EXPANDED COURSE DESCRIPTION
CIVIL ENGINEERING
Lassonde School of Engineering
Civil Engineering
LE / CIVL 4016 3.0 SECTION M
GEOLOGICAL ENGINEERING
FALL 2019 / WINTER 2020

COURSE CALENDAR DESCRIPTION
This course presents applications of geomechanics and rock engineering principles to design of rock slopes and underground excavations through discussion of case histories and presentation of empirical and numerical design methodologies. The focus will be on surface and underground construction challenges related to the inherent variability of rock and rock mass properties. The use of industry standard design tools and software will be incorporated into analysis and open-ended design problems. Prerequisite: LE/CIVL 3210 3.00.

INSTRUCTOR(S)

<table>
<thead>
<tr>
<th>Name</th>
<th>Section / Format / Term</th>
<th>Contact Email</th>
<th>Contact Phone</th>
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<tbody>
<tr>
<td>Perras, Matthew</td>
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ADDITIONAL INFORMATION

TEXTBOOKS

Required:
*Digital access via the library coming soon*

Suggested:

COURSE LEARNING OUTCOMES
After completing this course, the student should be able to:
1. Understand and evaluate the limitations of rock strength estimation and testing techniques [GA 3]
2. Differentiate between intact and rock mass properties in the context of geological engineering analysis and design [GA 3, 4]
3. Use industry-standard empirical and numerical tools and appraise appropriate rock constitutive models and associated inputs for analysis of a geological engineering problem [GA 3,4]
4. Judge the validity of lab testing and numerical modelling results and justify their use in geological engineering design [GA 4]
5. Communicate results obtained from lab testing and numerical modelling in an appropriate written format [GA 7]
6. Extract, summarize, critique, and report their findings from case histories, published literature, and available reports in an objective manner so as to keep themselves abreast of the latest technological advancements in geological engineering [GA 7,12]
MID-TERM & FINAL EXAMINATIONS

There will be one mid-term examination on February 28, 2018 in class, which is worth 15% of your final grade. There will be final examination in the exam period at the end of the winter term. The final exam is worth 45% of the final grade in the course. The date, time, and location of the exam will be announced through the course’s Moodle site and the official York examination schedule website. Any permitted materials will be announced prior to the exam date.

ONLINE LECTURE NOTES & E-LEARNING CONTENTS

Lecture materials and e-Learning contents will be posted on the LE/CIVL 4016 Moodle site. Students have to visit this often for the latest updates. Minimum technical skills are expected of the student in order to access the e-Learning materials. Students should contact the instructors for any difficulty experienced in accessing the recommended e-Learning materials.

EVALUATION SCHEME

Assignments - 10%
Laboratory Reports - 20%
Term Paper - 10%
Mid-Term Test - 15%
Exam - 45%

TOPICS

The course covers the following topics:

- **Introduction to Geological Engineering:** Differences between geotechnical engineering, engineering geology, and geological engineering, the focal points of geological engineering, design tools and resources
- **Rock Mechanics:** Laboratory testing methods, physical and mechanical properties of rock, stress-strain relationships, and strength and deformability
- **Site Investigation:** Planning and design, preliminary investigations, rock coring and borehole investigation tools, field estimated properties and strength
- **Rock Mass Classification:** Methods of classification (RMR, Q, GSI), description of discontinuities, stereonets, rock mass properties
- **Rock Slope Stability:** Factors influencing stability, types of slope failures, analysis methods, design of stabilization measures, monitoring, empirical and numerical design solutions, as applied to natural and man-made slopes including, road cuts and open pits
- **Underground Excavations:** Geomechanical design parameters, application of classification systems, tunnel, cavern, and mine excavation stability analysis, empirical and numerical design solutions, monitoring during and post-construction
- **Dams and Reservoirs:** Types of dams, geological criteria for dam selection, importance of dam foundations, improving dam foundation properties, reservoir stability
- **Geological Hazards:** Faults and earthquakes, seismic studies and hazard analysis, mitigation

The course has the following four 3-hr lab sessions (total 12 hrs.):

- **Introduction to Numerical Tools & Rock Testing:** Utilize industry standard software to understand the behavior of a rock specimen under simulated laboratory testing conditions.
- **Rock Properties:** Comparison of field estimated strengths with laboratory derived values for input into rock mass classification systems and empirical design methods
- **Geological Setting:** Analysis of geological and structural data using stereo nets and statistics to determine rock mass properties and classify the rock mass using RMR, Q, and GSI
- **Empirical & Numerical Design:** Determining a stabilization solution for either a slope or an underground excavation based on the rock mass properties and classifications. Also, utilizing industry standard software to determine stabilization solutions for either a slope or an underground excavation and compare these findings to the empirical design solution
ACADEMIC INTEGRITY LINKS
• Senate Policy on Academic Honesty - http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/
• Academic Integrity - http://lassonde.yorku.ca/academic-integrity

STUDENT LINKS
• Student Rights and Responsibilities - http://oscr.students.uit.yorku.ca/student-conduct
• Religious Observance - https://w2prod.sis.yorku.ca/Apps/WebObjects/cdm.woa/wa/regobs
• Academic Accommodation for Students with Disabilities - http://secretariat-policies.info.yorku.ca/policies/academic-accommodation-for-students-with-disabilities-policy/
• Student Accessibility Services (SAS) - https://accessibility.students.yorku.ca/
• York University’s Policies on Sexual Violence - http://secretariat-policies.info.yorku.ca/policies/sexual-violence-policy-on/
• York University’s Policies on Gender/LGBTQ+/Positive Space - http://rights.info.yorku.ca/lgbtq/

LAND ACKNOWLEDGEMENT
• We acknowledge our presence on the traditional territory of many Indigenous Nations. The area known as Tkaronto has been care taken by the Anishinabek Nation, the Haudenosaunee Confederacy, the Huron-Wendat, and the Métis. It is now home to many Indigenous Peoples. We acknowledge the current treaty holders, the Mississaugas of the New Credit First Nation. This territory is subject of the Dish With One Spoon Wampum Belt Covenant, an agreement to peaceably share and care for the Great Lakes region.
• The Indigenous Framework for York University: A Guide to Action can be found here: http://indigenous.info.yorku.ca/
• Meaning of a land acknowledgement: http://healthydebate.ca/opinions/indigenous-land-acknowledgements

Many courses utilize Moodle, York University’s course website system. If your course is using Moodle, click here to access it.

Moodle @ York University