

**CEE 9695 – Special Topics in CEE:**  
**Wind-Excited and Aeroelastic Response of Structures**

This course covers a broad range of Wind Engineering topics with special concern to Wind-Excited and Aeroelastic Response of Structures. The general aims are for the student to become able to:

- Recognize structures sensitive to wind-induced vibrations and aeroelastic phenomena.
- Analyse the dynamic response of structures to wind-excitation.
- Evaluate the critical velocity ranges in which structures are prone to motion-induced actions and aeroelastic instabilities.
- Recognize the need to carry out integrated analyses involving analytical, numerical, laboratory and full-scale evaluations.
- Recognize the engineering tools that make new and existing structures safe and suitable under wind loading.

**Prerequisites:**

1. CEE 9550 Seismic Analysis & Design of Buildings, or permission of the instructor. It is expected that students have basic knowledge of structural dynamics.
2. Completion of preparatory lectures and **passing the mandatory quiz at the end of the first week**, as required by the department, or permission of the instructor. It is expected that students have basic knowledge of probability theory, random processes and random dynamics. (schedule below)

Simple lecture notes will be made available to students on both the above topics, well in advance of the course, to verify such elementary knowledge.

**Corequisites:**

None.

**Antirequisites:**

None.

**Contact Hours:**

Lectures: July 8- July 26, 2019  
Monday- Friday; 9:30am-12:30pm  
FNB 1200

**Instructors:**

Giovanni Solari  
Professor of *Structural Engineering* and *Wind Engineering* at the University of Genoa (UNIGE)

Ibrahim Ibrahim, PhD Candidate  
Department of Civil & Environmental Engineering, Western University

**Textbook:**

Lecture notes, other useful reference material and data for assignments will be made available via OWL.

**Other References:**

- H. Sockel, Ed. (1994). Wind-induced vibrations of structures. Springer Verlag, Wien.
- E. Simiu, R.H. Scanlan (1996) Wind effects on structures: Fundamentals and applications, John Wiley, NY.
- J. Holmes (2001). Wind loading on structures, Spon Press, NY.

**Laboratory:**

None

**Specific Learning Objectives:**

1. Wind
  - 1.1 Atmospheric circulation
  - 1.2 Mean wind velocity
  - 1.3 Turbulent fluctuations
  - 1.4 Wind statistics
2. Aerodynamics
  - 2.1 Wind loading
  - 2.2 Tools
3. Wind-excited response
  - 3.1 Alongwind response
  - 3.2 3-D response of slender structures
  - 3.3 3-D response of buildings
  - 3.4 Thunderstorm loading and response
4. Aeroelasticity
  - 4.1 Vortex shedding
  - 4.2 Alongwind interaction
  - 4.3 Crosswind galloping
  - 4.4 Torsional instabilities
  - 4.5 Reynolds crisis
  - 4.6 3-D coupled aeroelasticity
  - 4.7 Flutter
5. Miscellanea
  - 5.1 Construction phase
  - 5.2 Non-structural elements

During the course lectures basic concepts and analytical formulations will be exposed, numerical simulations, model experiments and full-scale tests will be illustrated, academic exercises will be developed; problems related to real structures will be shown and discussed.

**Course Project :**

At the beginning of the course students will be divided in groups of 2-3 persons each. Each group will be involved in the analysis of a real structure. The project will be evaluated based on the submitted final report.

**Evaluation:**

The final course mark will be determined as follows:

Final examination~*	50%
Course project	50%
Total	100%

*\*Students must pass the final examination to pass this course.*

**Final Examination:**

The final examination will be **OPEN BOOK**.

*\*A passing grade on the final examination is 60/100; students must also achieve a minimum of 25/50 in the written portion of the final examination.*

**Units:**

SI units will be used in lectures, assignments and examinations.

**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 the improper use of English. Additionally, poorly written work with the exception of final examinations may be returned without grading. If re-submission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

**Scholastic Offences:**

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/handbook/appeals/scholastic\\_discipline\\_grad.pdf](http://www.uwo.ca/univsec/handbook/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.

**Conduct:**

Students are expected to arrive at lecture on time, and to conduct themselves during class in a professional and respectful manner that is not disruptive to others. Please turn off your cell phone before coming to a class, tutorial or examination.



**Sickness and Other Problems:**

Students should immediately consult with the instructor regarding any problem 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 or Department Chair regarding how best to deal with

the problem. Failure to notify the Instructor or Department Chair immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

**Notice:**

Students are responsible for regularly checking their e-mail and the course web site.

**Consultation:**

Office hours will be arranged for students to see the instructor. Other individual consultation can be arranged by appointment with the instructor. Students are encouraged to discuss problems with the instructor.