**Course number and name: MTSE 4020: Materials in Medicine**

**Credits and contact hours: Unknown**

**Instructor’s or course coordinator’s name**: Unknown

**Text book, title, author, and year**

“Biomaterials Science: An Introduction to Materials in Medicine”, edited by B.D. Ratner, A.S. Hoffman, F.J. Schoen, and J.E. Lemons, 2nd Edition, Elsevier Academic Press (2004).

1. *Other supplemental materials*

None

**Specific Course Information**

1. *Brief description of the content of the course (catalog description)*

The science and engineering of materials having medical applications. Provide students with an understanding of the challenges that materials (metals, polymers and ceramics) face/create during short- and long-term contact with physiological environment. To develop the student’s understanding of the relationships controlling acceptance or failure of a given material in the body. Expose students to strategies/approaches used in synthesis, fabrication, and design of current and future biomaterials. ABET criterion 3 Student Outcomes a, c, e, g.

1. *Prerequisites or co-requisites*

MTSE 3010 (Bonding and Structure) and MTSE 3050 (Mechanical Properties of Materials)

1. *Indicate whether a required, elective, or selected elective course in the program*

Elective

**Specific goals for the course**

1. *Specific outcomes of instruction*
2. *Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes that are addressed by the course.*

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|  | **Student/ABET Outcome** | **a** | **b** | **c** | **d** | **e** | **f** | **g** | **h** | **i** | **j** | **k** |
| **Specific Course Learning Outcome** |  | **x** |  | **x** |  | **x** |  | **x** |  |  |  |  |
| 1. Students will use their knowledge of mechanical behavior of materials to select specific biomaterials for specific load-bearing applications
 |  | x |  |  |  |  |  |  |  |  |  |  |
| 1. Students will classify the different types of biomaterials used in the human body for different types of implant applications
 |  | x |  |  |  | x |  |  |  |  |  |  |
| 1. Students will select a specific biomaterial and design for a specific implant application, and develop a project on this topic, write a term paper and present it in class
 |  | x |  | x |  | x |  | x |  |  |  |  |
| 1. Students will develop an understanding of how biomaterials interact with the tissues within the human body
 |  | x |  |  |  |  |  |  |  |  |  |  |

**Brief list of topics to be covered**

1. Classes of materials used in medicine
2. Basic concepts of biology, biochemistry, and medicine
3. Host reaction to biomaterials and biological testing
4. Application of materials in hard tissue implantation, artificial organs and other aspects of medicine
5. Processing of biomaterials
6. Wear, biodegradation, and biocorrosion, of biomaterials
7. Mitigation and Control of Biomaterials via surface engineering
8. Tissue engineering
9. Legal aspects and standards for biomaterials