Sustainable Energy (24SEM)

Description

The minor in Sustainable Energy provides students the opportunity to assemble courses in theme areas including: science; engineering and technology; sustainable resources; and social systems and policy. The minor is achieved by taking 16 credit hours that include core courses and advised electives in sustainable energy topics. The minor is designed to engage students from all majors, and provide an educational opportunity that accelerates development of energy systems for the future.

Requirements for Admission and Completion of the Minor:

- Admission to the minor requires that students have a cumulative and major GPA of 2.5 or better.
- Students must meet the pre-requisites for ES 300 (P: CH 101 or PY 212 or PY 208)
- Students must submit a ‘Declare a Minor” form to Registration and Records for adding to the student plan of study – see Minor Coordinator for detail.
- Students can take up to 6 credit hours that double-count for a major or for another minor and may use free elective credits within the major toward this minor.
- Upon completion of the minor requirements, the Minor Coordinator will submit approval for transcript notation.

Course Requirements: The minor will require 16 credit hours.

- ES 300- Energy and Environment (3 Cr)
- ES 497-Professional Development in Environmental Science (1 Cr)
- Advised Elective in Science, Engineering, or Technology (3 Cr) – See advisor for course selection options.
- Select Courses in Consultation with Advisor (9 CR): A student must have at least one elective course at the 400 level or higher.

Examples of focal areas in course selection:

A student majoring Environmental Science wants to pursue a career advancing sustainability in agriculture. The Environmental Science degree requires a minimum of a 15 CR focal area, and the student will use the Sustainability Energy minor to fulfill this degree requirement. Example courses could be:

- ES 300 Energy and Environment (3 CR)
- PB 213 Plants and Civilization (3CR)
- CS 230 Introduction to Agroecology (3CR)
- HS 432 Permaculture: Sustainable Living (3CR)
- AES 343, Agricultural Electrification (4 CR)
- ES 497, Professional Development in Environmental Science (1CR)

A student majoring in Forest Biomaterials is interested in managing forests for bioenergy production, and intends to use the Sustainable Energy minor to connect ecological principles to production of cellulosic bioenergy. Example courses could be:

- ES 300, Energy and Environment (3 CR)
- FOR 204, Silviculture (2CR)
- FOR 260, Forest Ecology (3CR)
- PB 360, Ecology (4CR)
- NR 460, Renewable Natural Resource Management and Policy (3CR)
- ES 497, Professional Development in Environmental Science (1CR)
A student majoring in Computer and Electrical Engineering wants to complete the Sustainability Energy minor to learn more about the science and policy connected to future energy systems. Example courses could be:

- ES 300, Energy and Environment (3 CR)
- ES 200, Climate Change and Sustainability (3 CR)
- EC 205, Fundamental of Economics (3CR)
- PS 320, U.S. Environmental Law and Policy (3 CR)
- CE 478, Energy and Climate (3CR)
- ES 497, Professional Development in Environmental Science (1CR)

A Nuclear Engineering student is interested in completing the Sustainable Energy to learn how Nuclear Engineering interacts with Sustainability. Example courses could be:

- ES 300 Energy and Environment (3 CR)
- MAE 301 Engineering Thermodynamics 1(3 CR)
- ECE 305 Electric Power Systems(3 CR)
- NE 419 Introduction to Nuclear Energy(3 CR)
- MAE 406 Energy Conservation in Industry. (3 CR)
- NE 400 Nuclear Reactor Energy Conversion (3 CR)

A student in Accounting wants learn how business is impacted by sustainability efforts, specifically how business needs to adapt to take advantage of opportunities provided by climate change. Example courses could be:

- ES 300, Energy and Environment (3 CR)
- ES 200, Climate Change and Sustainability (3 CR)
- ET 262, Renewable Energy Adoption: Barriers and Incentives (3CR)
- PS 336, Global Environmental Politics (3CR)
- ARE 436, Environmental Economics (3CR)
- ES 497, Professional Development in Environmental Science (1CR)

A student majoring in Plant and Soil Science is interested in pursuing a career that addressed genetically improving the yield of grain, fuel and fiber crops and the production of these crops in economically and environmentally sustainable way. Example courses could be:

- ES 300 Energy and Environment (3 CR)
- PB 208 Agricultural Biotechnology: Issues and Implications (3CR)
- CS 224 Seeds, Biotechnology and Societies (3CR)
- AES 323 Water Management (3CR)
- NR 460 Renewable Res Policy & Management (3 CR)
- ES 497 Professional Development in Environmental Science (1CR)

**Engineering Tracks for the Sustainable Energy Minor:**

In addition to the required courses (E 497 and ES 300), the following course options provide examples of a sustainable energy focus from the engineering perspective. Please see the catalog description for each course to determine whether or not the course has pre-requisites and any enrollment restrictions. Options should be discussed with the minor coordinator.

Students interested in pursuing an engineering track will be required to take one course focusing on Fundamental Energy and three elective courses.
Fundamental Energy: Select one course from the list below (3 credits)

- NE 201 Introduction to Nuclear Engineering
- NE 202 Radiation Sources, Interaction, and Detection
- MAE 301 Engineering Thermodynamics 1
- ECE 200 Intro to Signals, Circuits and Systems
- MSE 200 or MSE/201 Mechanical Properties of Structural Materials
- CHE 205 Chemical Process Principles

Select 9 hours of Elective Courses: Choose three (3) courses from any of the lists in groups I, II, III, or IV. Select no more than two (2) courses from any one group (Course substitutions may be made with minor advisor approval.)

Group I – Applied Concepts in Electrical Energy

- ECE 211 Electric Circuits
- ECE 305 Electric Power Systems

Group II – Applied Concepts in Thermal and Nuclear Energy

- MSE 301 Introduction to Thermodynamics of Materials.
- MAE 302 Engineering Thermodynamics II
- MAE 310 Heat Transfer Fundamentals
- NE 409 Nuclear Materials
- NE 419 Introduction to Nuclear Energy
- NE 500 Nuclear Reactor Energy Conversion

Group III – Environment and Conservation Engineering

- CE 373 Fundamentals of Environmental Engineering
- CE 478 Energy and Climate
- BAE 422 Systems Approach to Agricultural and Environmental Issues

Group IV – Advanced Engineering Principles

- ECE 331 Principles of Electrical Engineering 1
- ECE 451 Power Systems Analysis.
- ECE 452 Renewable Electric Energy Systems
- BAE402 Transport Phenomena
- PSE 425 Bioenergy and Biomaterials Engineering
- MAE 421 Design of Solar Thermal Systems
- NE 400 Nuclear Reactor Energy Conversion

Minor Coordinator:
Jordan Kern
Jordan Hall Addition 2225, Box 8008
Phone: 919-515-3617
jkern@ncsu.edu

SIS Code: 24SEM