

# OTHER DEGREES & PROGRAMS WITHIN THE COLLEGE OF ENGINEERING

## Undergraduate Programs

### MAJORS

- Engineering Science (<http://catalog.oregonstate.edu/college-departments/engineering/other-degrees-programs/engineering-science-bs-hbs/>)
- Outdoor Products (<http://catalog.oregonstate.edu/college-departments/engineering/other-degrees-programs/outdoor-products-bs-hbs/>)

### Minors

- Humanitarian Engineering (<http://catalog.oregonstate.edu/college-departments/engineering/other-degrees-programs/humanitarian-engineering-minor/>)
- International Engineering (<http://catalog.oregonstate.edu/college-departments/engineering/other-degrees-programs/international-engineering-minor/>)
- Outdoor Products (<http://catalog.oregonstate.edu/college-departments/engineering/other-degrees-programs/outdoor-products-minor/>)

### Engineering Science (ENGR)

## ENGR 003, UNDERGRADUATE RESEARCH, 0 Credits

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

## 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.

*Available via Ecampus*

## ENGR 102, DESIGN ENGINEERING AND PROBLEM SOLVING, 3 Credits

Explores the science of design and Design Thinking, including vetted ways of approaching and defining design problems, assessing stakeholder needs, ideation and concept generation, and prototyping and experimental design. Conducts work in teams of engineering designers to solve complex, real-world engineering problems. Learns methods to assess your problem-solving skills and to question your assumptions, reinforcing your core mathematics and science knowledge and employing computational thinking and programming. Develops advanced professional and communication skills in an engineering design team setting.

## ENGR 103, ENGINEERING COMPUTATION AND ALGORITHMIC THINKING, 3 Credits

Explores fundamental computational concepts and practices with algorithmic thinking. Focuses on problem solving skills, algorithm design, debugging, and writing programs using universal design principles. Articulates limitations in these solutions related to social or structural inequities such as: racial, cultural, gender, socioeconomic and accessibility. Explores computation through an application to specific topics.

**Prerequisite:** ENGR 102 with C or better and Math Placement - ALEKS with a score of 60

**Corequisites:** MTH 112

## 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.

**Equivalent to:** ENGR 111H

## 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

*Available via Ecampus*

## 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.

**Equivalent to:** ENGR 199H

*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.

**Prerequisite:** (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

*Available via Ecampus*

## 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

**Prerequisite:** (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.

**Prerequisite:** ENGR 201 with C or better or ENGR 201H with C or better

**Equivalent to:** ENGR 202H

*Available via Ecampus*

## ENGR 203, ELECTRICAL FUNDAMENTALS III, 3 Credits

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

**Prerequisite:** (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.

**Prerequisite:** MTH 252 with C or better or MTH 252H with C or better

**Equivalent to:** ENGR 211H

*Available via Ecampus*

## 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

**Prerequisite:** 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.

**Prerequisite:** (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

*Available via Ecampus*

## 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

**Prerequisite:** (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.

**Prerequisite:** ENGR 211 with C or better or ENGR 211H with C or better

**Equivalent to:** ENGR 213H

*Available via Ecampus*

## 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

**Prerequisite:** 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 ENG 221/ 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.

*Available via Ecampus*

## 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 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

*Available via Ecampus*

## 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. CROSSLISTED as ART 352/ENGR 352. (Bacc Core Course)

**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.

*Available via Ecampus*

## 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

*Available via Ecampus*

## 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.*

*Available via Ecampus*

## 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 415, ^ENGINEERING CAPSTONE DESIGN I, 4 Credits

Utilizes engineering methodologies in a team environment to develop real-world solutions to an engineering problem. Develops all phases of system development, including project planning, requirements analysis, design, testing, configuration management, quality assurance, documentation, and delivery. First course/term of a two term design project.

**Attributes:** CWIC – Core, Skills, WIC

## ENGR 416, ^ENGINEERING CAPSTONE DESIGN II, 4 Credits

Utilizes engineering methodologies in a team environment to develop real-world solutions to an engineering problem. Teams will be responsible for all phases of system development, including project planning, requirements analysis, design, testing, configuration management, quality assurance, documentation, and delivery. Second course/term of a two term design project.

**Attributes:** CWIC – Core, Skills, WIC

**Prerequisite:** ENGR 415 with C- or better

## ENGR 450, PROFESSIONAL PREPARATION FOR BEGINNING LEVEL 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, job search strategies and guidance on future professional development.

## 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 520, MENG INTRODUCTION TO PORTFOLIO, 1 Credit

Explores OSU resources, Graduate School, and College of Engineering requirements to prepare for work on an MEng final portfolio. Engages in writing skills necessary to complete the final portfolio. Investigates communication styles, Imposter Syndrome, understanding and coping mechanisms, and professional ethics as they relate to an MEng final portfolio.

## ENGR 521, MENG PORTFOLIO COMPLETION, 1 Credit

Demonstrate how graduate learning outcomes have been met. Formulate clear and reasonable professional goals and articulate how the program has helped prepare for achievement of those goals. Create a final portfolio document summarizing core knowledge and its integration with other fields.

**Prerequisite:** ENGR 520 with C or better

## 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.

*Available via Ecampus*

## 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.*

### Outdoor Products (OP)

## OP 101, INTRODUCTION TO THE OUTDOOR PRODUCTS INDUSTRY, 4 Credits

Introduction and history of the outdoor products industry. Characteristics of the industry through time. Current size and breadth of the industry, its economic significance, and its potential employment sectors. Relationship of the industry to the environment and public lands. Scope of industry influence in social justice and public lands policy.

## OP 231, EXPERIENCE OUTDOOR PRODUCTS - WATER, 2 Credits

Hands-on experience with multiple water-related outdoor products in classroom and outdoor settings. Identifying key characteristics for consumers and implications for design, development, marketing, business, and sustainability. Evaluating product performance and developing ideas for objective improvements. Includes one mandatory weekend outdoor-experience outing.

## OP 232, EXPERIENCE OUTDOOR PRODUCTS - WINTER, 2 Credits

Hands-on experience with multiple winter-related outdoor products in classroom and outdoor settings. Identifying key characteristics for consumers and implications for design, development, marketing, business, and sustainability. Evaluating product performance and developing ideas for objective improvements. Includes one mandatory weekend outdoor-experience outing.

## OP 233, EXPERIENCE OUTDOOR PRODUCTS - LAND, 2 Credits

Hands-on experience with multiple land-related outdoor products in classroom and outdoor settings. Identifying key characteristics for consumers and implications for design, development, marketing, business, and sustainability. Evaluating product performance and developing ideas for objective improvements. Includes one mandatory weekend outdoor-experience outing.

## OP 301, OUTDOOR PRODUCTS PROCESS CONNECTIONS, 4 Credits

The interrelated processes and connections of product commercialization. How product design decisions impacts business considerations such as margin, inventory, supply chain, cash flow, and profitability. How design thinking and nurturing a design culture that promotes innovation is necessary for business success and growth. Challenges of product sales and distribution related to design.

**Prerequisite:** OP 231 with C- or better or OP 232 with C- or better or OP 233 with C- or better

## **OP 307, OUTDOOR PRODUCTS PRE-PRACTICUM SEMINAR, 1 Credit**

**Prerequisite:** OP 101 with C- or better

## **OP 309, OUTDOOR PRODUCTS PRACTICUM, 1-6 Credits**

**Prerequisite:** OP 307 with C- or better

*This course is repeatable for 6 credits.*

## **OP 351, OUTDOOR PRODUCTS DESIGN AND DEVELOPMENT I, 4 Credits**

Explores needs-based design for Outdoor Products. Experiential-based projects related to function and design and understanding Design in context of Consumer Needs. Investigates design-choices impact upstream and downstream commercialization processes.

**Prerequisite:** OP 301 with C- or better

## **OP 352, OUTDOOR PRODUCTS DESIGN AND DEVELOPMENT II, 4 Credits**

Exploration of development and product creation cycles for Outdoor Products. Bridging the design and operations phases of commercialization. Investigate quality, sample production, product testing, and costing. Managing how development decisions impact upstream and downstream commercialization processes.

**Prerequisite:** OP 351 with C- or better

## **OP 360, OUTDOOR PRODUCTS BRANDING, MERCHANDISING AND SALES, 4 Credits**

Consumer behavior, emerging markets, building and nurturing brands, strategic communication. Content curation, merchandising and communication. Traditional and non-traditional sales channels.

**Prerequisite:** OP 352 with C- or better

## **OP 410, OUTDOOR PRODUCTS INTERNSHIP, 1-8 Credits**

**Prerequisite:** OP 307 with C- or better

*This course is repeatable for 8 credits.*

### **Science of Engineering (ESC)**

## **ESC 111, INTRODUCTION TO ENGINEERING, 3 Credits**

Describes different fields of engineering; Performs calculations and synthesize results; Develops critical thinking skills and apply to engineering problems; Applies engineering specific technical and soft skills.

**Equivalent to:** MIME 101

## **ESC 340, INTRO TO EXPERIMENTATION, 4 Credits**

Theory and application of instrumentation and measurement techniques are covered. Course topics include fundamentals of sampling theory, error and uncertainty analysis, signal conditioning, sensor fundamentals, and data analysis. Laboratory exercises provide experience utilizing data acquisition hardware and software, as well as a variety of sensors for measuring parameters from mechanical and electrical engineering systems.

**Prerequisite:** CS 162 with C or better and ENGR 202 [C] and PH 213 [C] and ST 314 [C]

## **ESC 350, ENGINEERING MATERIALS, 4 Credits**

An introduction to materials and their structures and properties. The physical and chemical phenomena responsible for the electrical, mechanical, and thermal behavior of solids will be studied.

**Prerequisite:** PH 213 with C or better and CH 232 [C]

## **ESC 401, RESEARCH, 1-16 Credits**

**Equivalent to:** ESE 401

*This course is repeatable for 4 credits.*

## **ESC 498, ^MIME CAPSTONE DESIGN, 4 Credits**

Product design; selection and replacement of major tools, processes, and equipment; paperwork controls; subsystem revision; system or plant revision; selection and training of personnel; long-run policies and strategy. (Writing Intensive Course)

**Attributes:** CWIC – Core, Skills, WIC

**Prerequisite:** ESE 497 with C or better or IE 497 with C or better or ME 497 with C or better or MIME 497 with C or better

**Equivalent to:** ESE 498, IE 498, ME 498

## **ESC 499, SPECIAL TOPICS, 4 Credits**

*This course is repeatable for 16 credits.*