

CBE 9361– BIOLOGICAL WASTEWATER TREATMENT
COURSE OUTLINE 2013-2014

Description

This course introduces the students to the principles of wastewater treatment and pollution control, with particular emphasis on municipal wastewater treatment. At the end of the course, students should have a thorough understanding of both liquid wastewater treatment processes as well as biosolids handling, treatment and disposal. That understanding should enable students to undertake process design activities as well as pursue and explore further research areas in the field.

Prerequisite

Graduate Student Status or permission of the department.

Corequisite

None.

Antirequisite

The former CBE 570.

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.

Contact Hours

3 lecture hours per week, 0.5 course.

Instructor

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Graduate Coordinator

Ashley Jokhu (TEB 477) Telephone: 519-661-2111 ext: 88352 email: cbegrad@uwo.ca

Required Text

Metcalf and Eddy Inc., "Wastewater Engineering: Treatment, Disposal and Reuse," 4th edition, McGraw Hill.

Reference Texts

Viessman, Jr. and Hammer, "Water Supply and Pollution Control", 4th edition, 1985
Fair, Geyer, and Okum, "Water and Wastewater Engineering", Vol. 2, 1978
Qasim, "Wastewater Treatment Plants: Planning, Design, and Operation", 1985
Bailey and Ollis, "Biochemical Engineering Fundamentals", 1977
Benfield and Randall, "Biological Process Design for Wastewater Treatment", 1980
Ramalho, R.S., "Introduction to Wastewater Treatment Processes", 2nd edition, 1983.

Course Notes

Notes will be available online

Units

Both SI and Customary US units will be adopted in this course.

Specific Learning Objectives

- Thorough understanding of biochemical reactions occurring in wastewater treatment processes including utilization of various non-inhibitory biokinetic models both in suspended-growth and attached- growth bioreactors.
- Application of fundamental biokinetic models to the design of aerobic and anaerobic biological treatment systems including bioreactors, settlers, and oxygenation systems.
- Gaining detailed information related to the principles governing biosolids treatment and disposal.
- Familiarization with treatment processes optimization techniques.

Topics**Wastewater Flow & Characteristics**

- Components of Wastewater Flows
- Determination of Wastewater Flows and Variations
- Wastewater Characterization Studies

Gas Transfer Processes

- Application of the Two-film Theory
- Aeration Equipment
- Analysis of Aeration Systems

Handling and Disposal of Sludges

- Sources and Conditioning
- Mechanical Dewatering Processes
- Application of the Flux Theory
- Land Disposal
- Incineration and Drying

Stoichiometry of Biological Reactions

- Goals of Microbial Metabolism
- Oxidation/Reduction Reactions
- Energy and Synthesis Half Reactions
- Energetics of Growth
- Stoichiometry of Maintenance

Kinetics of Suspended-Growth Reactions

- Cell Growth Rates
- Substrate-Utilization Rates
- Kinetic Coefficients
- Chemostat Reactors
- Recycle Reactors
- System Control Parameters

Kinetics of Fixed-Film Reactors

- Fixed-Film Reactors
- Basic Kinetic Relationships
- Solutions of Substrate Flux
- Biofilm Growth and Loss

- Steady-State Biofilm Model
- Dual Limitation
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Activated Sludge

- Stoichiometry and Kinetics
- Process Configurations
- Loading Criteria
- Clarifier Design

Aerobic Fixed-Film Processes

- Trickling Filters
- Rotating Biological Reactors
- Fluidized-Bed Treatment

Methanogenesis

- Microbiology and Biochemistry
- Kinetics and Stoichiometry
- Digestor Design
- Anaerobic Filters
- Toxicity and Inhibition
- pH Control

Evaluation

The final course mark will be determined as follows:

Homework Assignments	45%
Project	20%
Final Examination	35%

The final examination will be an open-book with scientific calculators allowed.

Note

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.

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.

Scholastic Offences

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_grad.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

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. Whenever students take an idea or a passage of text from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations.

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>).

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.

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 Associate Chair (Graduate) (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Associate Chair (Graduate), the student will be debarred from taking the regular 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 Associate Chair (Graduate) if they have any problems that could affect their performance in the course. The student should seek advice from the Instructor or Associate Chair (Graduate) regarding how best to deal with the problem. Failure to notify the Instructor or Associate Chair (Graduate) 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 Western email and notices posted on their Instructor’s door.