COURSE DESCRIPTION FORM	
Course Code and Name	BM222 DIGITAL DESIGN
Course Semester	4
Catalogue Data of the Course (*Course Content*)	Digital systems, binary numbers, base transformations, binary digits, complement arithmetic, signed numbers. Boole algebra, Boole functions, canonical and standard forms, logic operations and gates. NAND and NOR applications. Combinational logic circuits, adder, magnitude comparator, decoder, encoder, multiplexer. Sequential circuits, flip-flops, registers, counters. Memory, programmable logic circuits. Data path design. Applications with Verilog.
Course Textbooks	Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog (6th Edition) by M. Morris R. Mano (Author), Michael D. Ciletti (Author), Pearson, 2017
Supplementary Textbooks	Digital Design and Computer Architecture 2nd Edition by David Harris (Author), Sarah Harris (Author), Morgan Kaufmann, 2012 Digital Design with RTL Design, VHDL, and Verilog 2nd Edition by Frank Vahid (Author), Wiley, 2010
Credit (*ECTS*)	6
Prerequisites for the Course (*Attendance Requirements*)	Obligatory course attendance
Course Type	Compulsory
Language of Instruction	Turkish
Course Objectives	Explaining binary numbers and arithmetic operations with binary numbers. Explaining simplification with Boolean algebra and explaining how to use canonical and standard forms. Explaining how to simplify with Karnaough map method and using don't care cases. Explaining how to design combinational logic circuits and using them in the design of other circuits. Explaining designing sequential circuits. Explaining how to design a bus and how to use programmable logic circuits. Explaining the application of digital circuits with Verilog.
Course Learning Outcomes	1. Explains number systems and complements arithmetic. 2. Performs number-base conversions. 3. Performs algebraic simplification of Boolean functions. 4. Define canonical and standard forms. 5. Perform simplifications using Karnaugh map. 6. Explains how computers perform addition, subtraction, comparison, and multiplication. 7. Designs new circuits using various combinational logic circuits. 8. Designs sequential logic circuits. 9. Designs counters. 10. Designs registers. 11. Designs memory circuits. 12. Designs programmable logic circuits. 13. Implements digital circuits with Verilog.
Instruction Method *(Face-to-face, Distance education etc.)*	The mode of delivery of this course is face-to-face.
Weekly Schedule of the Course	1. Number systems, complements arithmetic and binary codes 2. Boolean algebra and boolean functions 3. Canonical and standard forms, logic operations and gates 4. Simplification with the Karno map method, don't care cases 5. NAND, NOR and XOR gates 6. Combinational logic circuits (Adder, subtractor, magnitude comparator) 7. Combinational logic circuits (Decoder, encoder, multiplexer) 8. Combinational logic circuit applications 9. Sequential logic and flip-flops 11. Asynchronous counters 12. Synchronous counters

13. Registers
14. Memory and programmable logic

Teaching Activities
(The time spent for the activities listed here will determine the amount of credit required)

Weekly theoretical course hours: 3
Weekly practical course hours: 2
Reading activities
Internet search and library work
Making a report
Midterm and revision for midterm
Final exam and revision for final exam

Assessment Criteria

	Number(s)	Weight (%)
Midterm exam	1	30
Assignment	0	
Application	10	30
Project	0	
Practice	0	
Quiz	0	
Final exam	1	40
Total	12	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	14	2	28
Reading activities	14	1	14
Internet search and library work	14	1	14
Designing and implementing materials			
Making a report	10	2	20
Preparing and making presentations	1	4	4
Midterm and revision for midterm	1	15	15
Final exam and revision for final exam	1	15	15
Total workload			152
Total workload/ 25			6,08
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				X	

		while being aware of their limitations.					
	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.		X			
	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.		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	Assoc. Prof. Dr. Ümit ATİLA umitatila@gazi.edu.tr