

# ENERGY SYSTEMS ENGINEERING (ESE)

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## **ESE 500 Sustainable Energy Systems 3 Credit Hours**

The course provides an overview of energy technology from a broad perspective that encompasses technical and environmental aspects. It covers a wide range of traditional and alternative energy sources and presents assessments of their availability, sustainability, and environmental impacts as well as evaluation of their potential role in solving the global energy problem. Course work includes project.

### **Restriction(s):**

Can enroll if Class is Graduate

Can enroll if Level is Rackham or Graduate

Can enroll if College is Engineering and Computer Science

## **ESE 501 Energy Conversion 3 Credit Hours**

This course covers fundamental engineering principles for converting available energy sources, renewable and nonrenewable, into other energy forms of direct utility. It may include such topics as steam and gas based power plants as well as devices for solar, wind, and hydraulic energy conversion.

### **Restriction(s):**

Can enroll if Class is Graduate

Can enroll if Level is Rackham or Graduate

Can enroll if College is Engineering and Computer Science

## **ESE 502 Energy Storage Systems 3 Credit Hours**

This course introduces the basics of energy storage systems for EDV. It will cover battery basics, ultracapacitors, flywheels, and hybrid energy storage concepts. Battery management, battery charging, and battery safety will be covered. Finally, the requirements of EDV and renewable energy application examples will be explained. Lead acid, nickel metal hydride, and lithium ion batteries will be covered. Other energy storage systems such as super conducting magnetic, hydraulic, compressed air, and integrated (hybrid) energy storage systems, will be discussed as well.

### **Restriction(s):**

Can enroll if Class is Graduate

Can enroll if Level is Rackham or Graduate or or Doctorate

Can enroll if College is Engineering and Computer Science

Can enroll if Major is Computer & Information Science, Software

Engineering, Electrical Engineering, Industrial & Systems Engin, Mechanical Engineering, Automotive Systems Engineering, Computer Engineering

## **ESE 503 Energy Policy, Econ & Environ 3 Credit Hours**

This course will give an overview of the current energy and environment policies, their origin and implementation, and the process of developing such policies. It will consider the public policy issues related to alternative and renewable energy systems at both national and international levels. The roles of government, industry and consumers in making these policies will be discussed. The economics of various alternative energies will be considered and trade-offs between them will be discussed from the viewpoint of availability, safety, environmental impact and related issues.

### **Restriction(s):**

Can enroll if Class is Graduate

Can enroll if College is Engineering and Computer Science

## **ESE 504 Energy Eval/Risk&Optimization 3 Credit Hours**

Formulation of economically efficient strategies and development plans for energy systems requires a sound understanding of energy supply, demand and allocation options as well as the interrelationships between the energy sector, environment, and the economy. Analysis of these energy policy decisions requires evaluation of investment decisions on potential energy projects (and programs) in terms of selected project viability indicators and comparison against a set of decision criteria. This course will provide students the knowledge and skills to identify, analyze, assess, and manage the risks inherent in selecting various energy sources, projects and portfolios of projects. The tools and techniques explored in this class will be applied to energy, environment and resource management policy and investment decisions which are multi-criteria including societal cost and environmental impacts.

### **Restriction(s):**

Can enroll if Class is Graduate

Can enroll if College is Engineering and Computer Science

## **ESE 591 Guided Stud in Energy Systems 1 to 3 Credit Hours**

Individual or group study of an energy systems engineering topic of contemporary interest.

### **Restriction(s):**

Can enroll if Class is Graduate

Can enroll if College is Engineering and Computer Science

## **ESE 699 Master's Thesis 3 to 6 Credit Hours**

Research for master's thesis under the direction of a faculty adviser.

### **Restriction(s):**

Can enroll if Class is Graduate

Can enroll if College is Engineering and Computer Science

\* An asterisk denotes that a course may be taken concurrently.

### Frequency of Offering

The following abbreviations are used to denote the frequency of offering: (F) fall term; (W) winter term; (S) summer term; (F, W) fall and winter terms; (YR) once a year; (AY) alternating years; (OC) offered occasionally