PURDUE UNIVERSITY FORT WAYNE | Department of Civil and Mechanical Engineering

Course	ME 445 – Biomaterials
Type of Course	Elective (Group 1) for ME program
Catalog Description	Science of biomaterials including understanding bulk and surface properties, interactions between materials and biological systems, response of biological systems to the material, response of the material to biological systems, and in vitro and in vivo biocompatibility. Overview of regulatory compliance and commercialization of biomaterials.
Credits	3
Contact Hours	3
Prerequisite Courses	BIOL 20300 and ME 30300
Corequisite Courses	None
Prerequisites by Topics	Human Anatomy & Physiology and Material Science
Textbook	*Biomaterials: The Intersection of Biology and Materials Science*, Temenoff and Mikos, current edition
Course Objectives	To help students know biomaterials and better understand interactions between materials and biological systems.
Course Outcomes	A student who successfully fulfills the course requirements will have demonstrated: 1. Know basic terminology associated with implantable biomaterials and the different classes of biomaterials. (1) 2. Understand fundamental interactions between materials and biological systems. (1) 3. Understand fundamentals of degradation and corrosion in biomaterials. (1) 4. Know how to characterize the interfaces between the implant and biological system. (1) 5. Understand the basics of regulatory compliance and commercialization of biomaterials. (4,7)
Lecture Topics	1. Overview of fundamentals of materials science

2. Chemical structures, physical properties, and mechanical properties of implantable materials
   - Metals/Ceramics/Polymers/Composites
   - Biological materials
3. Characterization and surface properties of biomaterials
4. Degradation of implantable materials, including corrosion, wear, fatigue failure, polymer degradation, and ceramic degradation
5. Implantable materials processing, characterizations, and sterilization
6. Tissue response to implants
7. Biocompatibility & biological responses to biomaterials
8. Toxicity, hypersensitivity, and tumorigenesis
9. Biofilms
10. Applications of biomaterials
11. Regulatory compliance and commercialization

Computer Usage	Low
Laboratory Experience	None
Design Experience	Low
Coordinator	Donald Mueller, Ph.D., P.E.
Date	2 September 2022