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

CEE 3362A - Drinking Water Quality & Treatment Outline 2016/2017

In the course students will be taught the basic principles of water quality and treatment. The course will introduce the need for proper treatment of domestic water for human consumption (ie: pathogen removal) and the problems associated with inadequate treatment. The course will also focus on drinking water treatment technologies, ranging from very simple low-tech solutions to larger technologies typically found in North America. Finally the course will study the identification of drinking water sources with adequate quality and quantity.

Calendar Copy:
In the course students will be taught the basic principles of water quality and treatment with particular focus on developing communities. Specific topics will include drinking water quality guidelines and legislation, identifying drinking water sources with adequate quality and quantity, drinking water treatment technologies and water distribution systems in developing communities.

Prerequisites:
Completion of second year of BESc.

Note: It is the student's responsibility to ensure that all Prerequisite 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 he/she has not taken a course listed as an Antirequisite. The student may be dropped from the course or not given credit for the course towards his/her degree if he/she violates the Prerequisite, Corequisite or Antirequisite conditions.

Corequisites:
None.

Antirequisites:
CEE 362a/b

Contact Hours:
Average of 3 lecture hrs/wk; 3 design lab/tutorial hrs.

Instructor:
Dr. Clare Robinson, Spencer Engineering Building Room 3045
Email: crobinson@eng.uwo.ca;

Admin. Asst.: Stephanie Laurence, Spencer Engineering Building Room 3005,
Email: civil@uwo.ca

Course Textbook:
Droste, R.L., ***Theory and Practice of Water and Wastewater Treatment***, J. Wiley & Sons

Other References:

Field Engineering: An Introduction to Development Work and Construction in Rural Areas. Editor (Peter Stern), Intermediate Technology Publications, 1993.

Evaluation for Village Water Supply Planning, Technical Paper Services 15, S. Cairncross et al., Published for IRC International Reference Centre for Community Water Supply and Sanitation by John Wiley & Sons, Inc., 1980

The Worth of Water, Technical Briefs on Health, Water and Sanitation, Intermediate Technology Publications, London, 1991.

Small Community Water Supplies, Technical Paper Series 18, Published by IRC International Reference Centre for Community Water Supply and Sanitation, reprinted, 1998.

Environmental Engineering in Developing Countries, Eli Dahi (Editor), 2nd Edition, Environmental Development Corporation, Copenhagen, Denmark, 1997.

Low-Cost Sanitation: A Survey of Practical Experience, J Pickford, Intermediate Technology Publications, London, 1995.

Linking Technology Choice with Operation and Maintenance for Low-Cost Water Supply and Sanitation, F. Brikke et al., Operation and Maintenance Working Group of the Water Supply and Sanitation Collaborative Council, World Health Organization, 1997.

Proposed Lecture Schedule (subject to change)

Week of:	Lecture Topic
Sept. 12	Introduction to Water Quality
Sept. 19	Sources of Drinking Water, Classes of Contaminants & Overview of Common Water Treatment Plant Unit Operation
Sept. 26	Reactor Flow
Oct. 2	Screening, Coagulation, Flocculation, Sedimentation and Clarification
Oct. 9	Sand Filtration
Oct. 16	Sand Filtration
Oct. 23	Sand Filtration
Oct. 30	Disinfection
Nov. 6	Disinfection
Nov. 13	Other Treatment Processes
Nov. 20	Other Treatment Processes
Nov. 27	Other Treatment Processes, Review of Course Material

Laboratory Schedule (subject to change)

Week of:	Laboratory Session
Sept. 12	An introduction to lab safety, equipment and expectations.
Sept. 19	Basic water tests: pH, alkalinity, acidity, hardness, color and turbidity
Sept. 26	Coliform enumeration
Oct. 3	Coagulation and flocculation using Jar Test and Charge Coagulant Analyzer Methods
Oct. 17	Chlorine Demand and Ammonia Removal of Colour and Turbidity by use of Sand and Carbon Filtering Oxygen Demand and Nitrates
Oct. 24	Oxygen Demand and Nitrates BOD, COD, Total suspended and dissolved solids, ammonia and nitrates
Oct. 31	Sand filter, suspended solids and particle size distribution measurement
Nov. 7	TBD (Project Session)
Nov. 14	TBD (Project Session)
Nov. 21	TBD (Project Session)
Nov. 28	TBD (Project Session)

Specific Learning Objectives:

1) Drinking water quality
   a) water borne diseases and the effects on human health
   b) anthropogenic sources of drinking water contamination and the effects on human health
   c) other sources of drinking water contamination and the effects on human health
   d) drinking water standards & legislation in North America and the rest of the world

2) Identifying drinking water sources with adequate quality and quantity
   a) hydrological cycle
   b) groundwater sources – quantity and quality and well hydraulics

3) Drinking water treatment technologies
   a) ideal flow systems / chemical reaction engineering
   b) nonideal flow systems / tracer studies
   c) disinfection/oxidation
   d) colloidal stability / coagulation
   e) flocculation / sedimentation
   f) other clarification processes / filtration
   g) filtration
   h) adsorption / gas transfer
   i) membrane filtration

General Learning Objectives

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

Evaluation:

The final course mark will be determined as follows:

Assignments	5%
Laboratory Reports	20%
Project	25%
Final Examination	50%

Note:

a) **Students must pass the final examination to pass this course.** Students who fail the final examination will be assigned 48% if the aggregate mark is higher than 50%, or the aggregate mark.

b) **Students must turn in all laboratory reports, and achieve a passing grade in the laboratory component, to pass this course.** Students who do not satisfy this requirement will be assigned 48% or the aggregate mark, whichever is less.

c) **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.

Use of English:

In accordance with Senate and Faculty Policy, students may be penalized 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.

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.

Attendance:

Any student, who, in the opinion of the instructor, is absent too frequently from class or laboratory periods in any course, 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 examination in the course.

Cheating:

University policy states that cheating is a scholastic offence. The commission of a scholastic offence is attended by academic penalties, which might include expulsion from the program. If you are caught cheating, there will be no second warning (see Scholastic Offence Policy in the Western Academic Calendar).

For more information on scholastic offenses, please see:
http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf

Plagiarism:

Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).

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.

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

Notice:
Students are responsible for regularly checking their email and notices posted on Instructors' doors.

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.

Additional information:
The document "*Instruction for students unable to write tests or examinations or submit assignments as scheduled*" IS ATTACHED AND IS PART OF THIS COURSE OUTLINE.

Course breakdown: Basic Science = ? AU's; Engineering Science = ? AU's; Engineering design = ? AU's; Complementary Studies = ? AU's; Mathematics = ? AU's.

Western University
Faculty of Engineering
2016-2017

INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED

If, on medical or compassionate grounds, you are unable to write term tests or final examinations or complete course work by the due date, you should follow the instructions listed below. You should understand that academic accommodation will not be granted automatically on request. You must demonstrate to your department (or the Undergraduate Services office if you are in first year) that there are compelling medical or compassionate grounds that can be documented before academic accommodation will be considered. Different regulations apply to term tests, final examinations and late assignments. Read the instructions carefully. (see the 2016 Western Academic Calendar).

A. *GENERAL REGULATIONS & PROCEDURES*

1. Check the course outline to see if the instructor has a policy for missed tests, examinations, late assignments or attendance.

2. Bring your request for academic accommodation to the attention of the Chair of the department (or the Undergraduate Services office if you are in first year) prior to the scheduled time of the test or final examination or due date of the assignment. If you are unable to contact the relevant person, leave a message with the appropriate department (or Undergraduate Services office, if you are in first year). The addresses, telephone and fax numbers are given at the end of these instructions. Documentation must be provided as soon as possible.

3. If you decide to write a test or an examination you should be prepared to accept the mark you earn. Rewriting tests or examinations or having the value of a test or exam reweighted on a retroactive basis is not permitted.

B. *TERM TESTS*

1. If you are unable to write a term test, inform your instructor and the Chair of your Department (or the Undergraduate Services Office if you are in first year) prior to the scheduled date of the test. If the instructor is not available, leave a message for him/her at the department office and inform the Chair of the Department (or the Undergraduate Services Office if you are in first year).

2. Be prepared to provide supporting documentation to the Chair and the Undergraduate Services Office (see next page for information on documentation).

3. Discuss with the instructor if and when the test can be rescheduled. **N.B.** The approval of the Chair (or the Undergraduate Services Office if you are in first year) is required when rescheduling term tests.

C. *FINAL EXAMINATIONS*

1. If you are unable to write a final examination, contact the Undergraduate Services Office PRIOR TO THE SCHEDULED EXAMINATION TIME to request permission to write a Special Final Examination. If no one is available in the Undergraduate Services Office, leave a message clearly stating your name & student number (please spell your full name).

2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). The following circumstances are not considered grounds for missing a final examination or requesting special examinations: common cold, sleeping in, misreading timetable and travel arrangements.

3. In order to receive permission to write a special examination, you must obtain the approval of the Chair of the Department **and** the Associate Dean and in order to apply you must sign a "Recommendation for a Special Examination Form" available in the Undergraduate Services Office. The Undergraduate Services Office will then notify the course instructor(s) and reschedule the examination on your behalf.

N.B. **It is the student's responsibility to check the date, time and location of the special examination.**

D. *LATE ASSIGNMENTS*

1. Advise the instructor if you are having problems completing the assignment on time (**prior** to the due date of the assignment).
2. Be prepared to provide documentation if requested by the instructor (see reverse side for information on documentation).
3. If you are granted an extension, establish a due date. The approval of the Chair of your Department (or the Associate Dean if you are in first year) is not required if assignments will be completed prior to the last day of classes.
4. i) Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean. Documentation is mandatory.
   ii) A Recommendation of Incomplete Form must be filled out indicating the work to be completed and the date by which it is due. This form must be signed by the student, the instructor, the department Chair and the Associate Dean.

SHORT ABSENCES

If you miss a class due to a minor illness or other problems, check your course outlines for information regarding attendance requirements and make sure you are not missing a test or assignment. Cover any readings and arrange to borrow notes from a classmate.

EXTENDED ABSENCES

If you are absent more than one week or if you get too far behind to catch up, you should consider reducing your workload by dropping one or more courses. (Note drop deadlines listed below). You may want to seek advice from the academic counsellor in your Department or the counsellors in the Undergraduate Services Office if you are in first year.

DOCUMENTATION

If you consulted an off-campus doctor or Student Health Services regarding your illness or personal problem, you must provide the doctor with a Student Medical Certificate to complete at the time of your visit and then bring it to the Department (or the Undergraduate Services Office if you are in first year). **This note must contain the following information: severity of illness, effect on academic studies and duration of absence.**

In Case of Serious Illness of a Family Member: Provide a Student Medical Certificate to your family member's physician to complete and bring it to the Department (or the Undergraduate Services Office if you are in first year).

In Case of a Death: Obtain a copy of the death certificate or the notice provided by the funeral director's office. You must include your relationship to the deceased and bring it to the Department (or the Undergraduate Services Office if you are in first year).

For Other Extenuating Circumstances: If you are not sure what documentation to provide, ask the Departmental Office (or the Undergraduate Services Office if you are in first year) for direction.

Note: Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).

ACADEMIC CONCERNS

You need to know if your instructors have a policy on late penalties, missed tests, etc. This information may be included on the course outlines. If not, ask your instructor(s).

You should also be aware of attendance requirements in some courses. You can be debarred from writing the final examination if your attendance is not satisfactory.

If you are in academic difficulty, check out the minimum requirements for progression in the calendar. If in doubt, see your academic counsellor.

Calendar References: Check these regulations in your 2016 Western Academic Calendar available at www.westerncalendar.uwo.ca.

Absences Due to Illness - page 117
Academic Accommodations for Students with Disabilities - page 118
Academic Accommodations for Religious Holidays - page 119
Incomplete Standing - page 104
Scheduling of Term Assignments – page 97
Scholastic Offences - page 113
Special Examinations - page 132

Note: These instructions apply to all students registered in the Faculty of Engineering regardless of whether the courses are offered by the Faculty of Engineering or other faculties in the University.

***Drop Deadlines*:**		
	First term half course (i.e. “A” or “F”):	November 5, 2016
	Full courses and full-year half courses (i.e. “E”, “Y” or no suffix):	November 30, 2016
	Second term half or second term full course (i.e. “B” or “G”):	March 7, 2017

Undergraduate Services Office:	SEB	2097	telephone: (519) 661-2130	fax: (519) 661-3757
Dept. of Chemical and Biochemical Engineering:	TEB	477	telephone: (519) 661-2131	fax: (519) 661-3498
Dept. of Civil and Environmental Engineering:	SEB	3005	telephone: (519) 661-2139	fax: (519) 661-3779
Dept. of Electrical and Computer Engineering, Software Engineering Mechatronics Engineering	TEB	279	telephone: (519) 661-3758	fax: (519) 850-2436
Dept. of Mechanical and Materials Engineering:	SEB	3002	telephone: (519) 661-4122	fax: (519) 661-3020