

WESTERN UNIVERSITY - FACULTY OF ENGINEERING
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

CEE 9513A – Design of Lateral Load Structural Systems – Course Outline 2018-19

This course covers selected design topics that are needed for engineers to pursue a profession as structural engineers. The course extends students' knowledge and abilities in structural behaviour and design of lateral load structural systems.

The general objectives are for student to be able to:

- Understand and quantify the behaviour of buildings with lateral load resisting systems consisting of shear walls, frames, wall-frame, and tubular structures.
- Understand three-dimensional modelling aspects and techniques.
- Design concrete shear walls and rigid frames under lateral loads in accordance with the provisions of CSA standards CAN/CSA A23.3-14.
- Design wood shear walls and diaphragms under lateral loads in accordance with the provisions of CSA standards CAN/CSA O86-14.
- Design masonry shear walls under lateral loads in accordance with the provisions of CSA standards CAN/CSA S304.1-04.
- Introduces students to selected engineering case studies covering modern lateral load structural system of worldwide famous high-rise buildings.

Calendar Copy:

Topics covered in this course include: analysis and behaviour of high-rise buildings; design of concrete, wood, and masonry buildings under lateral loads; and case studies of high-rise buildings worldwide.

Prerequisites:

Completion of the Civil and Environmental Engineering program

Antirequisites:

Students who took CEE 4428A/B can not take CEE 9513 for credit but they are welcome to audit the course

Note: It is the students' responsibility to ensure that all prerequisite and antirequisite conditions are met.

Instructor:

Ahmed (Mahdy) Hamada, *Ph.D., P. Eng.*, SEB 3117, email: ahamada2@uwo.ca
Administrative Support: Room SEB 3009

Teaching Assistant:

TBA

Contact Hours:

3 lecture hours per week - attendance is mandatory
1 hours/week office hours (Will be decided during the first lecture)

Textbook:

Prepared class notes should be uploaded to OWL and brought to all lectures and tutorial sessions.

Other references:

List of books

Concrete Design Handbook (Fourth Edition) 2015, Cement Association of Canada, Ottawa, ON, Canada

Wood Design Manual 2015 – Canadian Wood Council CWC 2010 and Canadian Standards Association, Mississauga, ON, Canada

R. G. Drysdale, and A. A. Hamid 2005, Masonry Structures: Behaviour and Design, Canadian Edition - Canada Design Masonry Design Center, Mississauga, ON, Canada

The above references will be on hold in Taylor library, and will be available for one-day borrowing.

Computing:

Final project involves computer modelling of high and low-rise buildings using the commercial program ETABS 2016, spread sheets, and writing report. The full-version of ETABS 2016 is available at the PC labs in the engineering building.

Specific Learning Objectives:

1. Lateral systems for buildings. At the end of this section, the student should be able to:

- a. Recognize different types of structural systems used to provide lateral resistance for high-rise buildings.
 - b. Identify the suitable system for each building.
 - c. Understand the interaction between frames and shear walls subjected to lateral load.
 - d. Understand three-dimensional modelling aspects and techniques and learn how to model structures using commercial software ETABS.
2. Design of concrete lateral loads structural systems in accordance with the provisions of CSA standards CAN/CSA A23.3-14
 - a. Design of shear walls
 - b. Design of rigid frames
 - c. Typical reinforcement details for concrete shear walls and rigid frames
 3. Design of wood lateral load structural systems in accordance with the provisions of CSA standards CAN/CSA O86-09:
 - a. Understand the design concepts of limit state design method
 - b. Design of wood
 - i. Shear walls
 - ii. Floor diaphragms
 4. Design of masonry lateral load structural systems in accordance with the provisions of CSA standards CAN/CSA S304.1-04:
 - a. Recognize different types of masonry building systems
 - b. Recognize different types of masonry construction
 - c. Design of masonry Shear walls
 5. Case studies of high-rise buildings
 - a. Study and analyze several case studies developed for some worldwide famous high-rise buildings.
 - b. Examine several case studies in which some critical engineering decisions and judgement must be made

Evaluation:

The final mark will be determined as follows:

Assignments	40%
Project I (High and Low-rise Buildings)	40%
Project II (Case Study – Group Project)	20%
Total	100%

Project I breakdown

Final Project Portfolio:

- Preliminary structure System Submission 05%
- Cover Letter 05%
- Design Brief 10%

- Calculations 20%
- Drawings 20%
- Oral discussion & Defence of design 40%

Project II breakdown

- Presentation and Oral Discussion 60%
- Report 40%

Final Project Portfolio

Cover letter and Design Brief

The length of the final design brief shall not exceed 10 typed pages (font size 12, double spaced). Suggested contents are: Cover Letter, Executive Summary; Introduction, Design Criteria, particulars of design/analysis, and Recommendations (or Conclusions). The Design Criteria would include the design standards and technical references used; the particular design criteria adopted also must be indicated succinctly. The particulars of design/analysis would summarize the rationale behind the various design decisions. The evaluation of the final design brief shall be based on the format, layout, completeness, technical content and use of English.

Calculations

Calculations must be well organized, clear, complete, and done on calculation paper. Each calculation page shall be dated, and shall indicate the name or initials of the person who performed the calculations. A final calculation set, which must be current, checked and indexed, shall be submitted with the final design brief. The evaluation of calculations will be based on their clarity, completeness, technical content, originality, and accuracy.

Drawings

Each student is required to prepare a set of drawings. Each drawing shall be dated and shall indicate the name or initials of the person who did the drawing. The drawings shall be developed using AutoCAD or similar drafting software. The evaluation of drawings will be based on their technical content, clarity, completeness, and quality of drafting.

Project II - Max. 4 Students/group

Presentation

Each group will give a 15 minutes presentation on their project followed by an oral discussion and defence of the report topic. Each student is required to be fully aware of all aspects of the report and **participate in presenting**. Some of the questions shall be asked individually to any of the group members, and others to the whole group.

Report

The length of the Project II report shall not exceed 10 typed pages (font size 12, double spaced, including all figures, references, title page, etc.). The evaluation of the final report shall be based on the format, layout, completeness, technical content and use of English.

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.

Assignments:

Each student must turn in the solution of the assignment at 9:00 am Monday Morning electronically on OWL. Hardcopy submissions are not accepted unless permission is granted by the instructor. Late assignment will be accepted till 4:00 pm on the same day and have to be submitted directly to the instructor. Late assignments will be marked out of 80% of the total mark. Extensions are to be negotiated with the course instructor, not the teaching assistants.

All required papers, assignments, and projects may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

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:

University policy states that cheating and plagiarism are scholastic offences. 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. Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_grad.pdf

Attendance:

Any student who, in the opinion of the Instructor, is absent too frequently from 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.

Accessibility:

Please contact the 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 Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

Conduct:

Students are expected to arrive at lectures on time, and to conduct themselves during class in a professional and respectful manner that is not disruptive to others. Late comers may be asked to wait outside the classroom until being invited in by the Instructor. Please turn off your cell phone before coming to a class, tutorial, quiz or exam.

Sickness and Other Problems:

Students should immediately consult with the Department of Civil and Environmental Engineering if they are ill or have any other problems that could affect their performance in the course. Where appropriate, the problems should be documented (see attached). The student should seek advice from the Instructor concerning the recovery of work missed. Failure to notify the Department of illness or any other matter that could affect academic performance immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

Notices:

Students are responsible for regularly checking their UWO-account email and notices posted outside the Civil and Environmental Engineering Department Office.

Consultation:

Students are encouraged to discuss problems with their Teaching Assistants and/or Instructor in tutorial sessions. Office hours will be arranged for the students to see the Instructor and Teaching Assistants. Other individual consultation can be arranged by appointment with the Instructor, preferably initiated by an electronic mail communication.

The document "*INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED*", attached, is to be considered part of this course outline.