



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 June 19, 2012)

Preparing 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 Jill Wable (energy@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

➤ Agriculture

[ABE 591 – Biomass Feedstock Systems Engineering](#)

Spring 2012 Semester, Credit 3

Instructor: Dr. Klein E. Iileji

Office: ABE 309

Tel: 49-41198 (office) Email: ileleji@purdue.edu

Office Hours: ABE-309

Class Schedule: Class/Lab – Tuesday and Thursday 3:00-4:15pm (ABE 205)

Consultation: Wednesday 9:00 to 11:30am.

Prerequisites: Applied mathematics, economics and management, agriculture, basic engineering or science courses at the undergraduate level or consent of the instructor.

The course covers logistics and post-harvest engineering and operations of lignocellulosic biomass feedstocks. An overview of the topics covered is listed below: Fuels and chemicals from lignocellulosic biomass; Biofuels and bioproducts conversion technologies and systems; Lignocellulosic biomass feedstock types, supply and logistics Unit operations in post-harvest handling of lignocellulosic biomass; Fundamentals principles in post-harvest handling of lignocellulosic biomass

[ABE 69100 – 003- Biomass-To-Biofuel Pathways](#)

Associated Term: Spring

Levels: Graduate, Professional, Undergraduate

Attributes: Variable Title

West Lafayette Campus

Individual Study Schedule Type

3.000 Credits

➤ Agricultural Economics

[AGEC 69000- Advanced Topics in Energy, Resource, and Environmental Economics](#)

Instructors: Juan Sesmero and Nelson Villoria

Location: RAWLS 2079

Time: Thursday, 12:00 – 12:50 PM

This seminar is intended to create a platform for students to present research or become aware of existing research on energy, resource and environmental economics (*EREE*) in the department and elsewhere. It is intended as an interactive seminar and all participants are expected to present their own work (if feasible), participate in discussions, and/or explore their own research ideas. Students who decide to present their work will have an outstanding opportunity to receive feedback from faculty and peers. See attached course description for more details.

[AGEC 60800 - Benefit-Cost Analysis](#)

Credit Hours: 2.00. Principles and practice for analysis of the benefits and costs of public investments. Topics include measures of project worth, choice of the discount rate, analysis of projects with multiple objectives and purposes, identifying and quantifying benefits and costs, applications of consumer and producer surplus in project analysis, treatment of risk and uncertainty, and shadow pricing techniques for project evaluation in developing countries. Concurrent Prerequisite: AGECE 60400; a graduate course in microeconomic theory. Typically offered Spring.

2.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: Lecture

Offered By: College of Agriculture

Department: Agricultural Economics

May be offered at any of the following campuses:

West Lafayette

Restrictions:

Must be enrolled in one of the following Levels:

Graduate

➤ 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

[EAS 54200 - Economic Geology: Petroleum](#)

Credit Hours: 3.00. Fundamental principles of the origin, migration, accumulation, exploration, and development of petroleum. Study of reservoir fluids, reservoir mechanics, and primary and secondary production techniques. Methods of prospect and leasehold evaluation and economic appraisal. Offered in alternate years. Typically offered Fall Spring.

3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: Lecture, Practice Study Observation, Recitation

Offered By: College of Science

Department: Dept of Earth & Atmospheric Sc

Course Attributes:

CH Technical Electives, Upper Division

May be offered at any of the following campuses:

West Lafayette

[EAS 59100 - Advanced Topics In Earth & Atmospheric Sciences-Solar & Thermal Radiation](#)

Arrange Hours and Credit. Specialized study offered on an individual basis or through specially arranged courses. Permission of instructor required. Typically offered Fall Spring Summer.

0.000 TO 18.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: Distance Learning, Individual Study, Laboratory, Laboratory

Preparation, Lecture, Recitation

Offered By: College of Science

Department: Dept of Earth & Atmospheric Sc

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

➤ Industrial Engineering

[IE 59000 – Power Systems & Smart Grid](#)

Students registering for this course must be pre-registered as a distance student with Engineering Professional Education - <http://proed.purdue.edu>

Associated Term: Spring

Levels: Graduate, Indiana College Network, Professional, Undergraduate

Attributes: Upper Division, Variable Title

West Lafayette Continuing Ed Campus

Distance Learning Schedule Type

3.000 Credits

➤ 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:

IUPUI, North Central, West Lafayette, TSW-Columbus, TSW-Kokomo, TSW-Lafayette, TSW-Muncie, TSW-New Albany, TSW-Richmond, TSW-South Bend.

[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

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:

IUPUI, North Central, West Lafayette, TSW-Columbus, TSW-Kokomo, TSW-Lafayette, TSW-Muncie, TSW-New Albany, TSW-Richmond, TSW-South Bend.

[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

Schedule Types: Distance Learning, [Lecture](#)

Offered By: College of Technology

Department: Mechanical Engineering Tech

Course Attributes:

Upper Division

May be offered at any of the following campuses:

IUPUI, North Central, West Lafayette, TSW-Columbus, TSW-Kokomo, TSW-Lafayette, TSW-New Albany, TSW-Richmond, TSW-South Bend.

[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:

North Central, Calumet, West Lafayette, TSW-Columbus, TSW-Kokomo, TSW-Lafayette, TSW-Muncie, TSW-New Albany, TSW-Richmond, TSW-South Bend.

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 42200 - Power Plants and Energy Conversion](#)

Credit Hours: 3.00. The theories and skills learned from prerequisite coursework are applied to the analysis and design of power plants and their systems and to selected technologies of energy conversion. Industrial procedures and methods are emphasized. Special projects are conducted at the Purdue power plant. Typically offered Fall Spring Summer.

3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: Distance Learning, Lecture

Offered By: College of Technology
Department: Mechanical Engineering Tech

Course Attributes:

Upper Division

May be offered at any of the following campuses:

West Lafayette, TSW-Columbus, TSW-Kokomo , TSW-Lafayette, TSW-Muncie,
TSW-New Albany, TSW-Richmond, TSW-South Bend

[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.

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:

IUPUI, North Central, Calumet, West Lafayette, TSW-Columbus, TSW-Indianapolis,
TSW-Kokomo, TSW-Lafayette, TSW-Muncie, TSW-New Albany, TSW-Richmond,
TSW-South Bend.

[MET 53000 - Facilities Engineering Technology](#)

Credit Hours: 3.00. A study of the application of the engineering sciences and technology to the solution of problems associated with mechanical and electrical systems in buildings. Emphasizes commercial and industrial facilities. Identifying energy conservation measures for both mechanical and electrical systems and evaluating their economic impact are an important focus of the course. Typically offered Fall Spring Summer.

0.000 OR 3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: Laboratory, Lecture

Offered By: College of Technology
Department: Mechanical Engineering Tech

Course Attributes:

Upper Division

May be offered at any of the following campuses:

West Lafayette

➤ Physics

[PHYS 13100 - Concepts In Physics I](#)

Credit Hours: 3.00. A nonmathematical course describing the concepts, language, methods, history, philosophy, and impact on society of physics. Topics include motion, electricity, light, relativity, and quantum physics with applications to areas such as the energy crisis and nuclear energy. Typically offered Fall Spring Summer.
3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: Distance Learning, Lecture

Offered By: Regional Campus Only

Course Attributes:

Lower Division

May be offered at any of the following campuses:

PU Fort Wayne

[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

[PHYS 54700 - Physics Of Semiconductor Devices](#)

Credit Hours: 3.00. Semiconductor phenomena including electronic band structure, impurities, statistics, junctions, nonequilibrium phenomena, and optical properties. Applications to diodes, transistors, solar cells, Gunn oscillators, semiconductor lasers, and acoustoelectric devices. Typically offered Fall.
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:
West Lafayette

[PHYS 65500 - Nuclear Physics I](#)

Credit Hours: 3.00. Fundamental concepts and processes of nuclear physics; theory of angular momentum, isobaric spin, nucleon-nucleon potentials and scattering, structure of the deuteron, photon emission and electromagnetic processes, and weak interactions as applied to nuclei. Prerequisite: PHYS 55600, 66100. Typically offered Spring.
3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

Offered By: College of Science
Department: Physics

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

[PHYS 65600 - Nuclear Physics II](#)

Credit Hours: 3.00. Continuation of PHYS 655. Theory of nuclear structure; nuclear shell and collective models; correlations in nuclear matter; nuclear reactions.

Prerequisite: PHYS 65500. Typically offered Fall.
3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

Offered By: College of Science
Department: Physics

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

[PHYS P1200 - Energy And Technology](#)

Credit Hours: 3.00. Provides the physical basis for understanding interaction of technology and society, and for the solution of problems, such as energy use and the direction of technological change. Intended for students majoring in the humanities, social sciences, business, music and education. Little or no background in science is assumed. Mathematics at the level of one year of high school algebra is used. Typically offered Fall Spring Summer.
3.000 Credit hours

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

Offered By: Regional Campus Only
Department: IUPUI Courses-IUPUI

Course Attributes:
Lower Division

May be offered at any of the following campuses:
TSW-New Albany

➤ Political Science

[POL 52200 - Energy Politics And Public Policy](#)

Credit Hours: 3.00. Examination of current public policy practices and political questions concerning energy, primarily in the United States. The course examines the main issues, participants, and policy orientations in relation to such energy sources as petroleum, electricity, and nuclear power. Typically offered Fall Spring.
3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

Offered By: Regional Campus Only

Course Attributes:
LA Pol Public Policy, Upper Division

May be offered at any of the following campuses:
Calumet

➤ School of Aeronautics and Astronautics

[AAE 56000 - System-Of-Systems Modeling And Analysis](#)

Credit Hours: 3.00. Introduction to features of system-of-systems problems; problem definition tools; role of complexity; network topology analysis and agent-based simulation models; architecture analysis; metrics for multi-stakeholder problems; semester team projects allow students to exercise and critique such methods for analyzing system-of-systems problems. Some background in probability and statistics (e.g. random variables, probability density and distributions, sampling methods) is expected. Typically offered Spring.
3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

Offered By: School of Aero and Astro Engr
Department: Aeronautics & Astronautics

Course Attributes:
Upper Division

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

Learning Objectives: 1. An introduction to modeling and analysis techniques for system-of-systems (SoS) problems in engineering. 2. Center on students' ability for understanding, modeling, and analyzing SoS problems, which consist of multiple, heterogeneous, distributed systems embedded in networks at multiple levels that evolve over time. These problems are often large-scale and interdisciplinary, involving systems and behaviors found in diverse fields such as engineering, economics, social science, policy, etc. 3. Presents recent developments in addressing system-of-systems problems, describes criteria, lexicon, and analysis methodology for their study, and, through semester-long team projects, allows students to explore the many unknowns that persist in this emerging field. 4. The major subjects covered are: distinguishing traits of and behaviors of SoS problems, complexity and complex adaptive systems, agent-based modeling, modern network theory and analysis tools, modeling for decision-making, and exploratory modeling.

➤ School of Chemical Engineering

[CHE 45000 - Design And Analysis Of Processing Systems](#)

Credit Hours: 2.00. Synthesize, develop, and evaluate a preliminary design of a chemical process that meets market requirements for a specific product. Analysis of design alternatives using case studies and optimization methods.

A memorable course for almost all engineers, the senior design course typically challenges students to solve real world problems and gain confidence in their abilities. It is an opportune time to expose students to new trends in engineering, while potentially inspiring their choice in where to start their career. By challenging soon-to-be graduates to map out the world energy portfolio until the year 2050, they are able to explore the opportunities embedded in the energy problem on their own. By their own calculations they see the reasons to work in this sector, providing invaluable personnel for the anticipated shift. The model's worldly basis also instills a sense of how the global economy will continue to intricate the interests of people and industries from all nations. The project also requires students to develop and discuss a technology evolution path for one energy source in depth. This develops the leadership skills of making decisions from incongruent reports, judging the reliability of a source of information and gauging the potential effectiveness of investment in different R&D areas.

Typically offered Spring.
0.000 OR 2.000 Credit hours

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

Offered By: School of Chemical Engineering

Department: Chemical Engineering

Course Attributes:
Upper Division

May be offered at any of the following campuses:
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.

➤ School of Civil Engineering

[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 41400 - Building Mechanical And Electrical System Design](#)

Credit Hours: 3.00. This course covers the design of building mechanical and electrical systems. In the first part of the course students learn principles of designing and integrating heating, ventilation, and air conditioning systems into building air delivery systems, mechanical cooling and heating technologies, duct design and layout, blower and pump selection, and hydronic systems. They also learn to design heating, ventilation, and air conditioning systems within the constraint of achieving satisfactory occupant thermal comfort in buildings. The second part of the course covers design concepts related to building electrical systems; including, single and three-phase power systems, motors, transformers, switching, and relays. The course includes a design project related to mechanical and electrical systems 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

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

Learning Objectives: 1. Utilize building thermal load information together with a knowledge of industry standards and numerical methods to design and integrate efficient heating, ventilation, and air conditioning systems into commercial and residential buildings. 2. Understand the benefits and drawbacks of conventional and innovative mechanical systems, and identify appropriate opportunities for the selection and integration of both. 3. Evaluate the performance and estimate energy consumption of common mechanical systems and components. 4. Understand the operating characteristics and appropriately size the components that are integrated into building electrical systems.

[CE 45000 - Urban Transportation Planning](#)

Credit Hours: 3.00. This class is an introduction to transportation planning in urban areas. The course will cover the history of urban transportation planning, transportation data sources and surveys, fundamentals of travel demand and network modeling, financial issues, transportation planning and environmental issues, local and federal regulations and policies, and contemporary issues. Typically offered Spring.

3.000 Credit hours

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

Offered By: Regional Campus Only

Course Attributes:

Upper Division

May be offered at any of the following campuses:

PU Fort Wayne

[CE 51300 - Lighting In Buildings](#)

Credit Hours: 3.00. This course focuses on the design of illumination systems in buildings (electric and natural lighting) in order to achieve energy efficiency and visual comfort. The first part of the course includes analytical lighting calculation techniques, visual perception, radiative transfer, lamp characteristics, electric lighting system design and control for calculation of required indoor illuminance levels. The second part of the course covers daylighting (natural lighting) systems, including state-of-the-art daylighting prediction models as well as design and control of such devices and advanced metrics. The course also has a lab section, in which the students learn how to work with lighting and daylighting tools and build their own computational transient lighting models in open programming languages, in order to design illumination systems and predict electricity consumption and potential energy savings. Typically offered Fall Spring.

0.000 OR 3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: Laboratory, 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. Understand fundamental illumination concepts. 2. Design and assess the performance of electric and natural lighting systems in buildings. 3. Calculate fundamental illuminance, non-point sources, radiant energy, lamp types, lighting controls, interior lighting design, daylight prediction models, optical properties of windows, advanced metrics and shading devices. 4. Build and solve lighting and daylighting models using advanced software and programming techniques to design lighting systems and calculate energy savings from the use of natural light and lighting controls. 5. Design a project, submit a project report and make an oral presentation (only individual projects are allowed). The project themes cover a wide variety of lighting/daylighting design and control such as: daylighting and lighting design of commercial buildings, measurements/monitoring of lighting levels in laboratory settings, prediction of potential energy savings, impact of shading design and control, and advanced daylighting system modeling.

[CE 51401 - Building Controls](#)

Credit Hours: 3.00. This course is designed to provide students with the knowledge of fundamentals, design, and analysis for building control systems. It primarily consists of three parts. The first part covers basic concepts, terminology, procedures and computations of control systems including block diagrams & transfer functions, open-loop & closed-loop control, control system modeling, time response, root locus techniques, design via root locus, and digital control systems. The second part focuses on issues surrounding the building controls: interfacing components such as sensors and actuators, problems encountered, and state-of-the-art solutions for building energy efficiency and thermal comfort. The third part aims to develop students' ability to convert control system concepts into real building control systems. The course provides a hands-on opportunity for students to complete three projects associated with the three primary components during the semester: indoor environmental quality assessment, building HVAC system commissioning and its control analysis, and new control algorithm development for building energy efficiency, occupant health, and individual productivity. Typically offered Fall Spring. 3.000 Credit hours

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. Demonstrate basic HVAC processes and explain the function, layout, and operation of commercial HVAC systems. 2. Analyze the function, operating characteristics, and appropriate applications of basic control loops and control modes as found in direct digital, analog electronic, electronic and pneumatic commercial control systems. 3. Understand and program a sequence of control, lay out a control system logic diagram and program it into a DDC controller. 4. Understand the function of network devices and network protocols such as a bridge, router, gateway, hub, firewall, Ethernet, TCP/IP, BacNet, and Lon Talk. 5. Use general-purpose and specific building automation software to monitor and control a building HVAC system. 6. Numerically model a building to define the key control parameters for thermal comfort. 7. Develop and program alternative control algorithms for building HVAC systems in order to enable sustainable buildings.

[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.

3.000 Credit hours

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.

3.000 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.
3.000 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 59400 - Transportation Systems Analysis](#)

Credit Hours: 3.00. Identifies concepts fundamental to the planning, design, operation, and management of transportation systems. Aims to impart a systems perspective to transportation problems. Incorporates concepts from economics, engineering, operations research, management, psychology, and public policy analysis. Topics include supply-demand microeconomic framework, analysis of transportation demand, system performance, network equilibrium, and associated case studies. Typically offered Fall.
3.000 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 32400 - Introduction To Energy Systems](#)

Credit Hours: 3.00. In this course, fundamentals of electrical machines, power circuit analysis techniques, concepts including torque, speed, DC machine equivalent circuit, synchronous and asynchronous AC machines, rotating fields, application of electronics on electrical machines, smart grids and their applications in power engineering, use of composite materials in energy applications, and alternative energy methods including solar energy. Typically offered Fall Spring.
3.000 Credit hours

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

Offered By: Regional Campus Only

Course Attributes:
Upper Division

May be offered at any of the following campuses:
PU Fort Wayne

Learning Objectives: 1. Basic knowledge of DC Machines. 2. Basic knowledge of AC Machines. 3. Understanding of power circuit analysis techniques. 4. Basic knowledge of application of electronics on electrical machines. 5. Basic knowledge of smart grids. 6. Basic knowledge of alternative energy methods.

[ECE 40700 - Semiconductor Measurements Laboratory](#)

Credit Hours: 1.00. Experiments incorporating state-of-the-art equipment and measurement techniques are performed to collect electrical characteristics exhibited by a representative set of semiconductor devices including the pn-junction diode, Schottky diode, photo devices (solar cell, photo detectors, LEDs), BJTs, the MOS-Capacitor, MOSFETs, and special resistor-like structures. The devices are subjected to d.c., a.c., and pulse biastry, magnetic fields, optical excitation, and/or temperature ranging. The measured characteristics are subsequently used to deduce information about the internal nature and/or operation of semiconductor devices. 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:
West Lafayette

[ECE 42300 - Electromechanical Motion Control](#)

Credit Hours: 3.00. The operation, analysis, and control of electromechanical systems are covered, including a treatment of electromechanical devices, power electronics, and control systems. Sample applications include servo-systems, propulsion drives, and variable-speed rotational equipment. Typically offered 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

[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 43300 - Power Electronics](#)

Credit Hours: 3.00. Introduction to the fundamental operating principles of power conditioning circuits that are currently being used to effect power flow from AC to DC and vice versa. Emphasis is on the relationship between form and function of these circuits. Circuits discussed will include AC/DC line-commutated converters, DC/DC converters, DC/variable frequency converters, resonant converters, and AC/AC converters. Computer simulations will be used as a part of the coursework. 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

[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 62500 - Analysis Of Electromechanical Systems II](#)

Credit Hours: 3.00. Extension of ECE 525. Electric propulsion systems including presentation of cycloconverter and rectifier-inverter drive systems. Dynamic and steady-state analysis of machine performance with series controlled rectifiers in the stator or rotor phases. MMF space harmonic analysis. Prerequisite: ECE 62500.

Typically offered 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

May be offered at any of the following campuses:

West Lafayette Continuing Ed
West Lafayette

[ECE 63000 - Topics In Energy Sources And Systems Engineering](#)

Credit Hours: 1.00 to 3.00. Coverage of selected topics in energy sources and systems engineering. Topics may change from semester to semester and will be announced one semester in advance. Possible topics include: machine modeling, power electronics, HVDC transmission, alternative energy systems, or power system topics. Typically offered Fall Spring.

1.000 TO 3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

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

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

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

[ECE 63300 - Modeling And Simulation Of Power System Components](#)

Credit Hours: 3.00. Recommended for those interested in learning to use computer simulation to investigate the dynamic and controlled behavior of electrical power components. Beginning with an introduction to MATLAB/SIMULINK, the course goes through the key steps of modeling, implementing and verifying the simulation of single and three-phase transformers, single and three-phase induction machines, three-phase wound field synchronous machines and permanent magnet machines useful in power applications, each case amply illustrated in projects around some interesting topics. Students are expected to implement and verify about 10 simulation projects and also discuss observed behaviors on topics such as inrush current in transformers, motoring, generating and braking operation of machines, and pulsating torque from subsynchronous resonance. Prerequisite: ECE 42500 or 43200.

Typically offered Fall.

0.000 OR 3.000 Credit hours

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

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

May be offered at any of the following campuses:
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

ECE695 Power Electronic Converters and Systems

ECE695 Grid Integration of Renewable Energy System

➤ School of Mechanical Engineering

[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.

3.000 Credit hours

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 30201 - 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 Summer.
3.000 Credit hours

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

Offered By: Regional Campus Only

Course Attributes:
Upper Division

May be offered at any of the following campuses:
North Central

[ME 30600 - General Thermodynamics II](#)

Credit Hours: 3.00. Thermodynamic relations. Power and refrigeration cycles, methods of thermodynamic analysis, technical thermodynamics and design, energy conversion. Thermodynamics of combustion processes and equilibrium. Typically offered Fall Spring Summer.
3.000 Credit hours

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

Offered By: Regional Campus Only

Course Attributes:
Upper Division

May be offered at any of the following campuses:
Calumet

[ME 40300 - Thermal Science Applications](#)

Credit Hours: 3.00. Applications of thermal science theory to such topics as heating, ventilating, and air conditioning; real cycles of combustion engines; turbomachinery; power plants and combustion. Typically offered Fall Spring Summer.
3.000 Credit hours

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

Offered By: Regional Campus Only

Course Attributes:
Upper Division

May be offered at any of the following campuses:
IUPUI

[ME 41400 - Thermal-Fluid Systems Design](#)

Credit Hours: 3.00. Application of basic heat transfer and fluid flow concepts to design of thermal-fluid systems. Emphasis on design theory and methodology. Design experience in thermal-fluid area such as piping systems, heat exchangers, HVAC, and energy systems. Design projects are selected from industrial applications and conducted by teams. Typically offered Fall Spring.
3.000 Credit hours

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

Offered By: Regional Campus Only

Course Attributes:
Upper Division

May be offered at any of the following campuses:
IUPUI

[ME 41500 - Energy Systems Engineering](#)

Credit Hours: 3.00. Application of thermodynamics, fluid mechanics, and heat transfer fundamentals to the design of energy systems. Applications include thermal regulation in buildings, nuclear/fossil fuel power plants, internal combustion engines, gas turbines, electronic equipment, processing of primary metals and plastics, and manufacturing processes. Optimization techniques, energy costs, economics, and environmental issues. Typically offered Spring.
3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: Distance Learning, 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 42100 - Heating and Air Conditioning I](#)

Credit Hours: 3.00. Fundamentals of fluid flow and heat transfer. Comfort conditions. Psychometrics. Solar radiation. Design conditions. Heating and cooling loads. Ventilation. Air distribution. Fans and pumps. Duct design. Pipe sizing. Refrigeration. Air conditioning systems. Typically offered Fall Spring Summer.

3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: Distance Learning, Lecture

Offered By: Regional Campus Only

Course Attributes:

Upper Division

May be offered at any of the following campuses:

PU Fort Wayne

[ME 42500 - Intermediate Heat Transfer: Theory And Applications](#)

Credit Hours: 3.00. Analytical study of conduction; energy and momentum equations in convective heat transfer and review of empirical relations; boiling and condensation; applications in heat transfer such as heat exchangers, refrigeration, and freezing of foods, cooling of electronic equipment, and heating and cooling of buildings. Typically offered Fall Spring Summer.

3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: Distance Learning, Lecture

Offered By: Regional Campus Only

Course Attributes:

Upper Division

May be offered at any of the following campuses:

PU Fort Wayne

[ME 42600 - Heating And Air Conditioning Analysis](#)

Credit Hours: 3.00. Psychometrics, air conditioning systems, equipment selection, duct design and piping design. Heating and cooling loads, solar radiation and heat transmission in buildings. Heat pumps. Application of air conditioning to residences, computer rooms, light commercial and high-rise buildings. Typically offered Fall Spring. 3.000 Credit hours

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

Offered By: Regional Campus Only

Course Attributes:
Upper Division

May be offered at any of the following campuses:
Calumet

[ME 42700 - Sustainable Energy Sources And Systems](#)

Credit Hours: 3.00. An introduction to energy sources and energy systems with an emphasis on sustainability. Students will apply material from thermodynamics, fluid mechanics, and heat transfer to analyze and design energy systems that utilize non-renewable energy sources such as fossil fuels, nuclear fission and fusion, and hydrogen, as well as renewable energy sources such as solar, wind, biofuels, geothermal, and oceans. Economic, environmental, social, and political issues related to energy are also considered. Typically offered Fall Spring. 3.000 Credit hours

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

Offered By: Regional Campus Only

Course Attributes:
Upper Division

May be offered at any of the following campuses:
PU Fort Wayne

Learning Objectives: 1. Evaluate and compare non-renewable and renewable energy sources for energy content and environmental impact. 2. Perform thermal, environmental, and economic analyses of energy systems. 3. Design energy systems (including economic analysis) and communicate results either orally and/or in writing. 4. Understand some of the ethical, economic, environmental, social, and political issues associated with energy and energy systems.

[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.

3.000 Credit hours

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 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.
3.000 Credit hours

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 - Internal Combustion Engines](#)

Credit Hours: 3.00. Application of thermodynamics, fluid mechanics and heat transfer to processes in internal combustion engines. Intake and exhaust processes in engines. Spark-ignition (SI), compression-ignition (CI), and alternate engines. Discussion of engine design and performance to complement lectures. Laboratory work on SI and CI engines. Current challenges facing engine designers. Typically offered Spring.
0.000 OR 3.000 Credit hours

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

[ME 47900 - Solar Engineering Systems](#)

Credit Hours: 3.00. Application of heat transfer, thermodynamics and photovoltaics to the design and analysis of solar energy collectors and systems. Theory, economics and practice of solar energy application. Typically offered Fall Spring Summer.
3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: Distance Learning, Lecture

Offered By: Regional Campus Only

Course Attributes:

Upper Division

May be offered at any of the following campuses:

North Central

Learning Objectives: 1. Learn how to apply heat transfer, thermodynamics and photovoltaics to solar energy collectors and storage energy balances. 2. Analyze radiant energy transfer and understand its application to solar exchangers.

[ME 50000 - Advanced Thermodynamics](#)

Credit Hours: 3.00. The empirical, physical basis of the laws of thermodynamics. Availability/exergy concepts and applications. Properties and relations between properties in homogeneous and heterogeneous systems. The criteria of equilibrium. Application to a variety of systems and problems, including phase and reaction equilibrium. Offered in alternate years. Typically offered 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:

Upper Division

May be offered at any of the following campuses:

West Lafayette Continuing Ed

PU Fort Wayne

IUPUI

Calumet
West Lafayette

[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 50700 - Laser Processing](#)

Credit Hours: 3.00. Introduces background knowledge in laser science and laser technology and fundamentals involved in laser processing and manufacturing. The following topics are discussed: laser fundamentals, industrial laser systems and processes, and the laser-induced thermal, thermo-mechanical, and thermo-acoustic effects. The course also discusses emerging areas of laser applications, such as microscale laser processing, ultrafast laser processing, and the related energy transport analyses. Laboratory and video demonstration sessions are used to enhance the overall understanding of the course materials. 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 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 51900 - Introduction To Wind Energy](#)

Credit Hours: 3.00. This course is intended for the undergraduate and graduate engineer or scientist who is interested in the wind energy technology; introduce the students to the technology and economics of converting wind energy to electricity and the environmental

concerns of wind energy. Topics include: Introduction to renewable energy; Wind characteristics; Wind resource estimation; Wind Turbine aerodynamics; Wind energy system economics, Wind turbine siting and Environmental aspect and impact. Typically offered Fall Spring Summer.

3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: Lecture

Offered By: Regional Campus Only

Course Attributes:

Upper Division

May be offered at any of the following campuses:

Calumet

Learning Objectives: 1. Specify the features for different kind of renewable energy, which includes solar, wind, geothermal, ocean, hydro and biomass. 2. Based on the given raw wind data, students can calculate the wind power density, the wind turbine power and Torque. Can analysis the economics of wind energy. 3. Can tell the local effects to wind characteristics by comparing different given local conditions, students will be able to calculate wind shear and various turbulent parameters in problems assigned in homework or project. 4. Based on the given raw wind data, students can do the preliminary wind energy assessment, which will eventually generate the wind power density map for a selected location. 5. Apply wind turbine aerodynamics analysis the flow fields around wind turbine blade for a given test case.

[ME 52500 - Combustion](#)

Credit Hours: 3.00. Physical and chemical aspects of basic combustion phenomena. Chemical energetics and equilibrium. Basic chemical kinetics, chain reactions, and explosions. Chain and thermal ignition. Homogeneous combustion models. Detonations and deflagrations. Laminar flame speed and flame extinction. The Shvab-Zeldovich formulation of the multicomponent conservation equations. Diffusion flames and droplet combustion. Introduction to turbulent combustion. Typically offered Spring.

3.000 Credit hours

Levels: Graduate, Professional, Undergraduate

Schedule Types: Distance Learning, 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 Continuing Ed

Indiana College Network

West Lafayette

[ME 54000 - Internal Combustion Engines](#)

Credit Hours: 3.00. Performance of internal combustion engines in relation to the fundamentals of thermodynamics, fluid mechanics, and heat transfer in the engine intake, cylinder, and exhaust systems. Spark-ignition and compression-ignition engine processes. Fundamental physics of turbulence, boundary layer effects, atomization and structure of sprays, premixed and non-premixed combustion and pollutants. Modeling of engine processes. Hands-on experience through laboratory experiments. Offered in alternate years. Not available to students with credit in M E 440. Typically offered Spring. 0.000 OR 3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Laboratory, 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 54200 - Introduction To Renewable Energy](#)

Credit Hours: 3.00. An introductory course on renewable energy. Students will learn the fundamental principles of the various renewable energy options and their applications and costs. After taking this course, students will be familiar with the economic and societal impact of renewable energy systems, and be able to participate in the design or selection of renewable energy systems. Typically offered Fall. 3.000 Credit hours

Levels: Graduate, Professional, Undergraduate
Schedule Types: Lecture

Offered By: Regional Campus Only

May be offered at any of the following campuses:
IUPUI

[ME 59700 – 029 - Sustainable Energy Options & Analysis](#)

Associated Term: Fall 2011

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

West Lafayette Campus
Lecture Schedule Type
3.000 Credits

[ME 59700 – 034 - Solar Energy](#)

Associated Term: Spring 2012

Levels: Graduate, Professional, Undergraduate

Attributes: Upper Division, Variable Title

West Lafayette Campus

Lecture Schedule Type

3.000 Credits

[ME 60600 - Radiation Heat Transfer](#)

Credit Hours: 3.00. Thermodynamics and physics of radiation and its interaction with interfaces and matter; radiation characteristics of surfaces and radiation properties of solids, liquids, and gases; analysis of radiation exchange between real and idealized surfaces; fundamentals of radiation transfer in absorbing, emitting, and scattering media; interaction of radiation with conduction and convection; remote temperature sensing and applications to selected problems involving combined energy transfer mechanisms. Offered in alternate years. Prerequisite: ME 31500. 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

[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

[ME 68700 - Laser Diagnostics for Reacting Flows](#)

Credit Hours: 3.00. The principles of spectroscopic laser diagnostics including absorption, fluorescence, and Raman scattering techniques. Theory of the interaction of laser radiation with atomic and molecular resonances. Lasers and detectors for optical diagnostics. Offered in alternate years. Prerequisite: ME 50100. 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

Course Attributes:
CH Engineering Electives, Upper Division

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

[NUCL 54400 - Nuclear Fuel Systems](#)

Credit Hours: 3.00. Nuclear plant economics, with emphasis on the effect of the nuclear fuel cycle on reactor design. Preparation and recovery of reactor fuels, core loading management, fuel design, plutonium and thorium systems. 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 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 55300 - Nano-Macro Scale Applications Of Nuclear Technology](#)

Credit Hours: 3.00. Introduction of the principles of nuclear science and engineering for addressing industrial and scientific issues ranging from sub nano-to-macro scales. Areas to be covered include: propulsion, high-energy density materials, supercooling, medical applications, sonoluminescence, novel detection systems for special nuclear and contraband materials, and advanced nuclear fusion power systems. 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 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, thermionic, 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](#)

Credit Hours: 3.00. Safety philosophy, levels and goals of safety. Approaches used for nuclear reactor safety for the protection of public health. Design basis accidents. Engineered safeguards and inherent safety features. Fundamentals of safety related thermal-hydraulic phenomena and their integration into a methodology for containment assessment. Prerequisite: ME 50500. 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 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