

**The University of Western Ontario
Department of Civil and Environmental Engineering**

**CEE 4477a/b “Environmental Applications of Nanotechnology”
Course Outline 2010/2011**

Introduction:

This course describes the technology, challenges, and applications of nanoscale devices for environmental technology and engineering. The course is divided into two main units. The first part of the course presents the underlying science behind nanotechnology, the tools used to create and characterize nanostructures and the various unique properties of nanomaterials. The second part discusses the current and potential applications of nanodevices in environmental science and engineering; showcasing how nanomaterials can be tailored to address some of the environmental remediation and sensing/detection problems faced today. Areas covered include emission reduction, environmental remediation and monitoring, water and wastewater treatment, energy conversion and storage as well as alternative energy and toxicology. Material will be presented on a level intended for upper-level engineering students. The course covers the following topics:

- review of the molecular basis that determines the properties and applications of nanostructured materials.
- overview of the most common tools used to characterize nanostructures.
- description of selected functional nanostructured materials, their structure and properties.
- presentation of a global perspective on how nanotechnology can address current environmental issues
- overview of selected areas in which nanotechnology is already used to target specific environmental problems.
- identification of target areas in which nanostructured materials can offer an adequate solution to existing environmental challenges.
- analysis of the impact of nanotechnology-based solutions in a global and societal context, as related to environmental issues.
- recognition of the consequences of indiscriminate release of nanomaterials in the environment

Calendar Copy:

This course describes the technology, challenges, and applications of nanoscale devices for environmental technology and engineering. The first part of the course will explore the underlying science behind nanotechnology and the tools used to create and characterize nanostructures; the second part will deal with the current and potential applications of such devices in environmental science and engineering. Material will be presented on a level intended for upper-level engineering students.

Prerequisites:

Completion of the second year of the Engineering program.

Corequisites:

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.

Contact Hours:

3 lecture hours

Instructor:

Dr. José E. Herrera (TEB 463); jherrera@eng.uwo.ca
Admin. SEB-3005, Tel: 661-2111 ext. 83344

Textbook:

Nanotechnology: Ratner, M.; Ratner, M.; "Nanotechnology: A Gentle Introduction to the Next Big Idea" (Paperback) Prentice Hall PTR; 2002. **Recommended**
Skeleton notes will be available for download from the course website.

Other References:

The following books form a useful additional source of reference material:

- Hornyak, G. et al "Introduction to Nanoscience and Nanotechnology" CRC Press 2009.
- Huber, J. "New Technologies and Environmental Innovation" Edward Elgar Pub. 2004.
- Hee, S. J.; Cheng, I. F. "Nanotechnology for Environmental Remediation" Springer 2006.
- Theodore, L.; Kunz, R. "Nanotechnology: Environmental Implications and solutions" Wiley, 2005

Units:

SI units will be the primary units used in lectures and examinations.

General Learning Objectives

| | | | | | |
|-------------------|---|-------------------|---|----------------------------------|--|
| Knowledge Base | | Individual Work | x | Ethics and Equity | |
| Problem Analysis | x | Team Work | | Economics and Project Management | |
| Investigation | x | Communication | x | Life-Long Learning | |
| Design | | Professionalism | | | |
| Engineering Tools | | Impact on Society | x | | |

Evaluation

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|----------------------|--------------|
| Participation | 10 % |
| Mid-term examination | 30 % |
| Final Examination | 35 % |
| Final term paper | 25 % |
| | = Total 100% |

1. **Students must present a final term paper to pass this course.** Students who fail to present a final term paper will be assigned the aggregate mark, as determined above or 48% whichever is less.

2. **Examination.** Midterm and final examinations will be 2 hours, midterm examination will be held between the 8th and 9th week of the term. The examinations will be OPEN BOOK: only

handheld non-programmable calculators and unmodified and unmarked class skeleton notes available on the class website may be brought to the examination.

3. Final term paper. Final term paper topics will be assigned by February 16th 2011. The topics can be proposed by the student also, but the final decision will be taken by the instructor. The final term papers will be due the last day of class: April 7^h 2011; right before the final examination week.

4. There will be no make-up midterm exams. If you are unable to write a test for medical or compassionate reasons, you must provide the appropriate documentation and the weighting of the final exam will be adjusted accordingly. Failure to provide the adequate documentation will result in a mark of 0.

5. Students who have failed this course previously must repeat all components of the course. No special permissions will be granted enabling a student to retain laboratory, assignment or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted.

Use of English

In accordance with Senate and Faculty Policy, students may be penalized 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 final examinations 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.

Cheating

University policy states that cheating is a scholastic offence. The commission of a scholastic offence is attended by academic penalties, which might include expulsion from the program. If you are caught cheating, there will be no second warning.

Plagiarism

Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).

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.

Attendance

Any student, who, in the opinion of the instructor, is absent too frequently from class or laboratory periods in any course, 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 examination in the course.

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.

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.

Consultation

Students are encouraged to discuss problems with their teaching assistants and/or course instructors in tutorial sessions. Other individual consultation can be arranged by appointment with the appropriate instructor. The instructor shall inform all students of their office hours for consultation during the first week of each term.

Notices

Students are responsible for regularly checking their e-mail, class website and notices posted outside the Civil and Environmental Engineering Departmental Office.



***INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS
OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED***

IF, ON MEDICAL OR COMPASSIONATE GROUNDS, YOU ARE UNABLE TO WRITE TERM TESTS OR FINAL EXAMINATIONS OR COMPLETE COURSE WORK BY THE DUE DATE, YOU SHOULD FOLLOW THE INSTRUCTIONS LISTED BELOW. YOU SHOULD UNDERSTAND THAT ACADEMIC ACCOMMODATION WILL NOT BE GRANTED AUTOMATICALLY ON REQUEST. YOU MUST DEMONSTRATE TO YOUR DEPARTMENT (OR THE UNDERGRADUATE SERVICES OFFICE IF YOU ARE IN FIRST YEAR) THAT THERE ARE COMPELLING MEDICAL OR COMPASSIONATE GROUNDS THAT CAN BE DOCUMENTED BEFORE ACADEMIC ACCOMMODATION WILL BE CONSIDERED. DIFFERENT REGULATIONS APPLY TO TERM TESTS, FINAL EXAMINATIONS AND LATE ASSIGNMENTS. READ THE INSTRUCTIONS CAREFULLY. (SEE THE 2009 UWO ACADEMIC CALENDAR).

A. GENERAL REGULATIONS & PROCEDURES

1. CHECK THE COURSE OUTLINE TO SEE IF THE INSTRUCTOR HAS A POLICY FOR MISSED TESTS, EXAMINATIONS, LATE ASSIGNMENTS OR ATTENDANCE.
2. BRING YOUR REQUEST FOR ACADEMIC ACCOMMODATION TO THE ATTENTION OF THE CHAIR OF YOUR DEPARTMENT (OR THE UNDERGRADUATE SERVICES OFFICE IF YOU ARE IN FIRST YEAR) PRIOR TO THE SCHEDULED TIME OF THE TEST OR FINAL EXAMINATION OR DUE DATE OF THE ASSIGNMENT. IF YOU ARE UNABLE TO CONTACT THE RELEVANT PERSON, LEAVE A MESSAGE WITH THE APPROPRIATE DEPARTMENT (OR WITH THE UNDERGRADUATE SERVICES OFFICE, IF YOU ARE IN FIRST YEAR). THE ADDRESSES, TELEPHONE AND FAX NUMBERS ARE GIVEN AT THE END OF THESE INSTRUCTIONS. DOCUMENTATION MUST BE PROVIDED AS SOON AS POSSIBLE.
3. IF YOU DECIDE TO WRITE A TEST OR AN EXAMINATION YOU SHOULD BE PREPARED TO ACCEPT THE MARK YOU EARN. REWRITING TESTS OR EXAMINATIONS OR HAVING THE VALUE OF A TEST OR EXAMINATION REWEIGHTED ON A RETROACTIVE BASIS IS NOT PERMITTED.

B. TERM TESTS

1. If you are unable to write a term test, inform your instructor and the Chair of your Department (or the Undergraduate Services Office if you are in first year) prior to the scheduled date of the test. If the instructor is not available, leave a message for him/her at the department office and inform the Chair of the Department (or the Undergraduate Services Office if you are in first year).
2. Be prepared to provide supporting documentation to the Chair and the Undergraduate Services Office (see next page for information on documentation).
3. Discuss with the instructor if and when the test can be rescheduled. **N.B.** The approval of the Chair (or the Undergraduate Services Office if you are in first year) is required when rescheduling term tests.

C. FINAL EXAMINATIONS

1. If you are unable to write a final examination, contact the Undergraduate Services Office **PRIOR TO THE SCHEDULED EXAMINATION TIME** to request permission to write a Special Final Examination. If no one is available in the Undergraduate Services Office, leave a message clearly stating your name & student number (please spell your full name).
2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). The following circumstances are not considered grounds for missing a final examination or requesting special examinations: common cold, sleeping in, misreading timetable and travel arrangements.
3. In order to receive permission to write a special examination, you must obtain the approval of the Chair of the Department **and** the Associate Dean and in order to apply you must sign a "Recommendation for a Special Examination Form" available in the Undergraduate Services Office. The Undergraduate Services Office will then notify the course instructor(s) and reschedule the examination on your behalf.

N.B. It is the student's responsibility to check the date, time and location of the special examination.

D. LATE ASSIGNMENTS

1. Advise the instructor if you are having problems completing the assignment on time (**prior** to the due date of the assignment).
2. Be prepared to provide documentation if requested by the instructor (see reverse side for information on documentation).
3. If you are granted an extension, establish a due date. The approval of the Chair of your Department (or the Associate Dean if you are in first year) is not required if assignments will be completed prior to the last day of classes.
4. i) Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean. Documentation is mandatory.

- ii) A Recommendation of Incomplete Form must be filled out indicating the work to be completed and the date by which it is due. This form must be signed by the student, the instructor, the department Chair and the Associate Dean.

SHORT ABSENCES

If you miss a class due to a minor illness or other problems, check your course outlines for information regarding attendance requirements and make sure you are not missing a test or assignment. Cover any readings and arrange to borrow notes from a classmate.

EXTENDED ABSENCES

If you are absent more than one week or if you get too far behind to catch up, you should consider reducing your workload by dropping one or more courses. (Note drop deadlines listed below). You may want to seek advice from the academic counsellor in your Department or the counsellors in the Undergraduate Services Office if you are in first year.

DOCUMENTATION

If you consulted Student Health Services regarding your illness or personal problem, you should complete a Records Release Form in your Departmental Office (or in the Undergraduate Services Office if you are in first year). This form will be forwarded to Student Health Services who in turn will provide confirmation of the problem to the Department or Associate Dean as requested. At your request the Department (or Undergraduate Services Office if you are in first year) will send confirmation to your instructor(s).

If you were seen by an off-campus doctor, you must provide the doctor with a Student Medical Certificate to complete and then bring it to the Department (or the Undergraduate Services Office if you are in first year). **This note must contain the following information: severity of illness, effect on academic studies and duration of absence.**

In Case of Serious Illness of a Family Member: Provide a Student Medical Certificate to your family member's physician to complete and bring it to the Department (or the Undergraduate Services Office if you are in first year).

In Case of a Death: Obtain a copy of the death certificate or the notice provided by the funeral director's office. You must include your relationship to the deceased and bring it to the Department (or the Undergraduate Services Office if you are in first year).

For Other Extenuating Circumstances: If you are not sure what documentation to provide, ask the Departmental Office (or the Undergraduate Services Office if you are in first year) for direction.

Note: Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).

ACADEMIC CONCERNS

You need to know if your instructors have a policy on late penalties, missed tests, etc. This information may be included on the course outlines. If not, ask your instructor(s).

You should also be aware of attendance requirements in some courses. You can be debarred from writing the final examination if your attendance is not satisfactory.

If you are in academic difficulty, check out the minimum requirements for progression in the calendar. If in doubt, see your academic counsellor.

Calendar References: Check these regulations in your 2010 Western Academic Calendar available at www.westerncalendar.uwo.ca.

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| Absences Due to Illness - page 22 |
| Academic Accommodations for Disabled Students - page 20 |
| Academic Accommodations for Religious or Holy Days - page 23 |
| Course Withdrawals - pages 45 |
| Debarred from Writing Examinations - page 39 |
| Incomplete Standing - page 18 |
| Scheduling of Term Assignments – page 40 |
| Scholastic Offences - page 23-28 |
| Special Examinations - page 38 |

Note: These instructions apply to all students registered in the Faculty of Engineering regardless of whether the courses are offered by the Faculty of Engineering or other faculties in the University.

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| <u>Drop Deadlines:</u> | First term half course (i.e. "A" or "F"): | October 15, 2010 |
| | Full courses and full-year half courses (i.e. "E", "Y" or no suffix): | November 30, 2010 |
| | Second term half or second term full course (i.e. "B" or "G"): | February 15, 2011 |

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| Undergraduate Services Office: | SEB 2097 | telephone: (519) 661-2130 | fax: (519) 661-3757 |
| Dept. of Civil and Environmental Engineering: | SEB 3005 | telephone: (519) 661-2139 | fax: (519) 661-3779 |