

Course name	ECE 49500 Electronic Fundamentals of Electric Vehicle
Credit and contact hours	(3 cr.) 3
Course coordinator's name	Maher Rizkalla
Textbook	Iqbal Hussain, <i>Electric and Hybrid Vehicles Design Fundamentals</i> , 2 nd Ed., CRC Press, 2010.
Course information	<p>2014-16 IUPUI Campus Bulletin description: This course provides students with theoretical background and design guidelines for electric vehicle components, modeling of energy storage components, and control strategy. Power electronics, electric machines, and motors, have been emphasized with applications geared towards electric vehicles. The course will serve educational aspects of electric and hybrid vehicles which in turn, will generate interest to support the development and usage of these vehicles. Further discussions will include electric and hybrid vehicle systems.</p> <p>Prerequisites/ Co-Requisite Phys 25100 and ECE 25500</p> <p>Required, Elective, or Selected Elective: EE Elective, CE Elective</p>
Goals for the course	<p>After the successful completion of this course, a student should be able to:</p> <ol style="list-style-type: none"> 1. Describe the different functions of the ICE, EH/HEV vehicle power trains, and the vehicle system. (a) 2. Describe and explain the electric motor torque-speed envelop. (a, e) 3. Understand the battery cell structures, the battery parameters, and electrochemical cell fundamentals. (a, e) 4. Understand the kinetics of the battery electrodes, and the battery models. (a, e) 5. Understand the operation of the traction batteries: Lead Acid, Nickel Cadmium, Nickel Metal Hydride, Li Ion, Zinc Air battery, and Sodium Sulfur battery. (a, e) 6. Understand the characteristics of the fuel cells, and the hydrogen storage systems. (c, e). 7. Discuss the features of ultra-capacitors storage based systems. (a, e) 8. Understand the theory of operation for the DC and AC machines and how they geared towards EV/HEV applications. (a, e) 9. Design and analyze the power electronics converters used in the EV system. (a, e, c)
List of topics to be covered:	<ol style="list-style-type: none"> 1. Introduction to Alternative Vehicles 2. Vehicle Dynamics

	<ol style="list-style-type: none">3. Series and Parallel Vehicle Architectures4. Battery Energy Storage5. Alternative Energy Storage (Fuel Cells, ultra-capacitors, compressed air, and flywheels)6. Electric Machines (DC and Induction and Synchronous machines, PM, and SRM)7. Power devices (IGBTs and Power MOSFETs)8. Power Electronics Converters
Syllabi approved by:	Maher E. Rizkalla
Date of approval:	05/27/2016