<table>
<tr><th colspan="2">COURSE DESCRIPTION FORM</th></tr>
<tr><td>Course Code and Name</td><td>CENG446 FUNDAMENTALS OF SOFTWARE DEFINED NETWORKS (TECH. ELECT.)</td></tr>
<tr><td>Course Semester</td><td>8</td></tr>
<tr><td>Catalogue Data of the Course (Course Content)</td><td>The philosophy of software defined networks (SDN), control layer, data layer, application layer, OpenFlow protocol, network virtualization, network functions virtualization (NFV), SDN programming, software defined networks and cyber security, 5G and beyond networks</td></tr>
<tr><td>Course Textbooks</td><td>Software Defined Networks: A Comprehensive Approach, Paul Goransson, Chuck Black and Timothy Culver, Second Edition</td></tr>
<tr><td>Supplementary Textbooks</td><td>Kreutz, D., Ramos, F. M., Verissimo, P. E., Rothenberg, C. E., Azodolmolky, S., & Uhlig, S. (2014). Software-defined networking: A comprehensive survey. Proceedings of the IEEE, 103(1), 14-76.</td></tr>
<tr><td>Credit (ECTS)</td><td>6</td></tr>
<tr><td>Prerequisites for the Course (Attendance Requirements)</td><td>There is no prerequisite or co-requisite for this course.</td></tr>
<tr><td>Course Type</td><td>Elective</td></tr>
<tr><td>Language of Instruction</td><td>English</td></tr>
<tr><td>Course Objectives</td><td>To teach the philosophy of software-defined networks and to introduce software-defined network-based technologies.</td></tr>
<tr><td>Course Learning Outcomes</td><td>1. Explains the basic philosophy behind softwarization of computer networks.
2. Explains the architecture of software-defined networks.
3. Explains software-defined network-based technologies and their operating principles.
4. Develops software-defined network applications.</td></tr>
<tr><td>Instruction Method
(Face-to-face, Distance education etc.)</td><td>The mode of delivery of this course is face to face.</td></tr>
<tr><td>Weekly Schedule of the Course</td><td>Week 1: Introduction to Software Defined Networks
Week 2: Network Virtualization Fundamentals
Week 3: Software-Defined Network Architecture
Week 4: Control Layer and Data Layer
Week 5: OpenFlow Protocol
Week 6: OpenFlow Protocol
Week 7: OpenFlow Applications on Mininet
Week 8: Application Layer and Northbound API
Week 9: Application Layer and Northbound API
Week 10: SDN Programming
Week 11: SDN, NFV and 5G Relationship
Week 12: 5G and Beyond Networks
Week 13: SDN and cyber security
Week 14: SDN forensic</td></tr>
<tr><td>Teaching Activities
(The time spent for the activities listed here will determine the amount of credit required)</td><td>Weekly theoretical course hours: 3
Reading activities
Internet search and library work
Making a report
Midterm and revision for midterm
Final exam and revision for final exam</td></tr>
<tr><td>Assessment Criteria</td><td>
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<tr><th></th><th>Number(s)</th><th>Weight (%)</th></tr>
<tr><td>Midterm exam</td><td>1</td><td>30</td></tr>
<tr><td>Assignment</td><td>3</td><td>30</td></tr>
<tr><td>Application</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td></td></tr>
<tr><td>Practice</td><td></td><td></td></tr>
<tr><td>Quiz</td><td></td><td></td></tr>
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	Final exam	1	40
	Total	5	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			
Reading activities	9	4	36
Internet search and library work	12	1	12
Designing and implementing materials			
Making a report	9	2	18
Preparing and making presentations			
Midterm and revision for midterm	3	6	18
Final exam and revision for final exam	4	6	24
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.					
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).		X			
	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.					
	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. M. Sedef DEMİRCİ sedefgunduz@gazi.edu.tr						