

Alanya Alaaddin Keykubat University | Rafet Kayış Faculty of Engineering
Genetics and Bioengineering Department
 2024-2025 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 | D105 |
| Content | Theoretical and practical concepts related to the design and operation of bioreactors |
| Prerequisites | n/a |
| Textbooks | <p>Primary</p> <ul style="list-style-type: none"> 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 <p>Supplementary</p> <p>Research article published in such library as PUBMED, ELSEVIER</p> |
| Objectives | <ul style="list-style-type: none"> 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 Improving research and presentation skills |
| 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 CO6. Synthesizing information from bioengineering literature and databases |

Weekly Schedule of Topics

| W | Topic |
|---|--|
| 1 | Introduction to bioprocess |
| 2 | Introduction to bioreactor and bioreactor design |
| 3 | Introduction to reaction engineering mole balances, rates, constants |
| 4 | Biochemical-microbial kinetics and bioconversions |
| 5 | Operation modes I: Batch |
| 6 | Operation modes II: Fed-batch and Continuous |
| 7 | Type of bioreactors |

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|---|--|
| 8 | Mass transfer in bioreactors |
| 9 | Aeration and agitation |
| 10 | Heat transfer in bioreactors and sterilization |
| 11 | Scale up and design parameters |
| 12 | Instrumentation |
| 13 | Presentations I |
| 14 | Presentations II |
| 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 | 2 | 4 | 4 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 |
| CO2 | 4 | 4 | 4 | 4 | 0 | 3 | 2 | 4 | 0 | 0 | 0 |
| CO3 | 4 | 3 | 2 | 2 | 2 | 0 | 0 | 2 | 0 | 0 | 0 |
| CO4 | 4 | 3 | 2 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 0 |
| CO5 | 4 | 4 | 0 | 3 | 4 | 0 | 0 | 5 | 4 | 1 | 3 |
| CO6 | 4 | 4 | 4 | 4 | 4 | 2 | 2 | 4 | 5 | 3 | 4 |

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

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|----------------------------------|---|------------------|------|--------------|------|--------------|-----|-------------------|------------|-------|------|
| Special Conditions | Students work in groups for presentations | | | | | | | | | | |
| Requirements | n/a | | | | | | | | | | |
| Course Policy | <ul style="list-style-type: none"> 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. Students must submit their essays to Turnitin assignment, otherwise students will not be graded for the group writing. | | | | | | | | | | |
| Cheating & Plagiarism | <ul style="list-style-type: none"> 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>Quiz (5 quizzes)</td><td>10 %</td></tr> <tr> <td>Presentation</td><td>20 %</td></tr> <tr> <td>Midterm Exam</td><td>30%</td></tr> <tr> <td><u>Final exam</u></td><td><u>40%</u></td></tr> <tr> <td>Total</td><td>100%</td></tr> </table> | Quiz (5 quizzes) | 10 % | Presentation | 20 % | Midterm Exam | 30% | <u>Final exam</u> | <u>40%</u> | Total | 100% |
| Quiz (5 quizzes) | 10 % | | | | | | | | | | |
| Presentation | 20 % | | | | | | | | | | |
| Midterm Exam | 30% | | | | | | | | | | |
| <u>Final exam</u> | <u>40%</u> | | | | | | | | | | |
| Total | 100% | | | | | | | | | | |
| Rubric | A rubric will be announced prior to presentation sessions. The rubric has 2 main parts for the grading: technical assessment and presentation performance for each student in student groups. | | | | | | | | | | |

Instructor

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| Name/Surname | Özge Güzel | Email | Ozge.guzel@alanya.edu.tr |
| Room | 321 | Office Hours | Tuesday 13:30-15:30 Wednesday 13:30-15:30 |

Prepared by Özge Güzel in October, 2024