



Powertrain Control Systems

ECE 5554

Credit Hours:

3.00 - 3.00

Course Levels:

Undergraduate (1000-5000 level)

Graduate (5000-8000 level)

Course Components:

Lecture

Course Description:

Application of digital control system theory, from viewpoints of input-output and state variable representations, to realistic problems in automotive powertrain systems.

Prerequisites and Co-requisites:

Prereq: 3551 or 5551, or Grad standing in Engineering, Biological Sciences, or Math and Physical Sciences.

Course Goals / Objectives:

- Gain a basic understanding of automotive electronics, sensors, and typical control modes for internal combustion engines and automatic transmission systems
 - Learn principles of control-oriented modeling of realistic automotive powertrain systems
 - Develop tools for analysis and design of discrete-time control systems, using Z transforms
 - Develop tools for analysis and design of discrete-time control systems, using state-variable techniques
 - Become proficient in computer-aided analysis and design using Matlab and Simulink
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Course Topics:

- Powertrain systems, automotive electronics, sensors and actuators
 - Control-oriented modeling of powertrain systems (input-output and state variables)
 - Overview and review of digital control principles as applied to powertrain systems, including Z-transform for design, and state variable techniques
 - The idle speed control problem, analysis, modeling, and control system design (multivariable control)
 - The air-to-fuel ratio control problem, analysis, modeling, and control system design
 - Estimator design and observability for idle speed control and air-to-fuel ratio control
 - Introduce students to Linear Quadratic Regulator (optimal control) as applied to multivariable powertrain control systems
 - Transmission systems control modes
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Designation:

Elective