MSE3130: BIOMATERIALS

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Biomaterials

Subject Code
MSE - Materials Science and Engineering

Course Number
3130

Academic Unit
Materials Science and Engineering (MSE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
AP2102/MSE2102 - Introduction to Materials Science and Engineering

Equivalent Courses
AP3130 Biomaterials

Exclusive Courses
AP4173 Biomedical Materials : From Engineering To Clinical Applications

Part II Course Details

Abstract
Developing materials for use in biomedical field is a challenging interdisciplinary process and requires an understanding of material bulk and surface properties, the various biological responses to the materials, the clinical context of their use,

manufacturing processes, cost, sterilization, packaging and regulatory issues. This course is designed to introduce students to the various classes of biomaterials in use and their applications in selected areas of the biomedical field.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the various classes of biomaterials on the basis of structure and function	25		x	
2	Apply various analytical methods to characterize bulk and surface properties of biomaterials	25	x		
3	Understand the working principles and applications of various types of biomedical materials	25		x	
4	Describe various practical aspects of biomedical device design, fabrication and testing	25		x	

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Explain key concepts, theories, and applications etc.	1, 2, 3, 4	3 hrs
2	Tutorial	Exercise practice	1, 2, 3, 4	0.5 hr
3	Lab	The students will carry out lab work	1, 2, 3, 4	0.5 hr

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Mid-term Test	1, 2, 3, 4	20	-	No
2	Six Lab Experiment Projects and Reports	1, 2, 3, 4	15	-	No

Continuous Assessment (%)

35

Examination (%)

65

Examination Duration (Hours)
2

Minimum Examination Passing Requirement (%)
30

Additional Information for ATs
For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Rubrics (AR)

Assessment Task
Midterms

Criterion
Understand the scientific principles and the working mechanisms. Identify and explain how the principles are applied to science and technology for solving physics and engineering problems.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Lab reports

Criterion
Understand the experimental principles and evidence of original thinking, Ability to communicate ideas via written texts.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task

Exam

Criterion

Demonstrate understanding of the scientific principles and the working mechanisms. Identify and explain how the principles are applied to science and technology for solving physics and engineering problems.

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Introduction of biomaterials; properties of polymeric materials, ceramics, and metal materials for biomedical applications; surface properties and characterization of biomaterials; biomaterial qualities: strength, wear, and sterilization; biological response to foreign materials, biocompatibility; degradable materials; biomedical devices, failure, retrieval & evaluation; applications in nephrology, ophthalmology, orthopaedics, and dentistry

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Joon Park and R. S. Lakes, "Biomaterials: An Introduction", Springer, 3rd edition, 2007, ISBN: 978-0387378794
2	Joon B. Park and Joseph D. Bronzino, "Biomaterials: Principles and Applications", CRC Press, 1st Edition, 2002, ISBN: 978-0849314919