PRINCIPLES OF GEOLOGICAL AND GEO-ENVIRONMENTAL ENGINEERING

CIVIL ENGINEERING 2J04
(WINTER 2019)

Instructor

Dr. Mohamed Mostafa, P.Eng., CEng MIEI., CPEng MIEAust., M.ASCE
mostam4@mcmaster.ca
Office Hours: By advance appointment only

Teaching Assistants:
Pedram Darbandsari - darbandp@mcmaster.ca
Jacob Ursulak - ursulajp@mcmaster.ca
Pengxiao Zhou - zhoup8@mcmaster.ca

Schedule:

Lecture:
Tuesdays, Wednesdays, and Fridays 12:30pm - 1:20pm BSB/B135

Tutorials:
Friday 2:30pm – 4:20pm Tutorial 01 KTH/B132
Tuesday 9:30am – 11:20am Tutorial 02 JHE/326H

Labs:
Monday 11:30am – 2:20pm Lab 01 JHE 114
Tuesday 2:30pm – 5:20pm Lab 02 JHE 114

Textbook:
The following textbooks are suggested, but they are not mandatory. The Custom Courseware is mandatory for this course.

Custom Courseware from Bookstore

Course Evaluation:

Assignments (approximately 10) 20%
Labs 10%
*(Late assignments and lab reports will not be accepted)*
Midterm Exam (Closed Book) 25%
Final Exam (Closed Book) 45%
*(Students must pass the Final Exam to pass this course)*

(Percentage to letter grade conversion scale is the same as that used by the Registrar’s Office)
CE-2J04 LECTURE SCHEDULE

**Topics:**

Week 1 (Jan. 7): Introduction; ecosystems and ecosystem structure; sustainability; soil ecosystem

Week 2 (Jan. 14): Minerals & rocks; igneous, sedimentary, and metamorphic rocks; Geological cycle; soil formation, transport and deposition

Week 3 (Jan. 21): Soil-particle size; clay minerals; mechanical analysis of soil; hydrometer test

Week 4 (Jan. 28): Phase Relationships, plasticity, and soil classification, seismology/earthquake

Week 5 (Feb. 4): Hydrology: surface water, engineering hydrology

Week 6 (Feb. 11): Evaporation & infiltration estimation, and Midterm exam (Feb. 15 @ 12:30pm in class)

Week 7 (Feb. 18): Reading Week / Midterm Recess

Week 8 (Feb. 25): Water pollution and prevention

Week 9 (Mar. 4): Solid water and management, air pollution

Week 10 (Mar. 11): Aquifers, groundwater flow, and monitoring

Week 11 (Mar. 18): Contaminant transport in aquifers, Boreholes, wells

Week 12 (Mar. 25): Site remediation

Week 13 (Apr. 1): Geo-environmental impact assessment

Week 14 (Apr. 8): Exam review, Classes End

**Note:** Shading denotes geology and geo-environmental related material.

**Midterm Exam** is on **Friday Feb. 15 at 12:30pm** in class (BSB/B135).
**Course Objectives:**

Lectures and related discussion will cover the topics of ecosystem fundamentals, ecosystem and sustainability, soil-based ecosystems, minerals and rocks, soil classification, seismology and earthquakes, surface water fundamentals, sediment and nutrient control, water use and land management, solid waste management, air pollution and human health, groundwater flow and monitoring, contaminants transport in aquifers, site remediation, land use and ecosystem impacts, and development of increasingly sustainable communities.

**Learning Outcomes:**

*Note: Numbers in parenthesis indicate learning indicators of attributes*

Once students have completed CE-2J04, they should have a good understanding of:

- Principles of geological and geo-environmental engineering (1.2)
- Environmental ecosystems and the processes which sustain them (1.2)
- Basic interrelationships that exist between the environment, humans and other living species (9.1)
- Fundamentals of geology (mineral and rocks) and seismology/earthquake (1.1; 1.2)
- Surface water (hydrology), groundwater flow, monitoring wells and contaminants transport (1.1; 1.2; 2.2)
- Solid waste management, hazardous waste management, and site remediation
- Air pollution and global atmospheric change, and impact on human health
- Actions which can be incorporated into the Engineering Profession and daily activities of individuals to solve geo-environmental problems and help curtail current and potential environmental impacts (1.2; 9.1)

The **Labs** will be on Soil Classification using: Hydrometer Method and Atterberg Limits (3.3)

---

**CEAB Attributes**

1. **Knowledge**
   - 1.1 Competence in Mathematics.
   - 1.2 Competence in Natural Sciences.

2. **Analysis**
   - 2.2 Ability to identify a range of suitable engineering fundamentals (including mathematical techniques) that would be potentially useful for analyzing a technical problem.

3. **Investigation**
   - 3.3 Can estimate outcomes, uncertainties and determine appropriate data to collect.

9. **Impact**
   - 9.1 Is able to identify and quantify the full range of short-term, long-term, local and global impacts of their engineering projects on society, including: economic aspects, social, cultural, and human health aspects, and; ecosystem integrity aspects.
Communication, Attendance and Schedule:
The main form of communication in this course will be the classroom. Therefore, course attendance is expected for lectures, tutorials, and labs. There is also an Avenue to Learn website, where course notes, and related information will be posted. Note that the schedule may change slightly throughout the term, and any changes will be announced in class and posted on the Avenue to Learn website. Students are strongly encouraged to take advantage of lecture, lab and tutorial time to ask questions and seek clarification.
Students are NOT authorized to record lectures or lab information sessions using video, audio or image recording devices without documented approval from the course instructor.

As a courtesy and to ensure timely response to emails, you must include your name and student ID number in the email signature and course code in the email subject line. Emails to the instructor or TAs must be sent from your McMaster University Account (not Avenue). Emails should be written in a professional manner, spell checked and proof read prior to sending them.

Requests for Relief for Missed Academic Term Work (Assignments, Lab work, Mid-Terms, etc.)
Late academic work will not be accepted. Accommodation will only be given to missed academic work with proper McMaster Student Absence Form (MSAF) and documentations (e.g. note from physician) submitted to your Faculty/Program office. It will be the general policy that the lowest mark you obtained for the other assignments will be assigned to your missed assignment. If you miss the midterm, your final will weigh 25% more. No mark will be entered for the missed work unless the Faculty/Program office gives its approval.

Laboratory Safety
The Faculty of Engineering is committed to McMaster University’s 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/rmm/index.php. It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for some of the experiments and the laboratory equipment.
The safety requirements for JHE 220 & JHE 114 are listed below. Students not abiding by these safety requirements will be given one warning. Second offences will result in the student being asked to vacate the laboratory, and receiving a grade of zero for that particular lab.

- Glasses or safety glasses/goggles must be worn in the lab at all times
- Contact lenses are not to be worn in the lab.
- No short (i.e., above the knee) pants or skirts are permitted in the lab – lab coats must be worn over top of your clothing in these instances.
- Closed-toe shoes must be worn at all times.
- No loose clothing allowed.
- Long hair must be tied back.
- Gloves must be worn when working with hazardous chemicals (as indicated by the laboratory instructor).

Academic Integrity
You are required to exhibit honesty and use ethical behaviour in all aspects of the learning process.
Academic credentials you earn are rooted in principles of honesty and academic integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour 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, located at: http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g., the submission of work that is not 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.

**Anti-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.


**Avenue to Learn**
In this course we will be using Avenue to Learn website. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.


Avenue to Learn will be available for the course and include a discussion board. This venue will be periodically but not continually checked by the course instructor or TA. Students are encouraged to discuss questions related to lecture notes and course material but CANNOT post lecture notes, data sets or solutions to lab or assignment related problems.

**Academic Accommodation of Students with Disabilities Policy**
Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or email sas@mcmaster.ca. For further information, please consult McMaster’s policy for Academic Accommodation of Students with Disabilities at


Students must forward a copy of the SAS accommodation to the instructor of each course and to the Program Undergraduate Administrative Assistant immediately upon receipt. If a student with a disability chooses NOT to take advantage of a SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete.
Possible Changes to Delivery Format and Assessment Methods
The instructor and university reserve the right to modify elements of the course during the term. The university 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 changes. It is the responsibility of the student to check their McMaster email and course websites at least weekly during the term and to note any changes.