EVE - Electronic-drive Vehicle Engineering

EVE 5110 Fundamentals of Electric-drive Vehicle Engineering Cr. 4
Cover engineering fundamentals and basic design of electric-drive vehicle powertrains by understanding and analyzing the relevant multi-physics and applying the associated equations and simple models. Offered Fall.
Equivalent: ME 5115

EVE 5120 Fundamentals of Battery Systems for Electric and Hybrid Vehicles Cr. 4
Fundamental electrochemistry and engineering aspects for electric propulsion batteries, including lead acid, nickel metal hydride, and lithium ion technologies. Offered Winter.
Equivalent: AET 5310, CHE 5120, ME 5215

EVE 5130 Fundamentals of Fuel-cell Powered Systems for Transportation Cr. 4
Introduce various types of fuel cells, materials properties of electrodes and polymeric membranes, and electrochemical mechanisms. Reforming of various types of hydrocarbon fuel to hydrogen, and reforming technology. Offered Fall.
Equivalent: AET 5110, CHE 5110, ME 5110

EVE 5150 Advanced Energy Storages Cr. 4
Fundamentals of all major energy storage methods, including storage of energy as heat, in phase transitions and reversible chemical reactions, and in organic fuels and hydrogen; principles of energy storage in mechanical, electrostatic and magnetic systems. Offered Fall, Winter.
Equivalent: AET 5150

EVE 5410 Power Electronics and Control Cr. 4
Control of electric energy using solid-state devices, diodes, thyristors, triacs; mathematical analysis of circuits containing these devices; power converters and control; solid-state drives for motor control. Applications to electric-drive vehicles. Offered Spring/Summer.
Equivalent: ECE 5410

EVE 5430 Modeling and Control of Electric-drive Powertrains Cr. 4
Dynamic modeling and control of electric-drive powertrains, including electronics, charging structure, battery systems, motors, engines, transmission, and power regeneration. Powertrain subsystem models and their integration and control method will be developed. Offered Fall.
Equivalent: AET 5330, ECE 5330

EVE 5450 Control and Optimization for Integrated Electric-drive Vehicle Systems Cr. 4
Understanding of how to control a system using modern control theory, how to optimize the performance of a system using various optimization technologies, and how to apply the control and optimization technologies to EDV systems. Offered Winter.
Prerequisite: EVE 5430,

EVE 5600 Electric-drive Vehicle Product and Infrastructure Development Cr. 4
Integration of design, development, and deployment processes, efficient operation of heterogeneous and complex design considerations, and proactive risk identification and management caused by technology and infrastructure uncertainties. Offered Fall.
Equivalent: AET 5600, IE 6405

EVE 5620 Energy Economics and Policy Cr. 4
Demand for energy, energy supply, energy markets, and public policies affecting energy markets. Coal, oil, natural gas, electricity, and nuclear power sectors and examines energy tax, price regulation, deregulation, energy efficiency and emission control policies. Offered Winter.
Equivalent: CHE 5620

EVE 5640 Energy and the Environment Cr. 4
Sustainability problems of our present energy systems and of potential solution in utility and transportation sectors. Energy evolution and decarbonization process from fossil fuels. Impacts of greenhouse gas emissions. Principles of renewable energy systems. Offered Fall.
Equivalent: AET 5640

EVE 5700 Electric-drive Vehicle Capstone Design Cr. 4
The class is divided into teams competing on same or similar Electric-Drive Vehicle (EDV) system design project on contemporary EDV issues with relevant vehicle powertrain and energy system contents, involving energy, environmental, safety and economic analyses. Offered Winter.
Prerequisites: EVE 5110 OR EVE 5310 OR EVE 5430

EVE 5810 Power Management for Advanced Energy Storage Systems and its Applications Cr. 4
Operating principles and modeling of energy storage techniques; control and power management, power electronic converters, electric machines, and power systems; power management strategies of hybrid energy systems including HEV and alternative energy systems. Offered Fall, Winter.
Equivalent: AET 5810

EVE 7300 Advanced Battery Systems for Electric-drive Vehicles Cr. 4
Aims to familiarize students with advanced battery technologies and their applications in hybrid and electric vehicles. Contents include: a descriptive overview of energy sources and conversions, HEV/PHEV/ EV technology, hybrid powertrain configuration and components, in-vehicle energy storage systems, electrochemistry fundamentals, battery power and capacity/energy, battery system design (cell, module and pack), Battery Management System (BMS), cell monitoring and balancing, thermal management, on-board diagnostics, battery charging schemes and systems. Offered Fall.
Prerequisite: EVE 5120, with a minimum grade of C
Equivalent: ET 7300

EVE 7310 Electric-drive Vehicle Modeling and Simulation Cr. 4
Cover modeling, simulation and control of electric-drive vehicle powertrain including plant modeling, controls model development, and in-the-loop controls testing. Proficiency in MATLAB/Simulink is required. Offered Winter.
Equivalent: ME 7315

EVE 7450 Embedded Systems for Vehicles Cr. 4
Advanced embedded processors and operating systems, power modules, auxiliary execution engine, display interface, memory controller, USB controller, DMA, I/O, initialization and configuration, programmable serial controller, serial audio interface, and video input. Offered Fall.
Prerequisite: EVE 5430, with a minimum grade of C

EVE 7990 Directed Study Cr. 1-4
Independent projects on subjects of interest in electric-drive vehicle engineering. Offered Every Term.
Repeatable for 4 Credits
EVE 7995 Special Topics in Electric-drive Vehicle Engineering Cr. 1-4
A consideration of special subject matter in electric-drive vehicle engineering. Topics to be announced in Schedule of Classes. Offered Every Term.
Repeatable for 4 Credits

EVE 8999 Master's Thesis Research and Direction Cr. 1-8
Offered Every Term.