2008 Winter Semester

ENGG*4260: WATER AND WASTEWATER TREATMENT DESIGN

Instructor:	Dr. Hongde Zhou	Room 1341, ext. 56990, hzhou@uoguelph.ca
	Office hour:	Wednesday 11:00AM to noon or via e-mail
GTA:	Heather Murphy:	Room 316, ext, 52132, murphy@uoguelph.ca
	Office hour:	Monday noon to 1:00PM
	Chantelle Leidl	Room 316, ext, 52132, cleidl@uoguelph.ca
	Office hour:	Thursday 1:00 to 2:00PM

Meeting Times:	Room:		ANNU 156	
	Tuesday and Thursday		11:30AM to 12:50PM	
Labs:	Section 101:	Monday	08:30AM - 10:00AM,	THRN 1103
	Section 102:	Friday	08:30AM - 10:00AM,	THRN 1103

Prerequisites: ENGG *3100, ENGG *3590

Note: If you do not meet this requirement, see your instructor immediately.

COURSE OBJECTIVES

The purpose of this course is to introduce students the current practices for the planning, design and operation of commonly used water and wastewater treatment facilities. Emphasis will be placed on integrating individual unit operations and processes to achieve the multiple treatment objectives and satisfy the given constraints. On successful completion of this course, you will be able to:

1) Properly identify the most critical issues and challenges in planning, design and operation of modern water and 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 most efficient and cost-effective treatment systems, and
3) Gain the independent learning skills and enhance your ability to work effectively in teams through PBL format.

COURSE DESCRIPTION

The course mainly consists of four representative design projects in the field of water and wastewater treatment. They are:

1) Conventional coagulation/sedimentation/filtration for drinking water treatment
2) Chemical oxidation and disinfection
3) Biological processes for municipal wastewater treatment
4) Sludge processing and disposal

To complement these projects, the institutional, technological and environmental considerations governing water supply and wastewater discharge and the common approaches to estimate water use and wastewater generation will be reviewed. The applicability and limitations of these treatment technologies to resolve the current and emerging challenges such as the removal of

harmful disinfection by-products, resistant microbial contaminants, biological nutrients, toxic synthetic organic compounds and water reuse will be highlighted.

The technologies involved in these design projects can be classified into primarily physical, chemical or biological. They are considered essential to improve water quality and have become key elements in the field of Environmental Engineering. As you are aware from previous experiences and news media, and will learn more from this course, greater demands have been placed on water supply and wastewater treatment facilities. First, the standards of water quality have increased significantly, at the meantime; the quality of raw water is deteriorating. Second, the contamination of watercourses by new toxic and hazardous materials has brought about a much broader concept in water-related environmental issues and has dramatically changed water and wastewater treatment practices. Third, the increase in the world population demands the installation of new water supplies and pollution control facilities. Finally, many of our municipal infrastructures were built after World War II, the rehabilitation of these aged facilities become impulsive to maintain our quality of life.

COURSE FORMAT: PROBLEM BASED LEARNING (PBL)

The course will be mainly offered in PBL format. Thus, it is essential that you are ACTIVELY engaged in the meetings and TEACH each other. The PBL is only effective through frequent interactions with your peers. Through these interactions you will strengthen your own understanding through the frequent feedback from your peers and through the explanations to your peers. Note that we will help your meetings, we will help your teaching, we will answer questions - we will NOT run your meetings, we will NOT make your decisions.

Maximum group size is five students. Some groups of four may be permitted depending on the final numbers in the class. You may choose the group members but the members of your group for the first two projects should be completely different from those for the last two projects.

COURSE EVALUATION

Project Reports (4)	**40%**
Quizzes (2)	**20%**
Final Exam (2:30 - 4:30pm, April 11)	**40%**

Design Reports. The specific requirements of the design reports will be provided for each project. These requirements have to be adhered to in order to achieve the perceived course objectives. The report should be technically sound, concise and comprehensive. Don't use your spare time to create a huge report!

Quizzes/Final Exam. All the quizzes and final exam will be open-book. You are allowed to bring the textbook and calculator but not the notes, project reports and other materials.

Other Policies. You must achieve a passing grade on the project section to pass the course. If you fail to do so, your final grade will be equal to that failing percentage.

If you miss a report or quizzes and have an acceptable, properly written excuse, the weight of the missed component will be added to the weight of the final exam.

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

You may appeal any mark within one week after it has been posted on the course website with the written reasons for remarking.

Please also note that university policy specified in University Calendar will be followed strictly.

REQUIRED TEXTBOOK

Metcalf & Eddy, Inc. (2003). *Wastewater Engineering: Treatment and Reuse*, 4th edition, McGraw Hill, Inc., New York, NY, 1796p

Notes and selected publications on pertinent topics will be posted on the web course link Blackboard throughout the semester.

REFERENCES

1 AWWA, (1999). *Water Quality and Treatment: A Handbook of Community Water Supplies*. 5th edition, McGraw Hill, New York, NY. **TD430 .W365 1999**

2 AWWA-ASCE, (2005). *Water Treatment Plant Design*. 4th edition, McGraw Hill, New York, NY. **TD434 .W38 2005**

3 Droste, R.L. (1997). *Theory and Practice of Water and Wastewater Treatment*. John Wiley & Sons, New York, NY, 800p. **TD430.D76 1997**

4 Eckenfelder, W.W. (2000). *Industrial Water Pollution Control*. 3rd edition, McGraw Hill, New York, NY, 584p. **TD745 .E23 2000**

5 Faust, S.D. and Aly, O.M. (1998). *Chemistry of Water Treatment*. Ann Arbor Press, Chelsea, MI, 581p. **TD433 .F38 1998**

6 Grady, C.P.L., Jr., Gaigger, G.T. and Lim, H.C. (1999). *Biological Wastewater Treatment*. 2nd edition, Marcel Dekker, New York, NY, 1076p. **TD755 .G72 1999**

7 Kawamura, S. (1991). *Integrated Design of Water Treatment Facilities*. John Wiley & Sons, New York, NY, 658p. **TH4538.K39 1991**

8 MWH Global, Inc. (2005). *Water Treatment Principles and Design*. 2nd edition, John Wiley & Sons, New York, NY, 1948p. **TD430 .W375 2005**

9 Qasim, S.R. (1999). *WastewaterTtreatment Plants: Planning, Design, and Operation*. Technomic Pub. Co, Lancaster, PA, 1107p. **TD746 .Q37 1999**

10 Qasim, S.R. (2000). *Water Treatment Plants:Pplanning, Design, and Operation*. Pearson Prentice Hall, Upper Saddle River, NJ, 884p. **TD434 .Q23 2000**

11 *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.

12 *Recommended Standards for Water Works*. 2003 Edition, The Great Lakes – Upper Mississippi River Board of State and Provincial Public health and Environmental Managers, Albany, NY, 124p.

13 Reynolds, T.D. and Richards, P.A. (1996). *Unit Operations and Processes in Environmental Engineering*, 2nd Edition, PWS Publishing Co. Boston, MA, 798p. **TD 430.R48 1996**

14 Viessman, W. Jr. and Hammer, M.J. (2005). *Water Supply and Pollution Control*. Pearson Prentice Hall, pper Saddle River, NJ, 865p. **TD353 .V54 2005**

15 WEF and ASCE, (1998). *Design of Municipal Wastewater Treatment Plants*, Vol. 1, 2 and 3, 4th Edition, Alexandria, VA. **TD746 D48 1998**

16 WEF and IWA, (2003). *Wastewater Treatment Plant Design*. Edited by A. Vesilind, Water Environment Federation, Alexandria, VA. **TD746 W38 2003**