

# "Towards the Greening of Our Minds"

CHE 406-11

Spring 2005

MWF 11:30-12:20

Daly 216

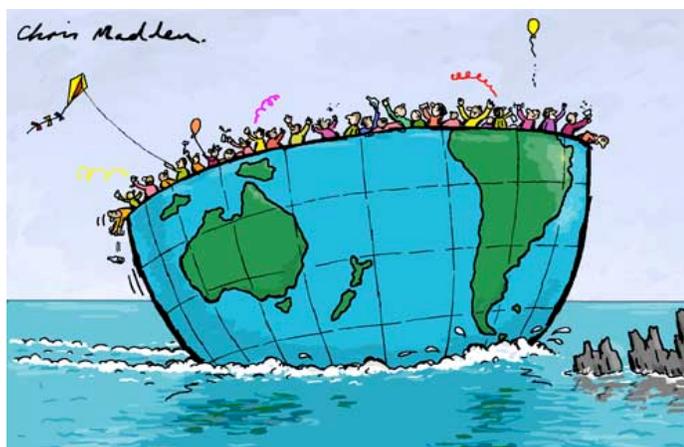
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*"The success of Green Chemistry depends directly on the training and dedication of a new generation of chemists: the students of today"*

*Dennis Hjeresen*



THE SHIP OF FOOLS AND THE ROCKS OF  
SHORT-TERM ECONOMIC PLANNING

### **About this course:**

Nowadays environmentally friendly scientists are conscious about the need to make chemistry "greener". The goal of this course is to present a different perspective regarding chemistry and its applications in academia and industry worldwide. This course will cover both the theoretical and practical aspects of green chemistry. The introduction will include the definition of green chemistry as well as a description of the tools and principles it employs. There will be an in-depth study concerning the evaluation of methods and tools in designing safer reactions and chemicals. Real-world cases in green chemistry will be used to illustrate the goals of green chemistry. The class will conclude by presenting where the future of the field is headed.

This course is a new course designed not only for chemistry majors and minors but also for anybody who is interested in the future of our planet and who have previously taken general and organic chemistry. There is no laboratory for this class. However some chemical demonstrations may take place during the class period. The students will be notified in advance.

This course is planned so that students will have the opportunity:

1. to **LEARN** about green chemistry, prevention of pollution at the source, protection of the environment and human being, which all lead to a more sustainable development,
2. to use **REAL-WORLD** examples to illustrate how **CREATIVE THINKING** and **PROBLEM SOLVING** can yield substantial effects in academia and in industry,

3. to **OPEN THEIR MINDS** on green chemistry in the developed and developing countries,
4. to **GAIN** general academic development in **WRITING** and **ORAL PRESENTATION** skills while working on a green chemistry topic, and
5. to **DEVELOP** communication and discussion skills.

### **Instructional Materials:**

The instructor will provide the necessary tools and bibliographic sources for this class. Copies of the lecture notes, articles used in discussion, and guidelines for the written paper and the oral presentations will be supplied.

### **How to succeed:**

- **Attend** class and **participate** in discussion
- **Take notes** during the class and review, correct, and complete them as soon as possible after class
- **Ask questions** to yourself, your classmates, and instructor
- **Learn to think** in a greener way.

### **Attendance:**

You are expected to **attend** class and **participate in class**. Attendance will be checked during each class. More than three absences from lecture, **including illnesses**, will result in lowering of the semester grade. Remember that part of your final grade (10%) will be determined based on your attendance and participation.

Each student should be involved in discussion and should answer questions at least once per lecture period.

Students on academic probation are reminded of the College requirement that they must attend **all** classes. Please let me know as soon as possible if you must miss a lecture due to an athletic event, field trip, or religious observance. Being late (even 5 minutes) will count as an absence! If illness or emergency should occur, alert me as soon as possible. It is **YOUR** responsibility to contact me. Students with special needs **MUST** talk to me as soon as possible at the beginning of the semester so that special accommodations can be arranged.

**Honor Code:**

You are expected to abide by the Washington College Honor Code for every assignment in this course. Plagiarism is not accepted under any circumstance and will be reported to the Associate Dean for academic advising for violation of the Washington College Honor Code.

**Office hours:**

Office hours have been scheduled for Tuesdays, 9:00-11:00 AM and Thursdays, 9:00-11:00 AM. You can also e-mail me, drop in my office anytime or make an appointment. Do not hesitate to knock on the door if it is closed.

**Format of the course:**

This course will develop communication and discussion skills. The students will be required to participate in discussions in a wise and organized manner. Remember that part of your grade is based on your participation (10%)! This demands the students to pay attention to the daily scientific news!

The introduction classes will give the students the necessary tools to discuss about green chemistry topics. The rest of the semester will be

divided between open discussions and examples of green chemistry cases explained by students. A list of real-cases in green chemistry will be provided and the students will be free to choose what they are the most interested in. This requires the students to come to class prepared! Research outside the class periods will be necessary. If you are late or absent, you will obviously not be able to get involved! There will be three assignments which will constitute the final grade. See evaluation paragraph for further details. Extensive guidelines will be provided by the professor for each assignment.

1. The first assignment will consist in writing a paper (no more than 4 pages long using font 12 and double spacing) using the scientific way of thinking. The paper will be focused on the study of a recent Presidential Green Chemistry Award. A list of Annual Presidential Green Chemistry Awards as well as a list of green chemistry resources will be supplied by the professor. EACH student will pick a topic of interest and search the appropriate resources to compile the paper.

The goal of this assignment is to stress out the importance of understanding, thinking and being able to write a concise article about a real green chemistry case.

2. The second assignment will be based on the oral presentation of the paper previously written. EACH student will present his/her article to the other students during 15 minutes and will lead a discussion for 10 minutes. The goal of this second assignment is to be able to communicate existent knowledge and lead questions and a discussion.
3. The third and last assignment will be an oral presentation based on a topic of students' choice. The chosen topic will be related to recent

publications in scientific journals and/or articles in the news and/or books and will constitute the basis for the elaboration of a green chemistry study. The students will be the innovators in this case and will come up with a "mini proposal". The topic of the proposal will be approved by the professor beforehand. The students will work IN PAIRS and will communicate their findings and ideas to their colleagues for 20 minutes followed by questions for 5 minutes.

The goal of this assignment is to improve search abilities, to deal with scientific bibliographic resources and to work out creativity and thought process towards the application of the green chemistry principles.

For the oral presentations an abstract highlighting the background and content of the presentation will be submitted by the students and posted on blackboard no later than three days before the actual presentation. Failure to do so will result in a lower grade. The abstracts will be approved by the professor beforehand. Each student will be evaluated by his peers and by the professor. Students working in pairs will not necessarily have the same grade for the joined presentation.

The overall goals of this class are:

- To think OUT-OF-THE-BOX,
- to relate theory and practice, research work and daily news,
- to expand and polish scientific writing skills,
- to convert a scientific written paper into an oral presentation and present it to an audience with different backgrounds,
- to develop leadership skills in discussions, and
- to build up confidence.

**Evaluation:**

- Attendance and class participation: 10%
- First assignment: Study of a real case in green chemistry (paper): 25%
- Second assignment: Individual oral presentation on a real case in green chemistry (15 minutes of presentation + 10 minutes of questions and discussion): 30%
- Third and last assignment: Final oral presentation in pairs (20 minutes of presentation equally shared between the 2 students + 5 minutes of questions): 35%

## TENTATIVE CLASS SCHEDULE

This schedule is subject to revision and to modification based on students' interest.

Date	Topic
Jan. 19 (W)	Syllabus-Introduction
Jan. 21 (F)	Introduction-Historical background
Jan. 24 (M)	Traditional Approaches
Jan. 26 (W)	Traditional Approaches
Jan. 28 (F)	<b><i>Last day to drop/add</i></b> Sources of Information about Chemical Hazards
Jan. 31 (M)	<i>Green Chemistry: Definition, Strategies and Resources</i>
Feb. 2 (W)	<i>Green Chemistry: Definition, Strategies and Resources</i>
Feb. 4 (F)	Tools of <i>Green Chemistry</i>
Feb. 7 (M)	Tools of <i>Green Chemistry</i>
Feb. 9 (W)	Principles of <i>Green Chemistry</i>
Feb. 11 (F)	Principles of <i>Green Chemistry</i>
Feb. 14 (M)	Summary of Evaluation of the Effects of Chemistry on humans, wildlife, local and global environments
Feb. 16 (W)	<i>Green Chemistry Industrial Cases Study</i> Open Discussion
Feb. 18 (F)	<i>Green Chemistry Industrial Cases Study</i> Open Discussion
Feb. 21 (M)	<i>Green Chemistry Industrial Cases Study</i> Open Discussion
Feb. 23 (W)	<i>Green Chemistry Industrial Cases Study</i> Open Discussion
Feb. 25 (F)	<i>Green Chemistry Industrial Cases Study</i> Open Discussion
Feb. 28 (M)	<i>Green Chemistry Industrial Cases Study</i> Open Discussion

Mar. 2 (W)	Green Chemistry Industrial Cases Study Open Discussion
Mar. 4 (F)	<b>Mid-term grades due</b> <b>Study of a real case in chemistry due (paper)</b> Green Chemistry Industrial Cases Study Open Discussion
<b>Mar. 7-Mar. 11</b>	<b>SPRING BREAK</b>
<b>Mar. 14 (M)</b>	<b>ACS meeting in San Diego</b> <b>NO CLASS</b>
<b>Mar. 16 (W)</b>	<b>ACS meeting in San Diego</b> <b>NO CLASS</b>
Mar. 18 (F)	Green Chemistry Industrial Cases Study Open Discussion
Mar. 21 (M)	<b>Student presentations: Examples of Green Chemistry</b>
Mar. 23 (W)	<b>Student presentations: Examples of Green Chemistry</b>
Mar. 25 (F)	<b>Student presentations: Examples of Green Chemistry</b>
Mar. 28 (M)	<b>Student presentations: Examples of Green Chemistry</b>
Mar. 30 (W)	<b>Student presentations: Examples of Green Chemistry</b>
Apr. 1 (F)	<b>Student presentations: Examples of Green Chemistry</b>
Apr. 4 (M)	<b>Student presentations: Examples of Green Chemistry</b>
<b>Apr. 6 (W)</b>	<b>Second advising day</b> <b>NO CLASS</b>
Apr. 8 (F)	<b>Last day to withdraw</b> The Concept of Sustainability
Apr. 11 (M)	Discussion about the book by Wiliam McDonough and Michael Braungart: "Remaking the Way We Make Things: Cradle to Cradle"
Apr. 13 (W)	Discussion about the book by Wiliam McDonough and Michael Braungart: "Remaking the Way We Make Things: Cradle to Cradle"

Apr. 15 (F)	Green Chemistry and the Developing Countries: a Myth or Reality?
Apr. 18 (M)	Green Chemistry and the Developing Countries: a Myth or Reality?
Apr. 20 (W)	Future Trends in Green Chemistry
Apr. 22 (F)	Catch up day or subject of interest to the students Questions and preparation for final presentation
Apr. 25 (M)	Catch up day or subject of interest to the students Questions and preparation for final presentation
Apr. 27 (W)	<b>Final oral presentation</b>
Apr. 29 (F)	<b>Final oral presentation</b>
May 2 (M)	<b>Final oral presentation</b>
<b>May 4 (W)</b>	<i>Last day of classes</i> <b>Final oral presentation</b>
May 9-14	<i>Final exam week</i> <i>No final exam scheduled</i>
May 17 (T)	<i>Final grades due</i>