

## Course Outline

### 1. COURSE INFORMATION

<b>Session Offered</b>	Winter 2017	
<b>Course Name</b>	Hydraulic Engineering	
<b>Course Code</b>	CIV TECH 4MH3	
<b>Date(s) and Time(s) of lectures</b>	Thursday 18:30 – 21:30	
<b>Program Name</b>	Civil Engineering Infrastructure Technology	
<b>Calendar Description</b>	Dimensional analysis and hydraulic models.; Application of continuity, momentum and energy principles; Steady, closed conduit flow in single pipes and pipe networks; Steady, open-channel flow under uniform and gradually varied conditions, control sections, hydraulic jumps, and energy dissipaters; Hydraulic transients; surges and water hammer in closed conduits, surface waves in open channels; Concepts and principles of turbo machinery, especially centrifugal pumps; similarity relations and cavitation; operation of pump-and-pipe systems; Introductory concepts of hydraulic structures, including environmental aspects of hydraulic works and water quality management.	
<b>Instructor(s)</b>	Mohamed Mostafa	E-Mail: mostam4@mcmaster.ca Office Hours & Location: ---

### 2. COURSE SPECIFICS

<b>Course Description</b>	Fluid Flow Fundamentals: Continuity, Energy, and Momentum; Viscous Effects on Flow: Laminar vs turbulent flow in closed conduits, Various friction loss relationships; Flow in Pipe systems: Single pipes, Pipe networks, surges and water hammer; Pumps: Pump characteristic curves, Net positive suction head, Pumps in series and parallel; Municipal Water Demand: Water demand variation, Population projection; Distribution Systems: Intake structures, Storage; Open Channel Flow: Specific energy, Gradually varied flow analysis, Rapidly varied flow, hydraulic jumps, design considerations; Hydraulic Structures: concept and design; Water Quality and Standards: Ontario Drinking Water Quality Standards.		
<b>Instruction Type</b>	<b>Code</b>	<b>Type</b>	<b>Hours per term</b>
	C	Classroom instruction	36
	L	Laboratory, workshop or fieldwork	---
	T	Tutorial	---
	DE	Distance education	---
	<b>Total Hours</b>		36
<b>Resources</b>	<b>ISBN</b>	<b>Textbook Title &amp; Edition</b>	<b>Author &amp; Publisher</b>
	ISBN: 0-13-283321-2	Water-Resources Engineering, 3 <sup>rd</sup> Edition, 2013	David A. Chin; Pearson
	<b>Other Supplies</b>	<b>Source</b>	
Various textbooks different other publishers such as : McGraw Hill Ryerson	- Boyle, W.P., "Applied Fluid Mechanics", McGraw-Hill Ryerson Ltd., 1986.		

	<p>Ltd., John Wiley &amp; Sons Inc., Prentice Hall Inc., and Heastad Methods</p> <ul style="list-style-type: none"> <li>- Roberson, J.A., J.J. Cassidy, and M.H. Chaudhry, "Hydraulic Engineering", Second Edition, John Wiley &amp; Sons Inc., 1998</li> <li>- Houghtalen, R.J., A.O. Akan, and N.H.C. Hwang, "Fundamentals of Hydraulic Engineering Systems", Fifth Edition, Pearson, 2017.</li> <li>- John, J.E.A. and W.L. Haberman, "Introduction to Fluid Mechanics", Third Edition, Prentice Hall Inc., 1988.</li> <li>- McGhee, T.J., "Water Supply and Sewerage", Sixth Edition, McGraw-Hill Inc., 1991.</li> <li>- Peavy, H.S., D.R. Rowe and G. Tchobanoglous, "Environmental Engineering", McGraw-Hill Inc., 1985.</li> <li>- Walskim, T. M., T. E. Barnard, S. R. Durrans and M. E. Meadows, "Computer Applications in Hydraulic Engineering", Heastad Methods, 2000.</li> <li>- Mays, L.W., "Water Resources Handbook", McGraw-Hill Inc., 1996.</li> </ul>
<b>Prerequisite(s)</b>	ENG TECH 4TF3E and registration in Civil Engineering Infrastructure Technology
<b>Corequisite(s)</b>	N/A
<b>Antirequisite(s)</b>	N/A
<b>Course Specific Policies</b>	<ul style="list-style-type: none"> <li>- The assigned assignments to be completed individually and not to be solved in groups.</li> <li>- All work must be shown and any assumptions must be verified from a reputable reference to get full credit.</li> <li>- Both of Mid-Term and final exams are closed book.</li> <li>- Absence from Mid-Term exam without a submitted McMaster Student Absence Form (MSAF) will result to a grade of zero in the Mid-Term. Missed Mid-Term exam with a submitted MSAF will have their weight shifted to the final exam at the discretion of the course instructor.</li> </ul>
<b>Departmental Policies</b>	<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>
<b>3. SUB TOPIC(S)</b>	
Week 1	<p><u>Introduction:</u> Overview of fluid flow properties and terms</p> <p><u>Fluid Flow Fundamentals:</u></p>

	Continuity, Energy, Momentum.
Week 2	<u>Viscous Effects on Flow:</u> Real vs. ideal fluids. Circular and non-circular conduit flow. Laminar and turbulent flow friction losses. Friction loss relationships.
Week 3	<u>Flow in Pipe systems:</u> Types of pipe flow problems. Minor losses.
Week 4	<u>Flow in Pipe systems, Cont.:</u> Pipe networks Energy and hydraulic grade lines. Siphons. Cavitation. Pressure surge and water hammer. Full and partially full flow in pipes
Week 5	<u>Pumps:</u> Types of pumps. NPSH. System curves. Pump characteristic curves. Single pumps. Pumps in series. Pumps in parallel.
Week 6	<u>Municipal Water Demand:</u> Water demand. Population projections. <u>Distribution Systems:</u> Distribution methods. Storage. Pressure and flow requirements. Water distribution system design considerations.
Week 7	Mid-Term
Mid-term Recess: Monday, February 20 to Sunday, February 26, 2017	
Week 8	<u>Open Channel Flow:</u> Principles of open channel flow. Channel cross-sections. Velocity distributions. Specific energy. Normal and critical depths. Subcritical and supercritical flows. Transitions and control sections. Gradually varied flow analysis. Rapidly varied flow analysis. Open channel design considerations.
Week 9	
Week 10	
Week 11	<u>Hydraulic Structures:</u>
Week 12	Weirs. Parshall Flumes. Spillways. Control Gates. Culverts.
Week 13	<u>Water Quality and Standards:</u> Physical, Chemical, Microbiological, and Biological Characteristic of Water, Ontario Drinking Water Quality Standards
Classes end: Thursday, April 6, 2017 Final examination period: Tuesday, April 11 to Thursday, April 27, 2016 All examinations MUST be written during the scheduled examination period.	
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.	
<b>4. ASSESSMENT OF LEARNING *including dates*</b>	
	<b>Weight</b>
Assignments (6 Bi-weekly assignments)	30%
Mid-term test (February 16 <sup>th</sup> , 6:30pm – 8:30pm)	30%
Final examination (tests cumulative knowledge)	40%
<b>TOTAL</b>	<b>100%</b>
Percentage grades will be converted to letter grades and grade points per the University calendar.	
<b>5. LEARNING OUTCOMES</b>	
1. Ability to draw and identify components of Hydraulic Grade Line (H.G.L.) and Energy Grade Line (E.G.L.) in a pipe system	
2. Ability to use the Hardy Cross Method to calculate flow in a pipe network system	
3. Ability to estimate population growth using forecast estimation models	
4. Ability to identify water surface profiles in an open channel based on various obstacles and bed slopes	

5. Ability to carry on calculations to identify whether flow conditions in an open channel will result in the generation of a hydraulic jump or not.

6. Ability to identify flow types in a culvert and calculate the hydraulic parameters needed for a hydraulic culvert design.

## 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/Discrimination\\_Harassment\\_Sexual\\_Harassment-Prevention&Response.pdf](http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf)

### Academic Integrity

You are required to exhibit honestly 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
3. 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 an on-line self-reporting tool for **Undergraduate Students** to report absences for:

- 1) Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three calendar days:
  - Students may submit a maximum of one academic work missed request per term. It is the responsibility of the student to follow up with instructors immediately (within the 3 day period that is specified in the MSAF) regarding the nature of the accommodation. All work due in that time period however can be covered by one MSAF.
  - MSAF cannot be used to meet religious obligation or celebration of an important religious holiday, for that has already been completed or attempted or to apply for relief for any final examination or its equivalent.
- 2) For medical or personal situations lasting more than three calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has not been used previously in that term:
  - Students must visit their Associate Dean's Office (Faculty Office) and provide supporting documentation.

### 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](mailto: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://studentconduct.mcmaster.ca/student\\_code\\_of\\_conduct.html](http://studentconduct.mcmaster.ca/student_code_of_conduct.html)