

# EGR - ENGINEERING

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## **EGR 1012 Introduction to Engineering I (1 Unit)**

An introduction to engineering as a career, including problem solving, engineering disciplines, design, teamwork, and communication. Introduction to multiple tools/techniques used by engineers, including data analysis, numerical methods, error analysis, and the use of computers for solving problems in physics and engineering.

**Corequisite(s):** EGR 1012L and MTH 1033 (or equivalent).

## **EGR 1012L Introduction to Engineering I Lab (1 Unit)**

Laboratory to compliment EGR 1012.

Meets three hours per week.

**Corequisite(s):** EGR 1012

## **EGR 1023 Introduction to Engineering II (2 Units)**

An introduction to the engineering design process building on the tools introduced in EGR 1012. In addition to designing a prototype, students learn the engineering aspects of teamwork development, ethics, professionalism, and reporting.

**Prerequisite(s):** EGR 1012 with a grade of C- or higher.

**Corequisite(s):** EGR 1023L

## **EGR 1023L Introduction to Engineering II Lab (1 Unit)**

Laboratory to compliment EGR 1023.

Meets three hours per week.

**Prerequisite(s):** EGR 1012 with a grade of C- or higher.

**Corequisite(s):** EGR 1023

## **EGR 1043 Introduction to Computer Programming (2 Units)**

Introduces the syntax of a high level programming language with emphasis on the programming environment and the use of the constructs of the language to write simple application programs. Topics include data types, sequential, conditional, and iterative statements, one and multi-dimensional arrays, simple graphical animation, the use of objects, and I/O. Programming assignments get progressively more complex and designed to demonstrate the use of computing in a variety of disciplines including the natural sciences.

Also offered as CSC 1043.

**Prerequisite(s):** MTH 1013 or equivalent.

**Corequisite(s):** EGR 1043L

## **EGR 1043L Introduction to Computer Programming Lab (1 Unit)**

A lab course designed for a hands-on exploration of Introductory Computer Programming. Meets two hours per week.

Also offered as CSC 1043L.

**Prerequisite(s):** MTH 1013 or equivalent.

**Corequisite(s):** EGR 1043

## **EGR 1054 Objects and Elementary Data Structures (3 Units)**

As a continuation of EGR 1043, this course deals with more advanced computing constructs and ideas, reinforced in weekly labs. Topics include object-oriented design, inheritance, polymorphism, exception handling, and recursion, along with more intentional development and debugging strategies. Linked lists are introduced as a viable option for implementing basic ADT's. Students gain experience in the design of graphical user interfaces, event driven programming, and larger programming projects.

Also offered as CSC 1054.

**Prerequisite(s):** EGR 1043 with a grade of C- or higher.

**Corequisite(s):** EGR 1054L

## **EGR 1054L Objects and Elementary Data Structures Lab (1 Unit)**

A lab course designed for a hands-on exploration of Objects and Elementary Data Structures. Meets two hours per week.

Also offered as CSC 1054L.

**Prerequisite(s):** EGR 1043 with a grade of C- or higher.

**Corequisite(s):** EGR 1054

## **EGR 2014 Engineering Mechanics: Statics (3 Units)**

Statics of particles and rigid bodies as applied to engineering design. Topics include vector algebra, forces, moments and couples, conditions of equilibrium, friction, and virtual work.

**Prerequisite(s):** PHY 2044 with a grade of C- or higher.

**Corequisite(s):** EGR 2014L

## **EGR 2014L Engineering Mechanics: Statics Lab (1 Unit)**

A lab course designed for a hands-on exploration of Engineering Mechanics.

Meets three hours per week.

**Prerequisite(s):** PHY 2044 with a grade of C- or higher.

**Corequisite(s):** EGR 2014

## **EGR 2024 Circuit Analysis (3 Units)**

Theory and analysis of electrical circuits. Topics include basic circuit elements, laws of circuit analysis, Kirchoff's laws, loop and nodal analysis, differential equations for modeling electronic circuits, AC and DC analysis, transient analysis, complex impedance and steady state analysis, Laplace Transforms, and frequency domain analysis.

**Prerequisite(s):** PHY 2054 with a grade of C- or higher.

**Corequisite(s):** EGR 2024L

## **EGR 2024L Circuit Analysis Lab (1 Unit)**

A lab course designed for a hands-on exploration of Circuit Analysis.

Meets three hours per week.

**Prerequisite(s):** PHY 2054 with a grade of C- or higher.

**Corequisite(s):** EGR 2024

## **EGR 3003 Python and UNIX (3 Units)**

A course in Python programming that focuses on applications in data science, data analytics, and computational science. Programming exercises will emphasize data analysis techniques using modern third-party libraries. Students will also be introduced to UNIX based commands and utilities in data management and manipulation.

Also offered as CSC 3003.

**Prerequisite(s):** EGR 1043 with a grade of C- or higher.

## **EGR 3014 Operating Systems (4 Units)**

A systems course focusing on operating systems, topics include basic operating system design, process management, device management, memory management, and file systems. Students are introduced to the basics of software evolution, reliability, concurrency, security and protection in the context of single-core, multi-core, distributed, and virtual environments. Class members gain experience using both GUI and command-line interfaces. In the course of implementing the CPU scheduling simulation, students understand the importance of thorough system testing and attention to system specs as they try to make parts of their systems work with those designed by their teammates.

Also offered as CSC 3014.

**Prerequisite(s):** CSC 2052 with a grade of C- or higher or CSC 2054 with a grade of C- or higher.

**EGR 3023 Software Engineering (3 Units)**

This course offers an in-depth treatment of the software development process. Software analysis and design study emphasizes an object-oriented approach that is introduced and contrasted with traditional design methodologies. CASE tools are used during the design process. Also offered as CSC 3023.

**Corequisite(s):** CSC 2054

**EGR 3034 Mechanics of Materials (3 Units)**

Theory and analysis of forces, stress, and strain within engineering structural elements and members. Topics include the theory of stress and strain, elastic and plastic deformation, modes of structural failure, compression and tension, torsion, shear, shafts, beams, posts, transformations of stress and strain.

**Prerequisite(s):** EGR 2014 with a grade of C- or higher and PHY 2044 with a grade of C- or higher.

**Corequisite(s):** EGR 3034L

**EGR 3034L Mechanics of Materials Lab (1 Unit)**

A lab course designed for a hands-on exploration of Mechanics of Materials.

Meets three hours per week.

**Prerequisite(s):** EGR 2014 with a grade of C- or higher and PHY 2044 with a grade of C- or higher.

**Corequisite(s):** EGR 3034

**EGR 3043 Analytical Mechanics: Dynamics (3 Units)**

Newtonian mechanics, dynamics of particles and rigid bodies, oscillatory motion, central forces, inertial tensors, Lagrangian and Hamiltonian formulations.

Also offered as PHY 3043.

**Prerequisite(s):** EGR 2014 with a grade of C- or higher, MTH 2074 with a grade of C- or higher, and PHY 2054 with a grade of C- or higher.

**Recommended:** MTH 3033

**EGR 3053 Analog Electronics (2 Units)**

AC/DC circuit analysis, transients, characteristics of equivalent circuits for diodes, transistors, power supplies, transistor/operational amplifiers, and feedback applications.

**Prerequisite(s):** EGR 2024 with a grade of C- or higher.

**Corequisite(s):** EGR 3053L

**EGR 3053L Analog Electronics Lab (1 Unit)**

A lab course designed for a hands-on exploration of Analog Electronics.

Meets three hours per week.

**Prerequisite(s):** EGR 2024 with a grade of C- or higher.

**Corequisite(s):** EGR 3053

**EGR 3063 Electricity, Magnetism, and Waves I (3 Units)**

Classical electromagnetism including topics in electrostatics, magnetostatics, fields in matter, electromagnetic induction, and Maxwell's equations.

Also offered as PHY 3063.

**Prerequisite(s):** MTH 2074 with a grade of C- or higher and PHY 2054 with a grade of C- or higher.

**Recommended:** MTH 3033

**EGR 3073 Networking and Security (3 Units)**

This course provides an introduction to modern computer network technologies. Students gain an understanding of networking fundamentals including layering and the old OSI model, protocols, standards, and network services. LANS, MANS, WANS, Internet and wireless networks are covered. The class will also cover the basics of network security. The class includes hands-on activities.

Also offered as ISS 3073.

**Prerequisite(s):** CSC 1054 with a grade of C- or higher or EGR 1054 with a grade of C- or higher and Junior standing.

**EGR 3083 Electricity, Magnetism, and Waves II (3 Units)**

Electrodynamics with an emphasis on application of Maxwell's equations particularly to electromagnetic radiation.

Also offered as PHY 3083.

**Prerequisite(s):** EGR 3063

**EGR 3093 Digital Electronics (2 Units)**

Boolean algebra, logic gates, combinational logic circuits, state minimization, flip/flops, sequential circuits, asynchronous and synchronous counters. Course emphasizes design aspects using electronic design software.

**Prerequisite(s):** EGR 2024 with a grade of C- or higher.

**Corequisite(s):** EGR 3093L

**EGR 3093L Digital Electronics Lab (1 Unit)**

A lab course designed for a hands-on exploration of Digital Electronics.

Meets three hours per week.

**Prerequisite(s):** EGR 2024 with a grade of C- or higher.

**Corequisite(s):** EGR 3093

**EGR 3113 Measurement and Instrumentation (3 Units)**

This course provides an in-depth analysis of a variety of commonly used instrumentation in industry and academic research settings. Example instrumentation include: lock-in amplifiers, waveform generators, low-noise preamplifiers, spin-coaters, tensile loading systems, and micromanipulator probe stations. Equipment will be used to carry out a variety of engineering experiments such as: electrical transport, temperature dependent resistivity, and stress-strain of materials.

**Prerequisite(s):** EGR 2014 with a grade of C- or higher and EGR 2024 with a grade of C- or higher.

**EGR 4003 Information and Computer Security (3 Units)**

This course provides an overview of modern topics in information and computer security, including: network security, web security, compliance and operational security, threats and vulnerabilities, privacy and anonymity, application, data and host security, access control and identity management, cryptography. This class includes theoretical analysis and hands-on activities.

Also offered as ISS 4003.

**Prerequisite(s):** CSC 3014 or EGR 3014; EGR 3073 or ISS 3073

**EGR 4013 Thermodynamics (3 Units)**

Fundamental concepts of thermodynamics and statistical mechanics; applications to both classical and quantum systems.

Also offered as PHY 4013.

**Prerequisite(s):** PHY 2054

**Recommended:** MTH 3033

**EGR 4042 Embedded Systems and Robotics (1 Unit)**

Embedded systems are everywhere. They are in your watch, your phone, and your TV. Embedded systems are also found in cars, airplanes, and robots. They are a fundamental part of the "internet of things." In this hands-on course you will learn the basics of designing, interfacing, configuring, and programming embedded systems by working with robots.

**Prerequisite(s):** CSC 2054 or EGR 2024 with a grade of C- or higher.

**Corequisite(s):** EGR 4042L

**EGR 4042L Embedded Systems and Robotics Lab (1 Unit)**

A lab course designed for a hands-on exploration of Embedded Systems and Robotics.

Meets three hours per week.

**Prerequisite(s):** CSC 2054 or EGR 2024 with a grade of C- or higher.

**Corequisite(s):** EGR 4042

**EGR 4054 Computer Architecture and Assembly Language (4 Units)**

This course covers the fundamentals of current pipelined computer designs. Experience with assembly language programming and digital logic and circuit design will be used to motivate the need for certain facets of the more general instruction set architecture. Throughout the course, performance issues, hardware constraints, and memory hierarchy will be shown to inform processor design. Additional topics include integer and floating point arithmetic, I/O and considerations surrounding multi-core architectures.

**Prerequisite(s):** CSC 1054 with a grade of C- or higher or EGR 1054 with a grade of C- or higher and Junior or Senior standing.

**EGR 4063 Solid State Physics (3 Units)**

An introduction to the study of solids, including crystal structure, reciprocal lattices, crystal binding, phonons, and electron band theory. Also offered as PHY 4063.

**Prerequisite(s):** PHY 2054 with a grade of C- or higher.

**EGR 4072 Senior Project I (2 Units)**

This course provides students (teams with) the opportunity to design and build a prototype of a project of their choosing. The students will give an oral presentation of their project in a design review setting. This course will normally be completed in a student's senior year.

**Prerequisite(s):** Consent of instructor.

**EGR 4082 Senior Project II (2 Units)**

This course provides students (teams with) the opportunity to hone and finish building the project design initiated in EGR 4072. The students will prepare a scientific paper about their research/project and give an oral presentation of their findings. This course will normally be completed in a student's senior year.

**Prerequisite(s):** EGR 4072 or consent of instructor.

**EGR 4090 Special Topics in Engineering (1-4 Units)**

The topics chosen in engineering depend on regular or visiting faculty expertise as well as student demand.

May be repeated (with varied topics) up to a total of six (6) units.

**Prerequisite(s):** Consent of instructor.

**EGR 4092 Internship in Engineering (2 Units)**

A supervised experience in which the student works with industry professionals to gain experience in engineering.

May be repeated up to a total of four (4) units. Credit/No Credit.

**Prerequisite(s):** Student must have taken at least two upper-division engineering or physics classes and consent of instructor.

**EGR 4099 Independent Studies in Engineering (1-4 Units)**

Independent investigation, under the supervision of a faculty member, of a specific problem in physics or engineering.

**Prerequisite(s):** Consent of instructor and department chair.

**EGR 4103 Electrical Signals and Systems (3 Units)**

Advanced techniques for the analysis of analog electrical systems.

Topics include: frequency domain analysis, Laplace transforms, Fourier series, Fourier transforms, and continuous versus discrete signal analysis. Frequency response is analyzed using transfer functions, Bode plots, and spectral plots. Digital Signal Processing (DPS) is introduced. Two lectures and one laboratory each week.

**Prerequisite(s):** EGR 2024 with a grade of C- or higher and MTH 3033 with a grade of C- or higher.