

MATSCEN 5651 (Approved): Biomaterials Processing

Course Description

The relationship between the processing of biomaterials - metals, polymers and ceramics - and the impact the these steps have on final biomedical properties.

Prior Course Number: MSE642, MSE643, and MSE645

Transcript Abbreviation: Biomat Processing

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Undergrad, Graduate

Student Ranks: Junior, Senior, Masters, Doctoral, Professional

Course Offerings: Spring

Flex Scheduled Course: Never

Course Frequency: Every Year

Course Length: 14 Week

Credits: 3.0

Repeatable: No

Time Distribution: 3.0 hr Lec

Expected out-of-class hours per week: 6.0

Graded Component: Lecture

Credit by Examination: No

Admission Condition: No

Off Campus: Never

Campus Locations: Columbus

Prerequisites and Co-requisites: MSE5611, MSE5641, or permission of instructor.

Exclusions:

Cross-Listings:

The course is required for this unit's degrees, majors, and/or minors: No

The course is a GEC: No

The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.1801

Subsidy Level: Baccalaureate Course

Programs

Abbreviation	Description
MATSCEN	Materials Science and Engineering

General Information

The success of any implant or medical device depends greatly on precise control over the processing and processing conditions used during its manufacture. The goal of this class is to provide up-to-date information on engineering and processing aspects of biomaterials. This includes engineering and biological design philosophy, impacts on biocompatibility, novel tissue engineering methodologies as well as sterilization and quality control issues. The relationship between material properties, processing methods and design will be the primary focus.

Course Goals

Students will learn about manufacturing conditions/techniques and how they govern the subsequent mechanical and chemical behavior of modern biomaterials.
Students will learn concepts related to chemical reaction kinetics and rate controlling steps in various manufacturing processes.
Students will learn about concepts of bulk and surface modification widely used in the manufacture of orthopedic implants.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Biomaterials processing and performance 3 material classes	3.0							
Basic processing methods	3.0							
Polymer rheology	3.0							
Unit operations and properties	3.0							
Particulate-based processing	3.0							
Microstructural development	3.0							
Case study - total hip replacement: development and processing	3.0							
Biomimetics and its limits	6.0							
Processing of tissue engineering scaffolds	6.0							
Surface Processing	3.0							

Representative Assignments

Homework problems will be assigned to improve comprehension of critical concepts.
Class projects will be assigned to round out the general knowledge of this field.

Grades

Aspect	Percent
Homework and class projects	30%
Mid-term Exam	30%
Final Exam	40%

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
**	a	An ability to apply knowledge of mathematics, science, and engineering.
*	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
***	c	An ability to design a system, component, or process to meet desired needs.
*	d	An ability to function on multi-disciplinary teams.
**	e	An ability to identify, formulate, and solve engineering problems.
*	f	An understanding of professional and ethical responsibility.
*	g	An ability to communicate effectively.
***	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
*	i	A recognition of the need for, and an ability to engage in life-long learning.
**	j	A knowledge of contemporary issues.
***	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

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