The University of Western Ontario
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

CEE9718A- Finite Element Analysis for Solids I
COURSE OUTLINE- 2020021

OBJECTIVES: This course is designed to achieve the following objectives:
1. Provide the basic knowledge of the theory of elasticity.
2. Provide an understanding of the foundations of the finite element method.
3. Train the student in deriving and coding finite element formulations.
4. Train the student in solving problems in solid mechanics using the finite element method.

TOPICS:
1. Introduction to the theory of elasticity: stress and strain tensors; constitutive relations; plane elasticity problems; beam bending problems.
2. Introduction to the Finite Element Method: Strain energy; principle of minimum potential energy; virtual work principle; Rayleigh-Ritz method.
5. Plane elasticity finite element; four node rectangular element; constant stress triangular element; natural coordinates and Co shape functions.
6. Isoparametric 2-D elements; general formulation; eight-node isoparametric element; Gauss-Quadrature numerical integrations.
8. Think Plate Bending Problems- Locking Phenomenon
9. Shell Problems- Degenerated Shell Elements
10. Introduction to Nonlinear Problems

PREREQUISITE B.Sc. Degree in Structural Engineering

ANTIREQUISITE CEE 9512

CONTACT HOURS: 4 hours lecture once or twice per week (personal study- 9 hours).

TEXT: NONE.

LECTURE NOTES: Will be posted on owl. It is strongly recommended to bring a copy of
the notes during lectures.

REFERENCES: Will be provided in the first lecture.

COMPUTING: Assignments will include modification of a basic finite element program written in FORTRAN. Assignments might include application of the commercial program SAP2000 which is available at the engineering computer lab.

UNITS: SI units will be used in lectures and examinations.

EVALUATION: Assignments 35% Class Participation 5% Final Examination 60%
An Open Book mid-term test might be scheduled during the term. It will have the same weight as a typical assignment. The final examination is OPEN BOOK. Students must obtain a grade of 50% in the final examination to pass this course.

INSTRUCTOR: Dr. A. El Damatty, P.Eng., SEB3006, Ext.82345 e-mail: damatty@uwo.ca

Contact policy: Contact instructor via email or through messages in OWL
Weekly Office hours are held via Zoom

ATTENDANCE: The lectures will be delivered synchronously through zoom. Any students who, in the opinion of the instructor, is absent too frequently from class or laboratory periods in any course, will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular examination in the course.

ENGLISH: In Accordance with Senate and Faculty Policy, students may be penalised up to 10% of the marks on all assignments, tests, and examinations for the improper use of English. Additionally, poorly written work with the exception of the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

COURSE CONTENT: The lecture notes and online lecture videos are copyrighted to the instructor and legally protected. Do not post these videos and lecture notes on any other website or online forums. The recording of the live/synchronous sessions of the course without the permission from the instructor is prohibited. The illegal posting and sharing of the copyrighted course content could be subjected to legal actions.
ONLINE PROCTORING NOTICE:
The final examination in this course will be conducted using Zoom. You will be required to keep your camera on for the entire session, hold up your student card for identification purposes, and share your screen with the invigilator if asked to do so at any time during the exam. The exam session will not be recorded.*

More information about the use of Zoom for exam invigilation is available in the Online Proctoring Guidelines at the following link: https://www.uwo.ca/univsec/pdf/onlineproctorguidelines.pdf.

Completion of this course will require you to have a reliable internet connection and a device that meets the system requirements for Zoom. Information about the system requirements are available at the following link: https://support.zoom.us/hc/en-us.

* Please note that Zoom servers are located outside Canada. If you would prefer to use only your first name or a nickname to login to Zoom, please discuss this with your instructor in advance of the test or examination.

CHEATING, PLAGIARISM/ACADEMIC OFFENCES
Academic integrity is an essential component of learning activities. Students must have a clear understanding of the course activities in which they are expected to work alone (and what working alone implies) and the activities in which they can collaborate or seek help; see information above under “Assessments” and ask instructor for clarification if needed. Any unauthorized forms of help-seeking or collaboration will be considered an academic offense. University policy states that cheating is an academic offence. If you are caught cheating, there will be no second warning. Students must write their essays and assignments in their own words. Whenever students take an idea or a passage of text from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence. Academic offences are taken seriously and attended by academic penalties which may include expulsion from the program. Students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence (see Western's scholastic discipline regulations for graduate students).

SYNCHRONOUS LEARNING ACTIVITIES
Students are expected to participate in synchronous learning activities as outlined in the course syllabus and/or described by the instructor. If you have issues that will impede your ability to participate in synchronous activities, please discuss with the course instructor at the beginning of the course.

CONDUCT
Students are expected to follow proper etiquette during synchronous and asynchronous activities to maintain an appropriate and respectful academic environment. Any student who, in the opinion of the instructor, is not appropriately participating in the synchronous and asynchronous learning activities and/or is not following the rules and responsibilities associated with the online learning activities, will be reported to the Associate Dean (Graduate) (after due warning has been
given). On the recommendation of the Department concerned, and with the permission of the Associate Dean (Graduate), the student could be debarred from completing the assessment activities in the course as appropriate.

HEALTH/WELLNESS
As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several health and wellness related services (remotely accessible) to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. Information regarding health- and wellness-related services available to students may be found at http://www.health.uwo.ca/.

Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. Campus mental health resources may be found at http://www.health.uwo.ca/mental_health/resources.html https://www.uwo.ca/health/psych/index.html

SICKNESS
Students should immediately consult with the Instructor (for a particular course) or Associate Chair (Graduate) (for a range of courses) if they have problems that could affect their performance. The student should seek advice from the Instructor or Associate Chair (Graduate) regarding how best to deal with the problem. Failure to notify the Instructor or the Associate Chair (Graduate) immediately (or as soon as possible thereafter) will have a negative effect on any appeal. Obtaining appropriate documentation (e.g., a note from the doctor) is valuable when asking for accommodation due to illness.

ACCESSIBILITY
Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at 661-2111 x 82147 or http://academicsupport.uwo.ca/accessible_education/index.html, for any specific question regarding an accommodation.