illinois.edu

CEE 195  About Civil Engineering  credit: 1 hours.
Civil engineering orientation including historical developments, education requirements, relation to science, professional practice, and specialties within the profession.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>29692</td>
<td>Lecture-Discussion</td>
<td>H</td>
<td>04:00 PM - 04:50 PM</td>
<td>W</td>
<td>100 - Materials Science &amp; Eng Bld</td>
<td>LaFave, J</td>
</tr>
<tr>
<td>69590</td>
<td>Lecture-Discussion</td>
<td>ZJU</td>
<td>04:00 PM - 04:50 PM</td>
<td>W</td>
<td>ARR - Zhejiang University</td>
<td>Liu, L</td>
</tr>
</tbody>
</table>

Departmental Approval Required
Restricted to ZJU Institute

CEE 201  Systems Engrg & Economics  credit: 3 hours.
Introduction to the formulation and solution of civil engineering problems. Major topics: engineering economy, mathematical modeling, and optimization. Application of techniques, including classical optimization, linear and nonlinear programming, network theory, critical path methods, simulation, decision theory, and dynamic programming to a variety of civil engineering problems. Credit is not given for both CEE 201 and IE 310. Prerequisite: MATH 231; credit or concurrent registration in MATH 225.

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<tr>
<th>CRN</th>
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<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
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<tbody>
<tr>
<td>29694</td>
<td>Lecture-Discussion</td>
<td>NP</td>
<td>09:30 AM - 10:50 AM</td>
<td>TR</td>
<td>1310 - Newmark Civil Engineering Bldg</td>
<td>Ouyang, Y</td>
</tr>
</tbody>
</table>

CEE 202  Engineering Risk & Uncertainty  credit: 3 hours.
Identification and modeling of non-deterministic problems in civil engineering design and decision making. Development of stochastic concepts and simulation models, and their relevance to real design and decision problems in various areas of civil engineering. Credit is not given for both CEE 202 and IE 300. Prerequisite: Recommended: Credit or concurrent registration in MATH 241.

<table>
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<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
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<tbody>
<tr>
<td>29696</td>
<td>Lecture-Discussion</td>
<td>LM</td>
<td>11:00 AM - 12:20 PM</td>
<td>TR</td>
<td>1310 - Newmark Civil Engineering Bldg</td>
<td>Kumar, P</td>
</tr>
</tbody>
</table>
CEE 300  **Behavior of Materials**  credit: 4 hours.
Macroscopic mechanical behavior in terms of phenomena at the nanometer and micrometer levels for the three types of engineering materials (metals, ceramics, and polymers) with emphasis on specific materials used in civil engineering -- steel, rocks, clay, portland cement concrete, asphaltic concrete, and wood. Same as TAM 324. Credit is not given for both CEE 300 and either ME 330 or MSE 280. Prerequisite: Completion of Composition I general education requirement; CHEM 104; TAM 251.

Students must register for one lab and one lecture section.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
</table>
| 33358| Laboratory      | AB1     | 10:00 AM  
- 11:50 AM    | M    | 201 - Talbot Laboratory |             |
| 33309| Laboratory      | AB2     | 02:00 PM  
- 03:50 PM    | M    | 201 - Talbot Laboratory |             |
| 33325| Laboratory      | AB3     | 01:00 PM  
- 02:50 PM    | T    | 201 - Talbot Laboratory |             |
| 33337| Laboratory      | AB4     | 10:00 AM  
- 11:50 AM    | W    | 201 - Talbot Laboratory |             |
| 33354| Laboratory      | AB5     | 08:00 AM  
- 09:50 AM    | F    | 201 - Talbot Laboratory |             |
| 54854| Laboratory      | AB6     | 05:00 PM  
- 06:50 PM    | W    | 201 - Talbot Laboratory |             |
| 34959| Lecture         | AL1     | 01:00 PM  
- 01:50 PM    | MWF  | 1310 - Newmark Civil Engineering Bldg | Kabir, P |

Restricted to Civil Engineering or Engineering Mechanics major(s).

CEE 310  **Transportation Engineering**  credit: 3 hours.
Design, planning, operation, management, and maintenance of transportation systems; integrated multi-modal transportation systems (highways, air, rail, etc.); layout of highways, airports, and railroads with traffic flow models, capacity analysis, and safety. Design of facilities and systems with life cycle costing procedures and criteria for optimization. Prerequisite: TAM 251; credit or concurrent registration in CEE 202.

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<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
</table>
| 29699| Lecture-Discussion | D       | 11:00 AM  
- 11:50 AM    | MWF  | 1310 - Newmark Civil Engineering Bldg | Tutumluer, E |

CEE 320  **Construction Engineering**  credit: 3 hours.
Construction engineering processes: contracting and bonding, planning and scheduling, estimating and project control, productivity models, and construction econometrics. Prerequisite: CEE 201; credit or concurrent registration in CS 101 and CEE 202.

<table>
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<th>Location</th>
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<tbody>
<tr>
<td>29701</td>
<td>Lecture</td>
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<td>03:30 PM - 04:50 PM</td>
<td>TR</td>
<td>1310 - Newmark Civil Engineering Bldg</td>
<td>Golparvar Fard, M</td>
</tr>
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</table>

CEE 330  **Environmental Engineering**  credit: 3 hours.
Sources, characteristics, transport, and effects of air and water contaminants; biological, chemical, and physical processes in water; atmospheric structure and composition; unit operations for air and water quality control; solid waste management; environmental quality standards. Prerequisite: CHEM 104.

<table>
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<th>Location</th>
<th>Instructor</th>
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<td>TR</td>
<td>1310 - Newmark Civil Engineering Bldg</td>
<td>Nguyen, T</td>
</tr>
</tbody>
</table>

CEE 340  **Energy and Global Environment**  credit: 3 hours.
Introduction to evaluating multiple impacts of engineering decisions. Topics include mass and chemical balances; effects of engineered systems on local and global environment, health, and risk; economic, consumer, and social considerations; provision of conventional and renewable energy; and future projections. Design projects emphasize making appropriate decisions by quantifying total impact and evaluating social environment. Approved for both letter and S/U grading. Prerequisite: PHYS 211; PHSY 213; CEE 201 or IE 310; CEE 202, IE 300, or STAT 200; or permission of instructor. CEE students only.

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</table>

Credit Hours: 3 hours

CEE 350  **Water Resources Engineering**  credit: 3 hours.
Quantitative aspects of water in the earth's environment and its engineering implications, including design and analysis of systems directly concerned with use and control of water; quantitative introduction to hydrology, hydraulic engineering, and water resources planning. Prerequisite: CEE 202; credit or concurrent registration in CEE 201.

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<th>Instructor</th>
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<tr>
<td>29704</td>
<td>Lecture-Discussion</td>
<td>C</td>
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<td>MWF</td>
<td>3310 - Newmark Civil Engineering Bldg</td>
<td>Konar, M</td>
</tr>
</tbody>
</table>

CEE 360  **Structural Engineering**  credit: 3 hours.
Analysis, behavior, and design of trusses and framed structures under static loads; member forces in trusses, shear and moment diagrams, deflections, simple applications of the force method and slope-deflection; computer applications. Prerequisite: TAM 251.

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<th>Instructor</th>
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<td>MWF</td>
<td>1310 - Newmark Civil Engineering Bldg</td>
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</table>

**CEE 380 Geotechnical Engineering**  credit: 3 hours.

Classification of soils, compaction in the laboratory and in the field, soil exploration, boring and sampling, permeability of soils, one-dimensional settlement analyses, strength of soil, and foundations. Prerequisite: TAM 251.

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<th>Instructor</th>
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<td>42446</td>
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<td>MWF</td>
<td>1310 - Newmark Civil Engineering Bldg</td>
<td>Hashash, Y</td>
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</tbody>
</table>

**CEE 398 Special Topics**  credit: 0 TO 4 hours.

Subject offerings of new and developing areas of knowledge in civil and environmental engineering intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. Approved for letter and S/U grading. May be repeated in the same or separate terms if topics vary.

<table>
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<tr>
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<th>Instructor</th>
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<tbody>
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<td>61260</td>
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<td>04:00 PM - 05:50 PM</td>
<td>TR</td>
<td>1233 - Newmark Civil Engineering Bldg</td>
<td>Roesler, J</td>
</tr>
</tbody>
</table>

Credit Hours: 2 hours

Project Based Learning in CEE
Not intended for Graduate - Urbana-Champaign.
Prerequisite CEE 195 or equivalent. The project-based learning course organizes students into multi-disciplinary teams to define, study, and propose sustainable solutions to a range of infrastructure engineering problems facing the University of Illinois campus community. This course also presents multiple case studies on a variety of sustainability topics in Civil and Environmental Engineering. Multiple field trips to local infrastructure facilities are integrated with the case studies and project themes.

**CEE 401 Concrete Materials**  credit: 4 hours.

Examination of the influence of constituent materials (cements, water, aggregates and admixtures) on the properties of fresh and hardened concrete, concrete mix design, handling and placement of concrete, and behavior of concrete under various types of loading and environment. Laboratory exercises utilize standard concrete test methods. Field trips are held during some scheduled laboratory sessions. 4 undergraduate hours. 4 graduate hours. Prerequisite: CEE 300.

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<th>Instructor</th>
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<td>29713</td>
<td>Laboratory</td>
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<td>CRN</td>
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<td>31541</td>
<td>Laboratory</td>
<td>3A</td>
<td>08:00 AM - 09:50 AM</td>
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<td></td>
<td>Lecture</td>
<td>3A</td>
<td>10:00 AM - 10:50 AM</td>
<td>MW</td>
<td>2312 - Newmark Civil Engineering Bldg</td>
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Credit Hours: 3 hours

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<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>41753</td>
<td>Laboratory</td>
<td>3B</td>
<td>10:00 AM - 11:50 AM</td>
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<tr>
<td></td>
<td>Lecture</td>
<td>3B</td>
<td>10:00 AM - 10:50 AM</td>
<td>MW</td>
<td>2312 - Newmark Civil Engineering Bldg</td>
<td>Ozer, H</td>
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Credit Hours: 3 hours

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<tr>
<th>CRN</th>
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<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>31543</td>
<td>Laboratory</td>
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<td>08:00 AM - 09:50 AM</td>
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<td>B226 - Newmark Civil Engineering Bldg</td>
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<tr>
<td></td>
<td>Lecture</td>
<td>4A</td>
<td>10:00 AM - 10:50 AM</td>
<td>MW</td>
<td>2312 - Newmark Civil Engineering Bldg</td>
<td>Ozer, H</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign. This section is reserved for graduate students only.

CEE 405  Asphalt Materials I  credit: 3 OR 4 hours.
Properties and control testing of bituminous materials, aggregates for bituminous mixtures, and analysis and design of asphalt concrete and liquid asphalt cold mixtures; structural properties of bituminous mixes; surface treatment design; recycling of mixtures. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CEE 310.
Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
This section is reserved for graduate students only.

CEE 406  **Pavement Design I**  credit: 3 OR 4 hours.
Analysis, behavior, performance, and structural design of highway flexible and rigid pavements; climate factors, drainage, traffic loading analysis, and life cycle cost analysis. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CEE 310.

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<tr>
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<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>29731</td>
<td>Lecture-Discussion</td>
<td>3</td>
<td>08:00 AM - 09:20 AM</td>
<td>TR</td>
<td>3310 - Newmark Civil Engineering Bldg</td>
<td>Al-Qadi, I</td>
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Credit Hours: 3 hours

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<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>40934</td>
<td>Lecture-Discussion</td>
<td>4</td>
<td>08:00 AM - 09:20 AM</td>
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<td>3310 - Newmark Civil Engineering Bldg</td>
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Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
This section is reserved for graduate students only.

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<tr>
<th>CRN</th>
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<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>69104</td>
<td>Lecture-Discussion</td>
<td>ONC</td>
<td>ARRANGED -</td>
<td>-</td>
<td>Al-Qadi, I</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
Departmental Approval Required
Restricted to BS:Civil Engineering -UIUC, MS:Civil Engineering -UIUC, PHD:Civil Engineering -UIUC, MS:Env Engr Civil Engr -UIUC, or PHD:Env Engr Civil Engr -UIUC.
Students in this section will complete this course completely online except for the following which must be completed on-campus: Exams (will be completed in the classroom with the instructor/TA), Homework/exam sessions, Office Hours. Contact Becky Stillwell (rborden@illinois.edu), Meg Griffin (mgriffn@illinois.edu), and the course instructor for permission to register.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>58939</td>
<td>Online</td>
<td>ONL</td>
<td>ARRANGED -</td>
<td>-</td>
<td>Al-Qadi, I</td>
</tr>
</tbody>
</table>

Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Industrial Engr Online-UIUC, MS:Mechanical Engineering -UIUC, MS:Env Engr Civil Engr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.
Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. Non-Degree students may enroll on a space-available basis with consent of Program Coordinator, Meg Griffin (mgriffn@illinois.edu).

CEE 408  **Railroad Transportation Engrg**  credit: 3 OR 4 hours.
Principles and analysis of railroad transportation efficiency, economics, energy, and engineering; effect on production and markets. Railroad infrastructure; locomotive and rolling stock design, function, and operation. Computation of train speed, power, and acceleration requirements; railway traffic control and signaling. Quantitative analytical tools for rail-transportation decision-making and optimization. Field trip to observe railroad infrastructure, equipment and operations. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CEE 310.

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<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>53742</td>
<td>Lecture-Discussion</td>
<td>E3</td>
<td>03:00 PM - 04:20 PM</td>
<td>MF</td>
<td>2312 - Newmark Civil Engineering Bldg</td>
<td>Barkan, C</td>
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<tr>
<td>54539</td>
<td>Lecture-Discussion</td>
<td>E4</td>
<td>03:00 PM - 04:20 PM</td>
<td>MF</td>
<td>2312 - Newmark Civil Engineering Bldg</td>
<td>Barkan, C</td>
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<tr>
<td>56680</td>
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<td>1311 - Newmark Civil Engineering Bldg</td>
<td>Ruppert, C</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

Restrictions:
- CEE 409 Railroad Track Engineering credit: 3 OR 4 hours.
- Railroad track engineering concepts including track component and system design, construction, evaluation, maintenance, load distribution, and wheel-rail interaction. Design and analysis tools for railroad track engineering and maintenance. Field trip to observe railroad track system and components. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CEE 310.

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<tr>
<th>CRN</th>
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<td>58940</td>
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<td>53743</td>
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<td>Ruppert, C</td>
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<td>54557</td>
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<td>02:00 PM - 03:20 PM</td>
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<td>1311 - Newmark Civil Engineering Bldg</td>
<td>Ruppert, C</td>
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</table>

Credit Hours: 3 hours

Restrictions:
- CEE 409 Railroad Track Engineering credit: 3 OR 4 hours.
- Railroad track engineering concepts including track component and system design, construction, evaluation, maintenance, load distribution, and wheel-rail interaction. Design and analysis tools for railroad track engineering and maintenance. Field trip to observe railroad track system and components. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CEE 310.
Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

**CEE 416  Traffic Capacity Analysis**  credit: 3 OR 4 hours.
Fundamentals of traffic engineering; analysis of traffic stream characteristics; capacity of urban and rural highways; design and analysis of traffic signals and intersections; traffic control; traffic impact studies; traffic accidents. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CEE 310.

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<tr>
<td>29733</td>
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<td>09:00 AM - 09:50 AM</td>
<td>MWF</td>
<td>3310 - Newmark Civil Engineering Bldg</td>
<td>Benekohal, R</td>
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Credit Hours: 3 hours

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<th>CRN</th>
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Credit Hours: 4 hours
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Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Industrial Engr Online-UIUC, MS:Mechanical Engineering -UIUC, MS:Env Engr CivilEngr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.
Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. Non-Degree students may enroll on a space-available basis with consent of Program Coordinator, Meg Griffin (mgriffn@illinois.edu).

**CEE 421  Construction Planning**  credit: 3 OR 4 hours.
Project definition; scheduling and control models; material, labor, and equipment allocation; optimal schedules; project organization; documentation and reporting systems; management and control. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CEE 320.

<table>
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Credit Hours: 3 hours

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Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
This section is reserved for graduate students only.
Departmental Approval Required
Restricted to BS: Civil Engineering - UIUC, MS: Civil Engineering - UIUC, PHD: Civil Engineering - UIUC, MS: Env Engr Civil Engr - UIUC, or PHD: Env Engr Civil Engr - UIUC.
Students in this section will complete this course completely online except for the following which must be completed on-campus: Exams (will be completed in the classroom with the instructor/TA), Homework/exam sessions, Office Hours. Contact Becky Stillwell (rborden@illinois.edu), Meg Griffin (mgriffn@illinois.edu), and the course instructor for permission to register.

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### CEE 434 Environmental Systems I credit: 3 hours.
Introduction to the concepts and applications of environmental systems analysis. Application of mathematical programming and modeling to the design, planning, and management of engineered environmental systems, regional environmental systems, and environmental policy. Economic analysis, including benefit-cost analysis and management strategies. Concepts of tradeoff, non-inferior sets, single- and multi-objective optimization. Practical application to case studies to convey an understanding of the complexity and data collection challenges of actual design practice. 3 undergraduate hours. 3 graduate hours. Prerequisite: CEE 201 and CEE 330.

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### CEE 437 Water Quality Engineering credit: 3 hours.
Fundamental theory underlying the unit processes utilized in the treatment of water for domestic and industrial usage, and in the treatment of domestic and industrial wastewaters. 3 undergraduate hours. 3 graduate hours. Prerequisite: CEE 330; credit or concurrent registration in TAM 335.

<table>
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Restricted to MS: Civil Engr - Online - UIUC, MCS: Computer Sci Online - UIUC, MS: Industrial Engr Online - UIUC, MS: Mechanical Engineering - UIUC, MS: Env Engr Civil Engr ONL-UIUC, MS: Aerospace Engr-Onl-UIUC, NDEG: Grad Nondegree-CE-UIUC, or MENG: Mech Engineering Onl-UIUC.

### CEE 442 Environmental Engineering Principles, Physical credit: 4 hours.
Analysis of the physical principles which form the basis of many water and air quality-control operations; sedimentation, filtration, inertial separations, flocculation, mixing, and principles of reactor design; energy flows, thermal pollution, earth’s energy balance. 4 undergraduate hours. 4 graduate hours. Prerequisite: CEE 437.

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<tr>
<th>CRN</th>
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Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Industrial Engr Online-UIUC, MS:Mechanical Engineering -UIUC, MS:Env Engr CivilEngr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.

Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. Non-Degree students may enroll on a space-available basis with consent of Program Coordinator, Meg Griffin (mgriffn@illinois.edu).

**CEE 443  Env Eng Principles, Chemical**  credit: 4 hours.

Application of principles of chemical equilibrium and chemical kinetics to air and water quality. Thermodynamics, kinetics, acid-base chemistry, complexation, precipitation, dissolution, and oxidation-reduction. Applications. 4 undergraduate hours. 4 graduate hours. Prerequisite: CEE 437.

<table>
<thead>
<tr>
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Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Industrial Engr Online-UIUC, MS:Mechanical Engineering -UIUC, MS:Env Engr CivilEngr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.

Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. Non-Degree students may enroll on a space-available basis with consent of Program Coordinator, Meg Griffin (mgriffn@illinois.edu).

**CEE 444  Env Eng Principles, Biological**  credit: 4 hours.

Application of principles of biochemistry and microbiology to air and water quality, wastes, and their engineering management; biological mediated changes in water and in domestic and industrial wastewater. 4 undergraduate hours. 4 graduate hours. Prerequisite: CEE 443.

<table>
<thead>
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</table>
CEE 445  **Air Quality Modeling**  credit: 4 hours.
Practical and advanced approaches to pollutant transport and fate in the environment with emphasis on air pollution modeling, including aspects of pollutant dispersion, chemical transformation, and loss. Gaussian plume, chemical mass balance, chemical reaction, grid and trajectory models. Evaluation of models and the development of efficient air quality management strategies. Applications with use of regulatory USEPA air quality models. Same as ATMS 425. 4 undergraduate hours. 4 graduate hours. Prerequisite: CEE 330 and credit or concurrent registration in TAM 335; or ATMS 302.

<table>
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CEE 446  **Air Quality Engineering**  credit: 4 hours.
Description and application of chemical and physical principles related to air pollutants, aerosol mechanics, attenuation of light in the atmosphere, air quality regulation, generation of air pollutants, methods to remove gaseous and particulate pollutants from gas streams, and atmospheric dispersion. 4 undergraduate hours. 4 graduate hours. Prerequisite: CEE 330; credit or concurrent registration in TAM 335.

<table>
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<tr>
<th>CRN</th>
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Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. Non-Degree students may enroll on a space-available basis with consent of Program Coordinator, Meg Griffin (mgriffn@illinois.edu).

CEE 450  **Surface Hydrology**  credit: 3 hours.
Descriptive and quantitative hydrology dealing with the distribution, circulation, and storage of water on the earth's surface; principles of hydrologic processes; methods of analysis and their applications to engineering and environmental problems. 3 undergraduate hours. 3 graduate hours. Prerequisite: CEE 350.
**CEE 451 Environmental Fluid Mechanics**  credit: 3 hours.
Incompressible fluid mechanics with particular emphasis on topics in analysis and applications in civil engineering areas; principles of continuity, momentum and energy, kinematics of flow and stream functions, potential flow, laminar motion, turbulence, and boundary-layer theory. 3 undergraduate hours. 3 graduate hours. Prerequisite: TAM 335.

<table>
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**CEE 457 Groundwater**  credit: 3 hours.
Physical properties of groundwater and aquifers, principles and fundamental equations of porous media flow and mass transport, well hydraulics and pumping test analysis, role of groundwater in the hydrologic cycle, groundwater quality and contamination. 3 undergraduate hours. 3 graduate hours. Prerequisite: CEE 350 and TAM 335.

<table>
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Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Industrial Engr Online-UIUC, MS: Mechanical Engineering - UIUC, MS: Engr CivilEngr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG: Mech Engineering Onl-UIUC.

**CEE 458 Water Resources Field Methods**  credit: 4 hours.
Scientific principles of measurement technologies and protocols used for water-resources measurements and experimental design of field-scale water-resources and environmental studies. Planning field studies; instruments and protocols for surface-water, and water-quality sampling; description of data quality. One-half-day laboratory field trips to streamflow monitoring stations and groundwater monitoring wells nearby. 4 undergraduate hours. 4 graduate hours. Prerequisite: CEE 350

<table>
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Restricted to MS: Civil Engr - Online - UIUC, MCS: Computer Sci Online -UIUC, MS: Industrial Engr Online-UIUC, MS: Mechanical Engineering - UIUC, MS: Engr CivilEngr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG: Grad Nondegree-CE-UIUC, or MENG: Mech Engineering Onl-UIUC.

Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. Non-Degree students may enroll on a space-available basis with consent of Program Coordinator, Meg Griffin (mgriffn@illinois.edu).
### CEE 460  **Steel Structures I**  credit: 3 hours.

Introduction to the design of metal structures; behavior of members and their connections; theoretical, experimental, and practical bases for proportioning members and their connections. 3 undergraduate hours. No graduate credit. Prerequisite: CEE 360.

<table>
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</table>

- Restricted to Undergrad - Urbana-Champaign.

### CEE 461  **Reinforced Concrete I**  credit: 3 hours.

Strength, behavior, and design of reinforced concrete members subjected to moments, shear, and axial forces; emphasis on the influence of the material properties on behavior. 3 undergraduate hours. No graduate credit. Prerequisite: CEE 360.

<table>
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### CEE 463  **Reinforced Concrete II**  credit: 3 OR 4 hours.

Strength, behavior, and design of indeterminate reinforced concrete structures, with primary emphasis on slab systems; emphasis on the strength of slabs and on the available methods of design of slabs spanning in two directions, with or without supporting beams. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CEE 461.

<table>
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Credit Hours: 3 hours

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Credit Hours: 4 hours
CEE 465  **Design of Structural Systems**  credit: 3 hours.
Examination of the whole structural design process including definition of functional requirements, selection of structural scheme, formulation of design criteria, preliminary and computer-aided proportioning, and analysis of response, cost, and value. 3 undergraduate hours. No graduate credit. Prerequisite: Credit in either CEE 460 or CEE 461 with concurrent registration in the other.

<table>
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Credit Hours: 3 hours
Restricted to Undergrad - Urbana-Champaign.
This section is reserved for undergraduate students only.

CEE 470  **Structural Analysis**  credit: 4 hours.
Direct stiffness method of structural analysis; fundamentals and algorithms; numerical analysis of plane trusses, grids and frames; virtual work and energy principles; finite element method for plane stress and plane strain. 4 undergraduate hours. 4 graduate hours. Credit is not given for both CEE 470 and ME 471. Prerequisite: CEE 360.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Days</th>
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Departmental Approval Required
Restricted to BS:Civil Engineering -UIUC, MS:Civil Engineering -UIUC, PHD:Civil Engineering -UIUC, MS:Env Engr Civil Engr -UIUC, or PHD:Env Engr Civil Engr -UIUC.
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Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Industrial Engr Online-UIUC, MS:Mechanical Engineering -UIUC, MS:Env Engr Civil Engr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.
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</table>
CEE 471  **Structural Mechanics**  credit: 3 OR 4 hours.

Beams under lateral load and thrust; beams on elastic foundations; virtual work and energy principles; principles of solid mechanics, stress and strain in three dimensions; static stability theory; torsion; computational methods. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: MATH 285 and TAM 251.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
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<td>Lopez-Pamies, O</td>
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</table>

Credit Hours: 3 hours

40940 | Lecture-Discussion | 4       | 02:00 PM - 03:20 PM | MW   | 2311 - Newmark Civil Engineering Bldg | Lopez-Pamies, O |

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
This section is reserved for graduate students only.

62166 | Online             | ONL     | ARRANGED -         | -    | -                               | Lopez-Pamies, O |

Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Industrial Engr Online-UIUC, MS:Mechanical Engineering -UIUC, MS:Env Engr CivilEngr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.
Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. Non-Degree students may enroll on a space-available basis with consent of Program Coordinator, Meg Griffin (mgriffn@illinois.edu).

CEE 472  **Structural Dynamics I**  credit: 3 OR 4 hours.

Analysis of the dynamic response of structures and structural components to transient loads and foundation excitation; single-degree-of-freedom and multi-degree-of-freedom systems; response spectrum concepts; simple inelastic structural systems; systems with distributed mass and flexibility. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CEE 360, MATH 285, and TAM 212.

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<tr>
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Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Industrial Engr Online-UIUC, MS:Mechanical Engineering -UIUC, MS:Env Engr CivilEngr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.
Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. Non-Degree students may enroll on a space-available basis with consent of Program Coordinator, Meg Griffin (mgriffn@illinois.edu).

29782 | Lecture-Discussion | TW3     | 03:30 PM - 04:50 PM | TR   | 2311 - Newmark Civil Engineering Bldg | Spencer, B      |

Credit Hours: 3 hours
3 Hours SECTION TW3:STRUCTURAL DYNAMICS PREREQ: TAM 212, MATH 385, and CEE 360

47439 | Lecture-Discussion | TW4     | 03:30 PM - 04:50 PM | TR   | 2311 - Newmark Civil | Spencer, B      |
CEE 483  **Soil Mechanics and Behavior**  credit: 4 hours.
Composition and structure of soil; water flow and hydraulic properties; stress in soil; compressibility behavior and properties of soils; consolidation and settlement analysis; shear strength of soils; compaction and unsaturated soils; experimental measurements. 4 undergraduate hours. 4 graduate hours. Prerequisite: CEE 380.

<table>
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<td>31546</td>
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<td>AB2</td>
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<td>R</td>
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<td>Mesri, G</td>
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<td>AL1</td>
<td>01:00 PM - 01:50 PM</td>
<td>MWF</td>
<td>B218 - Newmark Civil Engineering Bldg</td>
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CEE 491  **Decision and Risk Analysis**  credit: 3 OR 4 hours.
Development of modern statistical decision theory and risk analysis, and application of these concepts in civil engineering design and decision making; Bayesian statistical decision theory, decision tree, utility concepts, and multi-objective decision problems; modeling and analysis of uncertainties, practical risk evaluation, and formulation of risk-based design criteria, risk benefit trade-offs, and optimal decisions. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CEE 202.

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Credit Hours: 3 hours
CEE 493  **Sustainable Design Eng Tech**  credit: 4 hours.
Quantitative sustainable design (QSD) and how to navigate engineering decision-making. Economic (life cycle costing, techno-economic assessment) and environmental (life cycle assessment, LCA) sustainability assessments, and how to link these tools to design decisions under uncertainty. Design of engineered technologies individually and in teams, with special attention to water infrastructure and bioenergy production. Semester-long design project that includes components from two of the following three CEE sub-disciplines: environmental, hydraulic, geotechnical. 4 undergraduate hours. 4 graduate hours. Prerequisite: CEE 340 or Graduate Standing.

<table>
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Departmental Approval Required
Restricted to BS:Civil Engineering -UIUC, MS:Civil Engineering -UIUC, PHD:Civil Engineering -UIUC, MS:Env Engr Civil Engr -UIUC, or PHD:Env Engr Civil Engr -UIUC.
Students in this section will complete this course completely online except for the following which must be completed on-campus: Exams (will be completed in the classroom with the instructor/TA), Homework/exam sessions, Office Hours. Contact Becky Stillwell (rborden@illinois.edu), Meg Griffin (mgriffn@illinois.edu), and the course instructor for permission to register.

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Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Industrial Engr Online-UIUC, MS:Mechanical Engineering -UIUC, MS:Env Engr Civil Engr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.
Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. Non-Degree students may enroll on a space-available basis with consent of Program Coordinator, Meg Griffin (mgriffn@illinois.edu).

CEE 495  **Professional Practice**  credit: 0 hours.
Series of lectures by outstanding authorities on the practice of civil engineering and its relations to economics, sociology, and other fields of human endeavor. 0 undergraduate hours. 0 graduate hours. Approved for S/U grading only.

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CEE 497  **Independent Study**  credit: 1 TO 16 hours.
Individual investigations or studies of any phase of civil engineering selected by the student and approved by the department. 1 to 4 undergraduate hours. 1 to 16 graduate hours. May be repeated. Prerequisite: Consent of instructor.
CRN  | Type           | Section | Time         | Days | Location    | Instructor
---|----------------|--------|--------------|------|-------------|-------------
10474 | Independent Study |        | ARRANGED -   |      |             |             

Instructor Approval Required

**CEE 498 Special Topics**  
credit: 1 TO 4 hours.

Subject offerings of new and developing areas of knowledge in civil and environmental engineering intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. 1 to 4 undergraduate hours. 1 to 4 graduate hours. May be repeated in the same or separate terms if topics vary.

<table>
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Credit Hours: 3 hours  
Constr Equipment and Methods  
Prerequisite: CEE 320

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Constr Equipment & Methods  
Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Industrial Engr Online-UIUC, MS:Mechanical Engineering -UIUC, MS:Env Engr CivilEngr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.

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Credit Hours: 3 hours  
Rail Vehicle Technology  
Departmental Approval Required


Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. Non-Degree students may enroll on a space-available basis with consent of Program Coordinator, Meg Griffin (mgriffn@illinois.edu).

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Credit Hours: 3 hours  
Rail Vehicle Technology  
Departmental Approval Required
Introduction to railway vehicle technology. The railway and the environment: energy consumption, air pollutions, external noise, external vibrations. Railway traffic development and future. Rail vehicles - technical basis. Aerodynamics and running resistance. Running gear, bogies and car body tilting. Traction technology: traction motors, transmission, traction mechanics and current collection. Braking technology. Car bodies. Passenger environment, interior design and auxiliary power. Internal noise, internal vibrations and climate resistance. Rail vehicle market and development. Note: The material in this course has been developed by KTH Royal Institute of Technology, Sweden. UIUC students will be enrolled as online students in KTH course SD 2307 Rail Vehicle Technology to view lecture material. This will be a half-semester course with online lectures given October 20, 2014 – December 19, 2014.

**CEE 509 Transportation Soils**  credit: 4 hours.

Occurrence and properties of surficial soils, soil classification systems, soil variability; subgrade evaluation procedures, repeated loading behavior of soils; soil compaction and field control; soil moisture, soil temperature, and frost action; soil trafficability and subgrade stability for transportation facility engineering. Prerequisite: CEE 483.

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Restricted to Graduate - Urbana-Champaign.

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Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online - UIUC, MS:Industrial Engr Online - UIUC, MS:Mechanical Engineering - UIUC, MS:Env Engr Civil Engr ONL - UIUC, MS: Aerospace Engr Online - UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.

Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCEE students. Non-Degree students may enroll on a space-available basis with consent of Program Coordinator, Meg Griffin (mgriffin@illinois.edu).

**CEE 524 Construction Law**  credit: 4 hours.

Legal aspects of the construction process and the potential liability that engineers can incur through the design, and post-construction processes. Organization and operation of the American court system, contact formation, defenses, remedies, and typical areas of dispute, and design services contracts, torts, product liability, agency, business organizations, intellectual property, and risk
managements. Mock trial of a recent construction-related case with the class serving as plaintiffs and defendants. Prerequisite: CEE 420, CEE 421, and CEE 422.

<table>
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Restricted to MS: Civil Engr - Online - UIUC, MCS: Computer Sci Online - UIUC, MS: Industrial Engr Online - UIUC, MS: Mechanical Engineering - UIUC, MS: Env Engr Civil Engr ONL - UIUC, MS: Aerospace Engr Online - UIUC, NDEG: Grad Nondegree - CE - UIUC, or MENG: Mech Engineering Onl - UIUC.

Restricted to online grad non-degree, online MCS, online MSAE, online MSME, and online MSCE students. Center for Innovation in Teaching & Learning (CITL) restrictions and assessments apply, see https://online.illinois.edu. For more details on this course section, please see http://engineering.illinois.edu/online/courses/. Non-Degree students may enroll on a space-available basis with consent of Program Coordinator, Meg Griffin (mgriffn@illinois.edu).

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Restricted to Graduate - Urbana-Champaign.

**CEE 525 Construction Case Studies** credit: 4 hours.

Case studies of bridges, tunnels, buildings, transportation systems, heavy industrial construction, waterways, and marine structures in the context of construction engineering and management. Research, a team-oriented term project, presentations, and discussions in studio-style format. Prerequisite: Two of CEE 420, CEE 421, and CEE 422.

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Departmental Approval Required

Restricted to MS: Civil Engineering - UIUC, PHD: Civil Engineering - UIUC, MS: Env Engr Civil Engr - UIUC, or PHD: Env Engr Civil Engr - UIUC.

Students in this section will complete this course completely online except for the following which must be completed on-campus: Exams (will be completed in the classroom with the instructor/TA), Homework/exam sessions, Office Hours. Contact Becky Stillwell (rborden@illinois.edu), Meg Griffin (mgriffn@illinois.edu), and the course instructor for permission to register.

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Restricted to MS: Civil Engr - Online - UIUC, MCS: Computer Sci Online - UIUC, MS: Industrial Engr Online - UIUC, MS: Mechanical Engineering - UIUC, MS: Env Engr Civil Engr ONL - UIUC, MS: Aerospace Engr Online - UIUC, NDEG: Grad Nondegree - CE - UIUC, or MENG: Mech Engineering Onl - UIUC.

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Restricted to Graduate - Urbana-Champaign.

**CEE 538 Water Quality Control Proc II** credit: 4 hours.
Theory and its application for design and operation of processes used in water and wastewater treatment; emphasis is on biological treatment processes and related processes for gas transfer, sludge dewatering, sludge disposal, and solids separations. Prerequisite: CEE 442 and CEE 443; credit or concurrent registration in CEE 444.

<table>
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Credit Hours: 4 hours  
Departmental Approval Required  
Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Mechanical Engineering -UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.  
Permission for this course must be granted by Prof. Jeremy Guest. Not open to all majors or students.

**CEE 540 Remediation Design**  credit: 4 hours.  
Evaluation and design of alternative treatment processes for hazardous waste sites contaminated with organic or metal wastes. Group design project due at the end of the term. Prerequisite: CEE 440.

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Credit Hours: 4 hours  
Restricted to Graduate - Urbana-Champaign.

**CEE 555 Mixing in Environmental Flows**  credit: 4 hours.  
Physical processes involved in transport of pollutants by water; turbulent diffusion and longitudinal dispersion in rivers, pipes, lakes, and the ocean; diffusion in turbulent jets, buoyant jets, and plumes. Prerequisite: MATH 285 and TAM 335.

<table>
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Restricted to Graduate - Urbana-Champaign.

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<td>Tinoco Lopez, R</td>
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</tbody>
</table>

Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Industrial Engr Online-UIUC, MS:Mechanical Engineering -UIUC, MS:Env Engr CivilEngr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.

**CEE 559 Sediment Transport**  credit: 4 hours.  
Physical processes of transportation and deposition of sediment particles in liquid bodies with particular emphasis on fluvial sediment problems; sediment in desilting basins; reservoirs and delta formation; erosion; stable channel design; river morphology. Prerequisite: CEE 551.
CEE 574  **Probabilistic Loads and Design**  credit: 4 hours.

Application of probabilistic methods in describing and defining loads on structures with emphasis on the random fluctuation in time and space. Random vibration methods and applications to dynamic response of structures under wind and earthquake loads. Computer simulation of structural loads and responses. Probability-based safety criteria and review of current methods of selection of design loads and load combinations. Prerequisite: CEE 202 and CEE 472.

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<tr>
<th>CRN</th>
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<th>Section</th>
<th>Time</th>
<th>Days</th>
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</table>

Online Continuing Ed Aprv Req
Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Mechanical Engineerng -UIUC, MS:Env Engr CivilEngr ONL-UIUC, MS:Industrial Engr Online-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl/UIUC.
Restricted to online non-degree, online MCS, online MSME and online MS CE students. Online & Continuing Education (OCE) restrictions and assessments apply, see http://www.oce.illinois.edu. For more details on this course section, please see http://online.engineering.illinois.edu/descriptions/fall2011.htm

CEE 576  **Nonlinear Finite Elements**  credit: 4 hours.

Nonlinear formulations in solid mechanics and nonlinear equation solving strategies; finite deformation (hyperelasticity) elastostatics and elastodynamics, semi-discrete weighted residual formulations, implicit and explicit time-stepping algorithms and stability analysis; theory of mixed finite element methods, strain-projection methods, and stabilized methods; mixed methods for nonlinear coupled-field problems. Same as CSE 552. Prerequisite: CEE 471 or TAM 445; CEE 470 or ME 471.

<table>
<thead>
<tr>
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</table>

Restricted to Graduate - Urbana-Champaign.

CEE 580  **Excavation and Support Systems**  credit: 4 hours.

Classical and modern earth pressure theories and their experimental justification; pressures and bases for design of retaining walls, bracing of open cuts, anchored bulkheads, cofferdams, tunnels, and culverts. Prerequisite: Credit or concurrent registration in CEE 484.

<table>
<thead>
<tr>
<th>CRN</th>
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<td>MWF</td>
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</tr>
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</table>
**CEE 581  Dams, Embankments, and Slopes**  credit: 4 hours.

Fundamentals of static and seismic slope stability and shear strength; seepage in composite sections and anisotropic materials; methods of stability analyses; mechanism of failure of natural and man-made slopes; compaction; field observations. 4 graduate hours. No professional credit. Prerequisite: CEE 483 - Applied Soil Mechanics.

<table>
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<tr>
<th>CRN</th>
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CEE 582  **Consolidation of Clays**  credit: 4 hours.

Elastic solutions relevant to soil mechanics; permeability; general application of Terzaghi’s theory of one-dimensional consolidation; advances in consolidation theories; mechanism of volume change; delayed and secondary compressibility and creep; theory of three-dimensional consolidation and solutions; radial flow and design of sand drains; analysis and control of settlement. Prerequisite: CEE 483.

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<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
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<tr>
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</table>

CEE 586  **Rock Mechanics and Behavior**  credit: 4 hours.
Rock classification, stress and strain, elastic and inelastic deformation, failure criteria, rock-fluid interaction, poroelasticity, fluid flow in rock, thermal effect on rock deformation, geo-energy applications. 4 graduate hours. No professional credit. Prerequisite: CEE 483 and TAM 451.

<table>
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<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
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Restricted to Graduate - Urbana-Champaign.
Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Industrial Engr Online-UIUC, MS:Env Engr CivilEngr ONL-UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.
Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. Center for Innovation in Teaching & Learning (CITL) restrictions and assessments apply, see http://www.citl.illinois.edu. For more details on this course section, please see http://engineering.illinois.edu/online/courses/. Non-Degree students may enroll on a space-available basis with consent of Program Coordinator, Meg Griffin (mgriffin@illinois.edu).

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Restricted to Graduate - Urbana-Champaign.

CEE 595  Seminar  credit: 0 TO 1 hours.
Discussion of current topics in civil and environmental engineering and related fields by staff, students, and visiting lecturers. Approved for S/U grading only. May be repeated.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
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<th>Instructor</th>
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</table>

Adv Environmental Engr Seminar
Restricted to Graduate - Urbana-Champaign.
Topic: Advanced Environmental Engineering. Environmental Ph.D. students and second year M.S. students must enroll in CEE 595 AG each semester.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
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</table>

Energy Wtr Environment Sustain
Restricted to Graduate - Urbana-Champaign.
Energy-Water-Environment-Sustainability Seminar All EWES graduate students are required to register for CEE 595 EWS each semester.

<table>
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<tr>
<th>CRN</th>
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Geotechnical Engr Seminar
Restricted to Graduate - Urbana-Champaign.
Topic: Geotechnical Engineering
### Environmental Engr Seminar

Credit Hours: 1 hours  
Environmental Engr Seminar  
Restricted to Graduate - Urbana-Champaign.  
Topic: Environmental Engineering. Environmental first year M.S. students must enroll in CEE 595 G each semester.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Days</th>
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### Structural Engr Seminar

Restricted to Graduate - Urbana-Champaign.  
Topic: Structures. All Structures graduate students are required to register for CEE 595 S each semester.

<table>
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<tr>
<th>CRN</th>
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### Societal Risk Mngmt Seminar

Restricted to Graduate - Urbana-Champaign.  
Topic: Construction Management.

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<tr>
<th>CRN</th>
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<th>Section</th>
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<th>Days</th>
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<td>Gardoni, P</td>
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### Sustain & Resiliant Infrst Sys

Restricted to Graduate - Urbana-Champaign.  
Sustainable and Resiliant Infrastructures Systems Seminar All SRIS graduate students are required to register for CEE 595 SRS each semester.

<table>
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<tr>
<th>CRN</th>
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### Hydro Engr Seminar

Restricted to Graduate - Urbana-Champaign.  
Topic: Hydraulics and Water Resources.

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<th>CRN</th>
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<th>Days</th>
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<td>1310 - Newmark Civil Engineering Bldg</td>
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</table>

### CEE 597  Independent Study  credit: 1 TO 16 hours.

Individual investigations or studies of any phase of civil engineering selected by the student and approved by the adviser and the staff member who will supervise the investigation. May be repeated. Prerequisite: Consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
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Instructor Approval Required
### CEE 598  Special Topics  credit: 1 TO 4 hours.
Subject offerings of new and developing areas of knowledge in civil and environmental engineering intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. May be repeated in the same or separate terms if topics vary.

<table>
<thead>
<tr>
<th>CRN</th>
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</table>

Credit Hours: 4 hours  
Generalized FEM's  
Restricted to Graduate - Urbana-Champaign.  
Theory and applications of Generalized and eXtended Finite Element Methods: a-priori error estimates; control of conditioning; implementation in research and commercial software; verification; application to three-dimensional fracture mechanics, problems with moving interfaces, and multiscale problems. Prerequisite: Introductory finite element method course: CEE 570, AE 420, ME 471, or equivalent, or approval of instructor.

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Credit Hours: 4 hours  
Generalized FEMs  
Restricted to MS: Civil Engr - Online - UIUC, MS:Mechanical Engineering -UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, MCS:Computer Sci Online -UIUC, or MENG:Mech Engineering Onl-UIUC.  
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<td>MW</td>
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</tbody>
</table>

Credit Hours: 4 hours  
Globalization of Water  
Restricted to Graduate - Urbana-Champaign.  
CEE 450 or consent of instructor. Educate students on social aspects of hydrology, with a particular focus on the water footprint concept. The globalized food system has enormous implications for water resources, which will be explored in the course, drawing from hydrology, engineering, economics, econometrics, and complex systems analysis.

<table>
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<tr>
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<th>Days</th>
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Credit Hours: 4 hours  
Globalization of Water  
Restricted to Graduate - Urbana-Champaign. Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Mechanical Engineering -UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, or MENG:Mech Engineering Onl-UIUC.  
Restricted to online grad non-degree, online MCS, online MSME and online MSCEE students. Center for Innovation in Teaching & Learning (CITL) restrictions and assessments apply, see http://www.citl.illinois.edu. For more details on this course section, please see http://engineering.illinois.edu/online/courses/. Non-Degree students may enroll on a space-available basis with consent of Program Coordinator, Meg Griffin (mgriffin@illinois.edu).

### CEE 599  Thesis Research  credit: 0 TO 16 hours.
Approved for S/U grading only. May be repeated.

<table>
<thead>
<tr>
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Instructor Approval Required
Restricted to Graduate - Urbana-Champaign.