MSE 406: Biomaterials

Course description: Overview of the different types of materials used in biomedical applications such as implants and medical devices.

Number of credits: 3

Course Coordinator: S. Bose

Prerequisites by course: MSE 201

Prerequisites by topic:
1. Introductory material science.
2. Basic knowledge of bonding and properties of metal, ceramic, polymer and composite, organic and inorganic chemical structures.
3. Basic knowledge of biology.

Postrequisites: None.

Textbooks/other required materials:

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<th>Reference Books</th>
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<td>4. Recent articles will be cited as reference materials during some of the classes.</td>
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Course objectives:
1. Provide an introduction and issues related to different types of biomaterials.
2. Overview of basic biology: proteins/cells/tissues, tissue material interactions in vivo.
3. Overview of different types metallic, ceramic, polymeric and composite bio materials in biomedical, pharmaceutical applications in medicine and in artificial organs, orthopedics and dentistry. A brief overview of FDA regulations.

Topics covered:
1. Introduction to Biomaterials
2. Properties of Materials
3. Backgrounds in Biology: Proteins/Cells/Tissues
4. Biomaterials: Metals
5. Biomaterials: Ceramics
6. Biomaterials: Polymers and Composites
7. Tissue – material interactions and testing biomaterial
8. Applications of Biomaterials in Medicine
9. Biomaterials in Artificial Organs
10. Cardiovascular-artificial heart, heart valve, dialysis, etc.
11. Regulatory environment: FDA rules and regulations

**Expected learning outcomes:**

1. Knowledge of types of biomaterials, metals, ceramics, polymers and composites, based on application types and sites.
2. Knowledge of material properties required for different applications.
4. Knowledge of different types of tissue material interactions.
5. Knowledge of biomaterials in artificial organs, orthopedics and dentistry, and medicine.
6. FDA rules and regulations.

**Class schedule:**
Two 75-minute lecture sessions per week, for one semester

**Laboratory schedule:**
None

**Contribution to meeting the professional component:**
Engineering Topics

**Relationship of course to student outcomes:**
3 strongly supported; 2 supported; 1 minimally supported

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<th>Student Outcomes Pre-Fall 2018 (ABET EC2000)</th>
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**Prepared by:** Andrea Butcherite and Dr. Susmita Bose  
**Date:** May 30, 2018