

# ENGINEERING (EGR)

**NOTE: All prerequisites for Engineering (EGR) courses must be completed with a grade of "C-" or better.**

## Engineering (EGR) Courses

### **EGR 1003. Engineering Design and Problem Solving. (3-0) 3 Credit Hours.**

This course will introduce students to the scope of engineering, foundations of engineering science, and engineering design. Engineering fundamentals and design methods are addressed through rigorous design challenges and reverse engineering and redesign modules. The modules are designed so that students learn specific engineering content as they solve engineering problems in multiple contexts. This course is restricted to students in the Engineer Your World program. Course Fees: DL01 \$75; LRE1 \$25; STSE \$30.

### **EGR 1313. Calculus with Engineering Applications. (3-3) 3 Credit Hours.**

Prerequisite: Completion of precalculus or satisfactory performance on a placement examination. The first of a two-part integrated physics and calculus course. Calculus topics include an introduction to the concepts of limit, continuity, and derivative, mean value theorem, and applications of derivatives such as velocity and acceleration; introduction to the Riemann integral and the fundamental theorem of calculus. Physics topics include an introduction to vectors, force and Newton's Laws of Physics. Classes meet weekly for three hours of lecture and two hours of problem solving tutorials. Course Fees: LRE1 \$25; STSE \$30.

### **EGR 1333. Calculus II for Engineers. (3-0) 3 Credit Hours.**

Prerequisite: MAT 1213 (or MAT 1214 in previous catalogs), or equivalent. Methods of integration, applications of the integral, sequences, series, and Taylor expansions. Calculus topics are combined with physics applications, including an introduction to vectors, parametric equations, gradients, and Newton's Laws of Physics. (Credit can only be earned for one of the following: EGR 1333, EGR 1324, MAT 1224, or MAT 1223). Course Fee: LRE1 \$25; STSE \$30.

### **EGR 1343. The Impact of Modern Technologies on Society. (3-0) 3 Credit Hours.**

Prerequisites: Basic background in high school mathematics and physical sciences. This course is designed to inform students of the social impact of modern technologies. The course explores the issues faced by society as technology becomes an integral part of human life. The course prepares students to think critically, practically, creatively and responsively about technological and sociological challenges, and encourages them to examine solutions of their own. The course also explores and discusses the socio-technological interplay. May be applied toward the core curriculum requirement in Social and Behavioral Sciences. Course Fees: LRC1 \$12; LRE1 \$25; STSE \$30; DL01 \$75.

### **EGR 1351. First Year Participation in Engineering Projects in Community Service (EPICS). (1-2) 1 Credit Hour.**

Prerequisite: EGR 1352. Engineering Projects in Community Service (EPICS) courses create a vertical project track under which students work in multidisciplinary teams on long-term engineering-based design projects. Projects are intended to solve real problems that are defined in consultation with "customers" from the not-for-profit community and education organizations. EPICS courses are open to students from all disciplines; each student contributes expertise in their academic discipline. Students are encouraged to participate in an EPICS project team for two or more semesters. First year students gain insight into the specific project, and more generally, into the design and development process. They attend planning and reporting meetings with the customer and are expected attend all team meetings. Under the mentorship of the team's sophomores, juniors, and seniors they perform and report upon tasks consistent with their level of discipline expertise. The lab hours could be met through helping community partners. EGR 1352 and EGR 1351 together are equivalent to AIS. Course Fee: LRE1 \$25; STSE \$10; DL01 \$25.

### **EGR 1352. First Year Participation in Engineering Projects in Community Service (EPICS). (2-2) 2 Credit Hours.**

Continuation of Engineering Projects in Community Service (EPICS). Participants gain insight into the specific project, and more generally, into the design and development process. They attend planning and reporting meetings with the customer and are expected to attend all team meetings. Working with the team's sophomores, juniors, and seniors, they perform and report upon tasks consistent with their level of discipline expertise. The lab hours could be met through helping community partners. EGR 1351 and EGR 1352 together are equivalent to AIS. Course Fee: LRE1 \$25; STSE \$20.

### **EGR 1403. Technical Communication. (3-0) 3 Credit Hours.**

Prerequisite: WRC 1013. Oral, written, graphical and visual communication; technical instructions; design project with presentation; teamwork; and personal responsibility. May be applied toward the Core Curriculum requirement in the Component Area Option. Course Fees: L001 \$10; LRC1 \$12; LRE1 \$25; STSE \$30; DL01 \$75.

### **EGR 2103. Statics. (3-0) 3 Credit Hours. (TCCN = ENGR 2301)**

Prerequisite: PHY 1943, and completion of or concurrent enrollment in EGR 1333 or MAT 1223 (or MAT 1224 in previous catalogs). Vector analysis of force systems applied to particles and rigid bodies and free body diagrams. Engineering applications of equilibrium; of moments, internal forces, and friction; and of centroids, centers of gravity, and moments of inertia. Generally offered: Fall, Spring, Summer. Course Fee: LRE1 \$25; STSE \$30; DL01 \$75.

### **EGR 2213. Statics and Dynamics. (3-0) 3 Credit Hours.**

Prerequisite: EGR 1333 or MAT 1223 (or MAT 1224 in previous catalogs), and PHY 1943. Force, moment, equilibrium, centroids and moments of inertia, kinematics, and kinetics of particles. Not open to students in Civil or Mechanical Engineering. May not be substituted for EGR 2103. Generally offered: Fall, Spring, Summer. Course Fee: LRE1 \$25; STSE \$30.

### **EGR 2302. Linear Algebra for Engineers. (2-0) 2 Credit Hours.**

Prerequisite: Completion of MAT 1223 or EGR 1333 (or MAT 1224 or EGR 1324 in previous catalogs), or equivalent. Linear algebra and its applications. Topics include matrix addition and multiplication; solution of a linear system of equations via Gauss elimination and Cramer's rule; rank, determinant, and inverse of a matrix; eigenvalues and eigenvectors; existence and uniqueness of solutions of linear algebraic equations. Generally offered: Fall, Spring, Summer. (Credit cannot be earned for both EGR 2302 and EGR 2323). Course Fee: LRE1 \$25; STSE \$20.

**EGR 2313. Multivariable Calculus and Series for Engineers. (3-1) 3 Credit Hours. (TCCN = MATH 2315)**

Prerequisite: Completion of MAT 1223 or EGR 1333 (or MAT 1224 or EGR 1324 in previous catalogs), or equivalent. Application of mathematical principles to the analysis of engineering problems using vector differential and integral calculus and series; complex variables; discrete mathematics; and use of software tools. One hour of problem-solving recitation. Generally offered: Fall, Spring, Summer. (Credit cannot be earned for both EGR 2313 and EGR 3323). Course Fee: LRE1 \$25; STSE \$30.

**EGR 2323. Applied Engineering Analysis I. (3-1) 3 Credit Hours.**

Prerequisite: Completion of MAT 1223 or EGR 1333 (or MAT 1224 or EGR 1324 in previous catalogs), or equivalent. Application of mathematical principles to the analysis of engineering problems using linear algebra and ordinary differential equations (ODE's). Topics include: mathematical modeling of engineering problems; separable ODE's; first-, second-, and higher-order linear constant coefficient ODE's; characteristic equation of an ODE; non-homogeneous equations; Laplace transforms; shifting theorems; convolution; solution of an ODE via Laplace transform; matrix addition and multiplication; solution of a linear system of equations via Gauss elimination and Cramer's rule; rank, determinant, and inverse of a matrix; eigenvalues and eigenvectors; existence and uniqueness of solutions; solution to system of ODE's by diagonalization. One hour of problem solving recitation. (Same as EE 2323. Cannot be a substitution for EGR 2302 or EGR 3423. Credit can only be earned for one of the following: EE 2323, EGR 2302, EGR 3423, or EGR 2323.) Generally offered: Fall, Spring, Summer. Course Fee: LRE1 \$25; STSE \$30; DL01 \$75.

**EGR 2351. First Year Participation in Engineering Projects in Community Service (EPICS). (1-2) 1 Credit Hour.**

Continuation of Engineering Projects in Community Service (EPICS). Sophomores gain insight into the specific project, and, more generally, into the design and development process. They attend planning and reporting meetings with the customer and are expected attend all team meetings. Under the mentorship of the team's juniors and seniors, they perform and report upon tasks consistent with their level of discipline expertise. May be repeated for credit. Course Fees: LRE1 \$25; STSE \$10.

**EGR 2352. Sophomore Participation in Engineering Projects in Community Service (EPICS). (2-2) 2 Credit Hours.**

Continuation of Engineering Projects in Community Service (EPICS). Sophomores gain insight into the specific project, and, more generally, into the design and development process. They attend planning and reporting meetings with the customer and are expected attend all team meetings. Under the mentorship of the team's juniors and seniors they perform and report upon tasks consistent with their level of discipline expertise. May be repeated for credit. Course Fees: LRE1 \$25; STSE \$20.

**EGR 2413. Modern Physics for Engineers. (3-0) 3 Credit Hours.**

Prerequisite: EGR 1333 or MAT 1223 (or MAT 1224 in previous catalogs), and PHY 1943. Selected topics of modern physics, including special relativity, introductory quantum theory, and a survey of atomic, nuclear, and solid-state physics.

**EGR 2513. Dynamics. (3-0) 3 Credit Hours. (TCCN = ENGR 2302)**

Prerequisite: EGR 1333 or MAT 1223 (or MAT 1224 in previous catalogs), and EGR 2103. Kinetics of particles and plane rigid bodies, work and energy, impulse and momentum, equations of motion and engineering applications. Generally offered: Fall, Spring, Summer. Course Fee: LRE1 \$25; STSE \$30; DL01 \$75.

**EGR 3173. Numerical Methods. (2-3) 3 Credit Hours.**

Prerequisite: EGR 3423 or EGR 2323. Introduction to numerical algorithms to solve science and engineering problems. Techniques for mathematical solution of linear and nonlinear simultaneous equations; splines; root finding methods; numerical differentiation and integration; numerical solutions to ordinary differential equations; error analysis. (Same as CE 3173. Credit cannot be earned for both CE 3173 and EGR 3173.) This course has Differential Tuition.

**EGR 3303. Engineering Co-op. (0-0) 3 Credit Hours.**

Prerequisite: Acceptance into the Cooperative Education in Engineering Program. Designed for students participating in Cooperative Education in Engineering Program. Problems related to students' work assignments during their work for co-op employers. No more than 3 semester credit hours of Engineering Co-op may apply to a bachelor's degree. To apply 3 semester credit hours of Engineering Co-op as a technical elective toward a degree in engineering, a student must petition and get approval of a faculty supervisor prior to co-op activities. (Formerly EGR 3301. Credit cannot be earned for both EGR 3303 and EGR 3301.) This course has Differential Tuition.

**EGR 3323. Applied Engineering Analysis II. (3-1) 3 Credit Hours.**

Prerequisite: EGR 2323. Application of mathematical principles to the analysis of engineering problems using vector differential and integral calculus, partial differential equations, and Fourier series; complex variables; discrete mathematics; and use of software tools. One hour of problem solving recitation. (EGR 2313 cannot be a substitution for EGR 3323. Credit cannot be earned for both EGR 3323 and EGR 2313.) Generally offered: Fall, Spring, Summer. This course has Differential Tuition. Course Fee: DL01 \$75.

**EGR 3351. Junior Participation in Engineering Projects in Community Service (EPICS). (1-2) 1 Credit Hour.**

Prerequisite: Upper-division standing. Continuation of Engineering Projects in Community Service (EPICS). The responsibilities of juniors include working with the seniors in the planning and organization of the project, contributing to the design process, problem solving by contributing expertise from their discipline, meeting with the customer, and the mentorship of sophomores and freshmen. The EPICS procedures manual provides information on expected relative workload for students. May be repeated for credit. This course has Differential Tuition.

**EGR 3352. Junior Participation in Engineering Projects in Community Service (EPICS). (2-2) 2 Credit Hours.**

Prerequisites: Upper-division standing and permission of instructor required. Continuation of Engineering Projects in Community Service (EPICS). The responsibilities of juniors include working with the seniors in the planning and organization of the project, contributing to the design process, problem solving by contributing expertise from their discipline, meeting with the customer, and the mentorship of sophomores and freshmen. The EPICS procedures manual provides information on expected relative workload for students. May be repeated for credit. This course has Differential Tuition.

**EGR 3353. EPICS Engineering Co-op. (0-0) 3 Credit Hours.**

Prerequisite: Acceptance into the Cooperative Education in Engineering Program and permission of instructor required. Designed for students participating in EPICS Cooperative Education in Engineering Program. Problems related to students' work assignments during their work for co-op employers. No more than 3 semester credit hours of Engineering Co-op may apply to a bachelor's degree. To apply 3 semester credit hours of Engineering Co-op as a technical elective toward a degree in engineering, a student must petition and get approval of a faculty supervisor prior to co-op activities. This course has Differential Tuition.

**EGR 3423. Differential Equations for Engineers. (3-1) 3 Credit Hours.**

Prerequisite: Completion of EGR 1333 or MAT 1223 (or MAT 1224 in previous catalogs), or equivalent, and EGR 2302. Application of mathematical principles to the analysis of engineering problems using ordinary and partial differential equations. Topics include separable ODEs; first-, second-, and higher-order linear constant coefficient ODEs; characteristic equation of an ODE; non-homogeneous equations; Laplace transforms; shifting theorems; convolution; solution of an ODE via Laplace transform; solution to a system of ODEs by diagonalization; numerical solutions to PDEs. One hour of problem-solving recitation. (Credit cannot be earned for both EGR 3423 and EGR 2323). Generally offered: Fall, Spring, Summer. This course has Differential Tuition.

**EGR 3713. Engineering Economic Analysis. (3-0) 3 Credit Hours.**

Prerequisite: ECO 2023, and EGR 1333 or MAT 1223 (or MAT 1224 in previous catalogs). Time-value of money concepts; techniques for economic evaluation of engineering alternatives; depreciation and taxes; inflation and market rates; contracting practices; funding public projects and related public policy issues. Generally offered: Fall, Spring. This course has Differential Tuition. Course Fee: DL01 \$75.

**EGR 4351. Senior Participation in Engineering Projects in Community Service (EPICS). (1-2) 1 Credit Hour.**

Prerequisite: Upper-division standing. Continuation of Engineering Projects in Community Service (EPICS). Seniors are responsible for the management tasks of planning and organizing their team project activity. They are expected to contribute expertise from their discipline to the design of the team's projects throughout most of the design process phases of problem identification, specification development, design, production, and deployment. Seniors will also meet with the customer and mentor the freshman, sophomores, and juniors. The EPICS procedures manual provides information on expected relative workload for students. May be repeated for credit. This course has Differential Tuition.

**EGR 4352. Senior Participation in Engineering Projects in Community Service (EPICS). (2-2) 2 Credit Hours.**

Prerequisites: Upper-division standing and permission of instructor required. Continuation of Engineering Projects in Community Service (EPICS). Seniors are responsible for the management tasks of planning and organizing their team project activity. They are expected to contribute expertise from their discipline to the design of the team's projects throughout most of the design process phases of problem identification, specification development, design, production, and deployment. Seniors will also meet with the customer and mentor the freshman, sophomores and juniors. The EPICS procedures manual provides information on expected relative workload for students. May be repeated for credit. This course has Differential Tuition.

**EGR 4362. Senior EPICS Design I. (1-4) 2 Credit Hours.**

Prerequisite: Permission of instructor required. Continuation of Engineering Projects in Community Service (EPICS). Seniors using EGR 4363 to fulfill capstone or design requirements where approved for their major may be required to satisfy additional course requirements specified by their degree program. The EPICS procedures manual provides information on expected relative workload for students. Seniors are responsible for the management tasks of planning and organizing their team project activity. They are expected to contribute expertise from their discipline to the design of the team's projects throughout most of the design process phases of problem identification, specification development, design, production, and deployment. Seniors will also meet with the customer and mentor the first year, sophomores and juniors. May be repeated for credit. This course has Differential Tuition.

**EGR 4363. Senior EPICS Design I. (1-6) 3 Credit Hours.**

Prerequisite: Permission of instructor required. Continuation of Engineering Projects in Community Service (EPICS). Seniors using EGR 4363 to fulfill capstone or design requirements where approved for their major may be required to satisfy additional course requirements specified by their degree program. The EPICS procedures manual provides information on expected relative workload for students. Seniors are responsible for the management tasks of planning and organizing their team project activity. They are expected to contribute expertise from their discipline to the design of the team's projects throughout most of the design process phases of problem identification, specification development, design, production, and deployment. Seniors will also meet with the customer and mentor the first year, sophomores and juniors. May be repeated for credit. This course has Differential Tuition.

**EGR 4373. Senior EPICS Design II. (1-6) 3 Credit Hours.**

Prerequisite: EGR 4362 or EGR 4363, and permission of instructor. Continuation of EPICS courses. Seniors using EGR 4363 to fulfill capstone or design requirements where approved for their major may be required to satisfy additional course requirements specified by their degree program. The EPICS procedures manual provides information on expected relative workload for students. Seniors are responsible for the management tasks of planning and organizing their team project activity. They are expected to contribute expertise from their discipline to the design of the team's projects throughout most of the design process phases of problem identification, specification development, design, production, and deployment. Seniors will also meet with the customer and mentor the first year, sophomores, and juniors. May be repeated for credit. This course has Differential Tuition.

**EGR 4501. Engineering Ethics and Leadership. (1-0) 1 Credit Hour.**

Prerequisite: EGR 2323 and Upper-division standing. A study of professional engineering ethics including the history of ethical thinking, codes and professionalism, and problem-solving techniques. The connection of engineering ethics to emerging environmental, social, and governance ESG issues. Leadership is introduced using the Student Leadership Challenge to provide fundamental principles of leadership. The course will include case studies, guest speakers, and experiential learning to reinforce the topics. This course has Differential Tuition.

**EGR 4953. Special Studies in Engineering. (3-0) 3 Credit Hours.**

Prerequisite: Consent of instructor. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition. Course Fee: DL01 \$75; STSE \$30; LRE1 #25.

**EGR 4993. Honors Research. (0-0) 3 Credit Hours.**

Prerequisite: Enrollment limited to candidates for college honors during their last two semesters; approval by the College Honors Committee. Supervised research and preparation of an honors thesis. May be repeated once with approval. This course has Differential Tuition.