

Course Outline

1. COURSE INFORMATION

Session Offered	Fall 2023	
Course Name	Conceptual Design of Electric and Hybrid Electric Vehicles	
Course Code	SEP 6AT3	
Date(s) and Time(s) of lectures	Monday, 4:30PM – 6:20PM, PC 155 Thursday, 12:30PM – 1:20PM, PC 155	
Program Name	Master of Engineering	
Calendar Description	Problem based learning course in which groups of students research, discuss, and implement conceptual design aspects of electric or hybrid electric vehicles for modern transportation approaches. The major aspects of vehicle design are analysed from the vehicle specification phase to the environment assessment and sustainability.	
Instructor(s)	Dr. Dan Centea	E-Mail: Avenue email only Office Hours & Location: by appointment

2. COURSE SPECIFICS

Course Description	The course is delivered using a Problem-Based Learning (PBL) approach, also known in the academic world as McMaster Model. It allows students to cover the conceptual design of an electric or hybrid electric vehicle that is supposed to enter the consumer market in several years. Open-ended designs carried out in groups of four people focus on implementing modern vehicle technologies. Students cover eight major problems and prepare the technical and business aspects of a future vehicle designed for a modern use such as car sharing. Innovative design aspects like autonomous driving and modern vehicle connectivity are expected. Students are highly encouraged to combine their imagination in designing the features of a vehicle that they would like to use in several years with the engineering challenges that they expect to be reduced or solved within this period. The PBL approach allows students to develop or reinforce important skills such as problem solving, self-reflection, decision making, group work with strict deadlines, communication skills, technical writing, engineering inventivity, and innovation.		
Instruction Type	Code	Type	Hours per term
	C	Classroom instruction	36
	L	Laboratory, workshop or fieldwork	
	T	Tutorial	
	DE	Distance education	
	Total Hours		36
Resources	ISBN	Textbook Title & Edition	Author & Publisher
	N/A	No textbook	N/A
	Other Supplies	Source	
Prerequisite(s)	None		
Corequisite(s)			

<p>Course Specific Policies</p>	<p>The attendance is mandatory for all classes. Students will work in groups of four. Group members are selected either based on personal preferences or assigned by the course instructor.</p> <p>All students are required to carry out group activities that include brainstorming, problem solving, decision making, preparing presentations, submitting briefs and a project report. Students are expected to use various communication means to discuss, suggest solutions, evaluate and choose a solution, submit contributions, review and approve presentations, briefs, and a project report.</p> <p>A conceptual design is accomplished through eight problems listed in the Course Outline and Detailed Schedule. A group manager is assigned for each problem. Each student will act twice as group manager and six times as group member. The group manager moderates and takes notes during the brainstorming activities, works with the group members to evaluate the suggested solutions, approves the solution adopted by the group, assigns work and deadlines to group members, collects their work, assembles a presentation and a technical brief for the given problem, asks group members to review the work that will be submitted (presentation or brief), and submits it.</p> <p>Each member will be assessed separately for his/her individual contributions.</p> <p>The final presentation is a sales pitch. The purpose of this presentation is to convince the audience of the advantages of the vehicle design and service package. Although the sales pitch is marked as a group, each member is expected to have an equal contribution to the presentation.</p>
<p>Departmental Policies</p>	<p>In order to achieve the required learning objectives, on average, MEng students can expect to do at least 3 hours of “out-of-class” work for every scheduled hour in class. “Out-of-class” work includes reading, research, assignments and preparation for tests and examinations.</p> <p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p> <p>The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception.</p> <p>Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class.</p> <p>The instructor has the right to submit work to software to identify plagiarism.</p>
<p>3. SUB TOPIC(S)</p>	
<p>Week 1</p>	<ul style="list-style-type: none"> • Introduction to Problem-Based Learning (PLB). • Project organisation.
<p>Week 2</p>	<p>Problem 1: Vehicle Technical Specification (VTS)</p> <ul style="list-style-type: none"> • Automobile electrification • Specifications of the Service • Technical Specifications • Designing a vehicle for a specific Service

Week 3	Problems 2: Market research I <ul style="list-style-type: none"> • Competition • Business model • Customer analysis Problems 3: Market research II <ul style="list-style-type: none"> • SWOT analysis • Survey method • Business plan 	
Week 4	Modern trends in automotive design	
Week 5	Problem 4: Propulsion system <ul style="list-style-type: none"> • Powertrain • Design of powertrain parameters • Design principles and control strategy of the powertrain 	
<i>Midterm Recess, Monday, October 9th to Sunday, October 15th, 2023</i>		
Week 6	Problem 5: Electrical, electronic and control systems <ul style="list-style-type: none"> • Electric motor • Battery • Charging 	
Week 7	Problem 6: Connected and Automated Vehicles (CAV) <ul style="list-style-type: none"> • Connected vehicles • Hardware modules, technologies and functions of a connected vehicle • Advanced Driver Assistance Systems (ADAS) 	
Week 8	Problem 7: User control systems <ul style="list-style-type: none"> • Car reservations • Vehicle control • Mobile app 	
Week 9	Problem 8: Autonomous driving <ul style="list-style-type: none"> • Advantages and disadvantages of autonomous driving • Designing autonomous features • Autonomous driving • Self reflection 	
Week 10	Smart systems	
Week 11	Consultations on projects and presentations	
Week 12	Project presentations Consultations on project reports	
Week 13	Finalize and submit project report	
Classes end: Wednesday, December 6 th , 2023		
<p>Note that this structure represents a plan and is subject to adjustment term by term.</p> <p>The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.</p>		
4. ASSESSMENT OF LEARNING *including dates*		Weight
Presentation (individual – group manager) 1 x 6%		6
Quality of the brief (individual – group manager) 2 x 2%		4
Content of brief (individual – each group member) 6 x 6.67%		40
Project presentation: sales pitch (group) – November 27 th , 2023		10
Project report: updated briefs (individual) 6 x 1% – due December 4 th , 2023		6

Project report: content not included in briefs (group) – due December 4 th , 2023	10
Project report: aspect (group) – December 4 th , 2023	4
Case study	20
TOTAL	100%

Percentage grades will be converted to letter grades and grade points per the University calendar.

5. LEARNING OUTCOMES

1. Revise automotive engineering knowledge learned in previous courses.
2. Apply problem-based learning strategies
3. Investigate comprehensive topics related to vehicular design
4. Analyse design options and select appropriate solutions
5. Debate and compare various design solution
6. Generate the conceptual design of an electrical or hybrid electric vehicle

6. COURSE OUTLINE – APPROVED ADVISORY STATEMENTS

ANTI-DISCRIMINATION

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant <https://secretariat.mcmaster.ca/app/uploads/Discrimination-and-Harassment-Policy.pdf>

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. It is your responsibility to understand what constitutes academic dishonesty.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at <https://secretariat.mcmaster.ca/app/uploads/Academic-Integrity-Policy-1-1.pdf>

The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

AUTHENTICITY / PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMaster’s use of Turnitin.com, please go to <https://www.mcmaster.ca/academicintegrity/turnitin/instructors/index.html>

Students are not permitted to use generative AI in this course. In alignment with McMaster academic integrity policy, it “shall be an offence knowingly to ... submit academic work for assessment that was purchased or acquired

from another source". This includes work created by generative AI tools. Also state in the policy is the following, "Contract Cheating is the act of "outsourcing of student work to third parties" (Lancaster & Clarke, 2016, p. 639) with or without payment." Using Generative AI tools is a form of contract cheating. Charges of academic dishonesty will be brought forward to the Office of Academic Integrity.

COURSES WITH AN ON-LINE ELEMENT

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

COMMUNICATIONS

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy <https://secretariat.mcmaster.ca/app/uploads/Academic-Accommodations-Policy.pdf>

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

<https://secretariat.mcmaster.ca/app/uploads/2019/02/Academic-Accommodation-for-Religious-Indigenous-and-Spiritual-Observances-Policy-on.pdf>

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.