## Engineering Fundamentals (ENGR)

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/).

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Term Typically Offered</th>
<th>Prerequisite(s)</th>
<th>Description</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 100</td>
<td>Differential Calculus for Engineering - QR</td>
<td>4 Units</td>
<td>Fall, Spring</td>
<td>ENGR 181, appropriate math placement score, or completion of appropriate coursework.</td>
<td>Review of algebra, trigonometry, analytic geometry, and introduction of elementary calculus in preparation for Engineering Analysis I.</td>
<td>An additional $9.00 is charged for this course.</td>
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<tr>
<td>ENGR 101</td>
<td>Engineering Analysis I - QR</td>
<td>4 Units</td>
<td>Fall, Spring</td>
<td>A grade of C- or better in ENGR 100 or a grade of C- or better in an equivalent course or appropriate math placement score.</td>
<td>Introduction to vector methods and development and use of differentiation and integration to solve engineering problems, including those involving motion, related rates, optimization, moments and centers of mass.</td>
<td>Must be a Speed School of Engineering Student.</td>
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<tr>
<td>ENGR 102</td>
<td>Engineering Analysis II</td>
<td>4 Units</td>
<td>Fall, Spring</td>
<td>A grade of C- or better in ENGR 101.</td>
<td>Development and use of: integrating techniques, transcendental functions, vectors in three dimensions, polar coordinates, and power series to solve engineering problems, including work, hydrostatic force, statics, heating, cooling, and catenaries.</td>
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<tr>
<td>ENGR 110</td>
<td>Engineering Methods, Tools, and Practice I</td>
<td>2 Units</td>
<td>Fall, Spring</td>
<td>Must be a Speed School of Engineering Student.</td>
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<tr>
<td>ENGR 111</td>
<td>Engineering Methods, Tools and Practice II</td>
<td>2 Units</td>
<td>Spring, Summer</td>
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<td>ENGR 150</td>
<td>Engineering Graphics Fundamentals</td>
<td>2 Units</td>
<td>Fall, Spring, Summer</td>
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<tr>
<td>ENGR 151</td>
<td>Engineering Graphics Technology</td>
<td>1 Unit</td>
<td>Fall, Summer</td>
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<tr>
<td>ENGR 170</td>
<td>Special Topics in First Year Engineering Mathematics</td>
<td>4 Units</td>
<td>Fall, Spring, Summer</td>
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<td>Grading Basis: Pass/Fail</td>
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</table>

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm).
ENGR 181. Foundations in Applied Mathematics for Engineering  3 Units  
Term Typically Offered: Fall Only  
Prerequisite(s): Admission to either Speed School of Engineering or A&S pre-engineering and ACT Math sub-score of 21+ or SAT Math sub-score of 530+ or Accuplacer QRAS 250+ or successful completion of GEN 104.  
Description: Review of essential algebraic properties and operators. Introduction to functions and the use of linear, quadratic and trigonometric functions to model physical systems. Formulate and solve word problems involving rates, average rates of change, finding maximum or minimum values, and kinematic problems for one and two link planar robotic arms. This course may not be used for credit toward the J.B. Speed School of Engineering B. S. and M. Eng. Degrees. B. Speed School of Engineering B. S. and M. Eng. Degrees.  
Note: This course may not be used for credit toward the J.  

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ENGR 201. Engineering Analysis III  4 Units  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): A grade of C- or better in ENGR 102.  
Description: Development and use of: partial derivatives, Lagrange multipliers, Fourier series, vector-valued functions, and multiple integrals to solve engineering problems, including those involving thermodynamics, motion, fluid flow, curl, flux, and divergence.  
Note: Credit will not be granted for both ENGR 201 and MATH 301.  

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

ENGR 205. Differential Equations for Engineering  2 Units  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): ENGR 201.  
Fee: An additional $84.75 is charged for this course.  
Description: First- and higher-order differential equations (DE), systems of DE, partial DE, difference equations, numerical methods, Laplace transforms, engineering applications involving mechanical vibrations, electrical circuits, impact forces, and mixing problems.  
Note: Credit will not be granted for both ENGR 205 and MATH 405.  

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ENGR 209. ELLC Summer Research Project  1 Unit  
Grading Basis: Pass/Fail  
Term Typically Offered: Summer Only  
Prerequisite(s): Permission of the department; student must have participated in the Engineering Living-Learning Community during the most recent academic year.  
Description: Selected students will participate in a ten week research experience with a specific faculty member within their engineering department. Departments include: Bioengineering, chemical Engineering, Civil Engineering, Computer Engineering and Computer Science, Electrical and Computer Engineering, Industrial Engineering, and Mechanical Engineering. Students will meet as a group three times in the summer semester and will be required to spend a total of ten hours per week working with their faculty mentor. Oral and written presentations at the end of the summer semester are required.  
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ENGR 289. Co-op Education I  0 Units  
Grading Basis: Pass/Fail  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): BE 289 OR CEE 289 OR CHE 289 OR CSE 289 OR ECE 288 OR IE 288 OR ME 288.  
Description: First cooperative education work term, at Part-time status, in an area directly related to the field of specialization of student's degree program. Required for Professional School of Engineering students.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

ENGR 307. Numerical Methods for Engineering  2 Units  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): ENGR 201 Errors and error propagation, solving one and several equations, polynomial interpolation and divided differences, least squares approximation, numerical differentiation and integration, eigenvalues, eigenvectors, solving ordinary and systems of differential equations.  

Note: Credit will not be granted for both ENGR 307 and MATH 407.  

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

ENGR 330. Linear Algebra for Engineering  2 Units  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): ENGR 201.  
Description: Elimination and LU-factorization, dimension, rank, and nullspace, linear transformations and similarity, orthogonally and least squares, eigentheory and diagonalizability, linear differential equations and systems of linear differential equations.  
Note: Credit will not be granted for both ENGR 330 and MATH 325.  

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

ENGR 389. Co-op Education II  0 Units  
Grading Basis: Pass/Fail  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): BE 289 OR CEE 289 OR CHE 289 OR CSE 289 OR ECE 289 OR IE 289 OR ME 289.  
Description: Second cooperative education work term, at Part-time status, in an area directly related to the field of specialization of student's degree program. Required for Professional School of Engineering students.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  

ENGR 393. Independent Study in Engineering Fundamentals  1-6 Units  
Prerequisite(s): Consent of a faculty sponsor.  
Description: Independent study in any engineering fundamentals related area under the guidance of a faculty member.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)
ENGR 400. Special Topics in Engineering Fundamentals 1-6 Units
Term Typically Offered: Occasionally Offered
Description: Investigation of topics in any engineering fundamentals related areas that are not covered in regular courses. Topics will be announced in the Schedule of Courses.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ENGR 405. Practicum in Engineering Fundamentals Education 1-3 Units
Term Typically Offered: Fall, Spring, Summer
Prerequisite(s): ENGR 205 and Consent of Instructor.
Description: A guided learning experience in inquiry-based instructional techniques and best practices in STEM education that includes field experience as an undergraduate teaching assistant. Permission to enroll required. May be repeated for a maximum of 3 hours.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ENGR 589. Research Methods for Engineering and Engineering Education 3 Units
Description: This course will have students: learn how to engage in ethical conduct as researchers; acknowledge, reference, and document resources in organized ways; review and evaluate research in a critical and professional manner; synthesize existing literature to craft arguments; complete training for human subjects research (CITI Training); and write research questions that align with methods. It will also provide an overview of research methods: qualitative, quantitative, and mixed research methods.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)