

## MSE 406: Biomaterials

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| <i>Course description:</i>                 | Overview of the different types of materials used in biomedical applications such as implants and medical devices.  |
| <i>Number of credits:</i>                  | 3   |
| <i>Course Coordinator:</i>                 | S. Bose   |
| <i>Prerequisites by course:</i>            | MSE 201   |
| <i>Prerequisites by topic:</i>             | <ol style="list-style-type: none"><li>1. Introductory material science.</li><li>2. Basic knowledge of bonding and properties of metal, ceramic, polymer and composite, organic and inorganic chemical structures.</li><li>3. Basic knowledge of biology.</li></ol>  |
| <i>Postrequisites:</i>                     | None.   |
| <i>Textbooks/other required materials:</i> | <p><u>Reference Books</u></p> <ol style="list-style-type: none"><li>1. <i>Biomaterials Science: An introduction to Materials in Medicine</i>, edited by B.D. Rutner, A.S. Hoffman, F.J. Schoen and J.E. Lemons, Academic Press.</li><li>2. <i>An Introduction to Bioceramics</i>, edited by L. L. Hench and J. Wilson, World Scientific.</li><li>3. <i>Structural Biomaterials</i>, by J. Vincent, Princeton University Press.</li><li>4. Recent articles will be cited as reference materials during some of the classes.</li></ol>  |
| <i>Course objectives:</i>                  | <ol style="list-style-type: none"><li>1. Provide an introduction and issues related to different types of biomaterials.</li><li>2. Overview of basic biology: proteins/cells/tissues, tissue material interactions in vivo.</li><li>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.</li></ol>  |
| <i>Topics covered:</i>                     | <ol style="list-style-type: none"><li>1. Introduction to Biomaterials</li><li>2. Properties of Materials</li><li>3. Backgrounds in Biology: Proteins/Cells/Tissues</li><li>4. Biomaterials: Metals</li><li>5. Biomaterials: Ceramics</li><li>6. Biomaterials: Polymers and Composites</li><li>7. Tissue – material interactions and testing biomaterial</li><li>8. Applications of Biomaterials in Medicine</li><li>9. Biomaterials in Artificial Organs</li><li>10. Cardiovascular-artificial heart, heart valve, dialysis, etc.</li><li>11. Regulatory environment: FDA rules and regulations</li></ol> |
| <i>Expected student outcomes:</i>          | <ol style="list-style-type: none"><li>1. Knowledge of types of biomaterials, metals, ceramics, polymers and composites, based on application types and sites.</li><li>2. Knowledge of material properties required for different applications.</li><li>3. Knowledge of basic biology.</li><li>4. Knowledge of different types of tissue material interactions.</li><li>5. Knowledge of biomaterials in artificial organs, orthopedics and dentistry, and medicine.</li><li>6. FDA rules and regulations.</li></ol>  |
| <i>Class schedule:</i>                     | 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 program objectives:* Meets:  
1. School of MME Educational Objectives: 1, 2, 3  
2. ABET, Criterion 3 Program Outcomes: 2, 3, 4, 5, 7  
3. School of MME MSE Program Outcomes: 2, 3, 4, 5, 7, 8, 9, 10

*Prepared by:* Andrea Butcherite and Dr. Susmita Bose

*Date:* May 30, 2018

#### **POLICIES**

**A. Reasonable Accommodation** (the nature of the particular course determines which one applies):

- **Pullman Campus.** Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations **MUST** be approved through the Access Center.
- **WSU Online Course.** Reasonable accommodations are available in online classes for students with a documented disability. All accommodations must be approved through your WSU Disability Services office. If you have a disability and need accommodations, we recommend you begin the process as soon as possible. For more information contact a Disability Specialist on your home campus: Pullman or WSU Online (<http://accesscenter.wsu.edu>), Spokane (<http://spokane.wsu.edu/students/current/studentaffairs/disability/>), Tri-Cities (<http://www.tricity.wsu.edu/disability>), Vancouver (<http://studentaffairs.vancouver.wsu.edu/student-resource-center/disability-services>).

#### **B. Academic Integrity**

WSU expects all students to behave in a manner consistent with its high standards of scholarship and conduct. Students are expected to uphold these standards both on and off campus and acknowledge the university's authority to take disciplinary action. The Standards of Conduct for Students can be found at <http://conduct.wsu.edu>.

#### **C. WSU Safety**

WSU is committed to maintaining a safe environment for its faculty, staff, and students. Safety is the responsibility of every member of the campus community and individuals should know the appropriate actions to take when an emergency arises. In support of our commitment to the safety of the campus community the University has developed a Campus Safety Plan, <http://safetyplan.wsu.edu>. It is highly recommended that you visit this web site as well as the University emergency management web site at <http://oem.wsu.edu/> to become familiar with the information provided.