Hybrid electric vehicle engineering

Courses, certificates, and professional Master’s program
Curriculum funded by a US Department of Energy transportation electrification grant

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Continuing education for professional engineers
Hybrid electric vehicle engineering

Michigan Tech offers courses, undergraduate and graduate certificate programs, and a professional Master’s program focusing on hybrid electric vehicle (HEV) engineering.

The curriculum provides advanced knowledge and hands-on laboratories in the design, analysis, control, calibration, and operating characteristics of HEVs. The technologies required to achieve transportation electrification include clean and efficient internal combustion engines and e-machines, as well as emerging technologies for advanced batteries, fuel cells, and the recharging infrastructure required for each technology.

The curriculum is based on an online course in HEV technologies developed by Michigan Tech, General Motors, and AVL, delivered in southeast Michigan in partnership with The Engineering Society of Detroit (ESD) and selected by the Michigan Academy of Green Mobility for training automotive engineers. Development of the curriculum and mobile laboratory is funded by a Department of Energy grant under the Transportation Electrification program.

Fall semester offerings
Courses listed below in red will be available through online learning.

EE — Electrical and Computer Engineering
MEEM — Mechanical Engineering
MY — Materials Science and Engineering
CM — Chemical Engineering
ENT — Enterprise

MEEM 4200 Principles of Energy Conversion
MEEM 4295 Intro to Propulsion Systems for HEV*
MEEM 4296 Intro to Propulsion Systems for HEV Laboratory*
EE 4295 Intro to Propulsion Systems for HEV*
EE 4296 Intro to Propulsion Systems for HEV Laboratory*
MEEM 5200 Advanced Thermodynamics
MEEM 5220 Fuel Cell Technology
MEEM 4260 Fuel Cell Technology
MEEM 5250 Internal Combustion Engines II
MEEM 4700 Dynamic Systems and Controls
MEEM 5670 Experimental Design in Engineering
MEEM 5700 Dynamic Measurement/Signal Analysis
CM 3974 Fuel Cell Fundamentals
CM 3977 Fundamentals of Hydrogen as an Energy Carrier
CM 5760 Vehicle Battery Cells and Systems*
MY 5760 Vehicle Battery Cells and Systems*
ENT 3974 Fuel Cell Fundamentals
ENT 4900 Senior Enterprise Project Work I/Nonengineering Majors
EE 5221 Advanced Electric Machines
EE 3120 Electric Energy Systems
EE 4227 Power Electronics
EE 4228 Power Electronics Lab
EE 4221 Power System Analysis 1
EE 4261 Classical Control Systems
EE 4900 Design Fundamentals

*Dual-listed in two departments

Propulsion Systems for HEVs
These courses, EE/MEEM 4295 and 5295 together with their associated laboratory courses 4296 and 5296, undertake a comprehensive study of hybrid electric vehicle performance and system optimization. Powertrain component analysis and modeling techniques focusing on power flows and losses are developed to quantify vehicle performance over drive cycles. Students will develop vehicle and subsystem requirements in the form of a Vehicle Technical Specification (VTS) and develop a vehicle model for simulation. These tools are applied to design and develop the control and calibration for the hybrid powertrain to meet the VTS.

Classroom seats available in Southfield, Michigan
Four courses are offered in partnership with The Engineering Society of Detroit (ESD) and will take place in ESD classrooms in Southfield, MI.

MEEM/EE 4295 Intro to Propulsion Systems for HEV
CM/MY 5760 Vehicle Battery Cells and Systems
EE 5221 Advanced Electric Machines
EE 4227 Power Electronics

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Contact ESD at 248-353-0735
All others please contact the Graduate School at 906-487-2327

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