Western University - Faculty of Engineering
Department of Civil and Environmental Engineering

CEE 3340a – Analysis of Indeterminate Structures - Course Outline 2020

This course introduces methods of analysis for structures having a high degree of static indeterminacy such as continuous beams, trusses, plane frames, grids and multi-storey frames. The general objectives are for the student to become able to:

- identify, formulate, analyze and solve structural analysis and design problems involving statically indeterminate structures while working individually or functioning on a team.
- combine knowledge of statics, elastic deflection and compatibility gained in previous courses to understand and apply classical methods for the analysis of statically indeterminate trusses, beams and frames;
- improve communication skills by documenting design decisions in coherent and legible design calculations;
- develop an awareness of contemporary structures, and appreciate professional responsibility issues;
- recognize the need for life-long learning to keep abreast of new design and construction methods, enhance one’s abilities as a designer, and maintain one’s professional competence.

Calendar Copy:
A continuation of CEE 2221A/B. Methods of analysis of structures having a high degree of static indeterminacy such as frames, continuous beams and arches. Matrix formulation of the displacement methods and computer oriented analysis. Influence lines for indeterminate structures.

Prerequisites:
CEE 2221A/B

Antirequisites:
None

Note: It is the student's responsibility to ensure that all Prerequisite and Corequisite conditions are met or that special permission to waive these requirements has been granted by the Faculty. It is also the student's responsibility to ensure that they have not taken a course listed as an Antirequisite. The student may be dropped from the course or not given credit for the course towards their degree if they violate the Prerequisite, Corequisite or Antirequisite conditions.

Contact Hours:
3 lecture hours/week;
Lectures will be delivered asynchronously through pre-recorded videos posted to the course OWL site. Lectures will be organized into learning modules which students should review on a weekly basis. Quizzes at the end of each module will be used to track participation. Review of lecture material and self-study should take approximately 6 hours per week.

2 tutorial hours/week.
A 2-hour tutorial session will be delivered synchronously through Zoom each week during the scheduled tutorial hours. Tutorials are not mandatory but students seeking assistance with weekly assignments or clarification on lecture material are strongly encouraged to attend. The link to the Zoom meeting will be posted to OWL.
**Instructor:**
Dr. Jon Southen, SEB 3116  
jsouthen@uwo.ca
Office hours: Fridays 10:30-11:30 via Zoom (link can be found on course OWL site)

Administrative Assistant: Sandra McKay (smckay@uwo.ca)

**Textbook:**
(Purchase of the text is recommended (hardcopy or ebook). Previous editions may be acceptable.)

**Other References:**
*Structural Analysis*, R. C. Hibbler, Pearson, 10th edition, 2017 (or previous editions).

**Units:**
Both SI and FPS unit systems may be used in lectures, tutorials and examinations.

**Specific Learning Objectives:**
The lectures and tutorial assignments will prepare students to do the following [GA Indicator]:
1. Calculate the displacements of determinate structures using methods learned in year 2 [KB 3]
2. Use the force method to analyze statically indeterminate beams, frames and trusses [KB 4]
3. Use the slope deflection method to analyze frame structures with both prismatic and non-prismatic members, including frames subjected to no joint translations, prescribed joint translations and unknown joint translations. The results of these analyses and subsequent analyses are deflections, bending moment and shear diagrams. [KB 4, PA 2]
4. Use the moment-distribution method to analyze frame structures with prismatic or non-prismatic members, including frames subjected to no joint translations, prescribed joint translations and unknown joint translations. [KB 4, PA 2]
5. Use the stiffness method to formulate the stiffness, force and displacement matrices required to analyze truss, beam and frame structures and apply the matrix stiffness approach to analyze indeterminate structures. [KB 4, PA 2]
6. Develop influence lines for statically indeterminate structures. [KB 4]
7. Understand and apply the Raleigh-Ritz method for approximate solutions of equilibrium problems. [KB 4]

The instructor may expand or revise material presented in the course as appropriate.

**General Learning Objectives:**

<table>
<thead>
<tr>
<th>Knowledge Base</th>
<th>E (A)</th>
<th>Engineering Tools</th>
<th>T</th>
<th>Impact on Society</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Analysis</td>
<td>T</td>
<td>Team Work</td>
<td></td>
<td>Ethics and Equity</td>
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<tr>
<td>Investigation</td>
<td></td>
<td>Communication</td>
<td>T</td>
<td>Economics and Project Management</td>
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<tr>
<td>Design</td>
<td></td>
<td>Professionalism</td>
<td></td>
<td>Life-Long Learning</td>
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Evaluation:
The final mark will be determined as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Participation</td>
<td>5%</td>
</tr>
<tr>
<td>Weekly Assignments</td>
<td>30%</td>
</tr>
<tr>
<td>Quizzes (2)</td>
<td>20%</td>
</tr>
<tr>
<td>Written Final Examination</td>
<td>35%</td>
</tr>
<tr>
<td>Oral Final Examination</td>
<td>10%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
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Note: Students must pass the final examination to pass this course. Students who fail the final examination will be assigned the aggregate mark, as determined above, or 48%, whichever is less. Students who have failed this course previously must repeat all components of the course. No special permissions will be granted enabling a student to retain laboratory, assignment or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted.

1. Quizzes and Examinations:
Two one-hour quizzes will be held during tutorial hours. These quizzes are tentatively scheduled for Tuesday, October 20 and Tuesday, November 17. These quizzes will be conducted using randomized questions via the OWL platform.

A three-hour written final examination will be held during the regular examination period. The examination will be in a take-home format (download from Owl, upload to Owl when complete). The written examination will be followed by a 10-15-minute oral examination in which the written examination and general course material will be reviewed and discussed with the student.

2. Weekly Assignments:
Assignments will be given on a weekly basis. Assignments are to be submitted prior to the due date to OWL. Late assignments will be assessed a penalty of 10% per day, to a maximum of 4 days, after which they will receive a mark of zero. Extensions are to be negotiated with the course instructor, not the teaching assistants.

3. Participation:
Active engagement in course material is essential to effective learning. Participation will be evaluated on the basis of participation in tutorial sessions, postings to the forum on Owl and completion of quizzes at the conclusion of lesson modules.

4. Use of English:
In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests, and examinations for 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.

Cheating:
University policy states that cheating is a scholastic offence. The commission of a scholastic offence is attended by academic penalties that might include expulsion from the program. If you are caught cheating, there will be no second warning.
For more information on scholastic offenses, please see:
http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf
**Attendance:**
Any student who, in the opinion of the instructor, has not engaged sufficiently in class, laboratory, or tutorial periods 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 final examination in the course.

**Accommodation:**
Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The accommodation policy can be found here: Academic Accommodation for Students with Disabilities.

**Academic Consideration for Student Absence**
Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the term, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student’s final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student’s final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are not met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation. Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student’s Home Faculty.**

For Western University policy on Consideration for Student Absence, see Policy on Academic Consideration for Student Absences - Undergraduate Students in First Entry Programs and for the Student Medical Certificate (SMC), see:

**Religious Accommodation**
Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar.

**Use of Recordings:**
The remote learning sessions for this course may be recorded. The data captured during these recordings may include your image, voice recordings, chat logs and personal identifiers (name displayed on the screen). The recordings will be used for educational purposes related to this course, including evaluations. The recordings may be disclosed to other individuals under special circumstances. Please contact the instructor if you have any concerns related to session recordings.
Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor. The lecture notes and online lecture videos and tutorial sessions 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.

**Conduct:**
Some components of this course will involve online interactions. To ensure the best experience for both you and your classmates, please honour the following rules of etiquette:

- please “arrive” to class on time
- please use your computer and/or laptop if possible (as opposed to a cell phone or tablet)
- ensure that you are in a private location to protect the confidentiality of discussions in the event that a class discussion deals with sensitive or personal material
- to minimize background noise, kindly mute your microphone for the entire class until you are invited to speak, unless directed otherwise
- [suggested for classes larger than 30 students] In order to give us optimum bandwidth and web quality, please turn off your video camera for the entire class unless you are invited to speak
- [suggested for cases where video is used] please be prepared to turn your video camera off at the instructor’s request if the internet connection becomes unstable
- unless invited by your instructor, do not share your screen in the meeting

The course instructor will act as moderator for the class and will deal with any questions from participants. To participate please consider the following:

- if you wish to speak, use the “raise hand” function and wait for the instructor to acknowledge you before beginning your comment or question
- remember to unmute your microphone and turn on your video camera before speaking
- self-identify when speaking.
- remember to mute your mic and turn off your video camera after speaking (unless directed otherwise)

General considerations of “netiquette”:

- Keep in mind the different cultural and linguistic backgrounds of the students in the course.
- Be courteous toward the instructor, your colleagues, and authors whose work you are discussing.
- Be respectful of the diversity of viewpoints that you will encounter in the class and in your readings. The exchange of diverse ideas and opinions is part of the scholarly environment. “Flaming” is never appropriate.
- Be professional and scholarly in all online postings. Cite the ideas of others appropriately.

Note that disruptive behaviour of any type during online classes, including inappropriate use of the chat function, is unacceptable. Students found guilty of Zoom-bombing a class or of other serious online offenses may be subject to disciplinary measures under the Code of Student Conduct.

**Notice:**
Students are responsible for regularly checking their email, course website (https://owl.uwo.ca) and notices posted outside the Civil and Environmental Engineering Department Office.
Consultation:
Students are encouraged to discuss problems with their teaching assistant and/or the Instructor in tutorial sessions. Office hours will be arranged for the students to meet with the Instructor and teaching assistants. Other individual consultation can be arranged by appointment with the instructor.

Course Breakdown: (Values given in accreditation units)
Engineering Science = 100%

The attached document “INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS”