

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

**CEE 3355b – Municipal Engineering Design – Course Outline 2016**

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 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:**

2 lecture hours/week; 2 tutorial hours/week.

Attendance at the tutorial session is mandatory

**Prerequisites:** 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 ; SEB 3116 ; [jsouthen@uwo.ca](mailto:jsouthen@uwo.ca)

### **Textbook:**

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

### **Other References:**

*Urban Hydrology, Hydraulics and Stormwater Quality: Engineering Applications and Computer Modeling*, A. O. Akan & R. J. Houghtalen, John Wiley & Sons, 2003. [Recommended]

*Stormwater Management Planning and Design Manual*, Ontario Ministry of the Environment [Recommended]

*Analysis of Water Distribution Systems*, T.M. Walski, Van Nostrand Reinhold

### **Computing:**

Students are required to use personal computers running a Windows environment. Assignments may require the use of stormwater modelling programs:

EPA-SWMM (<http://www.epa.gov/water-research/storm-water-management-model-swmm>) and

HEC-RAS (<http://www.hec.usace.army.mil/software/hec-ras/>)

### **Units:**

Both SI and US units will be used in lectures and examinations

### **Specific Learning Objectives:**

#### 1. Hydrologic Modelling

- 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

- 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

- Design drainage structures for street pavements
- Design storm sewers
- Design culverts
- Design open channels for surface drainage

### 4. Storm Water Management

- 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

- 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

- Become familiar with HEC-HMS and EPA-SWMM models
- Use these models in the design of stormwater management systems

### 7. Water Distribution

- Estimate the population and water demand for a municipality
- Determine average-day, maximum-day and max-hour water demands
- 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
- Analyse flow and pressure in a pipe network, which has reservoirs and pumps

The instructor may modify course material as appropriate.

## **General Learning Objectives**

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

Knowledge Base	E	Engineering Tools	E	Impact on Society	I
Problem Analysis	T	Team Work		Ethics and Equity	
Investigation		Communication	T	Economics and Project Management	
Design	E	Professionalism	I	Life-Long Learning	T

## Evaluation:

The final course mark will be determined as follows:

Assignments:	20%
Tests:	20%
Final examination:	<u>60%</u>
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. Quizzes and Examinations:

Two 60 minute quizzes will be held during tutorial periods, tentatively scheduled on February 11 and March 24. Both quizzes and the final examination will be **OPEN BOOK** and **programmable calculators are permitted.**

### 2. Weekly Assignments

Problems and assignments will be discussed during the tutorial hours. Weekly assignments must be submitted for marking by the deadline specified to the locker location indicated in class. Late submissions will be assigned a mark of zero.

### 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.

**Plagiarism Checking:**

The University of Western Ontario uses software for plagiarism checking. Students may be required to submit reports in electronic form to Turnitin.com for plagiarism checking.

**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](http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf)

**Attendance:**

Any student who, in the opinion of the instructor, is absent too frequently from 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.

**Accessibility:**

Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

**Conduct:**

Students are expected to arrive at lectures on time, and to conduct themselves during class in a professional and respectful manner that is not disruptive to others. Late comers may be asked to wait outside the classroom until being invited in by the Instructor. Please turn off your cell phone before coming to a class, tutorial, quiz or exam.

On the premises of the University or at a University-sponsored program, students must abide by the Student Code of Conduct: <http://www.uwo.ca/univsec/board/code.pdf>

**Sickness and Other Problems:**

Students should immediately consult with the Instructor or Department Chair if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented (see attached). The student should seek advice from the Instructor or Department Chair regarding how best to deal with the problem. Failure to notify the Instructor or Department Chair immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

For more information concerning medical accommodations, please see:

[http://www.uwo.ca/univsec/handbook/appeals/accommodation\\_medical.pdf](http://www.uwo.ca/univsec/handbook/appeals/accommodation_medical.pdf)

**Notice:**

Students are responsible for regularly checking their email, course website (<https://owl.uwo.ca>) and notices posted outside the Civil and Environmental Engineering Department Office

**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.