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

CEE 9525B –Boundary Layer Meteorology – Course Outline Winter 2018

Objectives:

The objectives of this course are to provide a general introduction to the atmospheric boundary layer and its properties, including basic concepts and general characteristics, governing equations, turbulence, the parameterization of turbulence and surface fluxes, measurements and data analysis, and the effects of surface roughness changes and topography.

Topics:

Note that all topics may not be covered due to time constraints.

1. Basic characteristics of the atmospheric boundary layer.
2. The governing conservation equations for momentum, heat, and moisture, including the effects of Reynolds time averaging.
3. Turbulence in the atmospheric boundary layer, including the closure problem, the turbulent kinetic energy equation, the Kolmogorov energy cascade, and spectral density functions.
4. The effects of stability, including Monin-Obkuhov similarity theory and the use of the Richardson number.
5. The parameterization of surface fluxes and turbulence within the atmospheric boundary layer.
6. The measurement and analysis of turbulent flows in the atmosphere.
7. The effects of surface roughness changes and topography on the atmospheric boundary layer.

Prequisites:

This course is intended for graduate students enrolled in civil or mechanical engineering, physics or geography with an interest in the physical processes occurring in the atmospheric boundary layer. It is expected that students will have basic understanding of fluid mechanics obtained by taking suitable courses at either the undergraduate or graduate level. Students without a suitable background in fluid mechanics should discuss this with the instructor prior to registering for the course.

Corequisites:

None

Antirequistes:

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.

Instructor:

Dr Craig Miller, IGAB 3N50, email: cmiller@eng.uwo.ca. *Administrative Support:* SEB 3005

Contact Hours:

Three lecture hours per week.

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 and which are available through Western Libraries, either physically or online. These include:

- *An Introduction to Boundary Layer Meteorology*, by R. Stull, Kluwer Academic Publishers, 1997.
- *Atmospheric Boundary Layer Flows: Their Structure and Measurement*, by J.C. Kaimal and J.J. Finnigan, Oxford University Press, 1994.
- *Introduction to Micrometeorology*, by S.P. Arya, Academic Press, 2001.
- *The Atmospheric Boundary Layer*, by J.R. Garratt, Cambridge University Press, 1992.
- *Micrometeorology*, by T. Foken, Springer-Verlag, 2008 (available online through Western Libraries)

Prepared class notes will be made available through the course OWL site at http://owl.uwo.ca/, along with other useful reference material and data for assignments.

Computing:

Assignments will require the processing of experimental data using computer data-analysis software such as Matlab or similar, and students will be assumed to be proficient in the use of the software of their choice.

Units:

SI units will be used in lectures and examinations

Evaluation:

The final course mark will be determined as follows:

Assignments:	60%
Project:	40%

Total	100%

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.

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.

Plagiarism:

University policy states that plagiarism, defined as the "act or an instance of copying or stealing another's words or ideas and attributing them as one's own." (excerpted from Black's Law Dictionary, West Group, 1999, 7th ed., p. 1170) is a scholastic offence. In submitting any written work as part of the coursework requirements for this course students must ensure that this work is written 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.

All required papers 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).

A student who is found guilty of plagiarism in respect of any written work submitted as part of the coursework requirements for this course will be given a grade of zero for the submitted work. Repeated acts of plagiarism, either in this course or any other course subsequent to a first offence, will result in the student being given a failing grade for the course in which the subsequent offence occurs, and may also incur further penalties such as requiring the student to withdraw from the program in which they are enrolled in.

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 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 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.

On the premises of the University or at a University-sponsored program, students must abide by the Student Code of Conduct: http://www.uwo.ca/univsec/board/code.pdf.

Sickness and Other Problems:

Students should immediately consult with the Instructor or Department Chair if they have any 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 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.

For more information concerning medical accommodations, please see:
http://www.uwo.ca/univsec/handbook/appeals/accommodation_medical.pdf.

Notice:

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