Alanya Alaaddin Keykubat University | Rafet Kayış Faculty of Engineering
Genetics and Bioengineering Department
2024-2025 Spring Semester

Syllabus	
Code/Name	GBM202 / BIOMATERIALS
Type	Required
Credit/ECTS	3/3
Hour per Week	3
Level/Year	Undergraduate/2
Semester	Spring
Classroom	N/A
Content	GBM202 Biomaterials covers the properties, design, and applications of materials used in medical devices and implants, emphasizing material-biological interactions, biocompatibility, and the body's response.
Prerequisites	N/A
Textbooks	***Primary*** Biomaterials The Intersection of Biology and Materials Science, Temenoff, 2008 ***Supplementary*** Biomaterials Science An Introduction to Materials in Medicine, Ratner, 2020
Objectives	● To develop students' ability to identify and solve complex problems related to biomaterial selection, design, and application in biomedical contexts. ● To encourage critical analysis and evaluation of biomaterial properties and their interactions with biological systems. ● To enhance skills in designing biomaterials with specific physical, chemical, and mechanical properties that meet biomedical application needs.
Course Outcomes	CO1. Analyze and select appropriate biomaterials for specific biomedical applications. CO2. Evaluate and solve challenges related to biomaterial degradation in the body. CO3. Identify and troubleshoot issues in biomaterial processing and surface modification. CO4. Assess protein and cell interactions with biomaterials and propose design modifications to optimize these interactions. CO5. Formulate strategies to address adverse body responses to biomaterials, including immune reactions, inflammation, thrombosis, and infection. CO6. Apply problem-solving techniques to analyze case studies on biomaterial failures.

Weekly Schedule of Topics

W	Topic	Content
1	Materials for Biomedical Applications	Biomaterials and their classifications
2	Chemical Structures of Biomaterials	Bonding, crystallinity, and molecular composition
3	Physical Properties of Biomaterials	Density, thermal conductivity, and electrical properties
4	Mechanical Properties of Biomaterials	Elasticity, tensile strength, fatigue, and fracture toughness
5	Biomaterial Degradation	Hydrolysis, oxidation, and enzymatic degradation
6	Biomaterial Processing	Molding, extrusion, and surface treatments
7	Surface Properties of Biomaterials	Surface energy, roughness, and wettability
8	Protein Interaction with Biomaterials	Protein adsorption, surface modification techniques to control protein interactions

9	Cell Interactions with Biomaterials	Adhesion, proliferation, and differentiation
10	Biomaterial Implantation and Acute Inflammation	Acute inflammatory response following biomaterial implantation
11	Wound Healing and the Presence of Biomaterials	Wound healing process in the presence of biomaterials
12	Immune Response to Biomaterials	Foreign body response, chronic inflammation, immunocompatibility
13	Biomaterials and Thrombosis	Blood compatibility and methods to minimize thrombogenicity
14	Infection, Tumorogenesis, Calcification of Biomaterials	Prevention, detection, and mitigation of tumorogenesis and calcification

Professional Contribution	N/A

Contribution to Program Outcomes*

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	0	1	0	0	0	0	0	0	0
CO2	2	1	1	1	0	0	0	0	1	0	0
CO3	0	1	1	1	0	0	0	0	1	0	0
CO4	0	1	1	1	1	0	0	0	1	0	0
CO5	0	1	1	1	1	0	1	1	1	0	0
CO6	0	1	1	0	2	1	0	0	1	1	2

* Contribution Level | 0: None | 1: Very Low | 2: Low | 3: Medium | 4: High | 5: Very High

Special Conditions	N/A
Requirements	N/A
Course Policy	N/A

Cheating & Plagiarism	● Copying or letting someone copy anyone work on exams, assignments, or reports is cheating. ● Cutting and pasting text, figures and tables from web sources, AI or any other electronic source is plagiarism. ● The consequence of academic dishonesty is to receive a grade of **FF** for the course.
Evaluation	Assignments (2x) 20% Midterm Exam 40% Final exam 40% Total 100%
Rubric	N/A

Instructor

Name/Surname	Enes Durgut	Email	**enes.durgut@alanya.edu.tr**
Room	321	Office Hours	Students can arrange meetings through Google Calendar

Prepared by Enes Durgut on November 6th, 2024