EXPANDED COURSE DESCRIPTION

CIVIL ENGINEERING

Lassonde School of Engineering
Civil Engineering

LE / CIVL 3120 4.0 SECTION A
HYDRAULICS
FALL 2017 / WINTER 2018

Last Modified Date: 08/17/2017

COURSE CALENDAR DESCRIPTION

This course focuses on fundamentals of hydrostatics and hydrodynamics; flow potential; dimensional analysis; boundary layer development; transient and steady-state flow conditions; flow of water through open and closed conduits, notches, orifices, and weirs; flow of water past objects. Prerequisites: LE/CIVL 2210 3.00 or LE/CIVL 2210 4.00.

INSTRUCTOR(S)

<table>
<thead>
<tr>
<th>Name</th>
<th>Section / Format / Term</th>
<th>Contact Email</th>
<th>Contact Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khan, Usman T.</td>
<td>Sec. A / LECT / F</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ADDITIONAL INFORMATION

EXPANDED DESCRIPTION

The objective of this course is to introduce the student to hydraulic engineering as it pertains to Civil Engineering applications through the use of lectures, laboratory and tutorial sessions. Topics that will be covered in this course will include:

1. Review of basic concepts from LE/CIVL 2210 Fluid Mechanics
2. Flow through pipes: laminar and turbulent flows, major and minor head losses, pipe networks and pumps, flow measurement
3. Differential analysis of fluid flow: conservation of momentum, continuity equation, Cauchy momentum equation, the Navier-Stokes equations for laminar and turbulent flow
4. Potential Flow: Euler’s equation, inviscid and irrotational flow; potential and stream functions, and Laplace equations; Bernoulli’s equation; flow nets and pressures around objects
5. Boundary layer, lift and drag: boundary layer approximation and equations; friction and pressure drag, streamlined objects, and flow separation; lift.
6. Open Channel Flow: Basic characteristics; Froude number and waves; specific energy; uniform flow, gradually varied flow and hydraulic jumps; best hydraulic section; flow control and measurement through weirs and gates;

The course has six 1.5 hour long tutorial sessions. The first tutorial session involves a review of concepts learned in LE/CIVL 2210 Fluid Mechanics. Subsequent tutorial sessions involve individual and group problem-solving activities that are in sync with the course material being taught.

The course has the following five 3-hr-long laboratory sessions:

1. Pressure losses in pipes
2. Flow patterns around commonly shaped objects
3. Fluid flow through gates
4. Flow measurement using weirs
5. Energy dissipation in a hydraulic jump
COURSE LEARNING OBJECTIVES
The main objective of the course is to provide the students with understanding and application of fundamental concepts and techniques in hydraulics in the analysis and preliminary design of simple water conveyance and distribution systems. The course aims to build on the foundational knowledge gained in Year 2 Fluid Mechanics and provide sufficient background knowledge using real-life examples for the Year 4 elective courses in Hydrotechnical Engineering.

COURSE LEARNING OUTCOMES
By the end of this course, students will be able to:
1. Define key components and terminology in hydraulic engineering
2. Calculate losses in pipes and pumping requirements in pipe networks for different flow conditions
3. Understand and apply the conservation laws to determine the equations of motion for fluid flow under different flow approximations
4. Understand the impacts of flow over objects in a fluid, including drag and lift
5. Understand the difference in flow through pipes and open channels, including jumps, and flow measurement techniques
6. Analyse data acquired in the laboratory and communicate the results by writing a technical report.

ACADEMIC INTEGRITY LINKS
- Senate Policy on Academic Honesty - [http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/](http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/)
- Academic Integrity - [http://lassonde.yorku.ca/academic-integrity](http://lassonde.yorku.ca/academic-integrity)

STUDENT LINKS
- Student Rights and Responsibilities - [http://oscr.students.uit.yorku.ca/student-conduct](http://oscr.students.uit.yorku.ca/student-conduct)
- Religious Observance - [https://w2prod.sis.yorku.ca/Apps/WebObjects/cdm.woa/wa/regobs](https://w2prod.sis.yorku.ca/Apps/WebObjects/cdm.woa/wa/regobs)
- Counselling and Disability Services - [http://cds.info.yorku.ca/](http://cds.info.yorku.ca/)

Many courses utilize Moodle, York University's course website system. If your course is using Moodle, click here to access it.

Moodle @ York University