Energy Center, Discovery Park

Mission and Vision: The mission of the Purdue Energy Center is to grow the Purdue energy research and education enterprise. We engage researchers and students in a community that delivers new discoveries and develops disruptive technologies with national and global impact. Our vision is to position Purdue University as a global leader in energy sciences and engineering.

Energy Related Course Listings at Purdue University
(updated August 7, 2015)

Preparation of the next generation of professionals to position Purdue University as a global leader in energy sciences and engineering is a top priority of the Energy Center. At least twenty three departments and schools offer courses related to energy, including the areas of advanced ground vehicle power, batteries and energy storage technologies, bioenergy, clean coal combustion, nuclear energy, various renewable energy technologies, efficient buildings and socioeconomic as well as political aspects related to energy use and policy. The following document provides an overview with prerequisites, and list of courses usually offered during the academic year.

Purdue faculty may submit course updates for addition/deletion from this list by contacting Makeba Washington (makeba@purdue.edu) at Energy Center

Energy Center
Mann Hall, Rm 105
203 South Martin Jischke Dr.
Purdue University
West Lafayette, IN 47907-1971
765.494.5146; energy@purdue.edu
Agricultural and Biological Engineering

**ABE 30400 - Bioprocess Engineering Laboratory**

Credit Hours: 3.00. Laboratory course focused on bioprocessing topics such as fluid flow, mixing, rheology, hydrolysis, and fermentation of biomaterials. Students will participate in design of experiments, system set up, data collection, statistical data analysis, and presentation of results. Typically offered Spring.

**Levels:** Graduate, Professional, Undergraduate  
**Schedule Types:** Distance Learning, Laboratory, Laboratory Preparation  
**Offered By:** College of Agriculture  
**Department:** Ag & Biological Engineering  
**May be offered at any of the following campuses:**  
West Lafayette

Biological Sciences

**BIOL 60000 - Bioenergetics**

Credit Hours: 2.00. (BCHM 66400) Energy transduction in biological membranes: physical chemical foundations; electron transfer, proton translocation; and active transport. Atomic structures of integral membrane protein complexes responsible for respiratory, photosynthetic generation of electrochemical potential; ATPase motor, and structure-based mechanisms. Offered in alternate years. Prerequisite: BCHM 56100, BCHM 56200 and CHM 37300. Typically offered Fall.

2.000 Credit hours

**Levels:** Graduate, Professional, Undergraduate  
**Schedule Types:** Lecture

**Offered By:** College of Science  
**Department:** Biological Sciences

**May be offered at any of the following campuses:**  
West Lafayette

Botany & Plant Pathology

**BTNY 59000 - Special Problems**

Credit Hours: 1.00 to 3.00. Open to graduate students and qualified undergraduates who desire to study special problems in plant science not covered in regular coursework. Credit dependent upon work done. Permission of instructor required. Typically offered Fall Spring Summer.
0.000 TO 3.000 Credit hours

**Levels:** Graduate, Professional, Undergraduate  
**Schedule Types:** Individual Study, Laboratory, Lecture

**Offered By:** College of Agriculture  
**Department:** Botany and Plant Pathology

**Course Attributes:**  
Upper Division, Variable Title

**May be offered at any of the following campuses:**  
- West Lafayette Continuing Ed  
- West Lafayette

**Repeatable for Additional Credit:** Yes - May be repeated an unlimited number of times

**Featured Topic:**  
Plant Carbohydrate Metabolism (CRN 62097)

---

**Earth & Atmospheric Sciences**

**EAS 30100 - Oil !**

Credit Hours: 3.00. Petroleum is a common thread that interweaves Geoscience with the Political-Economic history of the 20th century. Its dominance in current society has major repercussions on our current and future society and environment. The unequal distribution of petroleum and natural gas, coupled with innovative geologists and engineers, has set the stage for the modern geo-political world. This course is a unique survey into the multitude of aspects of petroleum -- from its formation to "resource wars". Typically offered Fall.

3.000 Credit hours

Levels: Graduate, Professional, Undergraduate  
**Schedule Types:** Distance Learning, **Lecture**

**Offered By:** College of Science  
**Department:** Dept of Earth & Atmospheric Sc

Course Attributes:  
CH Technical Electives, M Natural Science, Upper Division

**May be offered at any of the following campuses:**  
- West Lafayette
EAPS 37500 - Great Issues - Fossil Fuels, Energy And Society

Credit Hours: 3.00. Prosperity of the 20th century was based on abundant and cheap energy; during the 21st century we will be faced with difficult challenges. Our society will face higher energy prices, decline of petroleum based fuels supplies, increased environmental effects of fossil fuels usage, and the challenge of solving the technological problems of developing alternative fuels. This course will review the structure, economics, and geopolitical issues faced by fossil fuel industries and the mitigation strategies that will be needed to change to low fossil fuel use society based on low polluting renewable energy sources. Counts for Great Issues course in College of Science for Juniors and Seniors. Typically offered Fall Spring.

Levels: Graduate, Professional, Undergraduate
Schedule Types: Distance Learning, Lecture
Offered By: College of Science
Department: Dept Erth Atmos & Planety Sci

Course Attributes:
Upper Division

May be offered at any of the following campuses:
West Lafayette

Materials Engineering

MSE 59700 - Selected Topics In Materials Engineering (Introduction to the Materials Science of Rechargeable Batteries)

MSE 597 is aimed at junior/senior undergraduate and graduate students interested on developing an understanding on the Materials Science of Rechargeable Batteries. The focus is on electrochemical materials, its non-idealities (e.g., transport limitations, failure mechanisms), and its application to energy storage devices, such as batteries and fuel cells, particularly for portable electronics and hybrid/electric vehicles. This course will deliver an introduction to basic electrochemistry, principles of electrochemical devices, and electroactive materials as used in such systems. Current trends and directions in the field of battery technology will be outlined.

Levels: Graduate, Professional, Undergraduate
Schedule Types: Distance Learning, Individual Study, Laboratory, Lecture

Offered By: School of Materials Engr
Department: Materials Engineering

Course Attributes:
Upper Division, Variable Title

May be offered at any of the following campuses:
West Lafayette Continuing Ed, Indiana College Network, Calumet, West Lafayette.

Repeatable for Additional Credit: Yes - May be repeated an unlimited number of times

Restrictions:
May not be enrolled as the following Classifications:
   Sophomore: 45 - 59 hours
   Sophomore: 30 - 44 hours
   Freshman: 0 - 14 hours
   Freshman: 15 - 29 hours

➤ Mechanical Engineering Technology

MET 22000 - Heat and Power

Credit Hours: 3.00. Heat/Power is an introduction to the principles of thermodynamics and heat transfer. Basic thermodynamic processes are used to evaluate the performance of energy-based systems such as internal combustion engines, power plants, and refrigeration equipment. Typically offered Fall Spring. 0.000 OR 3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Distance Learning, Laboratory, Lecture

Offered By: College of Technology
Department: Mechanical Engineering Tech

Course Attributes:
Lower Division

May be offered at any of the following campuses:

MET 23000 - Fluid Power

Credit Hours: 3.00. This course consists of the study of compressible and incompressible fluid statics and dynamics as applied to hydraulic and pneumatic pumps, motors, transmissions, and controls. Typically offered Fall Spring Summer. 0.000 OR 3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
**MET 32000 - Applied Thermodynamics**

Credit Hours: 3.00. Following a review of fundamental concepts, advanced power and refrigeration cycles are analyzed. Applications such as gas mixtures, air-vapor mixtures, and chemical reactions of combustion processes are presented. Typically offered Fall Spring Summer.

3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

**MET 42100 - Air Conditioning and Refrigeration**

Credit Hours: 3.00. Heat gains and losses, heat-producing equipment, cooling, and refrigeration equipment are studied. System design is presented, including controls and instrumentation for commercial, industrial, and residential systems. Typically offered Fall Spring.

0.000 OR 3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

**Schedule Types:** Distance Learning, Laboratory, Lecture.

**Offered By:** College of Technology

**Department:** Mechanical Engineering Tech
Course Attributes:
Upper Division

May be offered at any of the following campuses:

Learning Objectives: 1. Recognize and explain the operation of common refrigeration and air conditioning equipment. 2. Evaluate the performance of refrigeration and air conditioning equipment. 3. Use appropriate instrumentation for accurate measurements of HVAC&R equipment performance. 4. Identify equipment, operating strategies, or management practices that encourage energy conservation and sustainable buildings. 5. Apply standard industry practices to the design of HVAC&R systems.

MET 42600 - Internal Combustion Engines

Credit Hours: 3.00. The course deals with the fundamentals of internal combustion engines, with emphasis on performance, efficiency, and emissions. A comprehensive review of engine/vehicle operating systems is conducted. Related topics such as turbocharging, fuel oxygenates, lubrication, and computerized engine management are presented. Typically offered Fall Spring Summer.

Levels: Graduate, Professional, Undergraduate
Schedule Types: Distance Learning, Laboratory, Lecture.

Offered By: College of Technology
Department: Mechanical Engineering Tech

Course Attributes:
Upper Division

May be offered at any of the following campuses:

MET 58100 - Workshop In Mechanical Engineering Technology

New Alternative Energy Course-Fuel Cell Fundamentals, Modeling, and Diagnostic
**Credit Hours:** 0.00 to 8.00. Advanced study of technical and professional topics. Emphasis is on new developments relating to technical, operational, and training aspects of industry and technology education. Typically offered Summer Fall Spring.

0.000 TO 8.000 Credit hours

**Levels:** Graduate, Professional, Undergraduate

**Schedule Types:** Individual Study, Laboratory, Lecture

**Offered By:** College of Technology

**Department:** Mechanical Engineering Tech

**Course Attributes:**
Upper Division, Variable Title

**May be offered at any of the following campuses:**
West Lafayette

**Repeatable for Additional Credit:** Yes - May be repeated an unlimited number of times

---

**Physics**

**PHYS 55600 - Introductory Nuclear Physics**

Credit Hours: 3.00. Theory of relativity, brief survey of systematics of nuclei and elementary particles, structure of stable nuclei, radioactivity, interaction of nuclear radiation with matter, nuclear reactions, particle accelerators, nuclear instruments, fission, nuclear reactors. Typically offered Spring.

3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: [Lecture](#)

**Offered By:** College of Science

**Department:** Physics

**Course Attributes:**
CH Technical Electives, Upper Division

**May be offered at any of the following campuses:**
- IUPUI
- Calumet
- West Lafayette
CHE 59700 - Special Topics In Chemical Engineering

Arrange Hours and Credit. Hours and credits to be arranged. Permission of instructor required. Typically offered Fall Spring Summer. 0.000 TO 18.000 Credit hours

Our research motivation also informs our decision to focus on solar energy education. By focusing specifically on this form of alternative energy, we are able to engage students in the technical and economic challenges of designing solar devices as well as bringing them to market. By solving the detailed balance for a single junction photovoltaic device, students are able to understand first hand where the thermodynamic limitations arise. In addition to the physics of the solar energy conversion, students are also exposed to the costs associated with different types of systems. This exposure to the rationales behind choosing one conversion method over another develops the leadership skill of deciding to invest in the cost effective system of the day or a close competitor that has a high potential for improvement. Making sound choices in the face of future technological uncertainty will play an important role in which companies flourish in the growing energy market. By exposing our students to these problems today, they will be better prepared to effectively communicate the issues with others and lead the group of emerging energy professionals.

Levels: Graduate, Professional, Undergraduate
Schedule Types: Individual Study, Laboratory, Lecture, Practice Study Observation

Offered By: School of Chemical Engineering
Department: Chemical Engineering

Course Attributes:
CH Chemical Engr Electives, Upper Division, Variable Title

May be offered at any of the following campuses:
   West Lafayette Continuing Ed
   West Lafayette

Repeatable for Additional Credit: Yes - May be repeated an unlimited number of times.

CE 31100 - Architectural Engineering

Credit Hours: 3.00. This course introduces energy efficiency, thermal comfort, indoor environmental quality and green building design concepts. The course covers
engineering fundamentals required for the design and analysis of building systems such as thermodynamics, fluid mechanics, heat and mass transfer, light and sound transmission. The course presents engineering principles and selected applications related to hygrothermal analysis of building enclosures, air conditioning processes in heating, ventilating and air conditioning systems, building illumination, and building acoustics. Typically offered Fall Spring.

3.000 Credit hours

**Levels:** Graduate, Professional, Undergraduate

**Schedule Types:** Distance Learning, Lecture

**Offered By:** School of Civil Engineering

**Department:** Civil Engineering

**Course Attributes:**
Upper Division

**May be offered at any of the following campuses:**
West Lafayette

**Learning Objectives:** 1. Identify and analyze the characteristics of building environmental loads, building construction, and building operations as they define the requirements for a comfortable and healthy indoor environment. 2. Demonstrate knowledge of thermodynamics, fluid mechanics, heat and mass transfer, photometric quantities and sound transmission for use in building design. 3. Identify, formulate and solve realistic Architectural Engineering problems related to hygrothermal analysis of building enclosures, air conditioning processes in Heating Ventilating and Air Conditioning Systems, pipe and duct flow, building illumination and building acoustics. 4. Demonstrate an understanding of building systems integration to achieve efficient operation.

**CE 41300 - Building Envelope Design And Thermal Loads**

Credit Hours: 3.00. This course discusses the basic thermal processes in buildings and presents comprehensive methods for thermal design of envelope assemblies in commercial and residential buildings. The first part of the course includes steady-state transient conduction through envelope assemblies, convection and radiation heat transfer in buildings, solar radiation and solar gains, thermal performance of windows, internal gains, ventilation and infiltration. The second part of the course considers surface and room energy balance equations and presents analytical and computational models for calculation of hourly heating and cooling loads throughout the year. Climate-based standards, passive solar design, advanced energy guides, and innovative technologies for high performance buildings are discussed. The course also includes a design project on analytical heating/cooling load calculations for a commercial building. Typically offered Fall Spring.

3.000 Credit hours

**Levels:** Graduate, Professional, Undergraduate

**Schedule Types:** Distance Learning, Lecture

**Offered By:** School of Civil Engineering
Department: Civil Engineering

Course Attributes:
Upper Division

Learning Objectives: 1. Calculate heat transfer through envelope assemblies for commercial and residential buildings. 2. Solve energy balance equations for building surfaces and room air. 3. Calculate solar and internal gains and predict transient hourly heating and cooling loads for a building throughout the year using analytical and computational models. 4. Design building envelopes according to national standards. 5. Understand principles of passive solar design and the application of innovative envelope technologies.

CE 51501 - Building Energy Audits

Credit Hours: 3.00. This course is designed to provide students with the necessary skills to perform an energy audit on commercial and residential buildings. Energy accounting procedures for all major building subsystems are covered in detail, along with operational cost analysis of these systems. Students learn fundamental techniques for auditing the building envelope; electrical and lighting systems; heating, ventilation, and air conditioning systems; internal thermal loads; and building maintenance and operation procedures. Students also learn to analyze electric and natural gas utility tariffs and rate structures and apply their findings to the energy auditing process. Typically offered Fall Spring.

Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

Offered By: School of Civil Engineering
Department: Civil Engineering

Course Attributes:
Upper Division

May be offered at any of the following campuses:
West Lafayette

Learning Objectives: 1. Analyze utility tariffs and rate structures for electricity and natural gas, and use the information to help guide energy audits. 2. Perform an energy audit of all major building subsystems, including the building envelope, electrical and lighting systems, heating, ventilation, and air conditioning systems, internal thermal loads, and building maintenance and operation procedures. 3. Numerically model the energy consumption of each of the building subsystems, and run parametric studies to determine and recommend appropriate energy conservation measures.
CE 56100 - Transportation Systems Evaluation

Credit Hours: 3.00. Concepts and principles of transportation economic analysis, transportation costs and benefits, user and nonuser consequences, needs studies, finance and taxation, methods of evaluation of plans and projects, cost-effectiveness, environmental impact assessment. Typically offered Fall.

3.00 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

Offered By: School of Civil Engineering
Department: Civil Engineering

Course Attributes:
CE Transportation Emphasis, Upper Division

May be offered at any of the following campuses:
West Lafayette

CE 56600 - Transportation Planning

Credit Hours: 3.00. Fundamentals of transportation planning. Historical development and current status of techniques used in travel demand forecasting: trip generation, trip distribution, mode choice, traffic assignment. Data collection and use of surveys. Applications to passenger and freight movement in urban and statewide contexts. Implications for policy formulation and analysis. Typically offered Fall.

3.00 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

Offered By: School of Civil Engineering
Department: Civil Engineering

Course Attributes:
CE Transportation Emphasis, Upper Division

May be offered at any of the following campuses:
West Lafayette

➢ School of Electrical and Computer Engineering

ECE 32100 - Electromechanical Motion Devices
Credit Hours: 3.00. The general theory of electromechanical motion devices relating electric variables and electromagnetic forces. The basic concepts and operational behavior of DC, induction, brushless DC, and stepper motors used in control applications are presented. Typically offered Fall Spring.

3.000 Credit hours

**Levels:** Graduate, Professional, Undergraduate  
**Schedule Types:** Distance Learning, Lecture

**Offered By:** School of Elec & Computer Engr  
**Department:** Electrical & Computer Engr

**Course Attributes:**  
Upper Division

**May be offered at any of the following campuses:**  
- West Lafayette Continuing Ed  
- IUPUI  
- North Central  
- West Lafayette

**ECE 32300 - Electromechanical Motion Devices and Systems Laboratory**

Credit Hours: 1.00. Experiments closely coordinated with ECE 32100 involving measurement of fundamental parameters of various electromechanical devices using modern instrumentation techniques. Computer simulation is used to predict steady-state and dynamic operating characteristics. Comparison of predicted and measured performance is emphasized. Typically offered Fall Spring.

1.000 Credit hours

**Levels:** Graduate, Professional, Undergraduate  
**Schedule Types:** Distance Learning, Laboratory

**Offered By:** School of Elec & Computer Engr  
**Department:** Electrical & Computer Engr

**Course Attributes:**  
Upper Division

**May be offered at any of the following campuses:**  
- North Central  
- West Lafayette

**ECE 43200 - Elements Of Power System Engineering**

Credit Hours: 3.00. Fundamental concepts of power system analysis, transmission line parameters, basic system models, steady-state performance, network calculations, power flow solutions, fault studies, symmetrical components, operating strategies, and control. Typically offered Fall.


3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Distance Learning, Lecture

Offered By: School of Elec & Computer Engr
Department: Electrical & Computer Engr

Course Attributes:
Upper Division

May be offered at any of the following campuses:
- IUPUI
- Calumet
- West Lafayette

Learning Objectives: 1. An understanding of the function of the main components in a power system, and the basis of their circuit models. 2. An ability to build a system representation from components’ circuit models and to apply solution techniques to certain operational needs.

ECE 61000 - Energy Conversion

Credit Hours: 3.00. Basic principles of static and electromechanical energy conversion. Control of static power converters. Reference frame theory applied to the analysis of rotating devices. Analysis and dynamic characteristics of induction and synchronous machines. State variable analysis of electromechanical devices and converter supplied electromechanical drive systems. Prerequisite: Master's student standing or higher. Typically offered Fall.

3.000 Credit hours

Levels: Graduate, Indiana College Network, Professional, Undergraduate
Schedule Types: Distance Learning, Lecture

Offered By: School of Elec & Computer Engr
Department: Electrical & Computer Engr

May be offered at any of the following campuses:
- West Lafayette Continuing Ed
- Indiana College Network
- Calumet
- West Lafayette

ECE 69500 - Advanced Topics In Electrical And Computer Engineering

Credit Hours: 1.00 to 3.00. Formal classroom or individualized instruction on advanced topics of current interest. Permission of instructor required. Typically
offered Fall Spring Summer.
1.000 TO 3.000 Credit hours

**Levels:** Graduate, Professional, Undergraduate

**Schedule Types:** Distance Learning, Individual Study, Lecture

All Sections for this Course

**Offered By:** School of Elec & Computer Engr

**Department:** Electrical & Computer Engr

**Course Attributes:**
Variable Title

**May be offered at any of the following campuses:**
- West Lafayette Continuing Ed
- IUPUI
- Calumet
- West Lafayette

Repeatable for Additional Credit: Yes - May be repeated an unlimited number of times

**Featured Topics:**
ECE695 Electromagnetic and Electromechanical Component Design

➢ **School of Mechanical Engineering**

**ME 20000 - Thermodynamics I**

**Credit Hours:** 3.00. First and second laws of thermodynamics, entropy, reversible and irreversible processes, properties of pure substances. Application to engineering problems. Typically offered Spring Summer Fall.

3.000 Credit hours

**Levels:** Graduate, Professional, Undergraduate

**Schedule Types:** Distance Learning, Lecture

**Offered By:** School of Mechanical Engr

**Department:** Mechanical Engineering

**Course Attributes:**
Credit By Exam, Lower Division

**May be offered at any of the following campuses:**
- PU Fort Wayne
- IUPUI
- North Central
- West Lafayette
ME 30000 - Thermodynamics II

Credit Hours: 3.00. Properties of gas mixtures, air-vapor mixtures, applications. Thermodynamics of combustion processes, equilibrium. Energy conversion, power, and refrigeration systems. Typically offered Fall Spring.

Levels: Graduate, Professional, Undergraduate

Schedule Types: Distance Learning, Lecture

Offered By: School of Mechanical Engr

Department: Mechanical Engineering

Course Attributes:
AE Propulsion, CN Technical Electives, Upper Division

May be offered at any of the following campuses:
West Lafayette

ME 43000 - Power Engineering

Credit Hours: 3.00. Rankine cycle analysis, fossil-fuel steam generators, energy balances, fans, pumps, cooling towers, steam turbines, availability (second law) analysis of power systems, energy management systems, and rate analysis. Typically offered Fall.

Levels: Graduate, Professional, Undergraduate

Schedule Types: Distance Learning, Lecture

Offered By: School of Mechanical Engr

Department: Mechanical Engineering

Course Attributes:
CH Engineering Electives, CN Technical Electives, Upper Division

May be offered at any of the following campuses:
IUPUI
West Lafayette

ME 44000 - Automotive Prime Movers: Green Engines And Clean Fuel

Credit Hours: 3.00. Internal combustion engines (ICE), hybrid engines (HE), fuel-cell engines (FCE), and alternative/renewable fuels. ICEs topics- engines with advanced combustion systems such as clean diesels, direct-injection spark-ignition engines (DISI), and low-temperature combustion (LTC) compression-ignition. HE topics- different components of hybrid engines and the powertrain design. FCE topics- fundamentals of fuel cells and automotive applications. Clean fuel topics- biofuels, hydrogen, and natural gas, as well as, other cleaner fossil fuels for automotive applications. Well-to-wheel energy and cost analysis of prime mover designs/fuels. Typically offered Spring.

Levels: Graduate, Professional, Undergraduate

Schedule Types: Lecture

Offered By: School of Mechanical Engr

Department: Mechanical Engineering

Course Attributes:
AE Propulsion, CN Technical Electives, Upper Division

May be offered at any of the following campuses:
IUPUI
West Lafayette
Levels: Graduate, Professional, Undergraduate
Schedule Types: Distance Learning, Laboratory, Laboratory Preparation, Lecture

Offered By: School of Mechanical Engr
Department: Mechanical Engineering

Course Attributes:
Upper Division

May be offered at any of the following campuses:
  IUPUI
  Calumet
  West Lafayette

Learning Objectives: 1. Relate processes in automotive prime movers to engineering fundamentals. 2. Study low-carbon emitting, and LEV, ULEV, SULEV, PZEV, and ZEV prime mover designs. 3. Study prime mover designs that are alternative to conventional combustion engines. 4. Study cleaner alternatives to conventional fossil fuels. 5. Carry out analysis of prime mover designs and fuel alternatives to identify cost and energy tradeoffs.

ME 50100 - Statistical Thermodynamics

Credit Hours: 3.00. The molecular interpretation of thermodynamic equilibrium. Development of the partition function. Introduction to quantum mechanics and molecular spectroscopy. The Maxwell-Boltzmann formulation of statistical mechanics and applications to ideal gases, solids, radiation, and laser diagnostics. The Gibbs formulation of statistical mechanics and application to real gases. Kinetic theory and applications to transport properties and chemical kinetics. Offered in alternate years. Typically offered Fall.

3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

Offered By: School of Mechanical Engr
Department: Mechanical Engineering

Course Attributes:
Upper Division

May be offered at any of the following campuses:
  West Lafayette

ME 50300 - Micro-And-Nano-Scale Energy Transfer Processes

Credit Hours: 3.00. Transport of energy in natural and fabricated micro- and nano-scale structures. Physical nature of energy transport by three carriers – electrons, phonons, and photons. Bulk material properties (e.g., thermal/electrical conductivity) are derived from statistical particle transport theories. Effects of spatial confinement on bulk properties are quantified. Contemporary interdisciplinary engineering applications. Typically offered Spring.
3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

Offered By: School of Mechanical Engr
Department: Mechanical Engineering

Course Attributes:
Upper Division

May be offered at any of the following campuses:
   West Lafayette

Learning Objectives: 1. Gain an understanding of the fundamental elements of solid-state physics. 2. Develop skills to derive continuum physical properties from sub-continuum principles. 3. Apply statistical and physical principles to describe energy transport in modern small-scale materials and devices.

ME 51800 - Analysis of Thermal Systems

Credit Hours: 3.00. Modeling and optimization of thermal systems with a focus on heat-pumping equipment, such as vapor compression, absorption, and some advanced heat-pumping cycles. Students combine the use of thermodynamics, heat transfer, fluid mechanics, and numerical methods to develop and apply mathematical models for the analysis and optimization of specific equipment. Offered in alternate years. Typically offered Fall.
3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

Offered By: School of Mechanical Engr
Department: Mechanical Engineering

Course Attributes:
Upper Division

May be offered at any of the following campuses:
   West Lafayette

ME 59700 – 038 - Gas Turbine Combustion I

Associated Term: Spring 2014

Levels: Graduate, Professional, Undergraduate
Attributes: Upper Division, Variable Title

West Lafayette Campus
Lecture Schedule Type
3.000 Credits
ME 62500 - Advanced Combustion

Credit Hours: 3.00. Coupling of the energy, species, and mass conservation equations with the momentum equation. Statistical treatment of turbulence and the problems of interactions of turbulence with chemistry, radiation, and two-phase flows. Critical study of at least 10 seminal and recent contributions in the combustion literature. Offered in alternate years. Prerequisite: ME 52500. Typically offered Fall.

3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

Offered By: School of Mechanical Engr
Department: Mechanical Engineering

May be offered at any of the following campuses:
West Lafayette

School of Nuclear Engineering

NUCL 11000 - Introduction To Energy Engineering

Credit Hours: 1.00. This course, designed for first-semester freshmen, reviews and discusses the history of energy use by the world, the relation between energy usage and quality of life, the social impact of energy use, and the environmental constraints on energy usage. In particular, the role that engineering disciplines play in solving energy problems will be discussed. The full impact that the various energy alternatives have on economic and environmental issues will be reviewed in order to provide a rational basis for energy choices for the future. Typically offered Fall.

1.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Distance Learning, Lecture

Offered By: School of Nuclear Engineering
Department: Nuclear Engineering

Course Attributes:
Lower Division

May be offered at any of the following campuses:
West Lafayette

NUCL 20000 - Introduction to Nuclear Engineering

Credit Hours: 3.00. A course designed to acquaint students with the field of nuclear
engineering and design. Concepts of fission, fusion, radioactivity, and neutron physics are introduced. Modern applications of nuclear technology, including nuclear medicine, food preservation, space reactors and propulsion. Typically offered Fall Spring. 3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Distance Learning, Lecture

**Offered By:** School of Nuclear Engineering
**Department:** Nuclear Engineering

Course Attributes:
EC Engr Science Electives, Lower Division

May be offered at any of the following campuses:
West Lafayette

**NUCL 40200 - Engineering Of Nuclear Power Systems**

Credit Hours: 3.00. Principles and practice of power plant systems with design applications; thermal cycles, heat transport, mechanical designs, control, safety analysis, shielding analysis, fuel cycles; resources, optimization, options, waste management. Fusion and alternate energy sources. Typically offered Fall. 3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Distance Learning, Lecture

**Offered By:** School of Nuclear Engineering
**Department:** Nuclear Engineering

Course Attributes:
Upper Division

May be offered at any of the following campuses:
West Lafayette

**NUCL 47000 - Fuel Cell Engineering**

Credit Hours: 3.00. The principles of electromechanical energy conversion for a single fuel cell, fuel cell stack, process engineering in the fuel and oxidizer supply systems. Principles, components, operation and performance for alkaline, phosphoric acid, solid polymer, molten carbonate and solid oxide fuel cells. Provides broad insight into science, technology, system design, and safety concerns in design and operation of fuel cells. Typically offered Fall. 3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Distance Learning, Lecture

**Offered By:** School of Nuclear Engineering
**Department:** Nuclear Engineering
NUCL 55100 - Mass, Momentum, And Energy Transfer In Energy Systems

Credit Hours: 3.00. Formulations for analyzing complicated thermal-hydraulic phenomena in energy systems. Derivation of two-phase flow field equations and constitutive relations. Thermal-hydraulic modeling of nuclear reactor systems. Analyses of nuclear reactor safety related phenomena based on conservation principles. Typically offered Fall.
3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

Offered By: School of Nuclear Engineering
Department: Nuclear Engineering

Course Attributes:
Upper Division

May be offered at any of the following campuses:
West Lafayette

NUCL 55200 - Thermal-Hydraulics And Reactor Safety

Credit Hours: 3.00. Applications of thermal-sciences to nuclear reactor safety design and risk assessment. Emphasis on illustrating the use of basic principles in quantitative safety assessments of practical and current interest. The basic topics revolve around multiphase transients and applications which include study of accident analysis and its applications to licensing for light water reactor systems and for liquid metal fast breeder reactor. Typically offered Spring.
3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

Offered By: School of Nuclear Engineering
Department: Nuclear Engineering

Course Attributes:
Upper Division

May be offered at any of the following campuses:
West Lafayette
**NUCL 56300 - Direct Energy Conversion**

Credit Hours: 3.00. Review of energy sources and study of the basic processes of direct energy conversion and their applications to energy utilization, based on both conventional and nuclear energy conversion schemes. Conventional schemes include thermoelectric, photovoltaic, thermonic, magnetohydrodynamic generators, fuel cell systems, etc.; and nuclear energy conversion schemes correspond to nuclear radiation and fusion energy conversion. Permission of instructor required. Typically offered Spring.

3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: Lecture

**Offered By:** School of Nuclear Engineering  
**Department:** Nuclear Engineering

Course Attributes: Upper Division

May be offered at any of the following campuses: West Lafayette

**NUCL 65000 - Thermal Hydraulics For Nuclear Reactor Safety**


3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: Lecture

**Offered By:** School of Nuclear Engineering  
**Department:** Nuclear Engineering

May be offered at any of the following campuses: West Lafayette

**NUCL 66000 - Magnetic Confinement Fusion**

Credit Hours: 3.00. Applications of plasma physics for analysis and design of plasma configurations in fusion reactors. Topics include beam-driven fusion systems, plasma heating and ignition via neutral beams and RF wave heating, plasma waves, kinetic and fluid descriptions of plasmas, and energy transport; blanket neutronics for tritium breeding, energy conversion, and reactor design considerations. Prerequisite: NUCL 56000. Typically offered Spring.

3.000 Credit hours
Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

**Offered By:** School of Nuclear Engineering  
**Department:** Nuclear Engineering

May be offered at any of the following campuses:  
West Lafayette

**NUCL 66100 - Inertial Confinement Fusion**

Credit Hours: 3.00. Inertially confined thermonuclear fusion reactions and energy gains; laser-plasma interactions; hydrodynamic compression; energy transports including electron thermal conduction and radiation transport; beam transport and instabilities; driver energy deposition and the driver development for lasers, particle beams and accelerators; and target designs. Prerequisite: NUCL 56000. Typically offered Fall.

3.000 Credit hours

Levels: Graduate, Professional, Undergraduate  
Schedule Types: Lecture

**Offered By:** School of Nuclear Engineering  
**Department:** Nuclear Engineering

May be offered at any of the following campuses:  
West Lafayette