ENGINEERING 9605: Water and Wastewater Treatment

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Instructor E-mail beforehand.

Office Hours: Mon., Thurs., 12:30-1:30 p.m. and by appointment.

Communication: By email is best.

COURSE DESCRIPTION:

Overview of global freshwater, regional water supplies and sources of water; water treatment processes including coagulation and flocculation, sedimentation and settling, granular and membrane filtration, and disinfection; overview of centralized and decentralized wastewater treatment; biological wastewater treatment processes focusing on suspended growth processes; design of water and wastewater process components.

SCHEDULE:  
LECTURES: Tues., Thurs., 10:30 noon - 11:15 p.m. in EN 4008

CREDIT VALUE: 3 credits

RESOURCES:

TEXT BOOK

REFERENCES
- Godfray, H.C.J., Beddington, J.R., Crute, I.R., Haddad, L., Lawrence, D., Muir, J.F.,


- Schwartz, S.A., 2007, Trends that will affect your future...and nary a drop to drink, Explore, 3(2):95-97.


**MAJOR TOPICS:**

- Global water, overview of centralized and decentralized wastewater treatment, global warming effects on water resources, water supply and treatment overview, St. John’s regional water supply system, water usage and population forecasting (Ch. 2, General Water Supply Design Considerations)
- Groundwater and surface water supplies, water quality, stratification of reservoirs
- Coagulation and flocculation, static mixer design, paddle flocculator design (Ch. 3, Coagulation and Flocculation)
- Sedimentation, Type I and Type II settling, settling column tests, sedimentation basin design, high rate tube settlers (Ch. 7, Sedimentation)
- Filtration
Granular filtration, granular filter headloss, backwashing bed depth, rapid sand filter design, wash trough design (Ch. 8, Granular Filtration)
Membrane filtration, microfiltration and ultrafiltration, membrane flux, fouling and rejection, dead-end and cross-flow operation (Ch. 9, Membrane Filtration)
Reverse osmosis and nanofiltration, monovalent and divalent ions removal, carbonate buffer system (Ch. 6, Reverse Osmosis and Nanofiltration, and Ch. 3, Coagulation and Flocculation)
Disinfection, chlorine, ozone and ultraviolet disinfection (Ch. 10, Disinfection and Fluoridation)
Wastewater treatment overview, secondary treatment by suspended growth biological processes, nitrification, denitrification and phosphorus removal, facultative oxidation ponds, oxidation ditch design, sequencing batch reactor (Ch. 16, Secondary Treatment by Suspended Growth Biological Processes)

LEARNING OUTCOMES:
Upon successful completion of ENGI 9605, the student will be able to:
1. Identify environmental issues related to water and wastewater resources and treatment.
2. Identify and use valid sources of information.
3. Source, read and understand water and wastewater related academic articles
4. Appreciate the value of lifelong learning particularly with respect to ever-evolving environmental and societal issues.
5. Design components of water and wastewater treatment systems.
6. Forecast population growth and estimate water consumption.
7. Discuss groundwater and surface water supplies.
8. Communicate technical information in a clear and effective manner in writing and orally.

ASSESSMENT:

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<tr>
<th>Assessment</th>
<th>Proposed Due Dates</th>
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<tbody>
<tr>
<td>Term Paper</td>
<td>Thursday, February 9, by 12:00 noon</td>
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<tr>
<td>Presentation</td>
<td>Thursday, March 2 and 9</td>
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<tr>
<td>Term test 1</td>
<td>Thursday, February 2</td>
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<tr>
<td>Term test 2</td>
<td>Thursday, March 16</td>
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<tr>
<td>Final exam</td>
<td>April 10 – 20</td>
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Midterm and the final exams will be open book with scientific calculators only permitted and could have a theoretical part. Posted practice problems are to help in exam preparation.
(Missing test 1 will increase the weighting of test 2 and the final exam by 7.5% each. Missing test 2 will increase the weighting of the final exam by 15%.) Weather could delay a final exam.

During class time, personal laptops, phones and other electronic devices should be turned off.
However, phones may be used to photograph figures and tables from the class notes.

ACADEMIC INTEGRITY AND PROFESSIONAL CONDUCT:

The highest level of academic integrity is expected from students. Please consult Memorial University’s Code of Student Conduct at http://www.mun.ca/student/conduct. Any student found to commit an academic offence will be dealt with according to the practices as outlined by the School of Graduate Studies. The related calendar information is available at http://www.mun.ca/regoff/calendar/sectionNo=GRAD-0029

INCLUSION AND EQUITY:

Students requiring physical or academic accommodations may speak confidentially to the instructor so that appropriate arrangements can be made. Diversity of viewpoints, values, and backgrounds that each class participant possesses enrich the university experience. Insightful and comprehensive class discussion will be possible when dialogue is collegial and respectful.

STUDENT ASSISTANCE: Student Affairs and Services offers help and support in a variety of areas, both academic and personal. More information can be found at www.mun.ca/student. A specific resource is the Writing Centre at http://www.mun.ca/writingcentre/about/.

ADDITIONAL INFORMATION:

![Winter 2017 Schedule](image)