## CIVIL AND ENVIRONMENTAL ENGINEERING (CEE)

Subject-area course lists indicate courses currently active for offering at the University of Louisville. Not all courses are scheduled in any given academic term. For class offerings in a specific semester, refer to the Schedule of Classes [http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm](http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm).

500-level courses generally are included in both the undergraduate- and graduate-level course listings; however, specific course/section offerings may vary between semesters. Students are responsible for ensuring that they enroll in courses that are applicable to their particular academic programs.

### Course Fees

Some courses may carry fees beyond the standard tuition costs to cover additional support or materials. Program-, subject- and course-specific fee information can be found on the Office of the Bursar website [http://louisville.edu/bursar/tuitionfee](http://louisville.edu/bursar/tuitionfee).

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
<th>Grading Basis</th>
<th>Term Typically Offered</th>
<th>Prerequisite(s)</th>
<th>Description</th>
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<tbody>
<tr>
<td>CEE 503</td>
<td>Fundamentals of Engineering Exam Review</td>
<td>2</td>
<td>Pass/Fail</td>
<td>Fall, Spring, Summer</td>
<td></td>
<td>Review of topics covered on eight-hour NCEES Fundamentals of Engineering examination. Not to be counted towards meeting the requirements for a degree. For class offerings for a specific term, refer to the Schedule of Classes <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a></td>
</tr>
<tr>
<td>CEE 520</td>
<td>Design of Structural Systems</td>
<td>3</td>
<td></td>
<td>Fall, Spring, Summer</td>
<td>CEE 421, CEE 422, and CEE 452</td>
<td>Introduction to the design of structural systems. Model building codes. Material, structural system and foundation system selection. Design of connections. Economic, detailing constructability and erection issues. Preparation of engineering drawings. Review of shop drawing. For class offerings for a specific term, refer to the Schedule of Classes <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a></td>
</tr>
<tr>
<td>CEE 522</td>
<td>Fundamentals of Prestressed Concrete</td>
<td>3</td>
<td></td>
<td>Fall, Spring, Summer</td>
<td>CEE 322 and CEE 421</td>
<td>Introduction to pre-tensioned and post-tensioned prestressed concrete. Design of precast concrete slabs, buildings, and bridges in accordance with ACI specifications and the Prestressed Concrete Institute (PCI) recommended practices. Application of computer programs for member analysis and design. For class offerings for a specific term, refer to the Schedule of Classes <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a></td>
</tr>
<tr>
<td>CEE 523</td>
<td>Timber Design</td>
<td>3</td>
<td></td>
<td>Fall, Spring, Summer</td>
<td>CEE 254 or consent of instructor.</td>
<td>Concepts of Structural Timber design will be taught. The properties of wood materials will be reviewed and the procedures for the design of typical timber components will be presented. In addition to course assignments, and tests, required of all students, students taking this course for graduate credit will be required to complete a group design of a simple building. For class offerings for a specific term, refer to the Schedule of Classes <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a></td>
</tr>
<tr>
<td>CEE 530</td>
<td>Construction Materials</td>
<td>3</td>
<td></td>
<td>Spring Only</td>
<td>CEE 254 and CEE 255</td>
<td>Properties of construction materials such as cement, concrete, asphalt, and structural elastomers. Design of Portland cement concrete and asphaltic concrete mixes. For class offerings for a specific term, refer to the Schedule of Classes <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a></td>
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<tr>
<td>CEE 532</td>
<td>Experimental Stress Analysis</td>
<td>3</td>
<td></td>
<td>Fall, Spring, Summer</td>
<td>CEE 530</td>
<td>Fundamentals of experimental stress analysis, brittle coating, photoelastic coating, and electrical strain gage techniques, strain measurements under static and dynamic loading. For class offerings for a specific term, refer to the Schedule of Classes <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a></td>
</tr>
<tr>
<td>CEE 552</td>
<td>Earth Pressures and Retaining Structures</td>
<td>3</td>
<td></td>
<td>Fall, Spring, Summer</td>
<td>CEE 450</td>
<td>Earth pressure calculation: theory and practice. Design techniques for retaining walls, reinforced earth and soil nailing. For class offerings for a specific term, refer to the Schedule of Classes <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a></td>
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<tr>
<td>CEE 560</td>
<td>Traffic Engineering</td>
<td>3</td>
<td></td>
<td>Fall, Spring, Summer</td>
<td>CEE 460</td>
<td>Examines characteristics of the vehicle, the driver, and the traffic stream. Highway and intersection capacity, theory of traffic flow, parking, traffic safety. For class offerings for a specific term, refer to the Schedule of Classes <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a></td>
</tr>
<tr>
<td>CEE 562</td>
<td>Geometric Design of Highways</td>
<td>3</td>
<td></td>
<td>Occasionally Offered</td>
<td>CEE 460</td>
<td>The concepts of geometric design for rural and urban highways, utilizing proprietary design software are introduced and applied. For class offerings for a specific term, refer to the Schedule of Classes <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a></td>
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CEE 563. GPS Theory and Application  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): CEE 460.  
Description: This course is designed to give the student an overview of the use of Global Positioning Systems in surveying and engineering applications. Elements of coordinate systems, map projections, GPS principles of operation, mapping, boundary, and construction surveys will be covered. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 565. GIS Applications to Transportation  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): CEE 460.  
Description: Introduces an overview and application of current methods of implementing GIS solutions to highway data analysis and planning studies. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 570. Applied Hydraulics  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): CEE 572.  
Description: Application of basic principles of hydraulic engineering to analysis of flow in floodways, through bridge openings, culverts, and spillways. Analysis of stable channel design is also considered. Commonly used computer programs are utilized to design structures in floodways. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 571. Applied Hydrology  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): CEE 470.  
Description: Introduction to hydrologic systems; modeling runoff from watersheds using lumped and distributed methods; stormwater management and design; hydrologic and hydraulic routing including kinematic wave routing; computer rainfall-runoff simulation models. A hydrologic design project will be assigned to all students; special assignments dealing with hydrologic processes will be assigned to MS degree students. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 572. Open Channel Hydraulics  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): CEE 370.  
Description: Application of basic principles of hydraulic to open channel flow. Theory and analysis of critical, uniform and gradually varied flow and computer analysis. Select topics in rapidly varied and unsteady flow. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 573. Groundwater Hydrology  
Term Typically Offered: Occasionally Offered  
Prerequisite(s): CEE 450 and CEE 470.  
Description: Fundamental concepts of fluid flow and soil properties; theory of groundwater movement; mechanics of well flow; groundwater contaminant transport. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 590. Current Topics in Civil Engineering  
Term Typically Offered: Occasionally Offered  
Prerequisite(s): Consent of instructor.  
Description: An examination of one or more topics in Civil Engineering. Details announced each semester. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 604. Interaction of Soils and Structures  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): CEE 421, CEE 422, and CEE 452.  
Description: Response of foundation materials to applied static and dynamic loads. Foundation design procedures based upon consideration of soil-structure interaction. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 620. Advanced Mechanics of Solids  
Prerequisite(s): By permission of Department Chair.  
Note: Cross-listed with ME 620.  
Note: This class is for CEE students; students from other departments will need to get permission from CEE department chair.  
Description: Analysis of stress and strain. Topics include theories of failure, unsymmetric bending, curved beams, shear center, torsion, beams on elastic foundations, beams with combined axial and lateral loads, thick-wall cylinders, rotating disc, introduction to elastic stability.  

CEE 621. Finite Element Analysis for Structural Engineers  
Description: Introduction to the finite element method (FEM) and its application to structural engineering. Topics include displacement and variational base one-, two- and three-dimensional element formulation, introductory elasticity, isoparametric elements, interpolation methods, numeric integration, geometric and material nonlinearity. Emphasis on FEM program development. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 623. Advanced Structural Engineering  
Description: Design of earthquake resistant steel, concrete, and masonry structures. Introduction to time history, modal analysis and pushover analysis. Model code seismic design provisions. Ductility concepts. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)
CEE 625. Structural Dynamics  
Prerequisite(s): CEE 322.  
Description: Dynamic analysis of structural systems including dynamic response by modal superposition, step integration, response spectrum frequency analysis. Computer applications.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 626. Masonry Design  
Prerequisite(s): CEE 421.  
Description: Concepts of masonry design will be taught. The properties of masonry materials will be reviewed and the procedures for the design of typical masonry components will be presented.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 627. Non-Destructive Testing  
Prerequisite(s): Graduate/Professional standing.  
Description: Introduce different non-destructive testing methods for quality evaluation of concrete. Penetration resistance methods, resonant frequency methods, ultra-sonic pulse velocity, maturity technique will be covered. Ground penetrating radar.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 650. Measurement of Soil Properties  
Prerequisite(s): CEE 450.  
Description: Laboratory testing of soil mechanical properties; index testing; testing for permeability, compressibility, and shear strength.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 652. Advanced Earth Pressure and Retaining Structures  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 653. Design of Earth Structures  
Prerequisite(s): CEE 450.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 654. Rock Mechanics  
Prerequisite(s): CEE 450.  
Description: Physical properties of intact rock; mechanical properties of rock masses, emphasis on practical applications. Rock blasting. Tunneling.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 660. Transportation Planning and Urban Development  
Prerequisite(s): CEE 460.  
Description: Focuses on the principles of transportation planning in the urban environment, including land use planning, with emphasis on the orderly development of the transportation system.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 661. Environmental Analysis of Transportation Systems  
Description: An examination of the various impacts that transportation systems and projects may have on the natural and human environment. A detailed review and application of transportation noise analysis.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 662. Airport Planning & Design  
Prerequisite(s): CEE 460.  
Description: The principles of location, planning, design, and evaluation of airports are examined from the engineering perspective. In addition, laws and regulations concerning airports and the aviation system are thoroughly studied.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 663. Advanced Traffic Operations  
Term Typically Offered: Spring Only  
Description: This course has an emphasis on capacity analysis and using computer techniques to solve traffic problems.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 664. Fundamentals of Intelligent Transportation Systems  
Description: Examines the elements of traffic flow theory, incident/emergency management, dynamic route guidance, in-vehicle systems, and traffic signal systems.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 665. Pavement Design  
Prerequisite(s): CEE 450 and CEE 460.  
Description: Design of flexible and rigid pavements, base courses, and subgrades. Effects of loading on pavement life. Investigation of pavement distress and rehabilitation. Introduction to pavement management systems.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

CEE 670. Advanced Hydraulics  
Prerequisite(s): CEE 370.  
Description: Dimensional analysis; integral form of the equations of motion; shear stress distribution; turbulence and boundary layer theory; concepts in particle drag and settling.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)
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<th>Units</th>
<th>Description</th>
</tr>
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<tr>
<td>CEE 671</td>
<td>Stochastic Processes in Hydrology</td>
<td>3</td>
<td>Basic concepts and classification of stochastic processes with emphasis on hydrologic systems; analysis of hydrologic time series; models for stationary hydrologic stochastic processes.</td>
</tr>
<tr>
<td>CEE 672</td>
<td>Statistical Methods in Water Resources</td>
<td>3</td>
<td>Applications of advanced concepts of probability and statistics in hydrology and water resources including frequency analysis and regionalization; parameter estimation; analysis of variance and multiple regression techniques.</td>
</tr>
<tr>
<td>CEE 673</td>
<td>Advanced Hydrology</td>
<td>3</td>
<td>Advanced concepts for studying hydrologic processes; theory of linear hydrologic systems; conceptual models for modeling watershed rainfall-runoff response including geomorphological approaches.</td>
</tr>
<tr>
<td>CEE 674</td>
<td>Water Resources Systems</td>
<td>3</td>
<td>Application of systems analysis techniques in the planning and design of water resources projects; mathematical optimization; simulation and risk-based decision-making.</td>
</tr>
<tr>
<td>CEE 675</td>
<td>Surface Water Quality Modeling</td>
<td>3</td>
<td>Modeling, design and control of water quality in river, lake, and estuary systems; dissolved oxygen and toxic substance models; and lake eutrophication.</td>
</tr>
<tr>
<td>CEE 676</td>
<td>Sediment Transport and River Mechanics</td>
<td>3</td>
<td>Sediment transport theory; overland erosion; alluvial streams; analysis, prediction, and control of river characteristics; local scour at river structures.</td>
</tr>
<tr>
<td>CEE 677</td>
<td>Groundwater Modeling</td>
<td>3</td>
<td>Mathematical and numerical modeling of groundwater and pollution transport.</td>
</tr>
<tr>
<td>CEE 678</td>
<td>Civil Engineering Capstone Design</td>
<td>3</td>
<td>Restricted to CEE Master of Engineering students (SP). A capstone Civil &amp; Environmental Engineering course to include elements of geotechnical, structural, transportation, and water resources engineering in a comprehensive design project.</td>
</tr>
<tr>
<td>CEE 681</td>
<td>Green Engineering &amp; Sustainable Design</td>
<td>3</td>
<td>Understand the origins and applicability of sustainable design and green engineering. Ultimately, able to apply fundamental engineering concepts to these practices.</td>
</tr>
<tr>
<td>CEE 690</td>
<td>Master of Science Thesis in Civil Engineering</td>
<td>1-6</td>
<td>Experimental and/or theoretical research to be presented in thesis for degree requirement.</td>
</tr>
<tr>
<td>CEE 693</td>
<td>Independent Study in Civil Engineering</td>
<td>1-6</td>
<td>Independent study in a selected subject area with approval and supervision by a faculty member.</td>
</tr>
<tr>
<td>CEE 694</td>
<td>Special Topics in Civil Engineering</td>
<td>1-6</td>
<td>An examination of one or more specified areas of Civil Engineering. Topics vary; details announced each semester.</td>
</tr>
<tr>
<td>CEE 695</td>
<td>Civil Engineering PhD Seminar</td>
<td>3</td>
<td>A candidate for the Master of Engineering degree, specializing in the field of civil engineering, is required to perform a study, design, or investigation under the direction of a faculty member. A written thesis is required to be presented and defended orally and submitted to the faculty for approval.</td>
</tr>
<tr>
<td>CEE 698</td>
<td>Civil Engineering Capstone Design</td>
<td>3</td>
<td>Permission of the chair. Current literature in the field of civil engineering; extensive student presentations on research projects with interaction and feedback from students and faculty; guest speakers.</td>
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</tbody>
</table>
CEE 699. Civil Engineering PhD Research 1-18 Units

Prerequisite(s): Permission of dissertation director.

Description: Original research activity in an appropriate civil engineering discipline, under the direction of a Civil Engineering graduate faculty member.

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