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).

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/).

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**CEE 503. Fundamentals of Engineering Exam Review**

Grading Basis: Pass/Fail

Term Typically Offered: Fall, Spring, Summer

Prerequisite(s): 4th-year standing.

Description: 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 (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**CEE 520. Design of Structural Systems**

Term Typically Offered: Fall, Spring, Summer

Prerequisite(s): CEE 421, CEE 422, and CEE 452.


For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**CEE 522. Fundamentals of Prestressed Concrete**

Term Typically Offered: Fall, Spring, Summer

Prerequisite(s): CEE 322 and CEE 421.

Description: 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 (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**CEE 523. Timber Design**

Term Typically Offered: Fall, Spring, Summer

Prerequisite(s): CEE 254 or consent of instructor.

Description: 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 (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**CEE 524. Bridge Design**

Term Typically Offered: Summer Only

Description: This class offers detailed coverage of engineering basics for the design of short- and medium-span bridges.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**CEE 530. Construction Materials**

Term Typically Offered: Spring Only

Prerequisite(s): CEE 254 and CEE 255.

Description: 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 (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**CEE 532. Experimental Stress Analysis**

Term Typically Offered: Fall, Spring, Summer

Prerequisite(s): CEE 530.

Description: 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 (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**CEE 540. Construction Management**

Term Typically Offered: Fall Only

Description: This course discusses construction management including estimating, bidding, time/cost management, provisions, surety bonds, ownership, and project scheduling. Other topics, such as temporary erosion control and plan & print reading will also be covered.

Note: This section is restricted to students with a major in the department.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Term Typically Offered</th>
<th>Prerequisite(s)</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEE 541. Construction Equipment and Practice</td>
<td>3 Units</td>
<td>Spring Only</td>
<td>CEE 460.</td>
<td>An examination of one or more topics in Civil Engineering. Students will be directed to the anticipated content of the required textbook. For class offerings for a specific term, refer to the Schedule of Classes.</td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>CEE 552. Earth Pressures and Retaining Structures</td>
<td>3 Units</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.</td>
<td>Fall, Spring, Summer</td>
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<tr>
<td>CEE 553. Advanced Foundation Design</td>
<td>3 Units</td>
<td>Fall, Spring, Summer</td>
<td></td>
<td>This course covers site investigation and subsurface exploration with the purpose of foundation design. The course covers the analysis and design of single piles and group piles considering pile capacity and pile head displacement.</td>
<td>Fall, Spring, Summer</td>
</tr>
<tr>
<td>CEE 560. Traffic Engineering</td>
<td>3 Units</td>
<td>Fall, Spring, Summer</td>
<td></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.</td>
<td>Fall, Spring, Summer</td>
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<tr>
<td>CEE 562. Geometric Design of Highways</td>
<td>3 Units</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.</td>
<td>Occasionally Offered</td>
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<tr>
<td>CEE 563. GPS Theory and Application</td>
<td>3 Units</td>
<td>Fall, Spring, Summer</td>
<td>CEE 460.</td>
<td>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.</td>
<td>Fall, Spring, Summer</td>
</tr>
<tr>
<td>CEE 565. GIS Applications to Transportation</td>
<td>3 Units</td>
<td>Fall, Spring, Summer</td>
<td>CEE 460.</td>
<td>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.</td>
<td>Fall, Spring, Summer</td>
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<tr>
<td>CEE 570. Applied Hydraulics</td>
<td>3 Units</td>
<td>Fall, Spring, Summer</td>
<td>CEE 572.</td>
<td>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.</td>
<td>Fall, Spring, Summer</td>
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<tr>
<td>CEE 571. Applied Hydrology</td>
<td>3 Units</td>
<td>Fall, Spring, Summer</td>
<td></td>
<td>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.</td>
<td>Fall, Spring, Summer</td>
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<tr>
<td>CEE 572. Open Channel Hydraulics</td>
<td>3 Units</td>
<td>Fall, Spring, Summer</td>
<td>CEE 370.</td>
<td>Application of basic principles of hydraulics 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.</td>
<td>Fall, Spring, Summer</td>
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<tr>
<td>CEE 573. Groundwater Hydrology</td>
<td>3 Units</td>
<td>Occasionally Offered</td>
<td>CEE 460 and CEE 470.</td>
<td>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.</td>
<td>Occasionally Offered</td>
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<tr>
<td>CEE 590. Current Topics in Civil Engineering</td>
<td>1-4 Units</td>
<td>Occasionally Offered</td>
<td></td>
<td>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.</td>
<td>Occasionally Offered</td>
</tr>
</tbody>
</table>
CEE 604. Interaction of Soils and Structures 3 Units
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 3 Units
Prerequisite(s): By permission of 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.
Note: This class is for CEE students; students from other departments
will need to get permission from CEE department chair.
For class offerings for a specific term, refer to the Schedule
of Classes (http://htmlaccess.louisville.edu/classSchedule/
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CEE 621. Finite Element Analysis for Structural Engineers 3 Units
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/
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CEE 623. Advanced Structural Engineering 3 Units
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/
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CEE 625. Structural Dynamics 3 Units
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 3 Units
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/
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CEE 627. Non-Destructive Testing 3 Units
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/
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CEE 650. Measurement of Soil Properties 3 Units
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/
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CEE 652. Advanced Earth Pressure and Retaining Structures 3 Units
Description: Soil pressure-structure movement interactions. Design of
anchored bulkheads. Retained excavation analysis. Design of cellular
cofferdams. Introduction to culverts/tunnels.
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 3 Units
Prerequisite(s): CEE 450.
Description: Seepage and internal erosion. Stability analyses. Failure
mechanisms in natural slopes. Design of earth dams. Embankment
construction, control and instrumentation.
For class offerings for a specific term, refer to the Schedule
of Classes (http://htmlaccess.louisville.edu/classSchedule/
setupSearchClassSchedule.cfm)

CEE 654. Rock Mechanics 3 Units
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/
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CEE 656. Geotechnical Earthquake Engineering 3 Units
Description: This course is an introduction to the problems that engineers
face in earthquake prone regions. It is an "interdisciplinary" course in
the sense that it covers topics from geology, geophysics, structural and
geotechnical engineering, and probability. Emphasis in the course is
given to two main issues: (1) assessment of design motion at a site, and
(2) evaluation of the effects of this motion on geotechnical/structural
systems.
For class offerings for a specific term, refer to the Schedule
of Classes (http://htmlaccess.louisville.edu/classSchedule/
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CEE 660. Transportation Planning and Urban Development 3 Units
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  3 Units
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  3 Units
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  3 Units
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  3 Units
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  3 Units
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  3 Units
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)

CEE 671. Stochastic Processes in Hydrology  3 Units
Description: Basic concepts and classification of stochastic processes with emphasis on hydrologic systems; analysis of hydrologic time series; models for stationary hydrologic stochastic processes.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

CEE 672. Statistical Methods in Water Resources  3 Units
Prerequisite(s): IE 360.
Description: 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.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

CEE 673. Advanced Hydrology  3 Units
Prerequisite(s): CEE 470 and IE 360.
Description: Advanced concepts for studying hydraulic processes; theory of linear hydrologic systems; conceptual models for modeling watershed rainfall-runoff response including geomorphological approaches.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

CEE 674. Water Resources Systems  3 Units
Description: Application of systems analysis techniques in the planning and design of water resources projects; mathematical optimization; simulation and risk-based decision-making.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

CEE 675. Surface Water Quality Modeling  3 Units
Prerequisite(s): Consent of instructor.
Description: Modeling, design and control of water quality in river, lake, and estuary systems; dissolved oxygen and toxic substance models; and lake eutrophication.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

CEE 676. Sediment Transport and River Mechanics  3 Units
Prerequisite(s): CEE 370.
Description: Sediment transport theory; overland erosion; alluvial streams; analysis, prediction, and control of river characteristics; local scour at river structures.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

CEE 677. Groundwater Modeling  3 Units
Description: Mathematical and numerical modeling of groundwater and pollution transport.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)
CEE 680. Civil Engineering Capstone Design 3 Units
Prerequisite(s): Restricted to CEE Master of Engineering students (SP).
Description: A capstone Civil & Environmental Engineering course to include elements of geotechnical, structural, transportation, and water resources engineering in a comprehensive design project.
Course Attribute(s): CBL - This course includes Community-Based Learning (CBL). Students will engage in a community experience or project with an external partner in order to enhance understanding and application of academic content.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

CEE 681. Green Engineering & Sustainable Design 3 Units
Description: Understand the origins and applicability of sustainable design and green engineering. Ultimately, be able to apply fundamental engineering concepts to these practices.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

CEE 690. Master of Science Thesis in Civil Engineering 1-6 Units
Description: Experimental and/or theoretical research to be presented in thesis for degree requirement.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

CEE 693. Independent Study in Civil Engineering 1-6 Units
Description: Independent study in a selected subject area with approval and supervision by a faculty member.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

CEE 694. Special Topics in Civil Engineering 1-6 Units
Description: An examination of one or more specified areas of Civil Engineering. Topics vary; 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 697. Master of Engineering Thesis in Civil Engineering 1-6 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.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

CEE 698. Civil Engineering PhD Seminar 3 Units
Grading Basis: Pass/Fail
Prerequisite(s): Permission of the chair.
Description: Current literature in the field of civil engineering; extensive student presentations on research projects with interaction and feedback from students and faculty; guest speakers.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

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.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)