EXPANDED COURSE DESCRIPTION
MECHANICAL ENGINEERING
Lassonde School of Engineering
Mechanical Engineering
LE / MECH 4402 4.0 SECTION A
SIMULATION TOOLS FOR DESIGN & ANALYSIS
FALL 2019 / WINTER 2020

COURSE CALENDAR DESCRIPTION
This course provides an introduction to numerical modeling (e.g. finite element analysis) and commercial software of choice. The application of commercial software to a selected number of problems (e.g. stress analysis, heat transfer, and/or fluid flow, etc. to design or analyze a system) is discussed. Result verification/interpretation of numerical modeling are emphasized. Prerequisites: LE/MECH 2301 3.00 or LE/ENG 3330 3.00, LE/MECH 3203 3.00 or LE/ESSE 3360 3.00, and LE/MECH 2401 3.00.

INSTRUCTOR(S)

<table>
<thead>
<tr>
<th>Name</th>
<th>Section / Format / Term</th>
<th>Contact Email</th>
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<tbody>
<tr>
<td>Hanson, Ronald</td>
<td>Sec. A / LECT / F</td>
<td><a href="mailto:hansonre@yorku.ca">hansonre@yorku.ca</a></td>
<td>416-736-2100</td>
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ADDITIONAL INFORMATION

COURSE WEBSITE
MECH 4402 on http://moodle.info.yorku.ca

COURSE LEARNING OUTCOMES
Upon the completion of this course, students are expected to learn and retain the following concepts and skills:
1. Appraise the importance of modeling and simulation in engineering design and analysis.
2. Formulate the solutions of engineering problems (e.g., stress analysis, heat transfer, fluid flow) using finite difference/finite element/finite volume method.
3. Use commercial engineering software (STAR-CCM+, Matlab, Solidworks etc.) to model engineering systems.
4. Establish a process to validate computer models and simulation results.
5. Identify the capability of various engineering software in design, modeling and simulation and ability to select proper software for specific task.
6. Describe the importance of multiphysics software and to employ for modeling and simulation of multiphysics problems.

LECTURES AND LABORATORIES
Schedule of Lectures (subject to change)
Week 1: Introductions, Stiffness displacement method
Week 2: Development of Truss Equations
Week 3: Beam Elements and Theory
Week 4: Higher Order Systems
Week 5: Practical Considerations and Solid Mechanics Review
Week 6: Introduction to CFD and the Design Project
Week 7: Governing Equations of Fluid Flows (midterm tentative)
Week 8: Generating Mesh and Boundary Conditions
Week 9: Basics of CFD Techniques and Solution Analysis
Week 10: Practical Guidelines for CFD
Week 11: Basics of Optimization for Design and Analysis
Week 12: Introduction to the Simulation of Heat Transfer

Laboratories
The laboratories will be used to provide students with workshops on the use of commercial software in finite element/finite volume methods. The TA will deliver the practical laboratories or the Instructor if the TA cannot attend.

FINAL EXAMINATION
There will be a final examination in December 2019.

ONLINE LECTURE NOTES & e-Learning Contents
Slides will be available online through the course website within 2 days of the corresponding lecture.

EVALUATION SCHEME (subject to change within York University Policy)
Midterm (in-class, 90 minutes): 20%
Final Exam: 35%
Assignments (4 items total): 20%
Design Project: 25%

TEXTBOOKS
• A first course in the finite element Method, Sixth Edition, Logan.

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/cedm.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.

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