

# ENERGY (ENERGY)

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## **ENERGY 2130 Energy, Environment, and Society 3 Credits**

The course will provide the student with an overview of issues related to energy and renewable energy, including usage trends, historical patterns, social responses to energy changes, economic factors, market forces, geographical concerns, the various forms and sources of energy including renewable energy and bio-energy, how these sources may affect the environment, and recent developments in energy policies in the U.S. and the world. Energy, power, energy sources as well as usage patterns by societies over history will be presented. Field trips may be required in this course.

**Components:** Class

**GE:** Social Sciences

**Prereqs/Coreqs:** P or C: ENGLISH 1130

## **ENERGY 2340 Fundamentals of Energy Sources 4 Credits**

Traditional, renewable, and bio-energy sources and their characteristics will be studied. Advantages and disadvantages of existing and future energy sources will be explored along with the economic and environmental impact of various energy sources including fossil fuels, wind, photovoltaic, geothermal, and biofuels. Field trips may be required for this course.

**Components:** Laboratory, Class

**Prereqs/Coreqs:** P. "C-" or better in ENERGY 2130 or Sophomore standing

## **ENERGY 3130 Sustainability: Ecology, Resources and Practice 3 Credits**

Examination of sustainability, its different meaning in different contexts, the idea of long-term sustainability as the use of resources without compromising the ability of future generations to use those resources, the relationship between energy water resources and consumption; how industrial practices affect the sustainability of ecological systems; population dynamics, demographic trends, energy trends, peak oil, and true energy and resource usage will be explored. Practical applications are examined.

**Components:** Class

## **ENERGY 3230 Biorenewable Resources 3 Credits**

History of Biorenewable resource utilization. Fundamental principles of thermodynamics and chemistry as applied to bioenergy and biorenewable resources including discussion of biopolymer structure and routing of these biopolymers to dedicated energy production models. Current and projected biorenewable resource base, including waste materials and dedicated energy crops. Coverage of genetic efforts to engineer biomass possessing higher energy densities and yields. Overview of production practices of dedicated energy crops. Description of process heat, stationary power, fuels, chemicals, and fibers derived from biorenewable resources. Heat and power conversion processes including combustion, gasification, and anaerobic digestion. Environmental impacts, sustainability, and economics of biorenewable resource use.

**Components:** Class

**Prereqs/Coreqs:** P. ("C-" or better in ENERGY 2340) and (CHEMISTRY 1050 or higher)

## **ENERGY 3320 Understanding Electric Power Systems 2 Credits**

Basic electrical circuits and power in AC and DC systems. Single-phase and 3-phase systems. Components of electric power/energy systems: generation, transmission, and distribution systems. Renewable and non-renewable energy sources. Energy consumption. Interconnected powers systems and smart grid. Electrical standards and safety.

**Components:** Class

## **ENERGY 3330 Electrical Energy Systems and Energy Storage 3 Credits**

Principles of electrical energy generation and transmission systems and electric grid. Single phase and three phase power systems including generators, transformers, and transmission lines. Single and three phase power and energy calculations. Basic electric power electronic converters as applied to grid integration of renewable energy systems. Electrical safety and major energy storage systems.

**Components:** Class

**Prereqs/Coreqs:** P. ("C-" or better in ENERGY 2340) and (PHYSICS 1450 or PHYSICS 2340) and (MATH 2630 or MATH 2640)

## **ENERGY 3430 Green Building Design 3 Credits**

Students will study emerging delivery systems for high performance green buildings. The concept of integrated design is introduced together with emphasis on the main sustainable elements of the building including building site, water, energy, building construction, and Economics and Life-Cycle Costing Analysis. An overview provided on the different rating systems available including LEED, Green Globes, and other available international systems. Emphasis is given on the certification process of the USGBC Leadership in Energy and Environmental Design "LEED" systems as well as an introduction to energy modeling software.

**Components:** Class

**Prereqs/Coreqs:** P. "C-" or better in ENERGY 2130

**ENERGY 3580 Principles of Project Management and Sustainable Development 3 Credits**

This is an upper division course that brings together business-minded students with STEM-minded students who are interested in project management, particularly understanding how sustainable development can be integrated with business models for selecting projects from a portfolio, and sustainable aspects related to project management. Includes the ten knowledge areas within the discipline of project management. Students also work in teams to analyze case studies for decision-making related to energy conservation and non-energy conservation projects.

**Components:** Class

**Cross Offering:** BUSADMIN 3580

**Prereqs/Coreqs:** P. ("C-" or better in ENERGY 2340) or (JR Standing in Business Administration major or Accounting major)

**ENERGY 3830 Short Term Faculty-Led International Experience in Energy 3 Credits**

The course is designed as a field experience that will take place in the specific country. Each course will provide students the opportunity to travel and learn in another country. The course will broaden student awareness on governmental, cultural, and societal issues in the country of travel as they relate to energy consumption, production and efficiency.

**Components:** Field Studies

**GE:** International Education

**Prereqs/Coreqs:** P. sophomore standing and 2.8 gpa

**ENERGY 3950 Sustainability and Renewable Energy Systems Cooperative Education 2 Credits**

Enhancement of the educational experience through the placement of a student with a business, industry, or institution under the direction of the director of SRES Program. During co-op, the student is expected to be away from his/her studies at UWP and work for a company or institution for a semester.

**Components:** Field Studies

**Prereqs/Coreqs:** P. C- or better in ENERGY 2340 and Sophomore standing

**ENERGY 3970 Sustainability and Renewable Energy Systems Internship 1 Credit**

Enhancement of the educational experience through the placement of a student with a business, industry, or institution under the direction of the director of SRES Program. Internship is designed to provide experiential learning experience to the student during the summer period.

**Components:** Field Studies

**Prereqs/Coreqs:** P. C- or better in ENERGY 2340 and Sophomore standing

**ENERGY 4130 Sustainability Policy and Practice 3 Credits**

This course focuses on the development of sustainability best practices in businesses, projects, and ones personal lives; enhances the knowledge and practical skills of students in the area of integrating sustainable development in local and regional businesses and communities. Current government policies which promote as well as inhibit sustainable development at local, state, national, and international level will be presented. The course also provides opportunities for students to evaluate existing sustainability plans, develop plans and polices towards a more sustainable future, and implement such plans in their lives.

**Components:** Class

**Prereqs/Coreqs:** P. ("C-" or better in ENERGY 3130) or GEOGRPHY 3330

**ENERGY 4230 Biofuels 4 Credits**

The focus of this course is on combustion fuels made from non-petroleum sources. It will provide an overview of past, present, and future biofuels through the lens of energy utilization, productions, and infrastructure, as well as the effects of our energy choices on the environment. Biofuels is an interdisciplinary subject, so topics include the chemistry of combustion, fermentation, transesterification, and energy transformation; the biology of feedstocks and microbial organisms; the economics of biofuel production and costs; the environmental impacts of renewable fuels; the politics and policies that lead to advancements and challenges; and the social impacts that this sector has on people.

**Components:** Laboratory, Class

**Prereqs/Coreqs:** P. (("C-" or better in ENERGY 3230) and (MATH 1830 or MATH 4030)) or Consent of the instructor

**ENERGY 4330 Wind and Solar Systems Design 4 Credits**

The electric power industry in the U.S. The solar resource. Photovoltaic (PV) materials. Electrical characteristics of PV cells, modules, and arrays. PV systems. Concentrating solar power systems. PV systems economics. Wind resources. Wind turbine technology and energy production. Wind farms. Wind power economics. Environmental impacts of wind and solar systems. Integration of renewable energy systems into power grid. Smart grid concepts.

**Components:** Laboratory, Class

**Prereqs/Coreqs:** P. ("C-" or better in ENERGY 3330) and (MATH 1830 or MATH 4030)) or consent of instructor

**ENERGY 4430 Building Energy Management 3 Credits**

Students will learn about the fundamentals and objectives of energy management for residential and commercial buildings. Topics include energy auditing, rate structures, economic evaluation, lifecycle costing, lighting efficiency improvement, HVAC optimization, control systems and computers, renewable energy usage, and water management. Students will also be introduced and work with widely used software application in the area of energy management including eQuest and BLCC (Building Life Cycle Costing).

**Components:** Class

**Prereqs/Coreqs:** P. ("C-" or better in ENERGY 3430) and (GENENG 2820 or ACCTING 2020)

**ENERGY 4620 Data Analysis and Verification Tools 3 Credits**

This course will familiarize students with life cycle assessment and analysis; the DMAIC process; measurement, data collection, verification and analysis; database creation; monitoring and control of energy systems; and tools for building energy systems. Commonly used sensors, signal interfacing, measurement electronics, and various types of control devices will be used and tested. Building management systems and sensors will be explored.

**Components:** Class

**Prereqs/Coreqs:** P. MATH 2630 or MATH 2740; C: ENERGY 3330

**ENERGY 4920 Senior Design Project 3 Credits**

Comprehensive design course with team based projects from industry and/or prototype design. Teams will be multi-disciplinary, with a focus on sustainability, renewable energy, bio-energy, or bio-products. Consideration of real-life technical, economic, social, aesthetic, and environmental constraints will be applied. Discussion and experiences in project management, team work, and ethics will be included. A written report and formal presentation are required. Open to graduating seniors and minors only.

**Components:** Laboratory, Class

**Prereqs/Coreqs:** P. Senior standing and ("C-" or better in ENERGY 3580 or minoring in SRES)

**ENERGY 4940 Undergraduate Research 1-3 Credits**

Introduction to scientific research methods, literature review, data analysis, and design.

**Components:** Research

**Prereqs/Coreqs:** P. Junior standing and permission of department chair

**ENERGY 4980 Current Topics in Sustainability and Renewable Energy Systems 1-3 Credits**

In-depth study of a current topic of interest in energy and/or sustainability area. The course aims to better prepare students in the SRES major by providing the latest developments in the energy/renewable energy or sustainability areas and involving students in finding, assimilating and presenting current literature and research. Topics to be covered will be identified by the instructor at the time of the offering.

**Components:** Class

**Prereqs/Coreqs:** P. consent of instructor

**ENERGY 4990 Independent Study 1-3 Credits**

Advanced study or research in an area of specialization selected by student and approved by faculty member.

**Components:** Independent Study

**Prereqs/Coreqs:** P. consent of instructor