

Course Outline

1. COURSE INFORMATION

Session Offered	Fall 2020	
Course Name	Manufacturing Processes and Systems	
Course Code	AUTOTECH 3MP3	
Date(s) and Time(s) of lectures	Lecture: Mo 10:20 a.m. – 1:20 p.m. L01: Th 9:30 – 11:20 a.m. L02: Th 11:30 a.m. – 1:20 p.m. L03: Th 4:30 – 6:20 p.m. L04: Th 6:30 – 8:20 p.m.	
Program Name	Automotive and Vehicle Engineering Technology	
Calendar Description	Metal-casting processes and equipment; forming and shaping processes and equipment for metals, ceramics and plastics; material-removal processes and machines; joining processes and equipment; surface technology; engineering metrology and instrumentation.	
Instructor(s)	Dr. Dan Centea	E-Mail: Avenue email tool Office Hours & Location: virtual, by appointment

2. COURSE SPECIFICS

Course Description			
Instruction Type	Code	Type	Hours per term
	C	Classroom instruction	36
	L	Laboratory, workshop or fieldwork	24
	T	Tutorial	
	DE	Distance education	
	Total Hours		60
Resources	ISBN	Textbook Title & Edition	Author & Publisher
	ISBN: 9780470924679	Materials and Processes in Manufacturing	DeGarmo, E. Paul, Black, Wiley & Sons
	Other Supplies	Source	
		Software: CNC simulator, Autodesk Fusion	
Prerequisite(s)	AUTOTECH 2AE3, 2MT3 and registration in level III or above of Automotive and Vehicle Engineering Technology.		
Corequisite(s)			
Antirequisite(s)			
Course Specific Policies	All lecture and labs will be delivered virtually in a synchronous mode using Zoom. Lab submissions cannot be accepted for labs not performed. Lab attendance is mandatory for this course. Labs missed due to legitimate reasons will be completed by the students on their own time, at a time of mutual agreement with the instructor. Late lab submissions and late assignments will not be graded. Project late submissions will be penalized at 10% per day up to a maximum of 2 days. After 2 days, project late submissions will not be graded.		

	<p>Some work for this course is performed in groups. Students are free to choose their group members. However, students who cannot decide which group to join will be randomly assigned one by the instructor. If the number of students is uneven the instructor will decide if the remaining students will form a smaller group or if they will be rearranged within the existing groups.</p>	
Departmental Policies	<p>Students must maintain a GPA of 3.5/12 to continue in the program.</p> <p>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.</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>Instructor has the right to submit work to software to identify plagiarism.</p>	
3. SUB TOPIC(S)		
Week 1	- Classes start Tuesday, Sept.8. No lecture, Lab #1	
Week 2: Sept. 14	- Course intro, G-code, milling & turning	
Week 3: Sept. 21	- Machining Process: CAM milling & turning	
Week 4: Sept. 18	- Fundamentals of machining process	Assign. 1 (Mon)
Week 5: Oct. 5	- 3D printing technologies - 3D printing joints for assemblies & gear systems	Assign. 1 due (Fri)
Mid-term Recess		
Week 6: Oct. 19	- Midterm 1 - GD&T	
Week 7: Oct. 26	- Heat Treatment	
Week 8: Nov. 2	- Fundamentals of metal casting	Assign. 2 (Mon)
Week 9: Nov. 9	- Joining & forming	Assign. 2 due (Fri)
Week 10: Nov. 16	- Midterm #2 - Polymers & selection of materials	
Week 11: Nov. 23	- Composites production (demo) - Non-conventional material removal processes	
Week 12: Nov. 30	- Project presentation - Reliability, metrology, testing and inspection	
Week 13: Dec. 7	- Lean tools for manufacturing - Exam review	Project report due (Tue)
<p>Midterm Recess: Monday, October 12 to Sunday, October 18, 2020 Classes end: Wednesday, December 9, 2020 Final examination period: Thursday, December 10 to Wednesday, December 23, 2020 All examinations MUST be written during the scheduled examination period.</p>		

List of experiments	
Lab 1 – Thur. Sept 10	CAD review with intro 3d print consideration (considerations including part orientation, scale, supports, infill, etc.)
Lab 2 – Thur. Sept 17	CAD design for 3d printing assembly (joints, press-fits, tolerance consideration, orientation for strength, orientation for resolution)
Lab 3 – Thur. Sept 24	G-code, CNC Simulator Pro (Milling)
Lab 4 – Thur. Oct. 1	CAM part I - setup stock, working coordinate, tools, basic operations
Lab 5 – Thur. Oct. 8	CAM part II - intermediate/advanced programming including 3d surface contours, prep for tapping, profile with tabs
Lab 6 – Thur. Oct. 22	FEA analysis - linear, static analysis and why it is important for a design engineer (understanding important material properties)
Lab 7 – Thur. Oct. 29	Optimized design utilizing <i>REALIZE SHAPE</i> - extends an FEA analysis to create a mesh body utilizing a light weight structure while maintaining a stiffness criterion
Lab 8 – Thur. Nov. 5	Freeform CAD design - utilizing new <i>SCULPT</i> technique starting from a primitive shape, manipulated by push and pulling vertex, lines and surfaces; enhanced via weight and smoothing techniques
Lab 9 – Thur. Nov. 12	Assemblies - basic joints and understanding degrees of freedom
Lab 10 – Thur. Nov. 19	Kinematic Simulation - demonstrate an assembly's function by making it come to life.
Lab 11 – Thur. Nov. 26	Project
Lab 12 – Thur. Dec. 3	Project

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
Assignments: due Friday Oct. 9 and Nov. 13	5% + 5% = 10%
Mid-term tests: Monday Oct. 19 and Nov. 16	15% +15% = 30%
Project: due Tuesday, Dec. 8	15%
Labs	15%
Final examination (tests cumulative knowledge)	30%
TOTAL	100%

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

5. LEARNING OUTCOMES
1. Learn the manufacturing processes for different materials
2. Apply basic tools for numerical control programming and simulation
3. Experiment with CAD/CAM tools in developing a project for cutting using a CNC machine tool
4. Calculate the parameters for metal removal rates in manufacturing processes
5. Understand composite manufacturing production and machining techniques
6. Assess classical and modern measurement technologies used in quality assurance
7. Acknowledge the importance of reliability in manufacturing

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](http://www.mcmaster.ca/policy/General/HR/Discrimination%20Harassment%20Sexual%20Harassment-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-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, ThinkingCap, Moodle, 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 email 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.

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.

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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.