

# ENGINEERING & PHYSICS

While there are slight differences between programs of each branch of engineering and physics, the College provides courses common to all programs. All engineering and physics programs share a common core of math, science, and skills courses. Writing, reading, and mathematics skills are essential. These programs require a high degree of mathematical proficiency, and calculus is required for all transfer programs.

See the [Engineering and Physics page](#) for program and contact information.

## Degrees

### Transfer

#### Associate of Science

- [Engineering Emphasis - Associate of Science \(AS\)](#)

#### Associate of Arts Oregon Transfer

- [Physics - Associate of Arts Oregon Transfer \(AAOT\)](#)

## Courses

### ASTR 100 Introductory Astronomy: Overview of the Universe (4 Credits)

**Recommended preparation:** MTH 60 or MTH 98 or placement into Math level 10.

An overview of the main ideas in our current view of the universe, and how they originated. Galaxies, quasars, stars, pulsars, and planets. Intended primarily for non-science majors interested in a one-quarter survey of classical and modern astronomy.

### ASTR 121 Astronomy: Solar Systems (4 Credits)

**Recommended Preparation:** MTH 60 or MTH 98 or placement into Math level 10.

Introduces the solar system and other planetary systems to a non-science major audience. Examines topics that include the sun, the origin and exploration of the solar system, the formation of planets, the nature of comets and asteroids, the possibility of life on other worlds, and the characterization of planets beyond the solar system. ASTR 121, ASTR 122, and ASTR 123 may be taken in any order.

### ASTR 122 Astronomy: Stars and Stellar Evolution (4 Credits)

**Recommended preparation:** MTH 60 or MTH 98 or placement into Math level 10.

Introduces planet and constellation identification for a non-science major audience. Presents concepts of observed properties of stars, internal structure of stars, and the stages of a star's life (e.g., stellar births, white dwarfs, supernovae, pulsars, neutron stars, and black holes). ASTR 121, ASTR 122, and ASTR 123 can be taken in any order.

### ASTR 123 Astronomy: Galaxies and Cosmology (4 Credits)

**Recommended Preparation:** MTH 60 or MTH 98 or placement into Math level 10.

Introduces fundamental concepts of the universe for a non-science major audience. Explores modern cosmological concepts of the Big Bang, dark matter, curved space, black holes, and galaxy formation. Unpacks the scientific development of these concepts and explains the basic physics underlying them. ASTR 100, ASTR 121, ASTR 122, and ASTR 123 can be taken in any order.

### ASTR 199 Selected Topics: Astronomy (1-6 Credits)

This course is in development.

### ENGR 100 Introduction to Engineering I (3 Credits)

**Prerequisites:** MTH 111Z or higher or minimum placement into Math Level 20.

Explores the spectrum of engineering programs along with professional and academic expectations. Builds basic team skills in a problem solving environment. Identifies significant academic tools and resources to advance critical thinking skills. Analyzes and fabricates possible solutions to engineering challenges.

### ENGR 102 Introduction to Engineering II (3 Credits)

**Prerequisites:** MTH 111Z or higher or minimum placement into Math Level 20.

**Recommended preparation:** ENGR 100 and MTH 112Z.

Explores design strategies and design thinking to define multiple options to engineering problems that satisfy technical and social requirements. Practices professional engineering and communication skills that contribute to the success of teams. Applies appropriate hardware and software tools to implement one or more solutions to a design problem.

### ENGR 103 Introduction to Engineering III (3 Credits)

**Prerequisites:** MTH 111Z or higher minimum placement into Math Level 20.

**Recommended preparation:** ENGR 100 and ENGR 102.

Introduces fundamental computational concepts and practices with algorithmic thinking in the context of engineering problem solving. Explores problem-solving skills, algorithm design, debugging, and writing programs using universal design principles. Examines limitations in these problem solutions related to social or structural inequities. Applies these skills and insights through applications to engineering problems.

### ENGR 199 Selected Topics: Engineering (1-6 Credits)

This course is in development.

### ENGR 201 Electrical Fundamentals (4 Credits)

**Recommended preparation:** PH 202, PH 212 and MTH 251Z, MTH 252Z.

Topics covered in this course include: DC and 1st order transient analysis, Ohm's Law, Kirchhoff's Law (KCL and KVL), nodal analysis, branch analysis, source transformations, Thevenin and Norton equivalent circuits, maximum power transfer, operational amplifiers, inductance, capacitance, and transient response of RL and RC.

### ENGR 202 Electrical Fundamentals II (4 Credits)

**Recommended preparation:** ENGR 201 and MTH 251Z, MTH 252Z.

Topics covered in this course include: AC and 2nd order transient analysis, sinusoids and phasors, sinusoidal steady-state analysis, nodal analysis, branch analysis, source transformations, Thevenin's and Norton's equivalent circuits, sinusoidal steady-state power calculation, and balanced three-phase circuits.

### ENGR 211 Statics (4 Credits)

**Prerequisites:** MTH 251Z and PH 211.

Analyzes forces induced in structures and machines by various types of loading.

### ENGR 212 Dynamics (4 Credits)

**Prerequisites:** ENGR 211 and MTH 252Z.

Studies kinematics, Newton's law of motion, and work-energy and impulse-momentum relationships as applied to engineering systems.

**ENGR 212S 3D Dynamics for Mechanical Engineers (1 Credit)**

**Prerequisites:** ENGR 211; PH 211; and MTH 252Z.

**Prerequisites with concurrency:** ENGR 212.

**Recommended preparation:** PH 213.

Introduces and applies concepts of kinematics and kinetics of particles and rigid bodies in 3 dimensions, with applications to mechanical systems of current interest to engineers.

**ENGR 213 Strength Of Material (4 Credits)**

**Prerequisites:** ENGR 211 and MTH 252Z.

Studies properties of structure materials. Analyzes stress and deformation in axially-loaded members, in circular shafts and beams and in statically indeterminate systems containing these components.

**ENGR 298 Independent Study: Engineering (1-6 Credits)**

**Prerequisites:** Instructor approval required.

**Recommended preparation:** Prior coursework in the discipline.

Individualized, advanced study in engineering to focus on outcomes not addressed in existing courses or of special interest to a student. P/NP grading.

**ENGR 299 Selected Topics: Engineering (1-6 Credits)**

Provides a learning experience in engineering not currently available; this course is in development to be proposed as a permanent course.

**GS 104 Physical Science: Physics (4 Credits)**

**Recommended preparation:** one year of high school algebra or equivalent or concurrent enrollment in MTH 060.

Energy is used as the theme to develop basic understanding of introductory principles of physics. Energy topics include mechanical, acoustic, heat, electric, radiant and nuclear. Emphasis placed on practical application of various energy forms.

**PH 199 Selected Topics: Physics (1-5 Credits)**

Provides a learning experience in physics not currently available; this course is in development to be proposed as a permanent course.

**PH 201 General Physics I (5 Credits)**

**Recommended to be taken with:** MTH 111Z.

Studies Newtonian Mechanics beginning with basic math concepts and continuing into kinematics, dynamics, uniform circular motion, energy, momentum, and rotational equivalents of some of these topics. Lab addresses experiments and applied settings of Newtonian Mechanics along with explorations of diverse methods for analyzing and interpreting scientific data. Meets the basic requirements for many pre-health and life science programs. Should be taken in sequence.

**PH 202 General Physics II (5 Credits)**

**Recommended to be taken with:** MTH 112Z.

Studies basic electrostatic and magnetic interactions. Builds on concepts from PH 201 and continues into electrostatic forces, electric field concepts, electric potential, basic DC circuit concepts, magnetic interactions and forces, sources of magnetic fields and Faraday's Law. Lab addresses concepts and measurements in thermal physics and continues to explore the processes by which science seeks answers to questions. Meets the basic requirements for many pre-health and life science programs. Should be taken in sequence.

**PH 203 General Physics III (5 Credits)**

Studies periodic behavior and topics from modern physics. Builds on concepts from previous terms and considers the physics of periodic motion, mechanical waves, wave interference, standing waves, acoustic waves, electromagnetic waves, geometric optics, diffraction and topics from special relativity to quantum mechanics. Lab includes basic optical experiences along with a long-term project to affirm student abilities to integrate investigative lab concepts from previous terms. Meets the basic requirements for many pre-health and life science programs. Should be taken in sequence.

**PH 211 General Physics I (5 Credits)**

**Recommended preparation:** MTH 251Z.

Studies Newtonian Mechanics beginning with basic math concepts and continuing into kinematics, dynamics, uniform circular motion, energy, momentum, and rotational equivalents of some of these topics. At all stages, applications of calculus to the solving of problems will be explored. Lab addresses experiments and applied settings of Newtonian Mechanics along with explorations of diverse methods for analyzing and interpreting scientific data. Required for engineering students and most students planning programs in the physical sciences. Should be taken in sequence.

**PH 212 General Physics II (5 Credits)**

**Recommended preparation:** MTH 252Z and PH 211.

Studies basic electrostatic and magnetic interactions. Builds on concepts from PH 211 and continues into electrostatic forces, electric field concepts, electric potential, basic DC circuit concepts, magnetic interactions and forces, sources of magnetic fields and Faraday's Law. At all stages, applications of calculus to the solving of problems will be explored. Lab addresses concepts and measurements in thermal physics and continues to explore the processes by which science seeks answers to questions. Required for engineering students and most students planning programs in the physical sciences. Should be taken in sequence.

**PH 213 General Physics III (5 Credits)**

**Recommended preparation:** MTH 253Z and PH 212. Recommended to be taken with: MTH 256.

Studies periodic behavior and topics from modern physics. Builds on concepts from previous terms and considers the physics of periodic motion, mechanical waves, wave interference, standing waves, acoustic waves, electromagnetic waves, geometric optics, diffractions and topics from special relativity to quantum mechanics. At all stages, applications of calculus to the solving of problems will be explored. Lab includes basic optical experiences along with a long-term project to affirm student abilities to integrate investigative lab concepts from previous terms. Required for engineering students and most students planning programs in the physical sciences. Should be taken in sequence.

**PH 298 Independent Study: Physics (1-6 Credits)**

**Prerequisites:** Instructor approval required.

**Recommended preparation:** Prior coursework in the discipline.

Individualized, advanced study in Physics to focus on outcomes not addressed in existing courses or of special interest to a student. P/NP grading.

**PH 299 Selected Topics: Physics (1-5 Credits)**

This course is in development.