Objectives: This course covers the behaviour and design of statically determinate and indeterminate prestressed concrete structures.

Prerequisite: This course is intended for graduate students with bachelor’s degree in civil engineering.

Topics:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>Learning Activities</th>
<th>Tentative Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>principles and methods of prestressing, material properties, partial loss of prestress.</td>
<td></td>
<td>Weeks 1-2</td>
</tr>
<tr>
<td>Axially loaded members</td>
<td>short-term and long-term response, width and spacing of cracks.</td>
<td></td>
<td>Week 3</td>
</tr>
<tr>
<td>Flexural behaviour and design</td>
<td>moment-curvature relationship, service load design, ultimate flexural strength, composite beams, camber and deflections, width and spacing of cracks.</td>
<td></td>
<td>Week 4-8</td>
</tr>
<tr>
<td>Columns and walls</td>
<td>combined axial load and flexure.</td>
<td></td>
<td>Week 9</td>
</tr>
<tr>
<td>Shear behaviour and design</td>
<td>simplified method, modified compression field theory.</td>
<td></td>
<td>Week 10</td>
</tr>
<tr>
<td>Indeterminacy</td>
<td>indeterminate prestressed Concrete Structures, restraint action.</td>
<td></td>
<td>Week 11</td>
</tr>
<tr>
<td>Disturbed regions</td>
<td>anchorage zones, strut and tie models, bearing resistance, shear friction, shear interface of composite beams.</td>
<td></td>
<td>Week 12</td>
</tr>
</tbody>
</table>

Instructor: Dr. Maged A. Youssef, P. Eng., (youssef@uwo.ca).
Administrative Assistant: Eduard Sviridenko (esviride@uwo.ca).

Contact Hours: 3 lecture hours/week:
- Lectures will be delivered asynchronously through pre-recorded videos posted to the course OWL site.
  The course will be organized into learning modules, which students should review on a weekly basis. Assignments at the end of each module will be used to track participation. Gradescope platform will be used for the weekly assignments.
• Office hours will be held during the scheduled times for the lectures. The links to the ZOOM meetings will be posted on OWL. Other individual consultation can be arranged by appointment.

**Course Materials:**
There is no set textbook for the course. There are a number of textbooks that cover many of the aspects of the course material. These include:

• Concrete Design Handbook (current Edition), Cement Association of Canada, Ottawa, ON.
• CPCI, current edition, *Design Manual: Precast and Prestressed Concrete*, Canadian Prestressed Concrete Institute, Ottawa, ON.

Prepared class notes will be made available through the course OWL site at [http://owl.uwo.ca/](http://owl.uwo.ca/).

**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 live 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.

**Specific Learning Outcomes**

<table>
<thead>
<tr>
<th>Degree Level Expectation</th>
<th>Weight</th>
<th>Assessment Tools</th>
<th>Outcomes</th>
</tr>
</thead>
</table>
| Depth and breadth of knowledge | 45% | • Assignments  
• Final Exam | • Understanding of advanced concepts and theories  
• Understanding of computational and/or empirical methodologies to solve related problems |
| Application of knowledge | 45% | | • Ability to apply knowledge in a rational way to analyze a particular problem  
• Ability to use coherent approach to design a particular engineering system using existing design tools |
| Professional capacity / autonomy | 10% | | • Awareness of academic integrity  
• Ability to implement established procedures and practices in the coursework |

**Computing:**
Assignments will require using computer software such as Microsoft Excel.

**Evaluation:**
The final course mark will be determined as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly Assignments</td>
<td>50%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>50%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
**Final Exam:**
The final exam will be a 3-hour take-home exam. Selected students may be required to attend a follow-up meeting to discuss their answers. The chosen students may be assigned randomly. They may also be those whose answers raise suspicion about authenticity and uniqueness. All such decisions and follow-up discussions are at the sole discretion of the instructor. Should an instructor decide to initiate follow-up discussion, all selected students will be informed within one week after writing the exam. If a student is selected for a follow-up discussion, that discussion will constitute a mandatory component of the final exam and the instructor may change the final exam mark based on the outcome of the discussion.

**Online Proctoring Notice:**
The final examination in this course is expected to 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. 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.

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

**Use of 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.

**Cheating, Plagiarism/Academic Offences**
Academic integrity is an essential component of learning activities. You must work independently in all components of this course. 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).

**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 and 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.

Notice:
Students are responsible for regularly checking their email, and the course OWL site for new notices related to the course.