ME7236 - Powertrain Dynamics

This graduate course covers the essential aspects of automotive Powertrain dynamical modeling, with emphasis on the dynamics of the mechanical, electrical, thermal and fluid systems. The behavior of Powertrain subsystems are explored analytically and computationally.

A computer simulation of the overall Powertrain system will be used throughout the course. A special modeling and simulation project also is developed for each offering of the course.

28 graduate-level lectures include the following topics:

- Dynamics of fuel injection and charge intake process
- Dynamics of the combustion process & exhaust gas chemistry
- Modeling of the air-to-fuel ratio control loop
- Modeling of vehicle longitudinal dynamics & vehicle response
- Engine torsional dynamics
- Torque converter static and dynamic models
- Transmission mechanical and hydraulic systems models
- Shift hydraulic systems & open loop transmission control

Prerequisites: Basic knowledge of Thermodynamics, Fluid Mechanics, System Dynamics, and proficiency in Matlab and Simulink; minimally, this would be a basic working knowledge with Matlab and its basic functions, and some exposure to Simulink.

Ohio State University’s Powertrain Modeling & Control certificate includes international collaboration with European partner, University of Stuttgart.