CME440
Cities and Sustainable Infrastructure

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Hours: Lectures: Monday, Wednesday: 5:00pm – 6:15pm

Location: 1003 ERF (Engineering Research Facility)

Summary: This course exposes students to concepts of sustainability, cities, and infrastructure design. Infrastructure systems include: transport, buildings, electricity, and water. Emphasis is put on infrastructure integration and carbon accounting using principles of sustainability and resilience. The main assessment is a team design project where students are expected to design an entire neighborhood.

Pre-requisites:
- Undergraduate students: CME302 Transportation Engineering and CME311 Water Resources Engineering, or consent of the instructor.
- Graduate students: consent of the instructor.

Objectives: This course aims to provide students with the critical knowledge and technical expertise to analyze, plan and design future urban systems as integrated and low-carbon entities. More specifically, at the end of this course, students should be able to:

1. understand what sustainability means and how it can be applied for engineering projects.
2. understand the role that cities can play and use various techniques to forecast population.
3. analyze and calculate energy use and greenhouse-gas (GHG) emissions of most urban systems, including transport, buildings, water and electricity.
4. integrate their knowledge to identify inter-dependencies between each infrastructure system and plan an entire urban environment that is both sustainable and resilient.

Textbook: No textbook required. Notes will be supplied by the instructor for each chapter. Beyond the notes, list of useful resources for the course:

- SIG (2010) Getting to Carbon Neutral: A Guide for Canadian Municipalities, Sustainable Infrastructure Group at University of Toronto, produced for the Toronto and Region Conservation Authority, available at: http://trca.on.ca/dotAsset/81361.pdf

- Theis, T., and Tomkin, J. (2012) Sustainability: A Comprehensive Foundation, Connexions. Open-source Textbook, available at: http://tiny.cc/7m9jqx
- Bauer, K. (2010) City Planning for Civil Engineers, Environmental Engineers, and Surveyors, CRC Press, Taylor and Francis Group, Boca Raton, FL
- MacKay, D. (2009) (2014) Sustainable Energy - Without the Hot Air, UIT, Cambridge, UK, ISBN 978095445293. Free download at: http://www.withouthotair.com/
- Ascher, K., and Marech, W. (2005) The works: anatomy of a city, Penguin Press, New York, NY
- IPCC (2014) Climate Change 2014: Mitigation of Climate Change, Contribution of Working Group III Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, United Kingdom
- OECD (2006) Infrastructure to 2030: Telecom, Land Transport, Water and Electricity, Organization for Cooperation and Economic Development Publishing, Paris, France
- Striebig, B., Ogundipe, A., and Papadakis, M. (2015) Engineering Applications in Sustainable Design and Development, Cengage Learning, ISBN-10: 1133629776

Blackboard: All course notes will be published on blackboard, including syllabus, lecture materials and homework. Solutions to homework will not be published on Blackboard. Any document placed on blackboard can be modified/deleted at any time without notification from the instructor.

Grading Policy: Attendance, participation, behavior (5%)
Quizzes (10%) – Best 10 out of 17
Homework (27%) – Best 8 out of 9
Technology report and presentation (5%)
Mid-term exam (15%)
Final exam (15%)
Design: progress report (5%), leaflet for book compilation (5%), report (8%), presentation and poster (5%)

The grading policy can be changed at any moment during the term.

Work submitted late may receive a penalty. All homework must be submitted or students will be assigned a 0 grade for all of their homework.

While I understand it is easier to learn by collaborating, submissions must be individual except for the design project.

Plagiarism: Plagiarism is a serious offense and it will not be tolerated; see university policy.

Attendance Policy: All students are required to attend the lectures and be on time. If at any moment a student is to be absent, he/she should have discussed it prior with the instructor.

Professional Conduct: Students are always expected to conduct themselves with the utmost respect towards the instructor and their fellow students. Cellphones are to be turned off.

Class Schedule (may be modified):

Class	Date	Topic
1	Aug 22	Presentation
2	Aug 24	Documentary
3	Aug 29	Chapter 1 Introduction
4	Aug 31	Chapter 2 Sustainability
5	Sep 5	No Class (Labor Day)
6	Sep 7	Chapter 2 Sustainability
7	Sep 12	Chapter 3 Population Forecasting
8	Sep 14	Chapter 3 Population Forecasting
9	Sep 19	Chapter 4 Urban Planning
10	Sep 21	Chapter 4 Urban Planning
11	Sep 26	Chapter 5 Electricity
12	Sep 28	Chapter 5 Electricity
13	Oct 3	Chapter 5 Electricity
14	Oct 5	Chapter 6 Water
15	Oct 10	Chapter 6 Water
16	Oct 12	Chapter 6 Water
17	Oct 17	Technology Presentations
18	Oct 19	Revisions
19	Oct 24	Mid-term
20	Oct 26	Field Trip
21	Oct 31	Chapter 7 Transport
22	Nov 2	Chapter 7 Transport
23	Nov 7	Chapter 7 Transport
24	Nov 9	Chapter 7 Transport / Chapter 8 Buildings
25	Nov 14	Chapter 8 Buildings
26	Nov 16	Chapter 8 Buildings
27	Nov 21	Chapter 9 Urban Metabolism & Infrastructure Integration
28	Nov 23	Chapter 10 Science of Cities
29	Nov 28	Revisions
30	Nov 30	Final Exam
31	Dec 9	Final Presentations