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

CEE 3355b – Municipal Engineering Design – Course Outline 2022

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, 3:30-4:20 and Wednesdays, 1:30-2:20 will be held as a synchronous Zoom session. This session 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 using a synchronous Zoom session on Tuesdays, 8:30-10:30. 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.

Note that if and when a return to in-person learning is authorized by the University, lecture and tutorial session will be held in-person in ACEB 1415. All attempts will be made to accommodate those students who may be unable to attend in-person sessions, but such accommodation is not guaranteed.
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:
Professor 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.pcswwm.com/)
EPA-SWMM (http://www.epa.gov/water-research/storm-water-management-model-swmm)
OTTHYMO (https://civi.ca/visualothymo-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
   - 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>E</th>
<th>Engineering Tools</th>
<th>T</th>
<th>Impact on Society</th>
<th>I</th>
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</thead>
<tbody>
<tr>
<td>Problem Analysis</td>
<td>T</td>
<td>Team Work</td>
<td></td>
<td>Ethics and Equity</td>
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<td>Investigation</td>
<td></td>
<td>Communication</td>
<td>T</td>
<td>Economics and Project Management</td>
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<tr>
<td>Design</td>
<td>E</td>
<td>Professionalism</td>
<td>I</td>
<td>Life-Long Learning</td>
<td>T</td>
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Evaluation:

The final course mark will be determined as follows:

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<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Participation</td>
<td>10%</td>
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<tr>
<td>Assignments</td>
<td>30%</td>
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<tr>
<td>Tests</td>
<td>20%</td>
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<tr>
<td>Final examination</td>
<td>40%</td>
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<tr>
<td>Total</td>
<td>100%</td>
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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. Participation

Participation will be assessed using the following methods:

a. Completion of multiple-choice quizzes at the end of each lecture section.

b. Participation in lecture and tutorial discussions.

c. Posting questions and responding to questions in the course forum on OWL.

2. 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.
3. Tests and Examinations:
Two 60 minute tests will be held during tutorial periods, tentatively scheduled on February 8 and March 15. Both tests and the final examination will be **OPEN BOOK**, and **programmable calculators are permitted**.

4. 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
- Participation (asynchronous) using course OWL site “Forums”: Students are strongly encouraged to post questions/respond to posted questions on a weekly basis. Group discussion using “Forums” regarding course material and topics covered in lectures is permitted.

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

**Online Proctoring Notice:**
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 Student Absence

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the term, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student’s final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student’s final grade,
- if a student has already used the self-reporting portal twice during the academic year
If the conditions for a Self-Reported Absence are not met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation. Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.

For Western University policy on Consideration for Student Absence, see Policy on Academic Consideration for Student Absences – Undergraduate Students in First Entry Programs and for the Student Medical Certificate (SMC), see: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

Religious Accommodation
Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar.

Use of Recordings:
All of the remote learning sessions for this course will be recorded. The data captured during these recordings may include your image, voice recordings, chat logs and personal identifiers (name displayed on the screen). The recordings will be used for educational purposes related to this course, including evaluations. The recordings may be disclosed to other individuals under special circumstances. Please contact the instructor if you have any concerns related to session recordings.

Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor.

Conduct:
Some components of this course will involve online interactions. To ensure the best experience for both you and your classmates, please honour the following rules of etiquette:

- please “arrive” to class on time
- please use your computer and/or laptop if possible (as opposed to a cell phone or tablet)
- ensure that you are in a private location to protect the confidentiality of discussions in the event that a class discussion deals with sensitive or personal material
- to minimize background noise, kindly mute your microphone for the entire class until you are invited to speak, unless directed otherwise
- [suggested for classes larger than 30 students] In order to give us optimum bandwidth and web quality, please turn off your video camera for the entire class unless you are invited to speak
- [suggested for cases where video is used] please be prepared to turn your video camera off at the instructor’s request if the internet connection becomes unstable
- unless invited by your instructor, do not share your screen in the meeting

The course instructor will act as moderator for the class and will deal with any questions from participants. To participate please consider the following:

- if you wish to speak, use the “raise hand” function and wait for the instructor to acknowledge you before beginning your comment or question
- remember to unmute your microphone and turn on your video camera before speaking
self-identify when speaking.
remember to mute your mic and turn off your video camera after speaking (unless directed otherwise)

General considerations of “netiquette”:
• Keep in mind the different cultural and linguistic backgrounds of the students in the course.
• Be courteous toward the instructor, your colleagues, and authors whose work you are discussing.
• Be respectful of the diversity of viewpoints that you will encounter in the class and in your readings. The exchange of diverse ideas and opinions is part of the scholarly environment. “Flaming” is never appropriate.
• Be professional and scholarly in all online postings. Cite the ideas of others appropriately.

Note that disruptive behaviour of any type during online classes, including inappropriate use of the chat function, is unacceptable. Students found guilty of Zoom-bombing a class or of other serious online offenses may be subject to disciplinary measures under the Code of Student Conduct.

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%

The document “INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED” is part of this course outline.