To: The Faculty of the College of Engineering

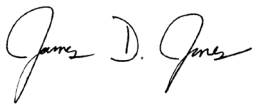
From: The Faculty of the School of Mechanical Engineering

RE: Approval of Energy Engineering (EEN) Courses

The faculty of the School of Mechanical Engineering has approved the adoption of the following Energy Engineering (EEN) Courses. This action is now submitted to the Engineering Faculty with a recommendation for approval.

As part of the IUPUI Realignment, the Energy Engineering Program will be discontinued as a separate degree program. However, some of the Energy Engineering courses will be retained and converted into ME courses. These courses can be used by students for ME Elective credit or Technical Elective credit.

Reason: The purpose of this EFD is to formally adopt select EEN courses so they can be included in the West Lafayette Course Catalog. On the following pages, the existing EEN courses are listed. These courses are currently listed with the EEN prefix, but will be converted to ME courses with this EFD. Also, some prerequisite courses will also be updated with this EFD. A proposed ME course listing with the changes shown in red is appended after the existing course list.



James D. Jones
Associate Professor and Associate Head
School of Mechanical Engineering

Energy Engineering (Original Course Listing)

- **EEN 22001 Fundamentals of Energy Materials (3 cr.)** P: CHEM C105. C: ME 20000, EEN 22501 This course examines the chemistry and structure of materials and their correlation with various electrochemical properties including their suitability for use in conversion and storage of electrochemical energy, energy related materials, and chemical and renewable energy sources.

- **EEN 22501 Energy Engineering Laboratory I (1 cr.)** C: EEN 22000 and ENGR 29700. Experiments on testing thermodynamics, parametric design and electrochemistry.

- **EEN 24000 Basic Engineering Mechanics (4 cr.)** P: PHYS 15200. C: MATH 26100. This course is an introductory mechanics course in energy engineering, covers force systems and couples, equilibrium, centroids, friction, Kinematics, kinetics of particles & rigid body, Newton's second law, energy, and momentum methods; equations of motions, and application to machine elements.

- **EEN 25001 Energy Engineering Laboratory II (1 cr.)** C: EEN 26200. Experiments on data analysis, hands-on programming with devices and fabrication.

- **EEN 26000 Sustainable Energy (3 cr.)** P: CHEM-C 10500. C: PHYS 25100 and ME 20000. The objective of this course is to familiarize the students with various forms of available energy. The concept of these energies in terms of efficiency, raw material, safety, economy and environmental impact will be introduced.

- **EEN 29700 Selected Topics in Energy Engineering (0-6 cr.)** P: Sophomore standing and/or consent of instructor. Topics of contemporary importance or of special interest in Energy Engineering.

- **EEN 31000 Fluid Mechanics (3 cr.)** P: ME 20000 and MATH 26600 and EEN 24000. C: EEN 32501. Continua, velocity fields, fluid statics, basic conservation laws for systems and control volumes, dimensional analysis. Euler and Bernoulli equations, viscous flows, boundary layers, flows in channels and around submerged bodies, and one-dimensional gas dynamics.

- **EEN 32501 Energy Engineering Laboratory III (1 cr.)** C: EEN 31000 and ME 27200. Experiments on testing of fluid mechanics and energy engineering.

- **EEN 33001 Modeling & Measurements of Dynamic Systems (3 cr.)** P: ECE 20400 and MATH 26600. C: EEN 24000. This course will cover the fundamentals of instrumentation, measurement, and dynamic systems modeling. Design, selection, and usage of the instrumentation systems and the interpretation of experimental results are also introduced. Basic concepts of measurements methods, measurement system response, assessment, uncertainty analysis of measured data, sensors, signal conditioning, recording/display devices, digital techniques, instrument interface, and measurement theories on stress and strain, temperature, pressure, fluid flow and velocity will also be covered. Additionally, fundamentals of dynamic systems including mechanical, electrical, and electromechanical systems will be introduced. Laplace transform, block diagram, transient and frequency response of linear first and second order system will be covered as well.

- **EEN 34500 Renewable Energy System and Design (3 cr.)** P: EEN 26000. C: ME 31400. This course is designed to introduce the system and design of energy conversion and storage devices for renewable energy sources. Students will first learn about energy sources available on earth including kinetic, solar, and chemical. Next, the course will provide students with a

review of the thermodynamic concepts behind energy constant and energy transfer via an energy conversion device. Finally, this course will tie together concepts of renewable energy sources and thermodynamics teaching students about design elements for energy conversion and storage devices, in which renewable energy sources are converted and stored.

- **EEN 35001 Energy Engineering Laboratory IV (1 cr.)** C: ME 31400. Experiments on testing of heat and mass transfer, and energy engineering.

- **EEN 39700 Selected Topics in Energy Engineering (0-6 cr.)** P: Junior Standing and/or consent of instructor. Topics of contemporary importance or of special interest in Energy Engineering.

- **EEN 40600 HVAC Design (3 cr.)** P: ME 31002 or EEN 31000. C: ME 31401. The fundamentals required to design and analyze HVAC systems used in buildings. This includes the fundamentals of the thermodynamics of HVAC systems & buildings, the thermodynamics of moist air (psychrometrics), calculating building heating/cooling loads, application of HVAC equipment to buildings, HVAC component analysis, and energy reduction strategies. Application to real building designs.

- **EEN 42501 Energy Engineering Laboratory V (1 cr.)** C: ME 48200 Experiments on testing of mechanical measurements, control systems and alternative energy systems.

- **EEN 44500 Compressible Flow and Renewable Kinetic Energy Design (3 cr.)** P: EEN 31000. This course is designed to introduce compressible flow, turbomachines and design of kinetic energy conversion and storage devices for wind, wave and tidal renewable energy sources. Students will first learn about compressible flow, turbomachines concepts and kinetic energy sources available on earth. Next, the course will provide students with analysis, design parameters and control renewable kinetic energies.

- **EEN 46200 Capstone Design (3 cr.)** P: Senior Standing. C: ME 48200 and EEN 44500. Concurrent engineering design concept is introduced and practiced. Application of the design is emphasized. Design problems from all areas of energy engineering are considered. Contemporary issues pertaining to energy engineering career will be discussed.

- **EEN 49700 Selected Topics in Energy Engineering (0-6 cr.)** P: Junior standing and/or consent of instructor. Topics of contemporary importance or of special interest in Energy Engineering.

Mechanical Engineering (Proposed Course Listing)

- **ME 22001 Fundamentals of Energy Materials (3 cr.)** P: CHEM C105. C: ME 20000, ME 22501 This course examines the chemistry and structure of materials and their correlation with various electrochemical properties including their suitability for use in conversion and storage of electrochemical energy, energy related materials, and chemical and renewable energy sources.

- **ME 22501 Energy Engineering Laboratory I (1 cr.)** C: ME 22000 ~~and ENGR 29700~~. Experiments on testing thermodynamics, parametric design and electrochemistry.

- **ME 24000 Basic Engineering Mechanics (4 cr.)** P: PHYS 15200. C: MA 26100. This course is an introductory mechanics course in energy engineering, covers force systems and couples, equilibrium, centroids, friction, Kinematics, kinetics of particles & rigid body, Newton's second law, energy, and momentum methods; equations of motions, and application to machine elements.

- **ME 25001 Energy Engineering Laboratory II (1 cr.)** C: ~~EEN 26200~~. Experiments on data analysis, hands-on programming with devices and fabrication.

- **ME 26000 Sustainable Energy (3 cr.)** P: CHEM-C 10500??. C: PHYS 25100 and ME 20000. The objective of this course is to familiarize the students with various forms of available energy. The concept of these energies in terms of efficiency, raw material, safety, economy and environmental impact will be introduced.

- ~~**EEN 29700 Selected Topics in Energy Engineering (0-6 cr.)** P: Sophomore standing and/or consent of instructor. Topics of contemporary importance or of special interest in Energy Engineering.~~

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- **ME 32501 Energy Engineering Laboratory III (1 cr.)** C: ME 30800 and ME 32300. Experiments on testing of fluid mechanics and energy engineering.

- **ME 33001 Modeling & Measurements of Dynamic Systems (3 cr.)** P: ECE 20400?? and MATH 26600. C: ~~EEN 24000~~??. This course will cover the fundamentals of instrumentation, measurement, and dynamic systems modeling. Design, selection, and usage of the instrumentation systems and the interpretation of experimental results are also introduced. Basic concepts of measurements methods, measurement system response, assessment, uncertainty analysis of measured data, sensors, signal conditioning, recording/display devices, digital techniques, instrument interface, and measurement theories on stress and strain, temperature, pressure, fluid flow and velocity will also be covered. Additionally, fundamentals of dynamic systems including mechanical, electrical, and electromechanical systems will be introduced. Laplace transform, block diagram, transient and frequency response of linear first and second order system will be covered as well.

- **ME 34500 Renewable Energy System and Design (3 cr.)** P: ~~EEN 26000~~??. C: ME 31500. This course is designed to introduce the system and design of energy conversion and storage devices for renewable energy sources. Students will first learn about energy sources available on earth including kinetic, solar, and chemical. Next, the course will provide students with a review of the thermodynamic concepts behind energy constant and energy transfer via an

energy conversion device. Finally, this course will tie together concepts of renewable energy sources and thermodynamics teaching students about design elements for energy conversion and storage devices, in which renewable energy sources are converted and stored.

- **ME 35001 Energy Engineering Laboratory IV (1 cr.)** C: ME 31500. Experiments on testing of heat and mass transfer, and energy engineering.

- **ME 39700 Selected Topics in Energy Engineering (0-6 cr.)** P: Junior Standing and/or consent of instructor. Topics of contemporary importance or of special interest in Energy Engineering.

- **ME 40600 HVAC Design (3 cr.)** P: ME 30800. C: ME 31500. The fundamentals required to design and analyze HVAC systems used in buildings. This includes the fundamentals of the thermodynamics of HVAC systems & buildings, the thermodynamics of moist air (psychrometrics), calculating building heating/cooling loads, application of HVAC equipment to buildings, HVAC component analysis, and energy reduction strategies. Application to real building designs.

- **ME 42501 Energy Engineering Laboratory V (1 cr.)** C: ME 48200 Experiments on testing of mechanical measurements, control systems and alternative energy systems.

- **ME 44500 Compressible Flow and Renewable Kinetic Energy Design (3 cr.)** P: ME 30800. This course is designed to introduce compressible flow, turbomachines and design of kinetic energy conversion and storage devices for wind, wave and tidal renewable energy sources. Students will first learn about compressible flow, turbomachines concepts and kinetic energy sources available on earth. Next, the course will provide students with analysis, design parameters and control renewable kinetic energies.

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