

COURSE SYLLABUS
UMBC ENCH 484/693: Biomedical Engineering
Spring 2009
Monday & Wednesday 3-4:15pm
ITE 239

Instructor: Jennie Leach, Ph.D.
 ECS 320
 410-455-8152
 jleach@umbc.edu
 Office Hours:
 Wednesday 10:00-11:00am in ECS 320
 By appointment (please arrange by email)

Prerequisites: ENCH 427, ENCH 440

Goals: This course is intended to introduce you to concepts and problems in biomedical engineering (BME). Emphasis will be placed on applying fundamental chemical engineering concepts to problems in cell biology and tissue physiology. The goal of this course is to allow you to

- 1) Conceptualize cellular and tissue processes based on biological descriptions;
- 2) Appreciate the multidisciplinary nature of BME and the critical role that chemical engineers contribute;
- 3) Provide you background for lifelong learning in BME (e.g., cell & tissue pathology, current surgical interventions, current debates in the media and popular culture)
- 4) Enhance your ability to read BME research literature;
- 5) Recognize critical factors affecting the development and success of clinical treatments and life science products.

Outline of Topics:

Part I: Anatomy and Physiology

- 1) Tissue and organ systems: structural, cardiovascular, neural, kidney, liver and immune systems
- 2) Development and stem cells
- 3) Wound healing, transplants and implants

Part II: Applications of Chemical Engineering Fundamentals to BME

- 1) Biomaterials
- 2) Artificial Organs
- 3) Drug Delivery
- 4) Tissue Engineering

Part III: Applications of Mechanical and Electrical Engineering Fundamentals to BME

- 1) Biofluid mechanics
- 2) Biomechanics of implants, organs and tissues
- 3) Bioimaging and Devices

Part IV: Commercialization and Ethics

- 1) Manufacturing and the FDA
- 2) Ethics

Assessment:

ENCH 484		ENCH 693	
Quizzes (13)	35%	Quizzes (13)	35%
Homework (4)	35%	Homework (4)	35%
Minute pitch (1)	15%	Minute pitch (2)	15%
Project	15%	Project	15%

Text, Reading and Online Materials:

- Required text: *Biomaterials Science* (2nd Edition), edited by BD Ratner, AS Hoffman, FJ Schoen and JE Lemons, Elsevier Academic Press, 2005, ISBN: 0-12-582463-7 (also in the UMBC Library)
- With few exceptions, there will be a reading assignment every week. Reading assignments and review questions will be posted on Blackboard. Students are expected to read the assignment and formulate answers to the review questions. A quiz each Monday will cover the reading assignment. One half of the quiz will cover material in the review questions. The other half will be based on the reading assignment and may or may not be covered by the review questions.
- Handouts will be used to supplement the text and will be posted on Blackboard or distributed in class
- The following online resources may aid your learning of medical terminology:
 - o Medline Dictionary (basic definitions): <http://www.nlm.nih.gov/medlineplus/plusdictionary.html>
 - o Medline Encyclopedia (detailed info & images): <http://www.nlm.nih.gov/medlineplus/encyclopedia.html>
 - o Stedman's Medical Dictionary: <http://www.stedmans.com>
- Recommended videos of surgeries involving biomedical technology: <http://www.biomaterialsvideos.org>

Course Format & Learning Activities:

Lectures:

- Lectures will complement readings from your text and class handouts. In general, lectures will be interactive, combining in-class discussions with small group problem-solving exercises, chalkboard problem analyses, quizzes, etc. In addition, guest speakers (from UMBC and local universities and industries) will present their expertise on BME-related topics.

In Class Quizzes:

- Short in-class quizzes (~10 minutes) will be held at the beginning of most Monday classes. Check the class schedule for specific quiz dates.
- The quizzes will cover basic concepts found in the reading assignment for that particular week and will evaluate your working understanding of the material. Quiz problems will test retention of facts and/or your conceptual understanding of the "big picture". Note that in general the reading assignment and quizzes will be held *before* the material is discussed in class. Therefore, in order to obtain full credit for quizzes, you must keep up with the reading assignments.
- Review questions will be provided with the reading assignment. Please formulate answers to these questions as you read and prepare for each Monday quiz.
- Students not present in class for quizzes will not receive credit (there are no make-up quizzes). If you will be absent from a Monday class, you must submit notice in writing (via email) in advance of the lecture. This is the only means for a quiz grade to be dropped.

Take Home Quizzes:

- Several take home quizzes will cover material covered by guest lectures. Take home quizzes will be handed out at the end of Wednesday classes and will be due the following Monday before class begins.

Homework:

- Homework assignments will be due before class begins on the assigned date. Most assignments will be due on Wednesdays. Late assignments will not be accepted.
- The lowest homework score will be dropped.
- You may discuss the assignments with each other. However, the final product must reflect your own work and adhere to UMBC's "Statement of Values for Student Academic Integrity" (<http://www.umbc.edu/integrity> and see below).

Minute pitch:

- *Motivation:* Every decisive moment in your career will depend on a presentation. This could take the form of a 5-minute introduction to a senior manager in your company (e.g., at the company picnic) or a senior researcher in your field (e.g., in an elevator at a technical conference). These opportunities commonly arise at business meetings, working lunches or other networking opportunities. The outcomes of these short presentations could range from name recognition (e.g., benefit of the doubt during a manuscript or grant review) to direct impact (e.g., interview, job offer, promotion). Delivering a short presentation or "pitch" with the intent of clearly and concisely conveying a marketed message is a vital skill. A second vital skill is ability to craft a one-page report. In a scientist's career, one-page reports take the form of progress reports, proposal cover pages and letters of recommendation. The strength of the minute pitch presentation and report relies on capturing your audience early and keeping their attention with concise and valuable supporting information.
- ENCH484 students will complete a single minute pitch assignment; ENCH693 will complete two minute pitch assignments. Each assignment will consist of a short presentation (5 minutes including questions), a one-page report summarizing the salient information, and a quiz question.
- Assessment: 75% will be graded based on the formal requirements of the assignment; 25% will be based on how well the class scored on your quiz question.

Project:

A group design project will be due toward the end of the semester. The project will be assigned mid-semester.

In-class participation:

Every student is expected to participate in each class meeting. Individual final grades may be rounded up or down based on the student's level of class participation.

Course Policies:

Regrading: All requests for regrading must be made via email within one week of the return of the assignment in question. The written request should identify clearly the disputed work and justify the request for additional credit. Only math errors and oversights will be considered valid reasons for dispute. If your work is not clear or the specific question involves subjectivity, then there is no justification for regrading.

Final course grades will be assigned according to the "gap system". In other words, the final grade distribution for all students will be plotted and cut-offs for grades will be determined based on breaks in the distribution. Thus, your performance in the class will be measured relative to the performance of the remainder for the class. Students with a 90+ course average will receive an A, an 80+ average will receive at least a B, 70+ at least a C, and a 60+ at least a D. For students whose final course scores are borderline between two letter grades, the higher or lower grade will be selected based on visits in office hours and whether quiz and exam performance has improved or declined during the semester.

Academic Integrity:

- <http://www.umbc.edu/integrity>
- By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal. To read the full Student Academic Conduct Policy, consult the UMBC Student Handbook, the Faculty Handbook, or the UMBC Policies section of the UMBC Directory.
- You are prohibited from using old homework and files from previous years. Adequate samples may be provided in class if requested. Anyone who violates this policy is in automatic violation of Chemical & Biochemical Engineering's policy and the faculty will treat this as a case of academic misconduct.
- Please read "A Letter to My Students" http://www.academicintegrity.org/pdf/Letter_To_My_Students.pdf