

Course Outline

1. COURSE INFORMATION

Session Offered	Fall 2017
Course Name	Fluid Mechanics
Course Code	AUTO TECH 3TS3
Date(s) and Time(s) of lectures	Tuesday (1:30-2:20 AM), Friday (3:30-5:20PM)
Program Name	Automotive and Vehicle Technology
Calendar Description	Fluid statics; forces on submerged and floating bodies; kinematics of flow and Bernoulli's equations; dimensional analysis and similarity; flow in closed conduits. Automotive Turbo-machines, fluid flow around bodies, lift and drag minimization by proper vehicle design.
Instructor(s)	Moein Mehrtash Phone: x 59105 E-Mail: mehrtam@mcmaster.ca Office Hours & Location : Friday 10:00-11:30 AM

2. COURSE SPECIFICS

Course Description	Hydrostatic pressure and its measurements; Hydrostatic forces & Buoyancy; Dimensional Analysis & Control Volume; Fluid dynamics; Momentum Equation; Bernoulli Equation; Mechanical Equation; Internal Flow & Pipe Flow Head Losses; Flow through Nozzles; Applications to matching pump and compressors to a fluid piping system; External Flow; Drag & Lift Forces Analysis for vehicle design;		
Instruction Type	Code	Type	Hours per term
	C	Classroom instruction	42
	L	Laboratory, workshop or fieldwork	12
	T	Tutorial	
	DE	Distance education	
	Total Hours		54
Resources	ISBN	Textbook Title & Edition	Author & Publisher
	978-1-118-32430-1	Fundamentals of fluid mechanics	Munson, Bruce R., Donald F. Young, and Theodore H. Okiishi, John Wiley & Sons (2013)
	Other Supplies	Source	
Prerequisite(s)	AUTOTECH 2TS3		
Corequisite(s)			
Antirequisite(s)			
Course Specific Policies	<ul style="list-style-type: none"> Lab attendance is mandatory. Labs missed due to illness may be excused by the professor if appropriate documentation is provided and the student completes the lab missed on his/her own time, to the professor's satisfaction. 		

	<ul style="list-style-type: none"> • Lab reports submitted after the posted deadline or without attending the lab will not be accepted, thus marked with zero. Due Date: Lab report must be submitted in two-weeks from the lab session. • The assignment submission is mandatory, zero for late submission. • Students should be aware that, the attendance for all quizzes is mandatory. • This course will be using a range of software. Students should be aware that, when they access the electronic components of this course, 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 this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor. The instructor may also use other software including: e-mail, Avenue, LearnLink, web pages, capa, Moodle, Thinking Cap, etc. 	
Departmental Policies	<p>Students must maintain a GPA of 3.5 on a 12 point scale 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>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 not in class.</p>	
3. SUB TOPIC(S)		
Week 1	<p>Intro to Fluid Properties & Measurements</p> <ul style="list-style-type: none"> • Fluid definitions and viscosity • Measurement Units • Dimensions 	Ch. 1
Week 2	<p>Fluid statics</p> <ul style="list-style-type: none"> • Hydrostatic pressure • Manometer concept 	Ch. 2
Week 3	<p>Hydrostatics and Buoyancy</p> <ul style="list-style-type: none"> • Hydrostatic force on flat and curved panel • Buoyancy and stability 	Ch. 2
Week 4	<p>Fluid Dynamics: Control Volume</p> <ul style="list-style-type: none"> • Bernoulli Eq applications • Head Loss Calculations in Fluid System • Pump and Turbine Powers 	Ch.3
Week 5	<p>Continuity and Momentum Equations</p> <ul style="list-style-type: none"> • Conservation of mass and momentum • Application of Momentum Eq.: Fluid Jet, Nozzle, ... 	Ch. 5
<i>Mid-term recess (Monday, October 12 to Saturday, October 17)</i>		
Week 7	Review #1 & Term Test #1	

Week 8	Mechanical Energy Equation <ul style="list-style-type: none"> • Comparison of energy equation with Bernoulli • Application of energy equation 	Ch. 5
Week 9	Internal Flow: Pipe Flow Head Losses <ul style="list-style-type: none"> • Laminar & Turbulent Pipe Flow • Major & Minor Losses • Applications to Pumps & Compressors 	Ch. 8
Week 10	External Flow: Drag & Lift <ul style="list-style-type: none"> • Drag Coefficients • Drag Forces on Cars • Techniques for Drag Reduction 	Ch. 9
Week 11	Review #2 & Term Test #2	
Week 12	Dimensional Analysis <ul style="list-style-type: none"> • Dimensional Analysis & Applications to Fluid Mechanics • Similitude and Modeling 	Ch.7
Week 13	Fluid Mechanics Application: Turbomachines and Pumps <ul style="list-style-type: none"> • Turbine Power Output & Efficiencies Centrifugal Turbine & Compressor 	Ch.12

Classes end – Tuesday December 8, 2015

Final examination period: Wednesday December, 9, 2015 to Tuesday, December 22, 2015

All examinations MUST BE written during the scheduled examination period.

List of laboratory experiments

Lab 1	Hydrostatic Pressure
Lab 2	Jet Force and Effects of Target Geometric Shapes
Lab 3	Bernoulli Demonstration
Lab 4	Turbines
Lab 5	Laminar & Turbulent Flow & the Reynolds Number
Lab 6	Parallel & Series Pumps
Lab schedule	Some of the labs will be performed on a rotating basis. The actual lab schedule will be provided by the instructor

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	Weight
Term Test 1	11%
Term Test 2	12%
Quizzes	9%
Assignments	15%
Labs	18%
Active Learning	5%
Final Examination	30%
TOTAL	100%

Course results determined on a percentage scale will be converted to an official letter grade, as indicated in the Undergraduate Calendar. The results of all courses attempted will appear on your transcript as letter grades.

5. LEARNING OUTCOMES

1. Relate real world components to fluid system mathematical model parameters
2. Construct fluid handling systems using pumps, piping, valves and nozzles
3. Evaluate the performance of fluid handling systems and the effects of changing fluid handling system parameters
4. Create fluid handling system performance specifications
5. Design fluid handling systems to achieve the required system performance
6. Analyze the aerodynamic forces acting on vehicle's body and suggest improvements for design optimization

6. POLICIES

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/Anti-Discrimination%20policy.pdf>

Academic Integrity

You are required 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.

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.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, located at: <http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf>.

The following illustrates only three forms of academic dishonesty:

1. Plagiarism. E.g. the submission of work that is not own or for which other credit has been obtained
 2. Improper collaboration in group work
- Copying or using unauthorized aids in tests and examinations.

Requests for Relief for Missed Academic Term Work (Assignments, Mid-Terms, etc.)

The McMaster Student Absence Form is a self-reporting tool for **Undergraduate Students** to report absences that last up to 3 days and provides the ability to request accommodation for any missed academic work. Please note, this tool cannot be used during any final examination period.

You may submit a maximum of 1 Academic Work Missed requests per term. It is YOUR responsibility to follow up with your Instructor immediately regarding the nature of the accommodation.

If you are absent more than 3 days or exceed 1 request per term you MUST visit your Associate Dean's Office (Faculty Office). You may be required to provide supporting documentation.

This form should be filled out immediately when you are about to return to class after your absence. <http://www.mcmaster.ca/msaf/>

E-Learning Policy

Consistent with the Bachelor of Technology's policy to utilize e-learning as a complement to traditional classroom instruction, students are expected to obtain appropriate passwords and accounts to access Avenue To Learn for this course. Materials will be posted by class for student download. It is expected that students will avail themselves of these materials prior to class. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail account, and program affiliation may become apparent to all other students in the course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about this disclosure please discuss this with the course instructor. Avenue can be accessed via

<http://avenue.mcmaster.ca>.

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.

Turnitin (Optional)

This course will be using a web-based service (Turnitin.com) to reveal plagiarism. Students submit their assignment/work electronically to Turnitin.com where it is checked against the internet, published works and Turnitin's database for similar or identical work. If Turnitin finds similar or identical work that has not been properly cited, a report is sent to the instructor showing the student's work and the original source. The instructor reviews what Turnitin has found and then determines if he/she thinks there is a problem with the work. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to

<http://www.mcmaster.ca/academicintegrity/turnitin/students/>

Protection of Privacy Act (FIPPA)

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades and all other personal information at all times. For example, the submission and return of assignments and posting of grades must be done in a manner that ensures confidentiality.

<http://www.mcmaster.ca/univsec/fippa/fippa.cfm>

Academic Accommodation of Students with Disabilities Policy

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information consult McMaster's policy for Academic Accommodation of Students with Disabilities

<http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf>

Students must forward a copy of the SAS accommodation to the instructor of each course and to the Program Administrator of the B.Tech. Program immediately upon receipt. If a student with a disability chooses NOT to take advantage of a SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. <http://sas.mcmaster.ca>

Student Code of Conduct

The Student Code of Conduct (SCC) exists to promote the safety and security of all the students in the McMaster community and to encourage respect for others, their property and the laws of the land. McMaster University is a community which values mutual respect for the rights, responsibilities, dignity and well-being of others. The purpose of the Student Code of Conduct is to outline accepted standards of behavior that are harmonious with the goals and the well-being of the University community, and to define the procedures to be followed when students fail to meet the accepted standards of behavior. All students have the responsibility to familiarize themselves with the University regulations and the conduct expected of them while studying at McMaster University.

<http://judicialaffairs.mcmaster.ca/pdf/SCC.pdf>

