

Energy and Sustainability Track

This technical track provides undergraduate students a deeper focus in the area of Energy and Sustainability. It is a supplement to the solid foundation in chemical engineering principles and practice they will acquire in the CBE program.

Renewable energy and sustainability are issues of contemporary interest. It is an area many CBE undergraduates end up working in after their graduation. This list of courses supplements their training in chemical engineering and equip them to contribute to the solutions of global sustainability and renewable energy challenges. Knowledge and understanding in Energy and Sustainability will also prepare students to be part of future workforce that will play a significant role in advancing technologies that create sustainable energy sources and energy resource management. The courses include fundamental energy and sustainability science and engineering topics.

Requirements for Energy and Sustainability Track

To fulfill the requirement for this track, students must complete two courses (6 credits total) with C or better grade for each course from the approved list below. Please note that some of the courses listed are not offered by the Department of Chemical Engineering. Some of the courses are not offered every year and you may need to complete additional courses to meet their pre-req requirements.

With approval of the CBE undergraduate program director, students may substitute one of the courses with 3 credits of Undergraduate Research (155:391, 392, 491, or 492 at the junior or senior level) performed in Energy and Sustainability areas supervised by a CBE faculty.

Approved Course List for the Sustainability and Energy track.

1) 11:374:299. Introduction to Sustainability (3 credit)

You see the word Sustainability attached to so many things, but what does it really mean? Are bamboo socks really important? Will electric cars save the world from climate change? What makes development sustainable? How do you measure success in sustainability? Given the long term risk of climate change, what management actions provide the most benefit and why aren't we already doing them?

Prerequisites: None.

2) 11:375:322. Energy Technology and Environment (3 credit)

The purpose of this course is to critically examine the technology of energy systems that will be acceptable in a world faced with global warming, environmental pollution, and declining supplies of oil. The course examines traditional (oil, natural gas, coal), renewable energy sources (solar, wind, biomass), and other non-carbon emitting sources (nuclear) and reduced carbon sources (co-generation, fuel cells). Both devices as well as overall systems will be analyzed.

Prerequisites: 01:640:135, 01:640:137, or 01:640:151

3) 16:155:571. Sustainable, Renewable and Clean Energy Science and Engineering (3 credits)

This course is intended to give mainly but not exclusively a chemical engineering and scientific perspective about conventional energy resources, energy challenges and our endeavors on the development of future, sustainable, clean and renewable energy sources. This course will start by offering an introduction and basic fundamental knowledge and science about available energy resources and fossil fuels. It will follow with the challenges we face related to energy; the current state-of-the-art in energy production; various energy resources and how they work; sustainable methods being developed for generation of various clean and renewable energy sources; and the design and optimization of materials, biomass, chemical products and processes that enable energy conservations. The course will also provide information on new materials/nanomaterials, engineering concepts, and thermochemical, photochemical and electrochemical devices for energy applications. The course will examine the relationship between materials, material designs, energy systems and energy resources to address sustainability and clean energy challenges, by providing special emphasis on fundamental roles played by chemical engineering and basic scientific principles.

Prerequisites: By Permission from the instructor and approval of the undergraduate program director.

4) 11:374:175. Energy and Society (3 credit)

Examines the social, environmental, economic and political impacts of our current human-energy system. Topics investigated include why societies make the energy choices they do, tools for analyzing energy decisions, and strategies and policies for transforming the human-energy system.

Prerequisites: None

5) 11:776:410. Plants for Bioenergy (3 credit)

Bioenergy introduction/discussion; Crops/Biomass Sources: Sugar/Starch, Grass/Fiber, Oil, Residue/Waste, Improvement; Harvest, Storage, Handling, Processing, Quality Analyses; Conversion Technologies; Use in NJ.

Prerequisites: General Biology 01:119:101 and 01:119:102.

6) 14:650:474. Alternative Energy (used to be called Solar Thermal Energy Collection and Storage) (3 credit) Introduction to the design and theory of systems that employ solar thermal energy as a replacement for fossil fuel energy used in buildings and homes. Design project. Open only to senior engineering or physical sciences majors.

Prerequisites: 14:650:351 Thermodynamics