

ENGINEERING

These courses include an engineering component and are relevant to more than one engineering discipline. An engineering component includes elements of engineering sciences, mathematics, exploration, historical or modern practice, or design.

Courses

ENGR 099. Engineering Seminar: Becoming a Bucknell Engineer. 0 Credits.

Offered Fall Semester Only; Lecture hours:Varies,Other:1

A weekly seminar for all first-year engineering majors.

ENGR 100. Engineering Design Experience. 1 Credit.

Offered Fall Semester Only; Lecture hours:3,Other:2

Introduction to the study and practice of engineering through authentic design projects centered around a common theme. Project-based course focuses on the engineering design process, teamwork fundamentals, engineering ethics, and the development of both technical and professional skills. Permission of instructor required for non-first-year students.

ENGR 101. Engineering Graphics. .5 Credits.

Offered Spring Semester Only; Lecture hours:1,Lab:2

Introduction to engineering graphics including drawing with drafting instruments, computer-aided drafting and surveying.

ENGR 1NT. ENGR Non-traditional Study. 1 Credit.

Offered Fall, Spring, Summer; Lecture hours:Varies,Other:3

Non-traditional study in engineering. Prerequisite: permission of the instructor.

ENGR 211. Introduction to Chemical Engineering Computing. .5 Credits.

Offered Spring Semester Only; Lecture hours:2,Lab:1

Programming fundamentals and introductory numerical methods. Problems drawn from mathematics and chemical engineering. With computational laboratory. Corequisite: ENGR 211L. Prerequisite: MATH 201. Not open to students who have taken ENGR 212 or ENGR 214.

ENGR 212. Engineering Computation. .5 Credits.

Offered Fall Semester Only; Lecture hours:1,Lab:2

An in-depth introduction to using computers as a fundamental tool for solving civil engineering problems. Course will include: structured programming, and numerical methods. Prerequisite: MATH 222 or equivalent. Not open to students who have taken ENGR 211.

ENGR 214. Computational Analysis. 1 Credit.

Offered Spring Semester Only; Lecture hours:3,Lab:2

Introduction to a modern computer language. Structured programming and algorithm design for engineering problems involving linear algebra, statistical analysis of data, and elementary numerical analysis. Introduction and use of a scientific application package as a tool. Not open to students who have taken ENGR 211 or ENGR 212. Open to mechanical engineering students only.

ENGR 215. Experimental Design and Data Analysis. .5 Credits.

Offered Spring Semester Only; Lecture hours:2,Lab:1

Introduction to the analysis of experimental and industrial data. Topics include statistical inference, analysis of variance, regression analysis, experimental design and computational methods. With computational laboratory. Not open to students who have taken BMEG 226, ENGR 226, MATH 216 or MATH 226.

ENGR 222. Civil Engineering Fluid Mechanics. 1 Credit.

Offered Either Fall or Spring; Lecture hours:3,Lab:3

Fluid properties and hydrostatics. Flow concepts and basic equations. Viscous flow in pipes and channels. Steady pipe flow. Potential flow. Introduction to open channels or hydraulic machinery. Prerequisite: ENGR 229.

ENGR 226. Probability and Statistics for Engineers. .5 Credits.

Offered Fall Semester Only; Lecture hours:1,Lab:2

Exploratory data analysis, probability theory, discrete and continuous random variables, point estimation, sampling distributions and methods of statistical inference. Prerequisites: MATH 202 and only open to civil or environmental engineering students.

ENGR 229. Solid Mechanics I. 1 Credit.

Offered Spring Semester Only; Lecture hours:4

Equilibrium of rigid body systems, including analysis of trusses, beams, and frames for internal forces and moments. Introduction to stress and strain, including their relationship and stress transformations. Prerequisites: (PHYS 211 and MATH 201) or MATH 205, or permission of the instructor.

ENGR 233. Chemical Engineering Fluid Mechanics. 1 Credit.

Offered Spring Semester Only; Lecture hours:3,Lab:2

Fluid statics, laminar and turbulent flow of incompressible fluids; introduction to compressible and non-Newtonian fluids; nature of forces, momentum transfer, shell balances; dimensional analysis; applications to pipe flow, drag, fluid measurement and pump design. With experimental laboratory. Corequisite: CHEG 210 or MATH 212.

ENGR 239. Solid Mechanics II. 1 Credit.**Offered Fall Semester Only; Lecture hours:3,Lab:2**

Behavior of deformable systems: analysis for forces/stresses and deformation/strains due to axial, torsional, flexural, shear, and combined effects. Analysis of indeterminate systems and basic concepts of stability of compression members. Laboratory experiments to demonstrate mechanics principles. Prerequisite: ENGR 229.

ENGR 240. Science of Materials. 1 Credit.**Offered Either Fall or Spring; Lecture hours:3,Lab:2**

Study of the relationships between atomic structure and observable properties of materials. Properties of metallic, ceramic, and polymeric materials. Selection of materials for engineering applications. Measurement and modification of material properties. With experimental laboratory. Pre/Corequisite: one of the following: CHEM 203, CHEM 205, CHEM 207, or equivalent, or instructor permission.

ENGR 242. Materials Engineering. 1 Credit.**Offered Spring Semester Only; Lecture hours:3**

Elements of science of civil engineering materials from a life-cycle perspective. Study of extraction, production, application, deterioration, repair, and end-of-life of wood, steel and concrete. Strategies for sustainable use of materials in civil engineering applications. Prerequisite: ENGR 229. Not open to students who have taken ENGR 240.

ENGR 245. Technical and Professional Communication for Engineers. 1 Credit.**Offered Either Fall or Spring; Lecture hours:4**

Survey of communication, including, but not limited to, oral and poster presentations, professional/business communication, and developing and conveying arguments, all of which are highly relevant to engineers pursuing academic, industrial, or other career paths.

ENGR 248. Engineering Problems. .5-1 Credits.**Offered Both Fall and Spring; Lecture hours:Varies; Repeatable**

Problems in engineering adapted to the needs of the students. Prerequisite: permission of the instructor.

ENGR 249. Introduction to Data Analysis in Python. 1 Credit.**Offered Occasionally; Lecture hours:3,Other:4**

In this course, we will explore the use of Python for data analysis. Through lectures, programming labs and a final project, we will develop skills in both data handling and programming. No prior coding experience is required, but some exposure to programming language(s) (Matlab, R, C++, HTML, etc.) is recommended.

ENGR 250. Product Archeology: Unearthing Business Decisions. .5 Credits.**Offered Either Fall or Spring; Lecture hours:2,Other:2**

An examination of device design by unearthing the technical and business decisions made in bringing a real product to market. Topics will include product dissection, competitive analysis, intellectual property, financial forecasting, marketing, sales, distribution, industry standards, project planning, project management, and individual and team professionalism. Requires permission of the instructor.

ENGR 290. Engineering: Global/Societal Context. 1 Credit.**Offered Occasionally; Lecture hours:Varies; Repeatable**

This study abroad course studies the global and societal context of engineering including impact of traditions, customs, and culture on engineering. A three-week study abroad course. Prerequisites: permission of the instructor.

ENGR 291. The Global Engineer. .25 Credits.**Offered Both Fall and Spring,Offered Occasionally; Lecture hours:1,Other:1; Repeatable**

Engineering and cultural awareness are explored in a global and societal context. Students develop skills necessary to become successful global engineers, informed global citizens and environmental stewards. Students are encouraged to take this course more than once. If the course is repeated four times, students can petition the Associate Dean of Engineering for this course to fulfill the global and societal perspectives requirement. Prerequisite: engineering majors only. Arts and Sciences students by permission of the instructor.

ENGR 400. Engineering Research Design and Methods. 1 Credit.**Offered Fall Semester Only; Lecture hours:3,Other:1**

Overview of common methods in engineering thesis research. Specific topics include literature searches and reviews, hypothesis driven research question formulation, research methodology development, and individual skill development. Upon completion of this course, students will have developed a plan for their thesis research and their professional development as undergraduate or graduate students. Crosslisted as ENGR 600.

ENGR 401. Engineering Research Communication. .25 Credits.**Offered Both Fall and Spring; Lecture hours:1; Repeatable**

Overview of communication strategies for effective oral and poster presentations, written technical documents, and professional communication primarily targeted at activities related to thesis research. Crosslisted as ENGR 601.

ENGR 452. Interdisciplinary Senior Design I. .5 Credits.**Offered Fall Semester Only; Lecture hours:2,Other:2**

Capstone design course emphasizing realization of engineered design solutions in interdisciplinary teams. Focus areas include problem definition, background research, solution generation, team skills, communication, and professional development. Emphasis placed on articulating, addressing, and validating customer-appropriate value proposition.

ENGR 453. Interdisciplinary Senior Design II. 1 Credit.**Offered Spring Semester Only; Lecture hours:3,Other:2**

Second semester of the interdisciplinary engineering design sequence emphasizing fabrication, instrumentation, testing and evaluation, development and roll-out, and final presentation of projects.