ENGG*3180 Air Quality
Course Outline
Fall 2014

UNIVERSITY of GUELPH

School of Engineering

(Revision 0: September 03, 2014)

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1 INSTRUCTIONAL SUPPORT

1.1 Instructor

Instructor: Bill Van Heyst, Ph.D., P.Eng.
Office: THRN 1333, ext. 53665
Email: bvanheys@uoguelph.ca
Office hours: TBA on Courselink or by appointment

1.2 Lab Technician

Technician: Joanne Ryks
Office: THRN 1142, ext. 54087
Email: jryks@uoguelph.ca

1.3 Teaching Assistants

GTA	Email	Office Hours
Jeni Spencer	jspencer@uoguelph.ca	TBA on Courselink

2 LEARNING RESOURCES

2.1 Course Website

Course material, news, announcements, and grades will be regularly posted to the ENGG*3180 CourseLink site. You are responsible for checking the site regularly.

2.2 Required Resources

ENGG*3180 Air Quality Course Notes (Van Heyst, 2014) – this set of notes is provided electronically on the CourseLink web site. No other textbook is required.

2.3 Recommended Resources

Not applicable for this course.

2.4 Additional Resources

Lab and Project Information: The handouts for the lab and projects will be distributed via CourseLink and discussed in class.

Assignments: Assignments are posted on the CourseLink web site. The teaching assistants will take up the solutions in the weekly tutorials. Assignments will not be graded.

Exams: A copy of last year's midterm and final exams will be posted on Courselink as samples with the solutions either taken up in class or tutorial.

2.5 Communication & E-mail Policy:

Please use lectures and lab help sessions as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly.** As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its student.

3 ASSESSMENT

3.1 Dates and Distribution

Labs: 5%

The course has one lab that entails the measurement of particulate matter from a smoke stack. The lab will be preformed during the weeks of Sept. 29 – Oct. 3 and Oct. 6 to 10. More details on scheduling and the lab will be provided in class.	**Due: Thursday, October 16, 2014**
Note: Both paper and electronic copies are to be submitted.	

Projects: 20%
The course has two projects:

Chemical Survey (5%) - More details will be provided in class.	**Due: Thursday, September 25, 2014**
Air Emission Summary and Dispersion Modelling (ESDM) project (15%) – More details will be provided in class.	**Due: Wednesday, November 26, 2014**
Note: Both paper and electronic copies are to be submitted.	

Midterm Exam: 25%
Tuesday, October 21, 2014, 10:00 – 11:20, in class

Final Exam: 50%
Thursday, December 04, 2014, 14:30 - 16:30, Room TBA on WebAdvisor, CourseLink and in class

3.2 Course Grading Policies

Missed Assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. See the undergraduate calendar for information on regulations and procedures for Academic Consideration: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

Passing grade: In order to pass the course, you must obtain a grade of 50% or higher.

Missed midterm exam: If you miss the midterm due to grounds for granting academic consideration or religious accommodation, the weight of the missed midterm will be added to the final exam. There will be no makeup midterm exams.

Lab Work: You must attend and complete the lab. If you miss the laboratory due to grounds for granting academic consideration or religious accommodation, arrangements must be made with the teaching assistant to complete a makeup lab.

Late Lab and Project Reports: Late submissions of lab reports will not be accepted.

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4 AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

4.1 Calendar Description

The study of the transport, transformation and deposition processes associated with air pollutants. The chemical and biological nature, impacts, and sources of air pollutants. The physical aspects of the atmospheric boundary layer. The mathematical treatment of diffusion in a homogeneous field in a boundary layer. Regulatory approaches worldwide and their use of air quality modeling. The use of models for the design of stacks and monitoring networks.

Prerequisite(s): ENGG*2230 (Fluid Mechanics), (ENGG*2560 (Environmental Engineering Systems) or ENGG*2660 (Biological Engineering Systems))

Co-requisite(s): ENGG*3260 (Thermodynamics)

4.2 Course Aims

The course covers the fundamentals associated with air quality. The course will provide an overview of historic air pollution events as well as current air quality issues and concerns. The focus of the course will be on the thermodynamics and fluid mechanics of the planetary boundary layer (PBL), the behaviour of plumes released into the PBL, and the computer modelling of air pollution sources. In addition, emission inventory preparation and air quality measurements will be addressed. This is a core course for Environmental Engineering students and will provide practical knowledge applicable to work placements.

4.3 Learning Objectives

At the successful completion of this course, the student will have demonstrated the ability to:

1. Explain air pollution events from chemical, physical and meteorological perspectives as well as explain the importance of historical air pollution events in society and the development of the air quality field of study.
2. Construct the various levels of the planetary boundary layer using fundamental thermodynamic and fluid mechanic equations and apply assumptions regarding the dominant forces.
3. Predict the dispersion of contaminants downwind using mass transfer relationships and the Gaussian plume model.
4. Generate downwind point of impingement concentrations using the Ontario Regulation 419 as well as AERMOD.
5. Assemble air emission inventories for sources using a variety of methods.

6. Differentiate and explain the required analytical methods required to measure pollutants in the atmosphere and the role of the Air Quality Index.
7. Defend and justify the use of EPA Method 5 for measuring particulate matter from point sources.

4.4 Graduate Attributes

Successfully completing this course will contribute to the following CEAB Graduate Attributes:

Graduate Attribute	Learning Objectives	Assessment
1. Knowledge Base for Engineering	1, 2, 3, 5, 6	Midterm, Final
2. Problem Analysis	2, 3, 4, 5	Lab, Projects, Midterm, Final
3. Investigation	2, 3, 4, 5, 7	Lab Projects, Midterm, Final
4. Design	-	-
5. Use of Engineering Tools	4, 5, 7	Lab, Projects
6. Communication	4, 5, 7	Lab, Projects
7. Individual and Teamwork	-	Lab, Projects
8. Professionalism	-	-
9. Impact of Engineering on Society and the Environment	1, 6	Midterm, Final
10. Ethics and Equity	-	-
11. Environment, Society, Business, & Project Management	-	Projects
12. Life-Long Learning	1	Projects

4.5 Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on Courselink but these are not intended to replace lectures. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for the lab, projects and exams.

4.6 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and tutorials. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

4.7 Relationships with other Courses & Labs

Previous Courses:

ENGG*2230 – Fluid Mechanics: application of the conservation of mass and momentum laws

ENGG*2560 – Environmental Engineering Systems: using a "systems" approach for problem investigation and analysis

Same Semester Courses:

ENGG*3260 – Thermodynamics: importance of psychrometry (water vapour in air)

Follow-on Courses:

ENGG*3430 – Heat and Mass Transfer: foundations of heat and mass transfer

ENGG*3470 – Mass Transfer Operations: foundations of control technologies

ENGG*4330 – Air Pollution Control: advanced control technologies to minimize the emissions of air pollutants

ENGG*41X0 – Engineering Design IV: Foundations of air quality and modelling for related 41X projects

5 TEACHING AND LEARNING ACTIVITIES

5.1 Timetable

Lectures:

Tuesday		10:00 – 11:20	ANNU 156
Thursday		10:00 – 11:20	ANNU 156
Tutorials/Lab:			
Thursday	Sec 01	12:30 – 14:20	THRN 1313/1002
Monday	Sec 02	14:30 – 16:20	THRN 1313/1002
Friday	Sec 03	14:30 – 16:20	THRN 1313/1002

5.2 Lecture Schedule

Lectures	Lecture Topics	References	Learning Objectives
Week1	Introduction & Air Quality Issues	Chapter 1	1
Week 2	Planetary Boundary Layer (PBL)	Chapter 2	1, 2
Week 3	PBL	Chapter 2	1, 2
Week 4	PBL	Chapter 2	1, 2
Week 5	PBL / Plume Behaviour	Chapter 2,3	1, 2, 3
Week 6	Plume Behaviour	Chapter 3	1, 3
Week 7	Plume Behaviour	Chapter 3	1, 3
Week 8	Plume Dispersion Modelling	Chapter 4	4
Week 9	Plume Dispersion Modelling	Chapter 4	4
Week 10	Emission Inventories	Chapter 5	5
Week 11	Ambient Air Quality	Chapter 6	6
Week 12	Industrial Source Testing	Chapter 6	7

5.3 Lab Schedule

The lab is scheduled for the weeks of Sept. 29 – Oct. 3 and Oct. 6 to 10. Further details will be announced in class.

5.4 Other Important Dates

Thursday, September 6, 2014: First class
Monday, October 13, 2014: Thanksgiving holiday – no classes
Tuesday, October 14, 2014: Fall Study Break – no classes
Friday, October 31 2014: drop date – 40th class
Thursday, November 28, 2014: last class (Monday Schedule in effect)

6 LAB SAFETY

6.1 SoE Safety Policy

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course, you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

6.2 Course Specific

Details of the lab safety specific for the course will be discussed in class prior to conducting the lab.

7 ACADEMIC MISCONDUCT

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member.

7.1 Resources

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:
http://www.academicintegrity.uoguelph.ca/

Please also review the section on Academic Misconduct in your Engineering Program Guide.

The School of Engineering has adopted a Code of Ethics that can be found at:
http://www.uoguelph.ca/engineering/undergrad-counselling-ethics

8 ACCESSIBILITY:

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability for a short-term disability should contact the Centre for Students with Disabilities as soon as possible

For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: http://www.csd.uoguelph.ca/csd/

9 RECORDING OF MATERIALS

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

10 RESOURCES

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs: http://www.uoguelph.ca/registrar/calendars/index.cfm?index