

BIEN 140B: Biomaterials – Part II

Lectures: Two lecture periods (1 hour and 20 minutes each) and one discussion session (50 min) per a week

Text: “*Biomaterials Science: an Introduction to Materials in Medicine*,” B. D. Ratner, A. S. Hoffman, F. J. Schoen and J. E. Lemon (editors).

Class notes and handouts:

An outline of the topics follows at the end of this syllabus. With additional handouts that will be distributed in due time, this rough outline of topics will be further broken in terms of text chapters and sections of particular interests and suggested problems and exercises. Concepts in terms of overarching ideas or paradigms will be built. These paradigms summarized will be distributed as handouts as the course proceeds.

Examinations and grading:

Quizzes: brief surprise quizzes will be conducted during the lecture periods.
Discussions on current publications related to the topics

Grades will be assigned on the bases of 100 points averaged with the following breakdown:

Quizzes	50 %
Discussions	50 %

Objectives of the course:

- To teach students the basic classes of biomaterials and how combinations of materials and biological moieties may be used for a desired physiological response
- To teach students the factors that govern biocompatibility, especially at materials-tissue interface
- To teach students mechanisms of material degradation in-vivo and how to apply these concepts to biomaterials design and analysis
- To teach students mechanisms of host responses to biomaterials so that these concepts may be used to design and evaluate new and existing biomaterials
- To provide students with a greater familiarity with the biomaterials research literature
- To provide training in critical thinking and analysis
- To introduce to students some ethical guides and regulations in implementation of biomaterials

Outline of topics and coverage:

Week 1: Overview of different types of materials and characterization of materials

Week 2: Overview of optical characterization of biomaterials and bioimaging

Week 3: Protein and cell adhesion, surfaces and interfaces, and biocompatibility

Week 4: Overview of cells; Protein and cellular mechanics

Week 5: Overview of ECM and tissues, and their interface with materials

Week 6: Blood compatibility of biomaterials

Week 7: Biological in vitro and in vivo testing of materials; assessing biocompatibility

Week 8: Deterioration of materials in biological environment

Week 9: Biodegradable and bioabsorbable materials

Week 10: Implants and devices