

ENGINEERING SCIENCE (ENGR)

ENGR 003. UNDERGRADUATE RESEARCH. (0 Credits)

Students engage in research activities appropriate to their discipline; and through the research experience, to acquire skills, techniques, and knowledge relevant to their field of study. In consultation with a faculty mentor, students will engage in research activity, and make and execute a plan for a project.

This course is repeatable for 99 credits.

ENGR 101. DESIGN OF COFFEE. (2 Credits)

Roast coffee beans and brew and taste coffee while using engineering design to create the perfect cup of coffee using the least amount of electricity. Lec/rec.

ENGR 111. ENGINEERING ORIENTATION I. (3 Credits)

Engineering as a profession, historical development, ethics, curricula and engineering careers. Introduction to problem analysis and solution, data collection, accuracy and variability. Lec/rec.

ENGR 112. INTRODUCTION TO ENGINEERING COMPUTING. (3 Credits)

Systematic approaches to engineering problem solving using computers. Logical analysis, flow charting, input/output design, introductory computer programming and use of engineering software. Lec/lab/rec.

Equivalent to: ENGR 112H

ENGR 112H. INTRODUCTION TO ENGINEERING COMPUTING. (3 Credits)

Systematic approaches to engineering problem solving using computers. Logical analysis, flow charting, input/output design, introductory computer programming and use of engineering software. Lec/lab/rec.

Attributes: HNRS – Honors Course Designator

Equivalent to: ENGR 112

ENGR 199. SPECIAL TOPICS. (0-16 Credits)

Graded P/N.

This course is repeatable for 16 credits.

ENGR 201. ELECTRICAL FUNDAMENTALS I. (3 Credits)

Analysis of linear circuits. Circuit laws and theorems. DC responses of circuits. Operational amplifier characteristics and applications. Lec/lab.

Prerequisites: (MTH 251 with C or better or MTH 251H with C or better) and (MTH 252 [C] or MTH 252H [C])

Equivalent to: ENGR 201H

ENGR 201H. ELECTRICAL FUNDAMENTALS I. (3 Credits)

Analysis of linear circuits. Circuit laws and theorems. DC responses of circuits. Operational amplifier characteristics and applications. Lec/lab.

Attributes: HNRS – Honors Course Designator

Prerequisites: (MTH 251 with C or better or MTH 251H with C or better) and (MTH 252 [C] or MTH 252H [C])

Equivalent to: ENGR 201

ENGR 202. ELECTRICAL FUNDAMENTALS II. (3 Credits)

Sinusoidal steady-state analysis and phasors. Application of circuit analysis to solve single-phase and three-phase circuits including power, mutual inductance, transformers and passive filters. Lec/lab.

Prerequisites: ENGR 201 with C or better or ENGR 201H with C or better

ENGR 203. ELECTRICAL FUNDAMENTALS III. (3 Credits)

Laplace transforms, Fourier series, Bode plots, and their application to circuit analysis.

Prerequisites: (ENGR 201 with C or better or ENGR 201H with C or better) and (ENGR 202 [C] or ENGR 202H [C]) and (MTH 256 [C] or MTH 256H [C])

ENGR 211. STATICS. (3 Credits)

Analysis of forces induced in structures and machines by various types of loading. Lec/rec.

Prerequisites: MTH 252 with C or better or MTH 252H with C or better

Equivalent to: ENGR 211H

ENGR 211H. STATICS. (3 Credits)

Analysis of forces induced in structures and machines by various types of loading. Lec/rec.

Attributes: HNRS – Honors Course Designator

Prerequisites: MTH 252 with C or better or MTH 252H with C or better

Equivalent to: ENGR 211

ENGR 212. DYNAMICS. (3 Credits)

Kinematics, Newton's laws of motion, and work-energy and impulse-momentum relationships applied to engineering systems. Lec/rec.

Prerequisites: (ENGR 211 with C or better or ENGR 211H with C or better) and (PH 211 [C] or PH 211H [C])

Equivalent to: ENGR 212H

ENGR 212H. DYNAMICS. (3 Credits)

Kinematics, Newton's laws of motion, and work-energy and impulse-momentum relationships applied to engineering systems. Lec/rec.

Attributes: HNRS – Honors Course Designator

Prerequisites: (ENGR 211 with C or better or ENGR 211H with C or better) and (PH 211 [C] or PH 211H [C])

Equivalent to: ENGR 212

ENGR 213. STRENGTH OF MATERIALS. (3 Credits)

Properties of structural materials; analysis of stress and deformation in axially loaded members, circular shafts, and beams, and in statically indeterminate systems containing these components. Lec/rec.

Prerequisites: ENGR 211 with C or better or ENGR 211H with C or better

Equivalent to: ENGR 213H

ENGR 213H. STRENGTH OF MATERIALS. (3 Credits)

Properties of structural materials; analysis of stress and deformation in axially loaded members, circular shafts, and beams, and in statically indeterminate systems containing these components. Lec/rec.

Attributes: HNRS – Honors Course Designator

Prerequisites: ENGR 211 with C or better or ENGR 211H with C or better

Equivalent to: ENGR 213

ENGR 221. THE SCIENCE, ENGINEERING AND SOCIAL IMPACT OF NANOTECHNOLOGY. (3 Credits)

Nanotechnology is an emerging engineering field that manipulates atoms and molecules to fabricate new materials and tiny devices. Properties of nanostructured materials, manufacturing methods, characterization methods, and impact on health and safety. Benefits and concerns about nanotechnology will be assessed. Lec/rec. CROSSLISTED as MATS 221.

Equivalent to: MATS 221

Recommended: One year of college science.

ENGR 248. ENGINEERING GRAPHICS AND 3-D MODELING. (3 Credits)

Introduction to graphical communication theory, including freehand sketching techniques, geometric construction, multi-view, pictorial, sectional and auxiliary view representation and dimensioning techniques. Practical application of theoretical concepts using solid modeling software to capture design intent and generate engineering drawings. Lec/Lab.

ENGR 299. SPECIAL TOPICS. (0-16 Credits)

Equivalent to: ENGR 299H

This course is repeatable for 16 credits.

ENGR 299H. SPECIAL TOPICS. (0-16 Credits)

Attributes: HNRS – Honors Course Designator

Equivalent to: ENGR 299

This course is repeatable for 16 credits.

ENGR 321. INTRODUCTION TO MATERIALS SCIENCE. (4 Credits)

Crystal structure, microstructure, and physical properties of metals, ceramics, polymers, composites, and amorphous materials. Also includes elementary mechanical behavior and phase equilibria. Lec. CROSSLISTED as MATS 321.

Prerequisites: CH 202 with C or better or CH 222 with C or better or CH 224H with C or better or ((CH 232 with C or better or CH 232H with C or better) and (CH 262 [C] or CH 262H [C] or CH 272 [C]))

Equivalent to: MATS 321

ENGR 322. MECHANICAL PROPERTIES OF MATERIALS. (3 Credits)

Mechanical behavior of materials, relating laboratory test results to material structure, and elements of mechanical analysis. Lec/lab. CROSSLISTED as MATS 322.

Prerequisites: (ENGR 213 with C or better or ENGR 213H with C or better) and (ENGR 321 [C] or ENGR 321H [C] or MATS 321 [C])

Equivalent to: MATS 322

ENGR 350. *SUSTAINABLE ENGINEERING. (3 Credits)

Examination of technological innovations and alternatives required to maintain human quality of life and environmental sustainability. (Bacc Core Course)

Attributes: CSST – Core, Synthesis, Science/Technology/Society

Equivalent to: ENGR 350H

ENGR 350H. *SUSTAINABLE ENGINEERING. (3 Credits)

Examination of technological innovations and alternatives required to maintain human quality of life and environmental sustainability. (Bacc Core Course)

Attributes: CSST – Core, Synthesis, Science/Technology/Society; HNRS – Honors Course Designator

Equivalent to: ENGR 350

ENGR 352. *CREATIVE COLLABORATION: DESIGNING AND BUILDING. (3 Credits)

Working in multi-disciplinary teams, design, implement, and document a piece of public art work or science museum display. Projects may be made of any media, but must demonstrate creativity both in the engineering used to create them and the technology and society message they convey. (Bacc Core Course) CROSSLISTED as ART 352.

Attributes: CPLA – Core, Pers, Lit and Arts

Equivalent to: ART 352

ENGR 363. *ENERGY MATTERS. (3 Credits)

Establishes a basic energy vocabulary, applies the fundamental concepts of identifying energy use and determining efficiency, and studies the implications of energy decisions in the context of traditional, alternative, and sustainable energy resources. (Bacc Core Course)

Attributes: CSST – Core, Synthesis, Science/Technology/Society

Equivalent to: ENGR 363H

Recommended: MTH 112 or higher

ENGR 363H. *ENERGY MATTERS. (3 Credits)

Establishes a basic energy vocabulary, applies the fundamental concepts of identifying energy and determining efficiency, and studies the implications of energy decisions in the context of traditional, alternative, and sustainable energy resources. (Bacc Core Course)

Attributes: CSST – Core, Synthesis, Science/Technology/Society; HNRS – Honors Course Designator

Equivalent to: ENGR 363

Recommended: MTH 112 or higher

ENGR 390. ENGINEERING ECONOMY. (3 Credits)

Time value of money; economic study techniques, depreciation, taxes, retirement, and replacement of engineering facilities.

ENGR 391. ENGINEERING ECONOMICS AND PROJECT MANAGEMENT. (3 Credits)

Critical issues in the management of engineering and high-technology projects are discussed. Economic, time, and performance parameters of engineering projects are analyzed from the organizational and resource perspectives. Network optimization and simulation concepts are introduced. Fundamental engineering economics concepts are introduced and applied to planning and managing projects.

Equivalent to: ENGR 391H

ENGR 391H. ENGINEERING ECONOMICS AND PROJECT MANAGEMENT. (3 Credits)

Critical issues in the management of engineering and high-technology projects are discussed. Economic, time, and performance parameters of engineering projects are analyzed from the organizational and resource perspectives. Network optimization and simulation concepts are introduced. Fundamental engineering economics concepts are introduced and applied to planning and managing projects.

Attributes: HNRS – Honors Course Designator

Equivalent to: ENGR 391

ENGR 399. SPECIAL TOPICS. (1-16 Credits)

Equivalent to: ENGR 399H

This course is repeatable for 16 credits.

ENGR 399H. SPECIAL TOPICS. (1-16 Credits)

Attributes: HNRS – Honors Course Designator

Equivalent to: ENGR 399

This course is repeatable for 16 credits.

ENGR 407. SEMINAR. (1-16 Credits)

Graded P/N.

Equivalent to: ENGR 407H

This course is repeatable for 16 credits.

ENGR 407H. SEMINAR. (1-16 Credits)

Graded P/N.

Attributes: HNRS – Honors Course Designator

Equivalent to: ENGR 407

This course is repeatable for 16 credits.

ENGR 499. SPECIAL TOPICS. (1-16 Credits)

Equivalent to: ENGR 499H

This course is repeatable for 16 credits.

ENGR 499H. SPECIAL TOPICS. (1-16 Credits)

Attributes: HNRS – Honors Course Designator

Equivalent to: ENGR 499

This course is repeatable for 16 credits.

ENGR 531. APPLIED IMAGING AND IMAGE PROCESSING. (3 Credits)

Explore image formats, storage issues, characteristics and significance of histograms; define and explain image artifacts such as random and periodic noise. Implement different image processing operations such as filters, registration, and mathematical algorithms to enhance an image and facilitate subsequent segmentation such as histogram thresholding, cluster analysis, watershed analysis, etc. Make quantitative measurements from images, such as length, area, orientation, connectivity, anisotropy, and perimeter of objects, as well as porosities, surface areas and curvatures. Apply advanced image analysis via skeletonization, morphological/ topological analysis, surface generation/ triangulation etc.

This course is repeatable for 3 credits.

Recommended: Introductory preparation in mathematical analysis, vectors, matrices, probability, statistics, linear systems, and computer programming

ENGR 550. PROFESSIONAL PREPARATION FOR ENGINEERS. (1 Credit)

Practical training on professional skills essential for a career as a practicing engineer. Covers development of networking and interviewing skills, preparation of a resume and related online media, and guidance on future professional development. As this is a graduate-level course, it will include guidance on how students can develop and present themselves in ways that differentiate their abilities from those of more junior engineers.

ENGR 555. FOUNDATIONS OF ENGINEERING EDUCATION RESEARCH AND PRACTICE. (3 Credits)

An examination as to why engineering education is practiced and researched the way that it is through reading, discussion and writing. The focus of the course will be on written and verbal interactions informed by careful reading of assigned texts.

ENGR 599. SPECIAL TOPICS. (1-16 Credits)

This course is repeatable for 16 credits.