

# ME 4813: Hybrid Vehicle Powertrains

**Instructor:** Dr. Michael Leamy (ME), 132 Erskine Love Building, [michael.leafy@me.gatech.edu](mailto:michael.leafy@me.gatech.edu)

**Meeting Times:** TBA

**Textbook:** None Required

Optional (available online through GT library): M. Ehsani, Y. Gao, S.E. Gay and A. Emadi, *Modern Electric, Hybrid Electric, and Fuel Cell Vehicles*, CRC Press, 2005

<http://www.crcnetbase.com.www.library.gatech.edu:2048/doi/book/10.1201/9781420054002>

**Prerequisites:** ECE-3710

**Office Hours:** Tuesday 11:00-12:00 and Wednesdays 3:00 – 4:00

## Course Topics:

### Introduction

Course Description, Components and Architectures

### HEV Mechanics and Modeling

Vehicle Longitudinal Dynamics

Powertrain Tractive Effort

Hybrid & Regenerative Braking

Electric Machine Fundamentals

Energy Storage Fundamentals

HEV Controls Fundamentals

### High-Level Series/Parallel Hybrid Design

Operation

Performance Goals

Sizing of Components

Supervisory Control Strategies

### Backward-Looking and Forward-Looking Simulation of HEVs

Modeling Fundamentals

Block Diagrams and Equivalent Circuits

Modeling of Electromechanical Systems

Controllability and Observability

\*Dynamic Programming\*

### HEV Exam (in class)

### Series Hybrid Lab

### Case Study 1: Toyota THS-II Powersplit

\*Case Study 2: GM 2-Mode Powersplit\*

Project Lab

Conclusion

Recap and Future Trends

Group Project Presentations (during final exam period)

\* \* denotes time permitting

**Grade Determination:**

HEV Exam (30%), Final Project (40%), Problem Sets (30%)

**Rules Regarding Homework:**

It is permissible to discuss homework assignments with your peers, but the written work that you turn in must be your own. Copying computer code and/or other parts of problem solutions is a serious violation of the Georgia Tech Honor Code and will be referred to the Dean of Students for investigation and penalties.

**Timing of Gradable Events:**

Exams are to be taken at the time announced by the instructor. Exceptions require prior approval from the instructor and will be granted only under unusual circumstances and with appropriate documentation.

Homework must be submitted on time to receive full credit. At the discretion of the instructor, homework submitted shortly after the due date may be accepted for partial credit, but no credit will be given once solutions are posted.

**Academic Misconduct:** All students are expected to comply with the Georgia Tech Honor Code. Any evidence of cheating or other violations will be referred to the Dean of Students with a recommendation that the penalty be an award of zero points for the graded requirement, and a one letter grade reduction in the course. Cheating includes, but is not limited to: using unauthorized references or notes; copying directly from any source, including friends, classmates, tutors, or a solutions manual; allowing another person to copy your work; taking an exam or handing in a graded requirement in someone else's name, or having someone else take an exam or hand in a graded requirement in your name; or asking for a re-grade of a paper that has been altered from its original form.

**Students with Special Needs:** Please see the instructors as soon as possible to discuss appropriate arrangements.