ENGINEERING
McMaster-Mohawk
Bachelor of Technology
Partnership

McMaster University

Course Outline

1. COURSE INFORMATION

Session Offered	Fall 2021	
Course Name	Automotive Engineering Technology II	
Course Code	AUTOTECH 3AE3	
Date(s) and Time(s) of lectures	**Lectures:** Tuesdays 2:30 pm to 4:20 pm and Fridays 2:30 pm to 3:20 pm **Labs:** TBA September 7, 2021 to December 8, 2021	
Program Name	Automotive and Vehicle Technology	
Calendar Description	Spark ignition engines; diesel engines, transmissions and driveline; steering systems and dynamics; suspensions; brakes; tires; vehicle aerodynamics; transmission matching and vehicle performance; alternative vehicles; case studies	
Instructor(s)	**Lecture:** Dr. Sherif Abdou **Lab:** George Apostol	**E-Mail:** abdoust@mcmaster.ca **Office Hours & Location:** Zoom meeting arranged through email **E-Mail:** apostog@mcmaster.ca **Phone:** (289)260-2664

2. COURSE SPECIFICS

Course Description

The lectures will cover the construction and operation of the major mechanical components of automotive systems, with the exception of engines which will be studied in another course. Here, the major specifications of spark-ignited and Diesel engines are introduced with the purpose of listing the utilized sensors and presenting the engine diagnostics.

Clutches, manual and automatic transmissions, drive shafts, CV joints and differentials, as major systems included in the transmission and drivetrain, are investigated and the design methodologies of some components are provided.

After describing the tires and wheels, the course presents the steering and suspension systems of road vehicles. Dynamic effects of the aerodynamics are investigated. The course also looks into the alternate vehicle power system, a topic covered in detail in a different course.

Labs will provide hands-on testing and advanced analysis using on board control systems and data acquisition to reinforce the understanding of automotive systems.

Instruction Type

Code	Type	Hours per term
C	Classroom instruction	38
L	Laboratory, workshop or fieldwork	24
T	Tutorial	
DE	Distance education	
	Total Hours	62

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Resources	ISBN	Textbook Title & Edition	Author & Publisher
	ISBN: 9780131248908	Automotive Technology: Principles, Diagnosis, and Service, Canadian Edition	*Halderman, J.D. et al* *Pearson Education Canada*
	ISBN: 9780135257272	Automotive Technology: Principles, Diagnosis, and Service, Sixth Edition	*Halderman, J.D. et al* *Pearson Education Canada*
	Other Supplies	**Source**	
	Safety glasses, safety boots		
Prerequisite(s)	AUTOTECH 2AE3, 2TS3		
Corequisite(s)	None		
Antirequisite(s)	None		
Course Specific Policies	• Email communication for this course is exclusively through Avenue Mail (from student's Avenue account to instructor's Avenue account). • Lab attendance is mandatory. Lab participation and involvement is graded. • Lab grade is calculated as the multiplication product of the two marks. • Lab quizzes can be taken only if the corresponding lab was attended by the student.		
Departmental Policies	Students must maintain a GPA of 3.5/12 to continue in the program. In order to achieve the required learning objectives, on average, B.Tech. 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. Where group work is indicated in the course outline, such collaborative work is mandatory. 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. 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.		

3. SUB TOPIC(S)			
Week 1	Week of Sept 7	• Course Introduction • Spark-ignited and Diesel engine operation, parts and specs.	Chapter 4
Week 2	Week of Sept 13	• Engine condition diagnostics • Ignition system operation and diagnostics	Chapter 5 Chapter 24
Week 3	Week of Sept 20	• Computers and sensors operation and diagnostics • Computers and on-board diagnostics	Chapter 25 Chapter 26
Week 4	Week of Sept 27 **Friday, Oct 1**	• Engine fuels and combustion • ***Term test #1 (45 min)***	Chapter 27 ***Weeks 1 to 3***
Week 5	Week of Oct 4	• Gasoline and Diesel fuel injectors • Emission control device operation	Chapter 29 Chapter 30

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Mid-term Recess: Monday, October 11 to Sunday, October 17			
Week 7	Week of Oct 18	• Clutches • Manual transmission / Transaxles	Chapter 44 Chapter 45
Week 8	Week of Oct 25 **Friday, Oct 29**	• Manual transmission / Transaxles (continued) • ***Guest Lecture (Tentative)*** • ***Term test #2 (45 min)***	Chapter 45 ***Weeks 4 to 7***
Week 9	Week of Nov 1	• Drive shafts and CV joints • Wheel bearings • Differentials	Chapter 46 Chapter 34 Chapter 47
Week 10	Week of Nov 8	• Four-wheel drive and all-wheel drive • Automatic transmission / Transaxle principles • Brake systems principles and operation • Master cylinders and the hydraulic systems	Chapter 48 Chapter 49 Chapter 32 Chapter 33
Week 11	Week of Nov 15	• Drum brakes • Disk brakes • Power assisted brakes	Chapter 35 Chapter 36 Chapter 38
Week 12	Week of Nov 22 **Friday, Nov 26**	• Antilock brakes • Tires and wheels • ***Term test #3 (45 min)***	Chapter 39 Chapter 40 ***Weeks 8 to10***
Week 13	Week of Nov 29	• Steering systems • Suspension systems • Wheel alignment principles	Chapter 41 Chapter 42 Chapter 43
Week 14	Week of Dec 6	• Final Exam Review	
TBA		• ***Final Exam***	***Weeks 1 to13***

Classes end: Wednesday, December 8, 2021
Final examination period: Thursday, December 9 to Wednesday, December 22, 2021
All examinations MUST be written during the scheduled examination period.

List of experiments	
Lab 1	Throttle position sensor
Lab 2	a) Temperature sensor b) MAP sensor
Lab 3	a) MAF sensor b) Oxygen sensor
Lab 4	EGR valve
Lab 5	Hands on / sensors
Mid-term Recess: Monday, October 11 to Sunday, October 17	
Lab 6	Hands on / sensors
Lab 7	Hands on / sensors
Lab 8	Hands on / sensors
Lab 9	Hands on / sensors
Lab 10	Hands on / sensors
Lab 11	a) Brakes b) Suspension
Lab 12	a) Steering & Tires

	b) 4x4 and Differentials

Note that this structure represents a plan and is subject to adjustment term by term.
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.

4. ASSESSMENT OF LEARNING *including dates*	Weight
Lab attendance and involvement	5
Lab reports	15
Term Test #1	10
Term Test #2	10
Term Test #3	10
Quizzes	7
Group Project	10
Final examination (tests cumulative knowledge)	33
TOTAL	**100%**

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

5. LEARNING OUTCOMES

1. Understanding of principles of operation and construction of the above listed subjects
2. Perform and evaluate mechanical and electronic measurements
3. Network handheld equipment to computer-controlled systems for data analysis
4. Operate advanced electronic alignment equipment
5. Understand and operate chassis dynamometer
6. Be aware of gasoline and diesel engine requirements
7. Be familiar with sensory systems for temperature, pressure, G-force and rotary motion
8. Understand evaluation of systems efficiencies
9. Managing manufacturers technical information
10. Problem solving and diagnostic strategies

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, as soon as possible.
http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.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/university-policies-procedures-guidelines/

The following illustrates only three forms of academic dishonesty: 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 www.mcmaster.ca/academicintegrity.

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.

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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.

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

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. http://www.mcmaster.ca/policy/Students-AcademicStudies/Studentcode.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.