Civil Engineering 4BP4

Building Science - Winter Term, 2018-2019

Instructor: Professor Samir E. Chidiac
JHE A414
Email: chidiac@mcmaster.ca

Teaching Assistants: Mohamed Elsayed  Email: elsaym4@mcmaster.ca

Lectures: Monday, Wednesday & Thursday (5:30-6:20) JHE A102
Tutorial: Thursday (9:30-11:20) ABB 165

Objectives and Learning Outcomes
At the end of this course student should be able to; 1) understand the fundamental modes of heat transfer; conduction, diffusion, convection and radiation, 2) understand the fundamental modes of dry and moist air transfer; convection, 3) understand the fundamental modes liquid/moisture transfer; sorption and diffusion, 4) know the building envelope components and functions, 5) assess the performance, durability, and code requirements for building envelope components, 6) know the various building systems, 7) model the heat and moisture transfer in building envelope, 8) model the energy consumption of buildings, and 9) be familiar with LEED.

Course Content

1. Introduction to building Science
2. Building Envelope components and functions
3. Codes and regulations
4. Heat transfer through the building envelope
5. Principle of mass transfer, water transfer through the building envelope
6. Heat & Moisture modelling tools and techniques
7. Building energy consumptions
8. Energy modelling tools and techniques
9. Building performance – durability, energy efficiency, sustainability, etc.
10. Problems of heat and moisture transport - freeze-thaw, condensation, corrosion, rot, mould, dissolution, etc.
11. LEED - Leadership in Energy & Environmental Design
12. Case studies

Depending on the progress of the course either additional topics may be covered, or some topics may not be covered. The order of topic shown may change.

Recommended Reference Material
It is not necessary to purchase a textbook in order to follow the course, as notes will be provided. Students are expected to find their own self-study materials. However, some useful background reading includes:

Avenue
http://avenue.mcmaster.ca/

Lecture notes; Additional notes and Assignments will be posted on Avenue. Students are expected to check and read all the material posted on avenue.

Assignments/Tutorials
During the course of this term, students are expected to work independently and in groups. Students are placed in a group of 4 to work together during tutorial time. Six assignments will be given during the term to assist in understanding the course material. Students are expected to work together on the assigned problems during tutorial time and hand in the assignment at the end of the tutorial with the group number and the name and student no of every group member written at the top of the 1st page.

Grading Procedure
Final grades will be converted to the twelve-point letter grade system using the standard conversion scale. Individual components will be weighted as follows:

- Assignments 12% (Group)
- Term Test 50% (Test 1 on February 28, Test 2 on March 28 - both at UH 213)
- Group Project 20% (Due April 5, 2019)
- Term Paper 18% (Due March 14, 2019)
- Bonus 2% (Class attendance & group participation)

To pass the course, students must complete and pass the Assignments, Term tests, Term paper, and Project portion of the course.

The aim of the term paper is to improve the student's knowledge in a specific area of the building envelope and its performance, including emerging technologies, by providing an individual report on a specific topic within the following categories:
1. Innovative and/or emerging materials for building envelope construction in terms of performance for one or more of: sound insulation, heat transfer, moisture transport, heat storage, smart material, etc.
2. Impact of climate change on the resiliency of buildings

The paper, which is a maximum of 10 double spaced pages, is to contain a discussion and evaluation of the research reported in the literature concerning theory, empirical, experimental (field and laboratory) and numerical modelling work carried out to investigate the building envelope topic being studied, including engineering, scientific and economic literature, where
appropriate. Topic can be selected by the students as well as a list of topics can be provided when requested.

Details of the group project and term paper will be discussed in class.

**Important Notes**

“The instructor and university reserve the right to modify elements of the course during the term. The university and instructor may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on the changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.”

1. **All lectures and tutorials are mandatory.**
2. All emails exchange are to be via the course dedicated email CE4BP4@mcmaster.ca using a McMaster University e-mail account. Emails from non-McMaster accounts will not receive a reply.
3. We will not check nor reply to emails sent via avenue.
4. Students are required to evaluate their peers for their contribution to the assignments and project. If there are any problems, communication/delivery or other problems, among group members, they are expected to first resolve it among themselves. If the problem is not resolved within one week, the group is expected to contact the TA for assistance. If the problem is not resolved, I would encourage the group members to contact me. Assignments’ and Project Mark will be adjusted to reflect the contribution of the students.
POLICY REMINDERS

Students are reminded of the following Policies, which could be relevant to activity in this course:

Calculators
Any Standard Calculator may be used during assignment/tutorials, term tests, and final examination.

Ethics and Dishonesty
Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at http://www.mcmaster.ca/senate/academic/ac_integrity.htm

The following illustrates only three forms of academic dishonesty:
1. Plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

Adverse Discrimination
The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem that cannot be resolved by discussion among the persons involved, individuals are reminded that they should contact their Department Chair, the Sexual Harassment Office or the Human Rights Consultant, as soon as possible.

Health and Safety
The Faculty of Engineering is committed to McMaster's University Workplace and Environmental Health and Safety Policy which states: "Students are required by University policy to comply with all University health, safety and environmental programs".

It is your responsibility to understand McMaster University Workplace and Environmental Health and Safety programs and policies. For information on these programs and policies please refer to McMaster University Environmental and Health Support Services Occupational Safety Risk Management Manual at: http://www.workingatmcmaster.ca/link.php?link=Job+Matters%3APolicy-Manual

It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for some of the experiments and the laboratory equipment.