ME 4014 Introduction to Automotive Engineering (Elective)

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Office Hours: Monday, 10:30 AM to 11:30 AM
Wednesday, 2:00 PM to 3:00 PM

Catalog Description: ME 4014 Introduction to Automotive Engineering (3-0-3)

Prerequisites: ME 2202 Dynamics or Rigid Bodies, ME 3322 Thermodynamics, ECE 3710 Circuits & Electronics

Introduction to automotive engineering from a systems perspective. Major automotive systems and subsystems described together with appropriate engineering models. Topics include powerplants, engine management and emissions, transmissions and driveline components, steering/suspension systems and dynamics, braking systems and tires, automotive control and CAN, and emerging trends in automotive design.

Textbook: *Automotive Engineering: Powertrain, Chassis System and Vehicle Body*, Edited by David A. Crolla, 2009

References: *Automotive Engineering Fundamentals*, Richard Stone and Jeffrey K. Ball, SAE International, 2004

Topics covered:

1. Introduction & Overview

2. Automotive Powerplants: IC Engines and Thermodynamic Cycles (brief), Electric Machines

3. Digital Engine Management & Emissions

4. Vehicle Longitudinal Dynamics

5. Transmissions & Driveline: Clutches, Manual Transmissions, Automatic Transmissions, Continuously Variable Transmissions, Powertrain Layouts (FWD, RWD, AWD)

6. Suspensions & Suspension Design: Ride Comfort, Handling

7. Automotive Controls & CAN

8. Hybrid-Electric Vehicles

9. Course Conclusion

Course outcomes:

Outcome 1: To teach students the basic principles underlying the operation, control, and design of modern vehicle subsystems.

    1.1   Students will demonstrate a basic technical understanding of the function, operation, and control of each subsystem of a vehicle.

    1.2   Students will demonstrate the ability to perform basic calculations necessary to support the analysis and design of major automotive subsystems.

Outcome 2: To educate students on system-level modeling and simulation of vehicle performance

    2.1. Students will learn backward-looking simulation techniques for deriving vehicle performance, such as acceleration performance and fuel economy.

2.2. Students will learn and apply specialized calculations for assessing subsystem performance, such as required in engine intake analysis, suspension design, and driveline characterization.

Outcome 3: To become acquainted with, and able to communicate, modern issues facing automotive engineering.

3.1. Students will become aware of the need for, and future of, alternative fuel and electric vehicles.

3.2. Students will be able to identify and address future needs in the automotive industry.

3.3. Students will be able to communicate to both technical and non-technical audiences new and existing technologies employed by automotive engineers.

Correlation between Course Outcomes and Student Outcomes:

ME 4014							
	Mechanical Engineering Student Outcome						
Course Outcomes	1	2	3	4	5	6	7
Course Outcome 1.1	X	X					
Course Outcome 1.2	X	X					
Course Outcome 2.1	X	X					
Course Outcome 2.2	X	X					
Course Outcome 3.1	X	X		X			
Course Outcome 3.2	X	X	X	X			
Course Outcome 3.3	X	X	X				X

GWW School of Mechanical Engineering Student Outcomes:

(1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
(2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
(3) an ability to communicate effectively with a range of audiences
(4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
(5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
(6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
(7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Grading Plan:

GRADED EVENT	VALUE
Problem Sets	15%
10 Minute Topic Presentation	10%
Exam 1	25%

Exam 2	25%
Final Exam (Not Cumulative)	25%

The following minimum grades are guaranteed:

90.0% +	A
80.0% +	B
70.0% +	C
65.0% +	D
< 65%	F

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 me as soon as possible so that we can make appropriate arrangements.