



WESTERN UNIVERSITY – Faculty of Engineering

CEE 9526A Wind Engineering Course Outline - Fall 2017

This course covers a large range of Wind Engineering topics from Climatology to the Atmospheric Boundary Layer, Bluff Body Aerodynamics and Fluid Structure Interaction problems. The general objectives are for the student to become able to:

- Understand the fundamental basis of the major chapters of the Wind Engineering chain.
- Use specific atmospheric science, fluid mechanics, and structural engineering methods in solving practical problems in Wind Engineering.
- Use the Wind section of the Canadian Building Code to estimate wind generated loading and responses on structures.
- Introduce the basic boundary layer wind tunnel techniques related to the wind engineering practice.
- Recognize the need for life-long learning to keep abreast of new experimental and computer tools in order to enhance one's abilities as an engineer.

Prerequisites:

None

Corequisites:

None.

Antirequisites:

None.

Contact Hours:

Two lectures per week, to a total maximum of 13 lectures until October 31st. Each lecture will be 2 hours in duration.

Instructor:

Dr. Horia M. Hangan, P.Eng., Ext.88136; email: hmhangan@uwo.ca

Teaching Assistant: TBA , Email: TBA

Administrative Support: Priscilla De Luca, IGAB Rm. 3N54, Ext. 88128, Email: Pdeluca3@uwo.ca

Textbook:

Prepared class notes by Dr. H. Hangan covering the material will be posted on OWL.

Other References:

“Wind Effects on Structures. Fundamentals and Applications to Design”, E. Simiu, R.H. Scanlan, 3rd Edition, J. Wiley & Sons, Inc, NY, 1996

Class:

Lectures will be offered on Tuesdays and Thursdays from 9:30 am to 11:30 am. **Tuesday** class will be in **SEB 2202** and **Thursday** class will be in **SSC 3022**.

Specific Learning Objectives:

1. **Introduction – Governing Equations:** In this section the student should be able to understand the momentum and continuity equations to atmospheric fluid mechanics problems.
2. **Atmospheric Boundary Layer (ABL):** At the end of this section, the student should be able to:
 - a) Understand the basic meso-scale atmospheric circulation models
 - b) Understand the simplified assumptions to be applied to the basic fluid mechanics equations in order to approximate the gradient and geostrophic wind velocities.
 - c) Apply the Classical Boundary Layer Theory to determine the ABL mean and turbulent velocity profiles. Use the boundary layer laws to determine ABL characteristics from site measurements.
 - d) Understand the basic concepts related to wind speed and wind directional normal distributions. Understand and apply the extreme wind distribution analysis to site measurements.
3. **Bluff Body Aerodynamics:** At the end of this section, the student should be able to:
 - a) Understand the pressure distribution and associated aerodynamic loading for typical bluff bodies for non-viscous (potential), viscous and turbulent flow conditions.
 - b) Be exposed to typical external pressure distributions on high rise and low rise structures. Use these pressure distributions to calculate the main aerodynamic loading.
 - c) Understand the main concepts related to mean and fluctuating internal pressures in buildings.
4. **Structural Response to Wind:** After completion of this section, the student should be able to:
 - a) Understand the basic concepts of the modal fluid-structure interaction problem as applied to wind engineering situations.
 - b) Know how to calculate the background and the resonant structural responses due to wind base on a theoretical approach as well as through simplified and code (CBC) approaches.
 - c) Be introduced to the typical Boundary Layer Wind Tunnel techniques for wind engineering applications.

Evaluation:

The final course mark will be determined as follows:

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|--------------------|------|
| Final examination* | 55% |
| Course Projects | 45% |
| Total | 100% |

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

Final Examination.

The final examination will be **OPEN BOOK**: approved hand-held programmable calculators are allowed

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 resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.