Western University - Faculty of Engineering  
Department of Civil and Environmental Engineering  

CEE 3355b – Municipal Engineering Design – Course Outline 2023

This course applies the principles of hydraulics and hydrology in the design of municipal water systems and introduces the student to design and analysis tools that are used in practice. The general objectives are for the student to become able to:

- apply knowledge of hydrology and statistics to describe rainfall events;
- use appropriate models to quantify the volume and rate of runoff resulting from rainfall events;
- use current methods to design stormwater drainage structures;
- recognize the effect of urbanization on stormwater runoff and design effective measures to mitigate this impact;
- use stormwater computer models effectively as part of the design process;
- understand municipal sanitary sewer and water distribution systems;
- improve communication skills by documenting design decisions in coherent and legible design calculations;
- recognize the need for life-long learning to keep abreast of new design and construction methods, enhance one’s abilities as a designer, and maintain one’s professional competence.

Calendar Copy:

Application of hydraulics and hydrology in design of water-related municipal systems. Topics include municipal water requirements and waste volumes; surface and ground water supplies; water treatment, transportation and distribution; sewerage, drainage and flood control. 0.5 Course.

Contact Hours:

Lectures:

Lecture material will be delivered asynchronously through videos and notes posted to the course OWL site. The lecture sessions on Mondays, 1:30-2:20 and Tuesdays, 12:30-1:20 will be held in person. These sessions will follow a flipped classroom approach, with the instructor available to answer questions related to the previous week’s lecture material, present worked examples, etc. Attendance at these sessions is not mandatory, but is strongly encouraged. Review of lecture material and self-study should take approximately 4 hours per week.

Tutorials:

Tutorial sessions will be held in person on Tuesdays, 9:30-11:30. In this session, students will work in teams to complete the first part (Part A) of the weekly assignment, which will be due at the end of the session. The second part of the weekly assignment (Part B) will be completed individually by each student and submitted at the end of the week. TAs and the course instructor will be available to answer questions related to both parts of the assignment during the tutorial sessions and may also make arrangements for additional office hours later in the week.

Prequisites:  CEE 2224
Corequisites:  None
Antirequisite: None
Note: It is the student's responsibility to ensure that all Prerequisite and Corequisite conditions are met or that special permission to waive these requirements has been granted by the Faculty. It is also the student's responsibility to ensure that they have not taken a course listed as an Antirequisite. The student may be dropped from the course or not given credit for the course towards their degree if they violate the Prerequisite, Corequisite or Antirequisite conditions.

Instructor:
Jon Southen, P.Eng.; SEB 3116; jsouthen@uwo.ca
Office hours: TBA

Textbook:
Class notes and other pertinent material will be made available via the course website (http://owl.uwo.ca).

Other References:

Stormwater Management Planning and Design Manual, Ontario Ministry of the Environment and Climate Change


Low Impact Development Stormwater Management Planning And Design Guide

Computing:
Students are required to use personal computers running a Windows environment. Assignments may require the use of stormwater modelling programs:
PCSWMM (https://www.pcsvm.com/)
EPA-SWMM (http://www.epa.gov/water-research/storm-water-management-model-swmm)
OTTHYMO (https://civi.ca/visualotthymo-single-and-continuos-events/)

Units:
Both SI and US units will be used in lectures and examinations
Specific Learning Objectives:

1. Hydrologic Modelling [ET1, ET2]
   - Define watershed characteristics (Area, length, slope, soil characteristics, land use, channel geomorphology, travel time)
   - Develop a unit-hyetograph for a watershed
   - Apply the Intensity-Duration-Frequency curve of rain
   - Develop a design storm of given frequency, duration and cumulative rain distribution
   - Use infiltration models to calculate the component of rain that contributes to runoff

2. Rainfall Excess, Open-Channel Flow and Runoff Rates in Urban Watersheds [ET1, ET2]
   - Investigate the hydraulics of open-channel and overland flow
   - Determine the run-off coefficients and time of concentrations of drainage areas
   - Apply the unit hydrograph method to calculate runoff hydrographs at the outlet of a watershed
   - Apply the rational method to calculate peak flows in storm sewers

3. Design of Stormwater Drainage Structures [D1, D2, D3]
   - Design drainage structures for street pavements
   - Design storm sewers
   - Design culverts
   - Design open channels for surface drainage

4. Storm Water Management [D1, D2, D3]
   - Recognize the detrimental effect of urban development on the quality and quantity of water released into streams and lakes.
   - Compare pre-development and post-development discharge hydrographs
   - Carry out flood routing calculations
   - Design a detention facility to manage stormwater quantity

5. Stormwater Pollution and Stormwater Quality Control [ET2, D1, D2, D3]
   - Use models to estimate stormwater quality
   - Design detention facilities and other methods of stormwater quality control
   - Recognize appropriate best management practices for stormwater quality

6. Stormwater Computer Modelling [ET1, ET2]
   - Become familiar with current stormwater management models
   - Use these models in the design of stormwater management systems

7. Sanitary Sewers and Water Distribution [D1, D2, D3]
   - Estimate sewerage and water demands in a municipal context
   - Determine required pipe sizing for a sanitary sewer system
   - Calculate working storage, emergency storage and fire-fighting storage requirements
   - Identify the components of a municipal water supply system and their design capacities
   - Learn about the type of pumps used in the water industry and their hydraulic behaviour

The instructor may modify course material as appropriate.
**General Learning Objectives**

E=Evaluate, T=Teach, I=Introduce (Advanced Level)

<table>
<thead>
<tr>
<th>Knowledge Base</th>
<th>T</th>
<th>Engineering Tools</th>
<th>E</th>
<th>Impact on Society</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Analysis</td>
<td>T</td>
<td>Team Work</td>
<td></td>
<td>Ethics and Equity</td>
<td></td>
</tr>
<tr>
<td>Investigation</td>
<td></td>
<td>Communication</td>
<td>T</td>
<td>Economics and Project Management</td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td>E</td>
<td>Professionalism</td>
<td>I</td>
<td>Life-Long Learning</td>
<td>T</td>
</tr>
</tbody>
</table>

**Evaluation:**

The final course mark will be determined as follows:

- Assignments: 40%
- Tests: 20%
- Final examination: 40%
- Total: 100%

**Note:**

(a) **Students must pass the final examination to pass this course.** Students who fail the final examination will be assigned the aggregate mark, as determined above, or 48%, whichever is less.
(b) **Students who have failed this course previously must repeat all components of the course.** No special permissions will be granted enabling a student to retain laboratory, assignment or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted.
(c) Should any of the quizzes conflict with a religious holiday that a student wishes to observe, the student must inform the instructor of the conflict no later than two weeks before the scheduled test.

(For further information on Accommodations for Religious Holidays see [http://www.uwo.ca/univsec/handbook/appeals/accommodation_religious.pdf](http://www.uwo.ca/univsec/handbook/appeals/accommodation_religious.pdf))

1. **Weekly Assignments**

A two-part assignment based on the previous week’s lecture material will be posted to OWL each week. The first part of the assignment will be completed in a team assigned by the course instructor and due at the end of each week’s tutorial session. The second part of the assignment will be completed individually and completed by 5:00 pm on the Friday following the tutorial. Problems and assignments will be discussed during the tutorial hours. Weekly assignments must be submitted for marking by the deadline specified to the course OWL site. Late submissions will be assigned a mark of zero unless an extension has been negotiated in advance with the instructor.

2. **Tests and Examinations:**

Two 60 minute tests will be held during tutorial periods, tentatively scheduled on February 7 and March 14. Both tests and the final examination will be **OPEN BOOK**, and **programmable calculators are permitted.**

3. **Use of English**
In accordance with Senate and Faculty Policy, students may be penalised up to 10% of the marks on all assignments, tests, and examinations for the improper use of English. Additionally, poorly written work with the exception of the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

Activities in which collaboration is permitted:
- Homework Assignments – Part A

Activities in which students must work alone (collaboration is not permitted):
- Homework Assignments - Part B
- Tests
- Final Exam

**Online Proctoring Notice:**

Note that all assessments are planned to be in-person.

Depending on COVID-19 restrictions and University guidelines, tests and the final examination in this course may be in the form of a “remote proctored/open book” exam, conducted using Zoom. You will be required to keep your camera on for the entire quiz/exam session. The camera should show your workspace including: your tabletop, material allowed to use on the exam, and your sitting area. Hold up your student card for identification purposes and share your screen with the invigilator if asked to do so at any time during the exam. The exam session will not be recorded. Please note that Zoom servers are located outside Canada. If you would prefer to use only your first name or a nickname to login to Zoom, please discuss this with your instructor in advance of the test or examination.

More information about the use of Zoom for exam invigilation is available in the Online Proctoring Guidelines at the following link:

Completion of this course will require you to have a reliable internet connection and a device that meets the system requirements for Zoom. Information about the system requirements are available at the following link: [https://support.zoom.us/hc/en-us](https://support.zoom.us/hc/en-us).

When deemed necessary, tests and examinations in this course may be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide personal information (including some biometric data) and the session will be recorded. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western’s Remote Proctoring website at: [https://remoteproctoring.uwo.ca](https://remoteproctoring.uwo.ca).
Course content

The lecture notes and online lecture videos are copyrighted to the instructor and legally protected. Do not post these videos and lecture notes on any other website or online forums. The recording of the live/synchronous sessions of the course without the permission from the instructor is prohibited. The illegal posting and sharing of the copyrighted course content could be subjected to legal actions.

Plagiarism:

University policy states that plagiarism, defined as the “act or an instance of copying or stealing another’s words or ideas and attributing them as one’s own.” (excerpted from Black’s Law Dictionary, West Group, 1999, 7th ed., p. 1170) is a scholastic offence. In submitting any written work as part of the coursework requirements for this course students must ensure that this work is written in their own words. A student who is found guilty of plagiarism in respect of any written work submitted as part of the coursework requirements for this course will be given a grade of zero for the submitted work. Repeated acts of plagiarism, either in this course or any other course subsequent to a first offence, will result in the student being given a failing grade for the course in which the subsequent offence occurs, and may also incur further penalties such as requiring the student to withdraw from the program in which they are enrolled in.

Cheating:

University policy states that cheating is a scholastic offence. The commission of a scholastic offence is attended by academic penalties that might include expulsion from the program. If you are caught cheating, there will be no second warning. For more information on scholastic offenses, please see: http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf

Attendance:

Any student who, in the opinion of the instructor, has not engaged sufficiently in class, laboratory, or tutorial periods will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular final examination in the course.

Accommodation:

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The accommodation policy can be found here: Academic Accommodation for Students with Disabilities.

Academic Consideration for Absences:

Students should immediately consult with the instructor if they have any problems that could affect their performance in the course. The student should seek advice from the instructor regarding how best to deal with the problem. Failure to notify the instructor (or as soon as possible thereafter) will have a negative effect on any appeal. Please visit for information on how to submit a request for Academic Consideration: https://www.eng.uwo.ca/undergraduate/academic-consideration-for-absences.html
**Notice:**

Students are responsible for regularly checking their email, course website (https://owl.uwo.ca).

**Consultation:**

Students are encouraged to discuss problems with their teaching assistant and/or instructor in tutorial sessions. Office hours will be arranged for the students to see the instructor and teaching assistants. Other individual consultation can be arranged by appointment with the appropriate instructor.

**Course breakdown:**
Engineering Science = 25% ; Engineering design = 75%