ENGG*4330 Air Pollution Control
Fall 2013

School of Engineering

(September 5, 2013 Version -- 1st Class Meeting)

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1 INSTRUCTIONAL SUPPORT

1.1 Instructor

Instructor: Warren Stiver, Ph.D., P.Eng.
Office: THRN 1343, ext. 54862
Email: wstiver@uoguelph.ca
Office hours: by appointment

1.2 Lab Technician

Technician: Joanne Ryks
Office: THRN 1114, ext. 54087
Email: jryks@uoguelph.ca

1.3 Teaching Assistants

GTA	Email	Office Hours
Joe McIntyre	jmcint03@uoguelph.ca	TBA on Courselink

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2 LEARNING RESOURCES

2.1 Course Website

Course material, news, announcements, and grades will be regularly posted to the ENGG*4330 Courselink site. You are responsible for checking the site regularly

2.2 Required Resources

Required resources will be provided via Courselink.

2.3 Recommended Resources

C.D. Cooper and F.C. Alley, **2011**, *Air Pollution Control: A Design Approach*, 4th Ed., Waveland Press, Inc. Prospect Heights, IL.

(Purchase if you are developing a library – I wouldn't purchase just for the semester. Older editions are effectively equivalent)

2.4 Additional Resources

Lecture Information: All the lecture notes will be posted on Courselink and generally before the specific lecture. The posted set are skeleton in character.

Lab Information: Requirements will be posted on Courselink.

Project Information: Requirements will be posted on Courselink.

Assignments: Posted on Courselink.

Tests: Old tests are posted on Courselink

Miscellaneous Information: Other information will also be posted on Courselink.

2.5 Communication & Email 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 Courselink site. **It is your responsibility to check the course website regularly.** As per university regulations, all students are required to check their <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

Energy & Emissions	Computer Prog Report	15%	Saturday Oct 5th at NOON
	Lab Report	25%	Saturday Oct 26th at NOON
Particulate Design	Phase I Report	15%	In Labs Nov 12-14th
	Phase II Report	25%	Sunday Dec 8th at NOON (during exams)
Tests	Test 1	10%	In Lecture Friday Oct 18th
	Test 2	10%	In Lecture Monday Nov 18th

Tests will be in class with an 8 ½ x 11 inch student generated aid sheet permitted.

Computer Program, Lab and Phase II Reports will be completed in teams from your same section. The Energy & Emissions teams will consist of 3 students and the Phase II teams will be a size of your choice.

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: The passing grade for this course is 50%.

Missed tests: If you miss a test due to grounds for granting academic consideration or religious accommodation, a makeup will be scheduled at a time suitable for all individuals involved.

Lab Work: You must attend and complete all laboratories. If you miss a laboratory due to grounds for granting academic consideration or religious accommodation, arrangements must be made with the teaching assistant to complete a makeup lab. If you do not pass the pre-lab safety quiz then you will not be able to complete the lab.

Late Submissions: Late (> 4 h) submissions will be penalized if there are not acceptable compassionate or medical grounds. A 30% penalty will be applied for reports submitted between 4 and 72 hours late. Reports received more than 72 hours late will be assigned a grade of zero. Students not ready to present in their scheduled presentation time will be assigned a grade of zero for that component.

Team Work: Teamwork is required for the Computer Program Report, the Lab Report and the Phase II Report. If there is some observation or evidence that you have not been an approximately equal contributor to the work then you will be asked to provide evidence of YOUR INDIVIDUAL efforts, contributions and results. Keeping a log book may be one effective means to help demonstrate your component.

4 AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

4.1 Calendar Description

Analysis and design of atmospheric pollution control techniques. Techniques considered include both in-process solutions as well as conventional end-of-pipe treatments. Pollutants covered include gaseous, particulate, metals and trace organics.

Prerequisite(s): ENGG*3180 (Air Quality), ENGG*3260 (Thermodynamics)
Corequisite(s): - None

4.2 Course Aims

This course aims to have students think deeply about energy systems and their corresponding atmospheric emissions and to critique particulate control technologies and identify opportunities for improvement.

In pursuing these aims, the course will do so through both investigation and design; using and advancing fundamental process engineering, fluid mechanics and thermodynamics principles; and building computer programs and using CAE tools. Thus, the course also aims to enhance student's foundational skills which have value well beyond the atmospheric pollution domain.

4.3 Learning Objectives

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

1. **Analyze** (5) thermodynamic models of combustion systems for the estimation of emissions and performance
2. **Develop (5)** computer programs to execute thermodynamic models
3. **Critique** (6) models of combustion systems for the estimation of emissions and performance
4. **Analyze (4)** conventional particulate control technologies
5. **Create (5)** ideas for incremental innovations within particulate control technologies
6. **Construct (3)** simple CFD models to explore ideas
7. **Summarize** (2) fugitive emission issues, estimation and control options

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	1,3,4	Tests, Projects
2. Problem Analysis	1,3,4,7	Tests, Energy & Emission Project
3. Investigation	3	Energy & Emissions
4. Design	5, 6	Particulate Project
5. Use of Engineering Tools	2, 6	Projects
6. Communication	3, 5	Projects
7. Individual and Teamwork	1,2,3,6	Projects

8. Professionalism	-	-
9. Impact of Engineering on Society and the Environment	-	-
10. Ethics and Equity	-	-
11. Business & Project Management	-	-
12. Life-Long Learning	5	Phase I Particulates

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/D2L but these are not intended to be stand-alone course notes. 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 tests and project.

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*1100 & ENGG*2100: Core design process skills are essential for the particulate design project. Team and project management skills are equally important.

ENGG*2560: Mass balances around reactor systems including reaction kinetics and equilibrium

ENGG*2230: Particulate Control dominantly builds on fluid mechanic principles

ENGG*3260: Energy & Emissions dominantly builds on thermodynamic principles

ENGG*3180: Air quality sets the context for the atmospheric control challenges that 4330 addresses

Before (Regular) and After (Coop) Courses:

ENGG*3100: Continuing to advance your design skills is essential for air pollution control

ENGG*3430 & ENGG*3470: Heat and Mass transfer limitations can play a significant role in the effectiveness of many air pollution control solutions

ENGG*3410: Automated control systems play an integral role in the operation and success of a very large fraction of emission control technology.

Follow-on Courses:

ENGG*4130: Many final design teams and projects will draw on 4330 skills. Directly benefitting teams addressing air pollution challenges in their design work. Indirectly benefitting teams that require thermodynamics, fluid mechanics, programming and/or CFD skills.

5 TEACHING AND LEARNING ACTIVITIES

5.1 Timetable

Lectures:

Mon, Wed, Fri		8:30 – 9:20	RICH 2529

Labs/Tutorials:

Section 01	Tues	14:00 – 15:50	THRN 1002, 1012, 2336
Section 02	Wed	15:30 - 17:20	THRN 1002, 1012, 2336
Section 03	Thurs	11:30 – 13:20	THRN 1002, 1012, 2313
Section 04	Tues	11:30 – 13:20	THRN 1002, 1012, 2336

- most weeks the labs/tutorials will be in THRN1002.

5.2 Lecture Schedule (approximate)

Lectures	Lecture Topics	References	Learning Objectives
1	Introduction and Atmospheric Challenges		
2-16	Energy & Emissions	Ch 11, 16, 18; Supp Notes	1, 2, 3
17	TEST		
18-29	Particulate Matter Control	Ch 3-7; USEPA docs	4, 5, 6
30	TEST		
31-35	Fugitive Emissions	Supp Notes	7
36	Closure		

5.3 Lab / Tutorial Schedule (approximate)

Week & Dates	Topics	Locations
1 Thurs Sept 5 – 12	Background recapture (Problem Set 0) Energy & Emissions	THRN 1002
2 Tues Sept 17 – 19	Energy & Emissions; Programming	THRN 1002, THRN 2336
3 Sept 24 – 26	Energy & Emissions; Programming	THRN 1002, THRN 2336
4 Oct 1 – 3	Energy & Emissions; Experimental design	THRN 1002, THRN 2336
5 Oct 8 – 10	Energy & Emissions	THRN 1002
6 Oct 15 – 17	Energy & Emissions; Simulation	THRN 1002, THRN 2336
7 Oct 22 – 24	Energy & Emissions	THRN 1002
8 Oct 29 – 31	Particulates; Fluent Introduction	THRN 2336
9 Nov 5 – 7	Particulates; Fluent	THRN 2336
10 Nov 12 – 14	Idea Presentations	THRN 1002
11 Nov 19 – 21	Particulate Design Support	THRN 2336
12 Nov 26 – 27	Particulate Design Support (Thursday section can attend one of other sections)	THRN 2336

Note: the experiments will be conducted outside of the scheduled lab/tutorial contact hours

5.4 Other Important Dates

Monday, 14 October 2013: Thanksgiving holiday, no classes
Thursday, 31 October 2013: 40th class day – last day to drop one-semester courses
Thursday, 28 November 2013: last class (Monday Schedule in effect as make up for Thanksgiving)

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6 LAB SAFETY

6.1 School of Engineering 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 ENGG*4330 Specific

Pre-Lab Safety Quiz must be passed prior to starting the lab. You will not be permitted to conduct your lab until all team members have individually passed the quiz (on-line Courselink). You may be asked equivalent safety questions in the lab and poor responses may lead to you being asked to leave the lab.

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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

7.2 Course Specific

If your contribution to a team report appears to be substantially less than an equal share and you have attempted to take credit for an equal share then this will be treated as a form of academic misconduct. If you cover for a peer who is taking inappropriate credit for their share of the work then you are also committing academic misconduct.

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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/