

3.051J/BE.340 *Materials for Biomedical Applications* Spring 2004

Meeting Date	Topic	Problem Set Schedule
1 2/3/04	<i>Course Introduction</i> Biomaterials Defined; Structural Hierarchy in Materials & Biology	
2 2/5/04	<i>Biomaterials Surfaces: Physics</i> Surface (vs. Bulk) Structure and Properties; Surface Energy; Adsorption, Segregation, & Reconstruction at Surfaces	
3 2/10/04	<i>Biomaterials Surfaces: Chemistry</i> Reactions at Surfaces: Chemisorption, Corrosion, Hydrolysis	PS1 out
4 2/12/04	<i>Biomaterials Surfaces: Chemistry</i> (continued)	
2/17/04	<i>No class—Monday schedule</i>	
5 2/19/04	<i>Protein-Surface Interactions</i> Proteins: Structure, Properties, Functions; Protein Adsorption: Langmuir Model	PS1 due PS2 out
6 2/24/04	<i>Protein-Surface Interactions</i> Protein Adsorption: Complex Phenomena, Measurement	
7 2/26/04	<i>Cell-Surface Interactions: Host Response to Biomaterials</i> Cell Adhesion Mechanisms; Coagulation Cascade	
8 3/2/04	<i>Cell-Surface Interactions: Host Response to Biomaterials</i> Immune Response: Alternative Complement Activation	PS2 due PS3 out
9 3/4/04	<i>Surface Modification Methods</i> Purposes; Plasma Treatments; Polymer/Organic Coatings; Patterned Surfaces	
3/5/04	<i>ADD DATE</i>	
10 3/9/04	<i>Surface Characterization</i> in vacuum: XPS/ESCA, AES, SIMS	PS3 due
11 3/11/04	QUIZ I	
12 3/16/04	<i>Surface Characterization In situ</i> Contact Angle, AFM	
13 3/18/04	<i>Quantifying Cell Behavior</i> Cell Cultures; Cellular Assays: Adhesion, Migration, Proliferation	PS4 out

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3/22/04- 3/26/04	<i>Spring Break</i>	
14 3/30/04	<i>Quantifying Cell Behavior</i> (continued) Cellular Assays: Differentiation, Function	
15 4/1/04	<i>Statistical Analysis</i> Error Sources, Distribution Functions, t- test	
16 4/6/04	<i>Statistical Analysis</i> (continued) Fisher test, Regression Methods	PS4 due PS5 out
17 4/8/04	<i>Biosensors and Diagnostic Devices</i> Biological Elements; Transduction Mechanisms; Properties Examples: Fiber Optic Biosensors, Nanobarcodes	
18 4/13/04	<i>Drug Delivery: Controlled Release</i> Diffusion-controlled, Membrane-based and Osmotic Devices	PS5 due PS6 out
19 4/15/04	<i>Drug Delivery: Controlled Release (continued)</i> Chemically-controlled Devices	
4/20/04	<i>Patriot's Day Vacation (no class)</i>	
20 4/22/04	<i>Drug Delivery: Controlled Release (continued)</i> Methods: Transdermal, Colloidal Vehicles; Mechanical Pumps	PS6 due
21 4/27/04	QUIZ II	
22 4/29/04	<i>Biomaterials for Organ Replacement</i> Organ Replacement Therapies; Mechanical Properties; Bone Substitutes	PS7 out
23 5/4/04	<i>Tissue Engineering</i> Cell Types; Approaches: In vitro, In vivo, Ex vivo/Cell Encapsulation; Scaffolds: Design & Fabrication <i>DROP DATE</i>	
24 5/6/04	<i>Tissue Engineering</i> Case Examples: Artificial Pancreas, Cartilage, Nerve Regeneration	PS7 due
25 5/11/04	<i>FDA Regulatory Issues</i>	
26 5/13/04	<i>Class Review and Evaluations</i>	
27 TBA	<i>Final Exam</i>	