Faculty of Engineering

CBE 4409B – Wastewater Treatment
Winter 2017

Description
This course introduces a basic understanding of municipal wastewater treatment processes. The course reviews pertinent environmental regulations, and general wastewater quality parameters. Processes and unit operations in wastewater treatment are introduced with particular emphasis on process design. Considerations in integrating unit processes and operations into a treatment system are presented.

Prerequisites
CBE 2290A/B or CEE 2217A/B or Chemistry 2210A/B.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Corequisites
None

Antirequisites
The former CBE 3363A/B

Contact Hours
3 lecture hours, 1 tutorial hour, 0.5 course.

Instructor
Dr. G. Nakhla (SEB 3037) Telephone: 519-661-2111 ext: 85470 email: gnakhla@uwo.ca

Undergraduate Assistant
(TEB 477) Telephone: 519-661-2111 ext: 82131 email: cbeugrad@uwo.ca
**Required Texts**

**Reference Texts**

**Course Notes**
"Wastewater Treatment", #M7913 will be available in the University Bookstore.

**Units**
SI units will be used.

**General Learning Objectives**

| A knowledge base for engineering | Individual and team work | A | Economics and project management | n.e. |
| Problem analysis | A | Communication skills | B | Life-long learning | n.e |
| Investigation | n.e. | Professionalism | B | Impact of engineering on society and the environment | B |
| Design | B | Use of engineering tools | Ethics and equity | n.e. |

Key:
B: evaluated at introductory level
I: evaluated at intermediate level
A: evaluated at advanced level
n.e.: not evaluated

**Specific Learning Objectives**

**What is Water Pollution?**
At the end of this topic, students should be able to gain:

- A fundamental understanding of water pollution.
- An understanding of discharge limits, for pollutants.
- An understanding of the environmental legislation.

**Water Pollution Control**
At the end of this topic, students should be able to:

- Describe basic concepts involved in water pollution control.
- Understand the function of various wastewater treatment processes.
- Integrate various unit processes and operations into an overall treatment train.
Physical, Chemical, Biological Characteristics of Pollution

- BOD, NOD
- COD, TOC, THOD
- VSS, TSS
- MLSS
- MPN
- Toxicity carcinogens
- Coliforms

At the end of this topic, students should be able to:

- Gain an understanding and describe physical, chemical and biological characteristics for water pollution.
- Preliminary Treatment
- Primary Treatment
- Biological Treatment
- Tertiary Treatment and Disinfection
- Natural Treatment, Lagoons
- Sludge Treatment and Anaerobic Digestion

At the end of topics 4-9, students should be able to:

- Describe water and wastewater treatment systems for municipalities and industry.
- Suggest and provide initial design of suitable solutions for commercial wastewater pollution problems.

Evaluation

The final course mark will be determined as follows:

Assignments 25%
Mid Term Examination 25%
Final Examination 50%

Both the mid-term and final examination are open book. The final examination is 3 hours in length.

Notes

1) 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.
2) Assignments are to be handed into CBE 4409b locker (#C456) located in the Thompson Engineering building on the specified due date provided by the Instructor.

Repeating All Components of the Course

In accordance with Senate and Faculty Policy, students who have failed an Engineering course (i.e. <50%) 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 for grading by the student in subsequent years.
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.

Attendance
Attendance at all lectures, tutorials and laboratories is mandatory. 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. Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf. 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).

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).

The University of Western Ontario has software for plagiarism checking. Students may be required to submit their work in electronic form for plagiarism checking. All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com).

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.

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. 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.
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.

**Notices**
Students are responsible for regularly checking the course website, their Western 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.

**Accreditation (AU) Breakdown**

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Science</td>
<td>70%</td>
</tr>
<tr>
<td>Engineering Design</td>
<td>30%</td>
</tr>
</tbody>
</table>