

Certificate: Vehicle Electronics

The increasing use of electrical systems and electronic sensors and devices in vehicles and automobiles has resulted in new developments in this field for vehicle application. With rapid progress in battery technology, it is envisaged that electric vehicles will become more affordable and more efficient. Electric drive control requires the use of power devices which are primarily high power electronic devices. Modern vehicles will rely on both analog and digital hardware for efficient operation of the vehicle. Engineers would be required to be well versed in the design of hybrid electrical and electronic systems.

The Vehicle Electronics certificate will introduce the participants to analog and digital electronics. Starting with simple diodes and rectifiers, students will be introduced to other solid state devices that are used in electronic circuits. Participants will learn the design of amplifiers, switches and other commonly used circuits. They will also receive instruction on digital logic and the use of microprocessors. Besides featuring hands-on laboratory practice, participants will be involved in several group design projects.
(12 credit hours)

AE 510 Vehicle Electronics 1 **3 credits**

Semiconductor diodes, junction transistors, FETS, rectifiers and power supplies, small signal amplifiers, biasing considerations, gain-bandwidth limitations, circuit models, automotive applications and case studies.

ECE 532 Auto Sensors and Actuators **3 credits**

Study of automotive sensory requirements; types of sensors and future needs. Study of functions and types of actuators. Integrated smart sensors and actuators. Term project.

ECE 505 Digital Systems and Microprocessors **3 credits**

Introduction to modern digital computer logic. Numbers and coding systems; Boolean algebra with applications to logic systems; examples of digital logic circuits; simple machining language programming; microprocessor programming input/output, interrupts and system design.

ECE 515 Vehicle Electronics II **3 credits**

Introduction to feedback control, control strategies, analog and digital controllers, fuzzy control systems, neural networks for controllers, applications of fuzzy logic, expert systems and neural networks for intelligent control of dynamic systems.

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*Other courses are available for all certificate topic areas with approval of department advisor.

ECE 520 Electromagnetic Field Theory

3 credits

Review of electrostatics from an advanced viewpoint; multiple fields, Green's functions, electric and magnetic energies, volume forces and stress tensors in material media; Maxwell's equations, inhomogeneous vector-wave equation. Hansen's methods, Hertz potentials, radiation and scattering. Fields of point charges in uniform motion and accelerated charges.

ECE 546 Electric Vehicles

3 credits

Fundamental concepts and specifications; energy sources; motors for electric vehicles; controllers and power electronics; engineering impact of electric vehicles.

AENG 545 Vehicle Ergonomics I

3 credits

Overview of drive characteristics, capabilities, and limitations. Human variability and driver demographics, driver performance measurements. Driver information processing models, driver errors and response time. Driver sensory capabilities, vision, audition, and other inputs. Vehicle controls and displays. Driver anthropometry, biomechanical considerations.