

**University of Kentucky
Department of Chemical and Materials Engineering**

**CME 599/780
Biomedical Micro- and Nanotechnology**

Fall 2005

263 Anderson Hall (Tower)
MWF 11:00 – 11:50 am

Instructor: Dr. J. Zach Hilt
163A Anderson Hall
Phone: 257-9844
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Office Hours: TBD

Textbook: No required textbook.

CME 599/780 is restricted to seniors with engineering standing and graduate engineering students, or consent of instructor.

This course will introduce the broad impact of miniature technologies on all fields of science and engineering, while focusing on applications in biological and medical fields. It will discuss the fundamental science behind the technologies, highlighting the advantages that result at the micro- and nanoscale (e.g. mass and energy transport). For example, medical applications (diagnostic and therapeutic devices) will be examined, with several examples of micro- and nanoscale systems exhibiting enhanced properties highlighted. The student will be introduced to the fundamental science, the cutting-edge research activities, and the current commercially available technologies.

Activities include the review of current literature, preparation of case studies, as well as examinations. Specific activities are as follows:

(i) Assignments/Paper Reviews:

Assignments will be given periodically during the semester. For paper reviews, several key papers will be provided. The student will be expected to summarize and critically review the paper with a focus on the advantages/disadvantages of the micro- or nanoscale aspects. Assignments should be submitted in-class. The penalty for late assignments is 20% per day (weekend counts as one day).

(ii) Case Studies:

Each student will be required to prepare two case studies: one on a diagnostic technology and one on a therapeutic technology. The choice of topic is at the student's discretion, but must be approved in advance by the instructor. Topics for the diagnostic case study are due no later than **Friday, October 14**. Topics for the therapeutic case study are due no later than **Friday, November 18**. If you are unsure as to the viability of your topic, you can e-mail your proposed topic/title in advance to Dr. Hilt for evaluation at hilt@engr.uky.edu. Papers should be submitted in-class. The penalty for late papers is 20% per day (weekend counts as one day).

(iii) Mid-term and Final Examinations:

There will be a mid-term examination during scheduled the class time on **Friday, October 28th**. There will be a final examination **at 10:30 am on Wednesday, December 14th**. Examination details will be provided in class.

COURSE SCHEDULE:

The tentative course schedule is attached. Attendance is considered mandatory.

COURSE GRADING:

The grade breakdown for the course is as follows:

Assignments/Paper Reviews	20%
Case Study I	20%
Case Study II	20%
Mid-term Exam	20%
Final Exam	<u>20%</u>
	100%

The guaranteed grading scale is: > 90% = A, 80-90% = B, 70-80% = C, 60-70% = D. This grading scale can be curved by the instructor. CME 599 and CME 780 students will be assigned grades on different scales. CME 780 students will have additional requirements for the Case Studies.

COURSE WEB SITE: <http://courses.engr.uky.edu/fall05/CME/cme599-780/>

This web site will include the course schedule and notes, copies of the lectures, and other relevant material. The web site is password protected (USERNAME: **cme599**; PASSWORD: **fall2005**)

EXPECTED OUTCOMES:

At the conclusion of this course, the student should be able to.....

- 1.) Apply knowledge of math, engineering and science to biomedical applications of micro- and nanotechnology.
- 2.) Design systems, components or processes related to biomedical micro- and nanotechnologies to meet needs.
- 3.) Identify, formulate and solve engineering problems relating to biomedical micro- and nanotechnology.
- 4.) Communicate effectively the technical and critical results of a diagnostic device case study and a therapeutic device case study in written reports.
- 5.) Have an appreciation for substantive technical issues in the field of micro- and nanotechnology related to global engineering, economics, environmental factors and political considerations.
- 6.) Have an appreciation for a range of contemporary issues in chemical engineering, specifically relating to biomedical micro- and nanotechnology.