EVE - ELECTRIC-DRIVE VEHICLE ENGINEERING

EVE 5110 Fundamentals of Electric-drive Vehicle Engineering Cr. 3
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.
Restriction(s): Enrollment limited to Graduate or Undergraduate level students; enrollment limited to students in the College of Engineering.
Equivalent: ME 5115

EVE 5115 Fundamentals of Electric-drive Vehicle Modeling Cr. 4
Covers engineering and modeling 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. MATLAB script m-file is required for all assignments. Offered Fall.
Restriction(s): Enrollment limited to students with a class of Senior; enrollment limited to Graduate or Undergraduate level students; enrollment limited to students in the College of Engineering.
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.
Restriction(s): Enrollment limited to Graduate level students; enrollment limited to students in the College of Engineering.
Equivalent: AET 5310, CHE 5120, ME 5215

EVE 5130 Fundamental Fuel Cell Systems 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.
Restriction(s): Enrollment limited to Graduate level students; enrollment limited to students in the College of Engineering.
Equivalent: AET 5110, CHE 5110, ME 5110

EVE 5410 Power Electronics and Control Cr. 4
Control of electric energy using power electronic semiconductor devices; mathematical analysis of circuits containing these devices; design, modeling and control of power converters; applications of power electronic converters. Offered Spring/Summer.
Prerequisites: ECE 4330 with a minimum grade of C-
Restriction(s): Enrollment limited to students in the College of Engineering.
Equivalent: ECE 5410

EVE 5430 Power Electronics and Control of Electric Vehicles Cr. 4
Basic methodologies for modeling, control system design of renewable power sources and power electronics systems. Offered Fall.
Prerequisites: ECE 4470 with a minimum grade of C-
Restriction(s): Enrollment limited to Graduate or Undergraduate level students; enrollment limited to students in the College of Engineering.
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
Restriction(s): Enrollment limited to students with a class of Applicant Masters, Candidate Masters, Unranked Grad, Graduate Certificate or Senior; enrollment limited to students in the College of Engineering.

EVE 5600 Integrated Product Development Cr. 3
Product development process: product architectures, concurrent engineering. Integration of marketing, design, and manufacturing functions for product development. How such processes are designed to account for various manufacturing and other business constraints to ensure that customer needs are met. Offered Fall.
Restriction(s): Enrollment limited to students in the College of Engineering.
Equivalent: AET 5600, IE 6405

EVE 5610 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 and (EVE 5310 or EVE 5430)
Restriction(s): Enrollment limited to students with a class of Applicant Masters, Candidate Masters, Unranked Grad, Graduate Certificate or Senior; enrollment limited to students in the College of Engineering.

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.
Prerequisites: ECE 4470
Restriction(s): Enrollment limited to students in the College of Engineering.
Equivalent: AET 5810

EVE 7300 Advanced Battery Systems for Electric-drive Vehicles Cr. 3
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
Restriction(s): Enrollment is limited to Graduate level students.
Equivalent: ET 7300

EVE 7310 Electric-drive Vehicle Simulation and Control 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.
Prerequisites: EVE 5115 with a minimum grade of B- or ME 5115 with a minimum grade of B-
Restriction(s): Enrollment is limited to Graduate level students; enrollment limited to students in the College of Engineering.
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
Restrictions: Enrollment limited to students with a class of Applicant Masters, Candidate Masters, Unranked Grad or Graduate Certificate; enrollment is limited to Graduate level students; enrollment limited to students in the College of Engineering.

EVE 7990 Directed Study Cr. 1-4
Independent projects on subjects of interest in electric-drive vehicle engineering. Offered Every Term.
Restrictions: Enrollment limited to students with a class of Applicant Masters, Candidate Masters, Unranked Grad or Graduate Certificate; enrollment is limited to Graduate level students; enrollment limited to students in the College of Engineering.
Repeatable for 4 Credits

EVE 7991 Internship in Industry Cr. 1
Industrial internship in automotive vehicle-related technologies, particularly in vehicle electrification, and related components and/or systems. Internships are off-campus experiential learning activities designed to provide students with opportunities to make connections between the theory and practice of academic study and the practical application of that study in a professional work environment. Internships are completed under the guidance of an on-site supervisor and a faculty sponsor, who in combination with the student will create a framework for learning and reflection. Offered Every Term.
Restrictions: Enrollment is limited to Graduate level students.
Repeatable for 3 Credits

EVE 8999 Master's Thesis Research and Direction Cr. 1-8
Offered Every Term.
Restrictions: Enrollment limited to students with a class of Applicant Masters, Candidate Masters, Unranked Grad or Graduate Certificate; enrollment is limited to Graduate level students; enrollment limited to students in the College of Engineering.
Repeatable for 8 Credits