Copilot

AUTO450 - Electric and Hybrid Vehicle Design

University: SkyTech Aeronautical University

Course Duration: Full Year (Fall 2023 & Winter 2024)

Instructor: Dr. Karen Mitchell

Contact Information: karen.mitchell@skytech.edu

Office Hours: Mondays and Wednesdays, 2:00 PM - 4:00 PM

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1. Calendar Information

In this project-based design course, teams of students will engage in the design and development of electric and hybrid vehicles. The course covers the fundamentals of electric and hybrid vehicle systems, including powertrain design, battery technology, and energy management. Students will work on a comprehensive project to design, prototype, and test an electric or hybrid vehicle system.

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2. Course Overview

AUTO450 is a capstone design project course intended to have students apply their knowledge of automotive engineering to the design and development of electric and hybrid vehicles. Students will identify design challenges, propose innovative solutions, and develop a working prototype. The course includes lectures, guest lectures from industry experts, hands-on practicums, and a student-driven design project.

The goal of this course is to provide students with the opportunity to practice engineering design skills within the context of electric and hybrid vehicles and to increase awareness of future technological advancements in the automotive industry. Topics will include powertrain design, battery management systems, energy efficiency, and vehicle dynamics.

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3. Learning Outcomes and Graduate Attributes

By the end of this course, students will be able to:

1. Identify and analyze the key components of electric and hybrid vehicle systems.
2. Design and optimize powertrain systems for electric and hybrid vehicles.
3. Develop and implement battery management systems.
4. Conduct energy efficiency analysis and optimization.
5. Prototype and test electric and hybrid vehicle systems.
6. Communicate design choices and project results in oral and written formats.
7. Work effectively in teams to manage and complete a comprehensive design project.

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4. Timetable

Section	Lec	Pra
Day of the Week	Tuesday	Friday
Start Time	12:00 PM	12:00 PM
End Time	2:00 PM	3:00 PM
Location	MB 78/64	MB 78/64

Office hours: Book a time to talk with me with an online meeting using this link: Office Hours

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5. Course Instructors

Course Coordinators

Name	Phone	Office	Email
Dr. Karen Mitchell	(416) 978-3702	MB321A	karen.mitchell@skytech.edu

Dr. Mitchell is the main point of contact for students and is responsible for evaluating and providing feedback to students.

Teaching Assistants

Name	Email
John Doe	john.doe@skytech.edu
Jane Smith	jane.smith@skytech.edu

Each team will be matched with a project supervisor who should be included in all communication with the project client. They will also attend all your progress meetings to monitor how well individuals are functioning as part of a team and provide evaluations of your team engagement as well as written and oral deliverables.

Communication Instructor

Name	Email
Nikita Dawe	nikita.dawe@skytech.edu

Ms. Dawe will provide support and feedback regarding your written and oral communications. She will provide feedback that is targeted to how you communicate your written and oral discourse.

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6. Textbook

The required textbook for this course is: “Electric and Hybrid Vehicles: Design Fundamentals” by Iqbal Husain. This textbook also has a large amount of online resources helpful for the design process and in vehicle development in general.

Required Text

Title	Author(s)	Edition, Year	Publisher
Electric and Hybrid Vehicles: Design Fundamentals	Iqbal Husain	2nd Edition (2015)	CRC Press

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7. Final Grade Determination

The final grade in this course will be based on the following components:

Component	Learning Outcome(s) Evaluated	Due Date	Weight
Course Engagement	3, 5, 7	See schedule	4%
Progress Presentations	3, 5, 7	See schedule	8%
Design Process (Team meetings and documentation)	6	See schedule	10%
Pre-Class Assignments	4	See schedule	5%
Project Requirements	1-4	Oct 30, 2023	10%
Project Proposal	1-6	Dec 4, 2023	10%
Design Review and Critique	3	Jan 22, 2024	5%
Demonstration Day	3	Mar 30, 2024	15%
Final Report	1-7	Apr 1, 2024	40%

Total: 100%

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8. Deliverables

All written submissions must be received by 11:59 PM on the date listed, with the exception of pre-class assignments which must be submitted before the start of class. Additional details related to each deliverable are given in guideline documents posted on the course platform.

Progress Presentations Each progress presentation will consist of 1) three slides to show current work and 2) project management update. Presentation duties will be split and team members not presenting will be expected to answer questions. Every member of each team must present twice and provide an answer at least twice.

Design Progress Four team meetings will be scheduled approximately every three weeks with the project supervisor. The main purpose of these meetings is to review progress using each team's project management board to uncover problems and plan for future events. The discussions and decisions resulting from the board and timeline review will be recorded in the meeting minutes and will be submitted to create a living document of your progress through your design project.

Pre-Class Assignments The purpose of these short pre-class assignments (PCAs) is to prepare for a synchronous discussion during small and class-wide discussions held during lectures. Each assignment will be considered complete by submitting it before the class has started or incomplete if submitted after the beginning of each class associated with a PCA.

Project Requirements Gathering information about your chosen problem and building an accurate understanding of your automotive-related need will allow you to define what a design must do to be an acceptable solution. Your team is responsible for submitting a concise document that communicates the design requirements (specifications) of your stated need.

Project Proposal Your team is responsible for drafting a project proposal document that: 1) defines the design problem, 2) proposes possible solutions and selects the most promising design, and 3) provides a plan to carry out the proposed solution.

Design Review and Critique Each team will present an overview of their project and show preliminary prototypes created so far. The aim of this presentation is to demonstrate your knowledge of the automotive need and the problem you have chosen to solve. The team will defend their design and key decisions with the aim to set your team up for building a working prototype during the winter term.

Demonstration Day Presentation Each team will present their design and demonstrate their final working prototype to the project supervisors and hopefully some of the users you have connected with as well. Consider this presentation as a pitch to investors or a presentation at a design competition where you need to clearly communicate the need you are addressing and the problem you are offering a solution to.

Final Project Report Your team must produce a final report that provides enough information for someone to develop your project further. While much of the project proposal can be reused, you are expected to incorporate feedback from your project supervisors and fellow students to demonstrate you have iterated your original goals, ideas, concepts, designs, etc.

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9. Course Policies

Accommodations for Disabilities Students with diverse learning styles and needs are welcome in this course. The University provides academic accommodations for students with disabilities in accordance with the terms of the Ontario Human Rights Code. This occurs through a collaborative process that acknowledges a collective obligation to develop an accessible learning environment that both meets the needs of students and preserves the essential academic requirements of the University's courses and programs. For more information on services and resources available to students, please contact Accessibility Services at (416) 978-8060 or Accessibility Services.

Lateness Policy Graded reports received later than the due date posted will be awarded a 10% deduction compounded for every day that the submission is late. Exceptions may be accommodated for valid reasons (such as severe illness or compassionate grounds), that are out of a student's control, and may be considered if supported by written documentation.

Attendance Policy While no notification of your absence is necessary, if you are absent, you will be responsible for gathering the information you need from your peers. In the case of the progress presentation that you must deliver, you should coordinate with your team to ensure you will be able to present. If you have a time conflict (e.g., religious obligation, varsity team involvement, academic conferences) with one of the lecture dates where your attendance is counted toward your participation grade, you must notify the instructor beforehand to make possible alternative arrangements.

Online Communication Policy All course-related questions should be posted in the "Course Q & A" discussion. If you have a question you should: 1) check the syllabus or guidelines for your answer, 2) check the Course Q & A discussion to see if your question has already been answered, or 3) ask a peer directly. Every attempt