Course Description Form	
Course Code and Name	CENG461 BIOINFORMATICS (TECH. ELECT.)
Course Semester	7
Catalog Content	Dynamic programming, Binary sequence alignments (Smith-Waterman and Needleman-Wunsch algorithms), Protein similarity matrices (PAM and BLOSUM), Multiple sequence alignment, Analysis of gene expression data (clustering and classification algorithms), Methods for analysis of large biological networks and graphs.
Textbook	Bioinformatics Algorithms: An Active Learning Approach, Phillip Compeau and Pavel Pevzner, 2015.
Supplementary Textbooks	Bioinformatics: Sequence and Genome Analysis 2nd Edition by David Mount, 2004. Fundamentals of Biochemistry: Life at the Molecular Level 5th Edition by Donald Voet, Judith G. Voet, Charlotte W. Pratt, 2016.
Credit	6
Prerequisites of the Course **(** *Attendance Requirements***)**	There is no prerequisite or co-requisite for this course.
Type of the Course	Technical Elective
Instruction Language	English
Course Objectives	molecular biology and basic computational problems in genomics, data sources and types for bioinformatics, major algorithms widely used in bioinformatics, important applications in bioinformatics, and algorithms widely used outside of biology.
Course Learning Outcomes	1. Basic concepts in molecular biology and genetics 2. DNA and 3-D structure databases, data scanning, knowledge bases, sorting algorithms, brief introduction to life chemistry, 3. DNA, RNA, PCR algorithms, hidden Markov model, protein folding problems 4. Monte Carlo method, gene expression, system control, signal processing, intracellular dynamics, system approach and computational biology.
Instruction Methods	The mode of delivery of this course is Face to face
Weekly Schedule	1. Week Basic concepts in molecular biology and genetics 2. Week DNA and 3-D structure databases 3. Week Scan data 4. Week Knowledge bases 5. Week Sorting algorithms 6. Week Introduction to life chemistry 7. Week DNA, RNA, PCR algorithms 8. Week Hidden Markov model, protein folding problems 9. Week Monte Carlo method 10. Week Gene expression, system control 11. Week Signal processing 12. Week Intracellular dynamics 13. Week System approach and computational biology 14. Week Gene mutation and human diseases

<table>
<tr><td>Teaching and Learning Methods

(These are examples. Please fill which activities you use in the course)</td><td>Weekly theoretical course hours: 3
Reading Activities
Internet browsing, library work Report
Preparation for Midterm and Midterm Exam
Final Exam and Preparation for Final Exam</td></tr>
<tr><td>Assessment Criteria</td><td>
<table>
<tr><th></th><th>Numbers</th><th>Total Weighting (%)</th></tr>
<tr><td>Midterm Exams</td><td>1</td><td>30</td></tr>
<tr><td>Assignment</td><td>5</td><td>30</td></tr>
<tr><td>Application</td><td></td><td></td></tr>
<tr><td>Projects</td><td></td><td></td></tr>
<tr><td>Practice</td><td></td><td></td></tr>
<tr><td>Quiz</td><td></td><td></td></tr>
<tr><td>Percent of In-term Studies (%)</td><td></td><td>60</td></tr>
<tr><td>Percentage of Final Exam to Total Score (%)</td><td></td><td>40</td></tr>
<tr><td>Attendance</td><td></td><td></td></tr>
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Workload

Activity	Total Number of Weeks	Duration (weekly hour)	Total Period Work Load
Weekly Theoretical Course Hours	14	3	42
Weekly Tutorial Hours	0	0	0
Reading Tasks	14	3	42
Studies	14	3	42
Material Design and Implementation	0	0	0
Report Preparing	0	0	0
Preparing a Presentation	0	0	0
Presentations	0	0	0
Midterm Exam and Preparation for Midterm Exam	1	12	12
Final Exam and Preparation for Final Exam	1	12	12
Other (should be emphasized)	0	0	0
Total Workload			150
Total Workload / 25			6
Course Credit (ECTS)			6

Contribution Level Between Course Learning Outcomes and Program Outcomes

No	Program Outcomes	1	2	3	4	5
1	Sufficient knowledge on mathematics, science and computer engineering; ability to apply theoretical and practical knowledge in these areas to model and solve engineering problems			X		
2	Ability to identify, define, formulate and solve complex engineering problems; ability to choose and apply appropriate analysis and modelling methods for these purposes					X
3	Ability to design a complex system, process, device, software, algorithm, or product under realistic constraints and circumstances to meet certain requirements; ability to apply modern design techniques for this purpose				X	
4	Ability to choose, develop and use modern techniques and tools necessary for engineering applications; ability to effectively use computing technologies				X	
5	Ability to design and implement systems or experiments to solve engineering problems, collect and interpret data to evaluate and analyze the results of solutions					X
6	Ability to work effectively in intradisciplinary and interdisciplinary teams or individually				X	
7	Ability to efficiently prepare, evaluate and interpret reports				X	
8	Ability to make presentations and conduct effective verbal and written communication in Turkish and English					X
9	Awareness of the necessity of lifelong learning; ability to access information, follow scientific and technological developments; ability to perpetually renew oneself					X
10	Awareness of professional and ethical responsibility, ability to act in accordance with ethical principles					X

	11	Ability to apply knowledge on project management, risk management and change management				X	
	12	Awareness of entrepreneurship and innovation, ability to design and build sustainable systems				X	
	13	Ability to devise local and global solutions to contemporary issues considering the effects of engineering applications on health, environment and security					X
	14	Awareness of the legal consequences of engineering solutions					X
	15	Ability to apply knowledge on software development process and documentation rules					X
	16	Knowledge on standards used in engineering applications				X	
	17	Awareness of occupational health and security, information security and privacy				X	
The Course's Lecturer(s) and Contact Information	Lecturer Dr. Oktay YILDIZ E-mail: oyildiz@gazi.edu.tr						