

Alanya Alaaddin Keykubat University | Rafet Kayış Faculty of Engineering
Genetics and Bioengineering Department
 2026-2027 Fall Semester

Syllabus

Code/Name	GBM 301 / BIOREACTORS
Type	Required
Credit/ECTS	3/3
Hour per Week	3
Level/Year	Undergraduate/3
Semester	Fall
Classroom	D305
Content	Theoretical and practical concepts related to the design and operation of bioreactors
Prerequisites	n/a
Textbooks	Primary - Doran, P. M., Bioprocess Engineering Principles, Elsevier Science & Technology Books - Clarke, K.G., Bioprocess Engineering an Introductory Engineering and Life Science Approach, Woodhead Publishing Limited - Najafpour, G., Biochemical Engineering and Biotechnology, 1st ed. Elsevier Science Bailey - J.E., Ollis, D. F., Biochemical Engineering Fundamentals, McGraw-Hill, - Shuler, M.L., Kargi, F., Bioprocess Engineering: Basic Concepts (2nd Edition), Prentice Hall - Villadsen J., Nielsen J., Liden G., Bioreaction Engineering Principles, Springer Supplementary Recent Research article published in such library as Scopus, WoS, etc.
Objectives	- Knowledge of basic methods and their applications in the field of Bioprocess Engineering - Introducing all aspects of bioreactor design - Transfer of theoretical and practical concepts related to the design and operation systems of bioreactors
Course Outcomes	CO1. Demonstrate knowledge about bioprocess fundamentals CO2. Application of engineering principles in bioreactor design CO3. Formulating and solving mass and energy balances for different processes and unit operations CO4. To be able to analyze metabolic stoichiometry and cell growth CO5. Problem solving and critical thinking in bioreactor design challenges

Weekly Schedule of Topics

W	Topic
1	Introduction to bioprocesses and bioreactors
2	Introduction to reaction engineering mole balances, rates, constants
3	Biochemical-microbial kinetics and bioconversions
4	Operation modes I: Batch
5	Operation modes II: Continuous
6	Type of bioreactors I; Stirred Tanks
7	Tutorial midterm
8	Type of bioreactors II; Airlift-bubble column

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9	Type of bioreactors III; Packed bed & other types
10	Mass transfer in Bioreactors; OTR, K _{la}
11	Aeration Agitation mixing
12	Heat transfer in Bioreactors- Sterilization
13	Tutorials
14	Recent advances in Bioreactor Technology

Professional Contribution Be able to get knowledge about bioprocess and bioreactor design.

Contribution to Program Outcomes*

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	5	3	0	3	0	0	0	0	0	0	0
CO2	5	5	4	3	2	0	0	0	0	0	0
CO3	5	5	3	4	2	0	0	0	0	0	0
CO4	4	4	3	2	2	0	0	0	0	0	0
CO5	4	4	4	3	2	3	0	2	1	3	0

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

Special Conditions	Students work in groups for presentations						
Requirements	n/a						
Course Policy	- Students should be in the class on time. - Both student and responsible lecturer should communicate in English - Students should prepare themselves by reading course presentation, book and articles sent. - At least 70% attendance is required, otherwise a grade of DZ will be assigned.						
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, chatGPT or any other electronic source is plagiarism. - The consequence of academic dishonesty is to receive a grade of FF for the course.						
Evaluation	<table> <tr> <td>Midterm Exam</td><td>40%</td></tr> <tr> <td><u>Final exam</u></td><td><u>60%</u></td></tr> <tr> <td>Total</td><td>100%</td></tr> </table>	Midterm Exam	40%	<u>Final exam</u>	<u>60%</u>	Total	100%
Midterm Exam	40%						
<u>Final exam</u>	<u>60%</u>						
Total	100%						

Instructor

Name/Surname	Şeref Akay	Email	seref.akay@alanya.edu.tr
Room	322	Office Hours	Wednesday 14:30-15:30 Thursday 09:30-10:30

Prepared by Şeref Akay in September, 2026