Scope and theme: This course focuses on contemporary issues affecting the design, fabrication, characterization and performance of current biomaterials used in medical components, surgical implants, prosthetics and diagnostic devices. Course content assumes a basic background in materials science, physiology, cell biology, and would benefit from an introduction to biomaterials or bioengineering. The lectures intend to promote critical review of the “state-of-the-art” biomaterial technologies by graduate students to identify the significant knowledge gaps required to overcome challenges and further biomaterials development. Primary topics to be discussed constitute several of the independent parameters that may influence design of novel multi-functional biomaterials in biomedical systems. A research-oriented problem-solving perspective is featured.

Instructor: Hamid Ghandehari, Professor of Pharmaceutics and Bioengineering

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Teaching assistant: Heather Herd (heather.herd@utah.edu), SMBB 5202, Dept of Bioengineering

Lecture Time: Tuesdays and Thursdays, 10:45am-12:05pm
Location: SMBB Auditorium (SMBB 2650) except January 15\textsuperscript{th} and March 19\textsuperscript{th}, class will be held in ARCH 228

Objectives:
1. Provide a graduate-level foundation on contemporary biomaterial principles.
2. Discuss concepts of materials, surfaces and tissue placement in biomaterial functions.
3. Introduce biomimetic & rational design approaches to biomaterials engineering.
4. Discuss diverse elements controlling biological responses to materials.
5. Develop critical analyses of biomaterials through grant proposal writing & review.

Readings: Required reading & analysis of research papers & material posted on webpage. Readings form basis of in-class discussions and integral part of class participation.


Optional: Physical chemistry of surfaces, A.W. Adamson and A.P. Gast, 6th ed, Wiley, 1997, or equivalent surface chemistry text. (ebook available through the library)

Web Page: Log on to Canvas

In-Class Exams: Two in-class exams (Feb 26\textsuperscript{th}, Apr 23\textsuperscript{rd})

Research Grant Proposal Requirement: Each student is required to create and submit their own original NIH-style research proposal (see guidelines in webpage) to address a significant fundamental or device-related biomaterials problem.

The proposal must include original (i) objective, hypothesis, and specific aims of the proposed
research, (ii) a statement of significance and critical review of relevant literature, and (iii) original experimental design and specific techniques and methods for proposed experiments, including experimental variables and appropriate controls, expected outcomes, and potential problems and alternative solutions. Students are required to submit their chosen proposal topic (1/2 page summary abstract) by January 31st for approval by the instructors. Students are also required to submit the specific aims section (1 page) by February 28th for scientific and technical feedback from the instructors. Final proposals (4 collated, bound copies) are due in class on April 11th.

Study Section peer-review session: Students will be assigned to one of two reviewing “study sections” (chaired by instructors) that will review grant proposals based on NIH merit criteria (see webpage). For each assigned proposal, students will critically review, provide a quality “score” and present a written and verbal critique at the panel discussion session (final exam week, April 30th). Peer- and instructor-reviewed scores are factored into the final grade for both the proposal and the course.

Academic Conduct: All students are expected to abide by the Student Code for academic integrity and dishonesty such as cheating as defined by the National Academy of Sciences and specifically in the University of Utah Student Code: http://www.regulations.utah.edu/academics/6-400.html.

Terminal behavior objectives
By completing this course, students should be able to:
• understand the issues facing the biomaterials field and potential of new technical approaches to biomaterials design to address these problems;
• understand emerging techniques currently used to improve biomaterials
• participate in active engaged dialog in class to address current problems in the field
Further, students will learn to prepare and critique scientific proposals in biomaterials:
• written proposal preparation similar to current national grant submissions
• written critical technical peer evaluations of proposals from fellow students
• exercise in group peer-reviewing and critique dynamics

Assessment and Grading Criteria
10% Class participation
50% Exams (25% each)
5% Specific aims
20% Grant proposal
10% Study section score
5% Study section participation

Attendance: Students are expected to arrive on time, fully attend and participate in ALL class sessions. Extenuating circumstances causing absence should be discussed with the instructor before the absence occurs, not post-facto.

Accommodations for Disabled Students:
The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you require such accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for necessary and appropriate accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.