



Internal Combustion Engine Modeling

MECHENG 7440

Credit Hours:

3.00 - 3.00

Course Levels:

Graduate (5000-8000 level)

Course Components:

Lecture

Course Description:

Comprehensive coverage of spark-ignited internal combustion engines modeling (fluid dynamics, thermodynamics and combustion). Additional coverage of compression ignition engine modeling and boosting.

Prerequisites and Co-requisites:

Prereq: 5530 or 630 or equiv, or permission of instructor.

Course Goals / Objectives:

- To review fundamental principles of internal combustion engines with the perspective of modeling
 - To develop crank-angle resolved mathematical models of the dynamics of mechanical engine components and friction
 - To develop crank-angle resolved mathematical models of in-cylinder processes in spark ignited engines, including heat release, heat transfer, and emissions
 - To develop crank-angle resolved mathematical models of breathing processes in internal combustion, spark ignited engines
 - To model 1-D compressible flow in engines using commercial software
 - To develop mathematical models of boosting technology for internal combustion engines
 - To analyze case-studies of where engine modeling is applied in industry
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Course Topics:

- Crank kinematics, dynamics and engine friction
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 - In-cylinder heat release
 - Combustion stoichiometry and chemical equilibrium
 - In-cylinder heat transfer
 - Heat release modeling - single zone
 - Heat release modeling - multi zone
 - Emissions modeling
 - Basic air modeling components - static elements
 - Wave dynamics
 - Basic air modeling components - dynamic elements
 - Basic air modeling components - dynamic elements
 - Basics of aftertreatment systems
 - Turbocharging the ICE
 - Overview of diesel engine modeling
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Designation:

Elective