# MATSCEN 5631 (Approved): Biomaterials Laboratory

## Course Description

A laboratory experience in the processing and characterization of biomaterials used for the replacement of human tissues.

**Prior Course Number:** MSE649
**Transcript Abbreviation:** Biomat Lab
**Grading Plan:** Letter Grade
**Course Deliveries:** Classroom
**Course Levels:** Undergrad, Graduate
**Student Ranks:** Junior, Senior, Masters, Doctoral, Professional
**Course Offerings:** Autumn
**Flex Scheduled Course:** Never
**Course Frequency:** Every Year
**Course Length:** 14 Week
**Credits:** 1.0
**Repeatable:** No
**Time Distribution:** 3.0 hr Lab
**Expected out-of-class hours per week:** 0.0
**Graded Component:** Laboratory
**Credit by Examination:** No
**Admission Condition:** No
**Off Campus:** Never
**Campus Locations:** Columbus
**Prerequisites and Co-requisites:** MSE5611 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:** 14.3101
**Subsidy Level:** Baccalaureate Course

## Programs

| Abbreviation | Description |
|---|---|
| MATSCEN | Materials Science and Engineering |

## General Information

In this class, the experiments involve materials used for bony tissue replacement, vascular grafts, tissue engineering scaffolds and cell growth on tissue engineering scaffolds. We will also study biomaterials surface characterization techniques and kinetic phenomena important in materials science.

## Course Goals

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| To provide the student with experiences with and an understanding of forming processes used in biomaterials. |
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| Students will learn about kinetic phenomena that determine materials behavior under both chemical and mechanical stresses within the human body. |

## Course Topics

| Topic | Lec | Rec | Lab | Cli | IS | Sem | FE | Wor |
|---|---|---|---|---|---|---|---|---|
| Hydroxyapatite formation and sintering. Materials directed toward the replacement of bony tissues. | | | 3.0 | | | | | |
| Electrospinning and mechanical properties. Generation of tubes of electrospun nanofiber suitable for use as blood vessel replacements. | | | 3.0 | | | | | |
| Tissue engineering scaffolds and the environment. The mechanical and microstructural behavior of tissue engineering scaffolds exposed to cellular media. | | | 3.0 | | | | | |
| Cell-scaffold interactions. The effects of cell culture on polymeric scaffolds. | | | 3.0 | | | | | |
| Surface characterization of biomaterials. XPS, SIMS, mass spectrometry of representative implant materials. | | 1.0 | 2.0 | | | | | |

## Representative Assignments

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| Laboratory exercises involving the synthesis and characterization of hydroxyapatite biomaterials and polymeric scaffolds. |
| Study of scaffold degradation and techniques for quantifying this behavior. |

## Grades

| Aspect | Percent |
|---|---|
| Four laboratory reports. | 80% |
| Final exam. | 20% |

## 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. |

**Prepared by:** John Lannutti