ELECT. & COMPUTER ENGRG (ECE)

ECE-601 ECE Principles for Mobility 4 Credits
Prerequisites: None
This graduate level course is designed to introduce the fundamental principles of electrical and computer engineering that are required for application in mobility systems for students with non-ECE degrees. Topics include: passive circuit components, basic laws and analysis techniques; active electronic elements and circuits, digital logic circuits, digital and analog sensors and actuators, electrical machines; power electronics and batterings; digital systems; signal processing; microcomputers and interfacing; and basic mobility system networking and CAN concepts. Approximately one week is devoted to each topic illustrated in the context of specific applications in mobility systems. Case studies with specific applications of ECE in mobility systems will be assigned.
Lecture: 4, Lab 0, Other 0

ECE-610 Modeling of Dynamic Systems 4 Credits
Prerequisites: None
This course covers modeling, simulation, and analysis of multivariable dynamic systems. Approaches to modeling a variety of dynamic physical systems are discussed using examples of dynamic systems taken from a variety of fields. The course places emphasis on modeling and analysis of electric vehicle systems and components. Transient and steady state behavior of power electronic circuits using state space models is included in this course. These systems are simulated using MATLAB simulation tools. Most of the course is devoted to the analysis of linear systems using now classical techniques based on linear algebra, state-space representations and the state transition matrix.
Lecture: 4, Lab 0, Other 0

ECE-630 Digital Signal Processing Techniques for Automotive Engineering 4 Credits
Prerequisites: None
This graduate level course is designed to introduce critical digital signal/ image processing principles/theories and techniques applied to a variety of automotive engineering applications. Special focus is given to autonomous driving and NVH analysis. Examples include, but are not limited to, edge detection methods in traffic sign recognition and identification, Kalman filtering for vehicle state estimation, Modal analysis (frequency domain) and expansion to time-frequency domain analysis of dynamic response using techniques such as wavelets and Empirical Mode Decomposition (EMD). MATLAB will be heavily used for analysis and simulations.
Lecture: 4, Lab 0, Other 0

ECE-632 Automotive Control Systems 4 Credits
Prerequisites: None
This class will focus on applying students' knowledge of fundamental principles of control systems to a variety of systems within automobiles. Specific topics will include the control of the air-fuel ratio, spark timing, idle speed, transmissions, cruise and headway, lane-keeping, and active suspensions. Other topics that may be included are antilock brakes, traction control and vehicle stability control. Simulations will be used and students will be using MATLAB/Simulink for many of the assignments.
Lecture: 4, Lab 0, Other 0

ECE-642 Machine Drives for Electric Vehicles 4 Credits
Prerequisites: None
Methods of controlling electric machines and their applications in electric vehicles are discussed. Topics include solid-state devices; various switching schemes; types of drives; characteristics of motors; controlling motors including vector control; braking of motors; and dynamics of electric drives and applications.
Lecture: 4, Lab 0, Other 0

ECE-648 Electromagnetic Compatibility 4 Credits
Prerequisites: None
In-depth classical and currents topics in the field of electromagnetic compatibility (EMC) are studied in this course. This includes signal integrity, high-speed digital design matching techniques, passive filter design, single and multilayer shielding, electrostatic discharge, high-frequency measurements, circuit board layout, and grounding methodology. Basic course work in electromagnetic compatibility is a prerequisite for this course.
Lecture: 4, Lab 0, Other 0