Introduction to Engineering Courses (ENGRI)

Introduction to Engineering courses are first-level courses intended to introduce students to various aspects of Engineering. They have no prerequisites and most are cross-listed with a department. Students should take one ENGRI during the first year. (NOTE: Some ENGRI's are offered both fall and spring, others are offered either fall or spring.)

ENGRI 1100: Lasers and Photonics (also AEP 1100); 3 credits
Lasers have had an enormous impact on communications, medicine, remote sensing, and material processing. This course reviews the properties of light that are essential to understanding the underlying principles of lasers and these photonic technologies. There also is a strong, hands-on laboratory component in which the students build and operate a nitrogen laser and participate in several demonstration experiments such as holography, laser processing of materials, optical tweezers, and fiber optics. (Fall, 3 credits)

ENGRI 1101: Engineering Applications of Operations Research; 3 credits
Introduction to the problems and methods of operations research and industrial engineering focusing on problem areas (including inventory, network design, and resource allocation), the situations in which these problems arise, and several standard solution techniques. In the computational laboratory, students encounter problem simulations and use some standard commercial software packages. (Fall, spring, 3 credits)

ENGRI 1110: Nanotechnology (also MSE 1110); 3 credits
Nanotechnology has been enabling the Information Revolution with the development of even faster and more powerful devices for manipulation, storing, and transmitting information. In this hands-on course students learn how to design and manipulate materials to build devices and structures in applications ranging from computers to telecommunications to biotechnology. (Fall, 3 credits)

ENGRI 1120: Introduction to Chemical Engineering; 3 credits
Design and analysis of processes involving chemical change. Students learn strategies for design, such as creative thinking, conceptual blockbusting, and (re) definition of the design goal, in the context of contemporary chemical and biomolecular engineering. Includes methods for analyzing designs, such as mathematical modeling, empirical analysis by graphics, and dynamic scaling through dimensional analysis, to assess product quality, economics, safety, and environmental issues. (Fall, 3 credits)

ENGRI 1130: Sustainable Design for Appledore Island (also CEE 1130); 3 credits
Utilizes a unique environment, Appledore island, as an example of how sustainability is addressed in the design of basic components of the built environment; energy, water supply, and waste treatment. (Spring, 3 credits)

ENGRI 1140: Materials: The Future of Energy (also MSE 1140); 3 credits
New technologies are urgently needed to fulfill projected global energy requirements. Materials properties typically limit the performance that can be achieved in generation, transport, and utilization of energy. The experiential learning course will explore how new materials can increase our energy supply and decrease consumption. Materials issues in photovoltaic, fuel cell, battery, wind, transportation, lighting, and building technologies will be studied. Through integrated lab-based activities, students will develop a broad understanding of materials issues in order to successfully design and build energy generation system. (Spring, 3 credits)

ENGRI 1160: Modern Structures (also CEE 116); 3 credits
Introduction to structural engineering in the 21st century - the challenges structural engineers face and the innovative approaches they are using to address them. Using case studies of famous structures, students learn to identify structural forms and understand how various forms carry load-using principles of statics, mechanics, and material behavior. The historical, economic, social, and political context for each structure is discussed. Case studies of failures are used to explain how structures fail in earthquakes and other extreme events, and students are introduced to analytical and experimental approaches (shake table and wind tunnel testing) to quantifying loads on structures subjected to extreme events. Types of structures considered include skyscrapers, bridges, aircraft, and underground structures. (Fall, 3 credits)

ENGRI 1170: Introduction to Mechanical Engineering (also MAE 1170); 3 credits
Introduction to fundamentals of mechanical and aerospace engineering. Students learn and understand topics such as materials characteristics, the behavior of materials, and material selection for performing engineering function. They also learn fundamentals including topics such as stress and strain, fluid mechanics, heat transfer, automotive engineering, and engineering design and product development. (Fall, 3 credits)

ENGRI 1190: Biomaterials for the Skeletal System (also MSE 1190); 3 credits
Biomaterials are at the intersection of biology and engineering. This course explores natural structural materials in the human body, their properties and microstructure, and their synthetic and semisynthetic replacements. Bones, joints, teeth, tendons, and ligaments are used as examples, with their metal, plastic, and ceramic replacements. Topics include strength, corrosion, toxicity, wear, and biocompatibility. Case studies of design lead to consideration of regulatory approval requirements and legal liability issues. (Fall, 3 credits)
ENGRI 1200: Introduction to Nanoscience and Nanoengineering (also AEP 1200); 3 credits
Lecture/laboratory course designed to introduce freshmen to some of the ideas and concepts of nanoscience and nanotechnology. Topics include nanoscience and nanotechnology-what they are and why they are of interest; atoms and molecules; the solid state; surfaces; behavior of light and material particles when confined to nanoscale dimensions; scanning tunneling microscopy (STM), atomic force microscopy (AFM), micro electromechanical systems (MEMS) design; basic micromachining and chemical synthesis methods, i.e., “top-down” and “bottom-up” approaches to nanofabrication; how to manipulate structures on the nanoscale; physical laws and limits they place on the nanoworld; some far-out ideas. In the laboratory, students use an AFM to record atomic resolution images, use a MEMS computer-aided design software package to model the entire manufacturing sequence of a simple MEMS device, examine the simulated behavior of the device and compare it with real behavior, construct a simple STM and learn through hands on experience the basic workings of the device. (Fall, Spring, 3 credits)

ENGRI 1220: Earthquake! (also EAS 1220); 3 credits
Explores the science of natural hazards, their societal impacts, and means of mitigation. The focus is on earthquakes, volcanoes, and tsunami, but hurricanes, severe weather, climate change, landslides, wildfires, and the threat of extinction from a future impact by an extraterrestrial body are also considered. (Spring, 3 credits)

ENGRI 1270: Introduction to Entrepreneurship and Enterprise Engineering (also MAE 1270); 3 credits
A solid introduction to the entrepreneurial process to students in engineering. The main objective is to identify and to begin to develop skills in engineering work that occurs in high-growth, high-tech ventures. Basic engineering management issues, including the entrepreneurial perspective, opportunity recognition and evaluation, and gathering and managing resources are covered. Technical topics such as the engineering design process, product realization, and technology forecasting are discussed. (Spring, 3 credits)

ENGRI 1310: Introduction to Biomedical Engineering (also BME 1310); 3 credits
An introduction to the field of biomedical engineering with emphasis on application. Specific applications include biomechanics, bioimaging, bioinstrumentation, biotechnology/nanofabrication, artificial organs, cancer therapy and vaccines. (Spring, 3 credits)

ENGRI 1620: Visual Imaging in the Electronic Age (also ARCH 3702, ART 2107, CIS/CS 1620); 3 credits
Interdisciplinary survey course designed to introduce students in the creative arts, science, and engineering to the concepts of 2D and 3D digital pictorial representation and display. It is a concept course that concentrates on "why" rather than "how." Topics include perspective representations, display technology, how television works, bandwidth concepts, digital photography, computer graphics modeling and rendering, color perception, 3D data acquisition, volumetric imaging, and historical precedents, primarily from the art world. (Fall, 3 credits)

ENGRI 1820 - Electricity Lights Camera Action: Nanoengineering for the Future of Bits and Bytes (also ECE 1820)
Our society relies on devices that generate, process, and transmit information. In this course, students will fabricate and test hardware devices that are basic building blocks of modern information processing devices, such as a PDA. The students will fabricate devices that represent information and energy using (1) electrons (nano-memory, transistors, neural probes, fuel-cells), (2) photons (light emitting diodes, e-ink, solar-cells), and (3) electro mechanical interfaces (accelerometers, surface-acoustic wave RF filters, piezoelectric power harvester). Intuition for the devices will be motivated by technology limitations, of what can be accomplished with existing devices, versus what we would want the devices to do. These would-be holy-grail capabilities such as brain-like processing power, free energy, telekinesis, and muscle-like robotic actuators. Group problem solving will address potential solutions to current technology limitations. The intent of this course is to better prepare the students to understand the context of higher-level technical courses in electronics, photonic, and mechanical devices. (Fall, 4 credits)