ENGG**4260 Water and Wastewater Treatment Design
Fall 2014

School of Engineering

(Revision 2: August 28, 2014)

1 INSTRUCTIONAL SUPPORT

1.1 Instructor

Instructor: Sheng Chang, Ph.D., P.Eng.
Office: THRN 2519, ext. 56619
Email: schang01@uoguelph.ca
Office hours: 2:00 to 3:00 pm, Thursday

1.2 Lab Technician

Not applicable

1.3 Teaching Assistants

GTA	Email	Office Hours
Bei Wang	bwang02@uoguelph.ca	TBA on Courselink

2 LEARNING RESOURCES

2.1 Course Website

Course material, news, announcements, and grades will be regularly posted to the ENGG*4260 Courselink site. You are responsible for checking the site regularly.

2.2 Required Resources

Metcalf & Eddy, Inc. (2014). Wastewater Engineering: Treatment and Resource recovery, 5th edition, McGraw Hill, Inc., New York, NY, 2018p.

2.3 Recommended Resources

REFERENCE BOOKS

Davis, M.L. (2010). Water and Wastewater Engineering: Design Principles and Practice. McGraw Hill, Inc., New York, NY.
Droste, R.L. (1997). Theory and Practice of Water and Wastewater Treatment. John Wiley & Sons, New York, NY, 800p.
Grady, C.P.L., Jr., Gaigger, G.T. and Lim, H.C. (1999). Biological Wastewater Treatment. 2nd edition, Marcel Dekker, New York, NY, 1076p.
Henze, M., van Loosdrecht M.C.M., Ekama, G.A., Brdjanovic, D. 2008. Biological Wastewater Treatment: Principles, Modelling and Design. IWA Publishing, London, UK, 511p.
Metcalf & Eddy, Inc. (2006). Water Reuse: Issues, Technologies and Applications, McGraw Hill, Inc., New York, NY, 1570p.
Qasim, S.R. (1999). WastewaterTtreatment Plants: Planning, Design, and Operation. Technomic Pub. Co, Lancaster, PA, 1107p.
Recommended Standards for Wastewater Facilities. 1997 Edition, The Great Lakes – Upper Mississippi River Board of State and Provincial Public health and Environmental Managers, Albany, NY.
Reynolds, T.D. and Richards, P.A. (1996). Unit Operations and Processes in Environmental Engineering, 2nd Edition, PWS Publishing Co. Boston, MA, 798p.
Viessman, W. Jr., Hammer, M.J., Perez, E.M. and Chadik, P.A. (2009). Water Supply and Pollution Control. Pearson Prentice Hall,,U pper Saddle River, NJ, 843p.
WEF and ASCE, (1998). Design of Municipal Wastewater Treatment Plants, Vol. 1, 2 and 3, 5th Edition, Alexandria, VA.
WEF and IWA, (2010). Wastewater Treatment Plant Design. Edited by A. Vesilind, Water Environment Federation, Alexandria, VA.

REFEREED JOURNALS

Water Research
Water Environment Research
American Water Works Association Journal
Journal of Environmental Engineering, ASCE
Environmental Science & Technology

2.4 Additional Resources

Lecture Information: All the lecture notes are posted on the web page .
Design Projects and Assignments: The information for all the design projects and assignments will be posted on the course website. Download them according to the schedule given in this handout.
Miscellaneous Information: Other information related to the course is also posted on the web page.

2.5 Communication & Email Policy

Please use lectures and lab help sessions as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly.** As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

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3 ASSESSMENT

3.1 Dates and Distribution

Projects: 40% (total)
Project 1: 20%: Due on Thursday, Oct 16, in class
Project 2: 10%: Due on Thursday, Nov 6, in class,
Project 3: 10%: Due on Thursday, Nov 27, in class,
Note: Both hardcopies and electronic copies are to be submitted

Assignments: 10% (Assignment #1: 5%; Assignment 2: 5%)
Assignment 1: Due on Thursday, Oct 16, in class
Assignment 2: Due on Thursday, Nov 6, in class,

Note: Only hardcopies are to be submitted

Midterm: 20%
Mon., Oct 20, 8:30 – 10:20 AM, MCKN 223

Final Exam: 30%
08:30AM - 10:30 AM (2014/12/10), Room TBD

3.2 Course Grading Policies

Missed Assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. Please see below for specific details and consult the undergraduate calendar for information on regulations and procedures for Academic Consideration:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

Passing grade: You must achieve a passing grade on the project design component in order to pass the course. If you fail to do so, your final grade will be equal to that failing percentage.

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Missed Midterm/Design Reports/Assignments: If you miss the midterm/design reports/assignments due to grounds for granting academic consideration or religious accommodation, the weight of the missed course work will be added to the final exam. There will be no makeup midterm test/Project Reports/Assignments.

Project Reports: The course will be offered mainly in problem based learning format. Maximum group size is four students. Some groups of three may be permitted depending on the final numbers in the class.

Each project report must meet the requirements and formats specified in the course handout in order to achieve the perceived course objectives. The report should be technically sound, CLEARLY readable, and concise. Don't use your spare time to create a huge report!

Late Project Reports: Late submission of the project reports will be devalued by 50% per every day.

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4 AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

4.1 Calendar Description

Application of design principles for a variety of water purification systems, including drinking water, municipal wastewater, industrial wastewater and agricultural wastewater. This involves the design of physical, chemical and biological unit operations, and evaluating the optimum combination to satisfy the given design constraints and criteria. The optimum designs integrate engineering science, basic science, economics, and occupational health and safety for the workers and the public.

Prerequisite(s): ENGG*3100, ENGG*3590

4.2 Course Aims

The goal of this course is to provide the students with the theories and practices for the planning, design and operation of commonly used wastewater treatment facilities. Emphasis will be placed on integrating individual unit operations and processes to achieve multiple treatment objectives while satisfying the given constraints.

4.3 Learning Objectives

At the successful completion of this course, the student will have demonstrated the ability to:

1. properly identify the critical issues and challenges in planning, design and operation of modern wastewater treatment facilities to meet not only current but also anticipated regulatory requirements,
2. develop reasonable working knowledge and hands-on experiences that can be used to devise and design the efficient, cost-effective treatment and water reuse systems, and
3. gain the independent learning skills and enhance your ability to work effectively in teams through problem based learning format.

4.4 Graduate Attributes

Successfully completing this course will contribute to the following CEAB Graduate Attributes:

Graduate Attribute	Learning Objectives	Assessment
1. Knowledge Base for Engineering	1, 2	Projects, Assignment, Exams
2. Problem Analysis	1, 2	Projects, Assignment Exams
3. Investigation	1,2	Projects, Assignment
4. Design	1, 2	Project
5. Use of Engineering Tools	1,2	Projects, Assignment
6. Communication	1, 2, 3	Project
7. Individual and Teamwork	3	Project
8. Professionalism	-	-
9. Impact of Engineering on Society and the Environment	1	Project
10. Ethics and Equity	-	-
11. Environment, Society, Business, & Project Management	1, 2,3	Projects, Assignment
12. Life-Long Learning	1, 2, 3	-

4.5 Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on Courselink but these are not intended to be stand-alone course notes. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for tests and project.

4.6 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and tutorials. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

4.7 Relationships with other Courses & Labs

Previous Courses:
ENGG*3100: some design tools, writing and public speaking techniques, codes, safety issues, environmental assessment and professional management

ENGG*3590: water quality, basic theories of physical, chemical and biological treatment Processes;

5 TEACHING AND LEARNING ACTIVITIES

5.1 Timetable

Lectures:

Tuesday	8:30 am – 9:50 am	MCKN 224
Thursday	8:30 am – 9:50 am	MCKN 224

Tutorials:

Monday	8:30 am – 10:20 am	MCKN 223

The Tutorials are designed: 1) to provide more informal discussions among the group students to resolve the issues arising from the design projects ; 2) to introduce selected regulatory design guidelines and standards currently employed by provincial, federal and international agencies, and 3) to demonstrate the application of computer simulation packages in designing and optimizing wastewater treatment facilities,

5.2 Lecture Schedule

Weeks	Lecture Topics	References	Learning Objectives
0.5	0 – Introduction:, · Course outline · Wastewater treatment and reuse: overview		1, 2
0.5	I - Fundamentals of Wastewater Treatment and Reuse · Wastewater sources and flow rates · Physical, chemical and biological characterization · Treatment objectives · Introduction to wastewater treatment process selection	Chapter 1, 2	2,3
1	II – Wastewater Microbiology · Role and classification of microorganisms · Microbial growth kinetics · Types of biological treatment processes	Chapter 7	1, 2

Weeks	Lecture Topics	References	Learning Objectives
3.5	III – Suspended Growth Biological Treatment Processes · Activated sludge process analysis and control · Aeration selection and design · Secondary settling · Biological nutrient removal processes	Chapter 8	2, 3
	Midterm		
2.5	III – Attached Growth Biological Treatment · Attached growth kinetics and mass transfer limitation · Tricking Filter · Rotating biological contactors · Hybrid processes	Chapter 9	2, 3
2.5	IV – Sludge Processing, Utilization and Disposal · Sources, quantities and Characteristics · Regulations for the utilization and disposal · Anaerobic digestion · Other sludge processing processes	Chapter 14	2, 3
1.5	V – Tertiary Treatment and Water Reuse · Health and environmental concerns in water reuse · Technologies and systems for water reclamation · Water reuse and applications	Chapter 13	2, 3

5.3 Other Important Dates

Thursday, September 4, 2014: First day of class
Monday, October 13, 2014 Holiday: no classes scheduled
Tuesday, October 14, 2014: Fall Study Break Day – no classes scheduled
Friday, October 31, 2014: 40th class day, last day to drop
Friday, November 28, 2014: Last day of class

6 LAB SAFETY

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

If the laboratory rules are not followed, consequences will include removing student's access to the lab. If this results in lab work not being completed, the student will receive a grade of 0.

7 ACADEMIC MISCONDUCT

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member.

7.1 Resources

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:
http://www.academicintegrity.uoguelph.ca/

Please also review the section on Academic Misconduct in your Engineering Program Guide.

The School of Engineering has adopted a Code of Ethics that can be found at:
http://www.uoguelph.ca/engineering/undergrad-counselling-ethics

8 ACCESSIBILITY

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability for a short-term disability should contact the Centre for Students with Disabilities as soon as possible

For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: http://www.uoguelph.ca/csd/

9 RECORDING OF MATERIALS

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

10 RESOURCES

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs: http://www.uoguelph.ca/registrar/calendars/index.cfm?index