

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

Syllabus

Code/Name	GBM 403 / BIOINFORMATICS
Type	Required
Credit/ECTS	7/7
Hour per Week	3 (3+0+0)
Level/Year	Undergraduate/4
Semester	Fall
Classroom	D-306
Content	This course introduces the principles and applications of bioinformatics in bioengineering. Students will explore how biological data are generated, stored, analyzed, and interpreted using computational tools. Emphasis will be placed on hands-on practice with bioinformatics software for DNA, RNA, and protein data.
Prerequisites	Basic knowledge of molecular biology and computer operation.
Textbooks	Primary Bioinformatics and Functional Genomics, 3rd Edition, by Jonathan Pevsner Bioinformatics For Dummies 2nd Edition by Jean-Michel Claverie, Cedric Notredame Secondary Selected online bioinformatic tool guides and database tutorials
Objectives	By the end of this course, students will be able to: • Explain fundamental concepts of bioinformatics and biological data generation. • Retrieve and analyze DNA, RNA, and protein sequence data using online tools and software. • Apply algorithms for sequence alignment, similarity searching, and structure prediction. • Interpret and evaluate biological data to solve problems in biotechnology and genetics.
Course Outcomes	C01 Explain the importance and application areas of techniques related to the production of biological data C02 Identify and apply computational methods for the analysis of biological data by using major bioinformatics tools and databases. C03 Select and justify appropriate bioinformatics tools and databases for the analysis of a biological problem. C04 Integrate multiple bioinformatics tools to design a project addressing a real biological problem. C05 Work collaboratively within a team to execute a bioinformatics project and communicate the findings clearly through professional presentations and written reports.

Weekly Schedule of Topics

W	Topic
1	Introduction to Bioinformatics: scope, data types, applications in bioengineering
2	Biological Databases: NCBI, Uniprot, Ensembl, ClinVar
3	Bioinformatics File Formats

4	Sequence Alignment Theory: Alignment algorithms, scoring matrices, local vs. global alignment
5	Multiple Sequence Alignment: Tools and applications for DNA, RNA, and protein sequences
6	Phylogenetic Analysis: Tree construction methods and evolutionary relationships
7	Gene and Transcript Annotation Tools (Gene finding, ORF prediction)
8	SnapGene Applications: Vector mapping, cloning strategies, and restriction site analysis
9	Site-Directed Mutagenesis experimental design and interpretation of Sanger sequencing results
10	Protein 3D Structure Analysis I: Structure visualization
11	Protein 3D Structure Analysis II: Modeling and structure evaluation
12	Protein-Protein and Protein-Ligand Docking: Principles and tools
13	PCR Primer Design: Theory and practical use of primer design tools
14	Student Group Project Presentations – Integration of Bioinformatics Tools to a Real Research Topic

Professional Contribution	This course enhances students' professional competence by developing skills in biological data analysis, problem-solving, and the practical use of bioinformatics tools.
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Contribution to Program Outcomes*

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

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

Special Conditions	Students work in groups for the presentations.										
Requirements	Basic knowledge of biology and Basic Computer Knowledge										
Course Policy	• Communication should be in English at all times. • Minimum 80% attendance required; otherwise, a grade of DZ will be assigned. • Attendance is mandatory for presentations; absence results in no grade.										
Cheating & Plagiarism	• Copying or allowing others to copy during exams, assignments, or reports is cheating. • Using uncredited content from others, electronic sources or AI tools constitutes plagiarism.										
Evaluation	• Any academic dishonesty results in a grade of FF for the course. <table> <tr> <td>Assignments</td><td>5%</td></tr> <tr> <td>Group Project & Presentation</td><td>15%</td></tr> <tr> <td>Midterm</td><td>30%</td></tr> <tr> <td><u>Final Exam</u></td><td><u>50%</u></td></tr> <tr> <td>Total</td><td>100%</td></tr> </table>	Assignments	5%	Group Project & Presentation	15%	Midterm	30%	<u>Final Exam</u>	<u>50%</u>	Total	100%
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Total	100%										

Instructor

Name/Surname	Senem UYLAŞ	Email	senem.uylas@alanya.edu.tr
Room	329	Office Hours	Thursday 11:00-13:20

Prepared by Senem UYLAŞ on September 28th, 2026.