

Chemical Engineering 4310  
**Chemical Process Safety/Environment**  
Course No: 80394  
Fall Semester, 2006

**Course credit:** 3 credits

**Course times:** MWF, 3:05 - 3:55 PM, 139 Fisher

**Instructors:** Dr. Daniel A. Crowl, Herbert H. Dow Professor for Chemical Process Safety  
202B Chemical and Engineering Sciences Building  
487-3221  
EMAIL: [crowl@mtu.edu](mailto:crowl@mtu.edu)  
Office hours: By appointment, see schedule on office door.

Dr. David R. Shonnard, Professor  
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487-3468  
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Office hours: To be announced, and by appointment.

**Prerequisites:** Senior standing, CHE thermo, transport

**Grading:** The process safety content will be provided during the first 10 weeks of the course (thru Nov. 2) and the environmental part will be the last 4 weeks (beginning Nov. 4). The exams and assignments for the environmental part will focus only on the environmental material.

Item	Safety		Environment	
	Number	Percent	Number	Percent
Midterms:	2	40%	1	15%
Homework:	~5	20%	2-3	10%
Computer:	1	5%	1	5%
Essay:	0	0%	1	5%
<b>TOTAL:</b>		<b>65%</b>		<b>35%</b>

**HOMEWORK** - Homework assignments will be given on a regular basis - usually biweekly for safety and weekly for the environmental part. Completed assignments must be deposited in a designated box on the 2nd floor Chemical and Engineering Sciences building by 4 pm on the day the assignment is due. Solutions to the homework will be posted on the web or on reserve at the library. Verbal collaboration on homework is encouraged, however, outright copying and submission of identical homework will not be tolerated - all involved will receive a zero on that homework.

**COMPUTER ASSIGNMENT** - One computer assignment will be given in each area. The environment section will include a more detailed assignment, requiring spreadsheet solution or a full life cycle assessment (SimaPro7.0). The work submitted must be original -- the original spreadsheet or computer outputs are required. Identical computer outputs submitted by more than one individual will not be tolerated.

**ESSAY** - An essay will be assigned for the environmental part of the course during week 10.

**TEXTBOOK** - Safety Part: Daniel A. Crowl and Joseph F. Louvar, *Chemical Process Safety: Fundamentals with Applications*, 2<sup>nd</sup> ed., Prentice Hall, Englewood Cliffs, NJ, 2002. Course material will include chapters 1 through 11, and Appendix I. Download errata sheet from safety part web site.  
Environment Part: David T. Allen and David R. Shonnard, *Green Engineering: Environmentally-Conscious Design of Chemical Processes*, Prentice-Hall, 2002.

**COURSE WEB PAGE:** Safety part web page: [www.dancrowl.com](http://www.dancrowl.com) Then select course page tab at top of page and then CM4310.

Environment part web page: [www.chem.mtu.edu/~drshonna/deptbio/drshonna.htm](http://www.chem.mtu.edu/~drshonna/deptbio/drshonna.htm).

**VIDEO MATERIALS** - A link will be provided on the course web site providing a link to the video series. Students are required to view these videos using the schedule provided on the outline below. The videos can be viewed on any computer with an internet link and a video viewer software. Study guide for video series: D. A. Crowl, C. DeFrain, and A. Edelson, *Safety in the Chemical Process Industries*, available on the safety web page: [www.dancrowl.com](http://www.dancrowl.com). Please download and print the study guide sections prior to the showing of the video. The study guide contains an outline and space for notes.

**EXAMS** - All exams will include an open book and closed book part. The closed book part (20% of the exam grade) will consist of multiple choice and short answer type questions dealing with non-calculational aspects of process safety. The open book part (80% of exam grade) will consist of quantitative problems. Midterm exams are given in the evening, with a designated lecture canceled.

**TEACHING ASSISTANT** - Shu Chiang Yat, [scyat@mtu.edu](mailto:scyat@mtu.edu), 202N Chemical Sciences

**HELP SESSIONS** - Primarily to help with homework assignments. Will be scheduled once or twice per week, in the evening.

	<u>Week</u>	<u>Content</u>
<b>Process Safety</b>	1	Wednesday only Chapter 1: Introduction
	2	Chapter 2: Toxicology Plant accident video Watch DVD 1, Part 2: Introduction to Corporate Safety
	3	Chapter 3: Industrial Hygiene Watch DVD 1, Part 3: Laboratory Safety and Inspections Chapter 4: Source Models BASF Emergency Response Video
	4	Complete Chapter 4: Source Models Chapter 5: Toxic Release and Dispersion Models Watch DVD 1, Part 4: Personal Protective Equipment
	5	Completion of Chapter 5 Chapter 6: Fires and Explosions Watch DVD 2, Parts 1 and 2: Process Area Safety Features and Procedures
	6	Completion of Chapter 6: Fires and Explosions Chapter 7: Designs to Prevent Fires and Explosions Watch DVD 2 Part 3: Process Area Inspections
	7	Chapter 8: Introduction to Reliefs Chapter 9: Relief Sizing Watch DVD 3, Part 2: Dust and Vapor Explosion Apparatus
	8	Completion of Chapter 9 Watch DVD 3, Part 1: DIERS and VSP
	9-10	Chapter 10: Hazards Identification Watch DVD 4, Parts 1 - 3: Safety Reviews
	10	Monday and Wednesday only Completion of Chapter 10: Hazards Identification Piper Alpha Video
<b>Environment</b>	10	Friday only Chapter 1: Introduction to Environmental Issues
	11	Chapter 5: Environmental Properties of Chemicals Based on Structure Chapter 7: Green Chemistry (selected topics) Chapter 8: Environmental Performance During Process Synthesis (selected topics)
	12	Chapter 11: Evaluation of Environmental Performance of a Flowsheet
	13	Chapter 11: Completion Chapter 13: Life-Cycle Concepts, Product Stewardship and Green Engineering
	14	Chapter 13: Completion