EXPANDED COURSE DESCRIPTION
CIVIL ENGINEERING
Lassonde School of Engineering
Civil Engineering
LE / CIVL 4001 3.0 SECTION A
ADVANCED STRUCTURAL ANALYSIS
FALL 2019 / WINTER 2020

Last Modified Date: 08/07/2019

COURSE CALENDAR DESCRIPTION

The course presents modern methods of structural analysis related to the computer-aided solution of statically indeterminate structures. The Virtual Work principle in Matrix Form is the basis of the course's development. Development of the matrix form of flexibility and stiffness methods of analysis. The Direct Stiffness Method. Matrix formulation and computer analysis. Application to structural systems including continuous beams, frames, and trusses, using modelling with advanced software platforms. Introduction to the finite element method. Prerequisite: LE/CIVL 3130 3.00

INSTRUCTOR(S)

TBD

ADDITIONAL INFORMATION

TOPICS AND CONCEPTS
- Spatial discretization of structures. Review of matrix algebra. Adaptation of simple matrix manipulation operations in a programming environment
- Formulation of the Virtual Work Principle in matrix form
- Matrix form of the Displacement Method of Structural Analysis
- The Basic Element Stiffness Matrix in local and global coordinates: Spring (1 deformational degree of freedom ddof), 2-D truss (1 ddof), 2-D Beam (3 ddof), 3-D beam (6 ddof).
- The Direct Stiffness Assembly of the equations of nodal equilibrium
- Solvers, software development, and application examples
- State determination of structural members
- Modeling of truss structure using commercial software
- Modelling of frame structure using commercial software
- Parametric evaluation of constraints, releases, error evaluation and debugging of models

LIST OF LEARNING OUTCOMES AND EXAMPLES OF

Upon the completion of this course, students are expected to learn and retain the following concepts and skills:
- Have an understating of the automated process of structural analysis in computers
- Be able to deal with compact matrix notation.
- Understand Coordinate Transformation
- Understand the architecture of structural analysis software
- Be able to model and analyze realistic structures
- Be able to model loads, kinematic constraints and environmental effects using software
- Develop an understanding of the workings of structural systems
- Gain experiential learning of the process involved in computer simulation of structural behavior
- Understand the implications of modeling assumptions on computed results
- Develop knowledge and background for the more general Finite Element Methods of Analysis
**GRADED ASSESSMENT**
Assignments/Quizzes and Lab Reports: 60%
Final Examination: 40%

**REQUIRED TEXT**
Manual of SAP2000 (downloadable from the internet)
http://docs.csiamerica.com/manuals/etabs/Analysis%20Reference.pdf

**ADDITIONAL RESOURCES**

**COURSE WEBSITE**
All course material will be uploaded in the CIVL4001 Moodle space in http://learn.lassonde.yorku.ca

**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 Racism Policy and Procedures -
  http://secretariat-policies.info.yorku.ca/policies/racism-policy-and-procedures/
- 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