COURSE DESCRIPTION FORM	
Course Code and Name	CENG461 BIOINFORMATICS (TECH. ELECT.)
Course Semester	7
Catalogue Data of the Course (*Course 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.
Course Textbooks	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 (*ECTS*)	6
Prerequisites for the Course (*Attendance Requirements*)	There is no prerequisite or co-requisite for this course.
Course Type	Technical Elective
Language of Instruction	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 Method *(Face-to-face, Distance education etc.)*	The mode of delivery of this course is sace to face.
Weekly Schedule of the Course	Week 1: Basic concepts in molecular biology and genetics Week 2: DNA and 3-D structure databases Week 3: Scan data Week 4: Knowledge bases Week 5: Sorting algorithms Week 6: Introduction to life chemistry Week 7: DNA, RNA, PCR algorithms Week 8: Hidden Markov model, protein folding problems Week 9: Monte Carlo method Week 10: Gene expression, system control Week 11: Signal processing Week 12: Intracellular dynamics Week 13: System approach and computational biology Week 14: Gene mutation and human diseases
Teaching Activities *(The time spent for the activities listed here will determine the amount of credit required)*	Weekly theoretical course hours Reading activities Internet search and library work Midterm and revision for midterm Final exam and revision for final exam

Assessment Criteria

	Number(s)	**Weight (%)**
Midterm exam	1	30
Assignment	5	30
Application		

Project			
Practice			
Quiz			
Final exam	1	40	
Total	7	100	

Workload of the Course

Activity	Number of Weeks	Duration (Weekly Hour)	End of Semester Total Workload
Weekly theoretical course hours	14	3	42
Weekly practical course hours	0	0	0
Reading activities	14	3	42
Internet search and library work	14	3	42
Designing and implementing materials	0	0	0
Making a report	0	0	0
Preparing and making presentations	0	0	0
Midterm and revision for midterm	1	12	12
Final exam and revision for final exam	1	12	12
Total workload			150
Total workload/ 25			6
Course Credit (ECTS)			6

Contribution Level between Course Outcomes and Program Outcomes

No	Program Outcomes	1	2	3	4	5
1	Knowledge of mathematics, science, basic engineering, computing, and computer engineering; ability to use this knowledge in solving complex engineering problems.					X
2	Ability to define, formulate and analyze complex engineering problems using basic science, mathematics and engineering knowledge and considering the UN Sustainable Development Goals relevant to the problems addressed.			X		
3	Ability to design creative solutions to complex engineering problems; ability to design complex systems, processes, devices, software, algorithms or products to meet current and future requirements, considering realistic constraints and conditions.					X
4	Ability to select, use and develop appropriate techniques, resources and modern engineering and informatics tools, including estimation and modeling, for the analysis and solution of complex engineering problems while being aware of their limitations.					X
5	Ability to use research methods to examine complex engineering problems or research topics in computer engineering, including reviewing the literature, designing experiments, conducting experiments, collecting data, analyzing and interpreting results.				X	
6	Knowledge of the effects of engineering practices and the standards used in these practices on society, health and safety, economy, sustainability and environment within the scope of the UN Sustainable Development Goals; awareness of the consequences of engineering solutions in the fields of information security and law.			X		

	7	Acting in accordance with engineering professional principles and knowledge on ethical responsibility; awareness of acting impartially, without discrimination on any issue, and being inclusive of diversity.					
	8	Ability to work effectively individually and as a team member or leader in intradisciplinary and multidisciplinary teams (face-to-face, remote, or hybrid).					
	9	Ability to conduct effective verbal and written communication on technical issues in Turkish or English, prepare reports, make effective presentations and prepare software documentation, considering the various differences of the target audience (such as education, language, profession).				X	
	10	Knowledge of business practices such as project, risk and change management and economic feasibility analysis; awareness of entrepreneurship and innovation.			X		
	11	Lifelong learning skill that includes the ability to learn independently and continuously, to adapt to new and developing scientific practices and technologies, and to think inquisitively about technological changes.					X
Lecturer(s) and Contact Information	Assist. Prof. Dr. Yılmaz Atay yilmazatay@gazi.edu.tr						