Course Description Form	
Course Code and Name	BM222 DIGITAL DESIGN
Course Semester	4
Catalog Content	Digital systems, binary numbers, base transformations, binary digits. Boole algebra, Boole functions, canonical and standard forms, logic operations and gates. NAND and NOR applications. Logic circuits, adder, multiplexer, decoder, encoder. Serial circuits, flip-flops, registers, counters. Memory, programmable logic circuits. State machines. Processors Architecture: Control Unit. Datapath design. Verilog applications of these topics.
Textbook	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 with RTL Design, VHDL, and Verilog 2nd Edition by Frank Vahid (Author), Wiley, 2010 Digital Design and Computer Architecture 2nd Edition by David Harris (Author), Sarah Harris (Author), Morgan Kaufmann, 2012
Credit	6
Prerequisites of the Course (*Attendance Requirements*)	There is no prerequisite for this course.
Type of the Course	Compulsory
Instruction Language	Turkish
Course Objectives	Using binary number system effectively, learning Boole algebra operations, designing logic gates and sequential logic circuits, learning processor's internal structure and Verilog hardware definition language, designing digital systems using Verilog.
Course Learning Outcomes	Ability of understanding and processing of binary number system Ability of Converting number bases Ability of simplification of Boole functions with Boole algebra Learning of canonical and standard forms Ability of simplification with Karnaugh maps Understanding of how computers add, subtract, compare and multiply Ability of designing new circuits by using different combinational logic circuits. Ability of designing sequential circuits Ability of designing counters Ability of using registers Ability of using processor's internal structure: bus (Datapath) and control Ability of designing datapath
Instruction Methods	The mode of delivery of this course is face to face and laboratory exercises.
Weekly Schedule	1. Digital systems, binary numbers, base transformations 2. Complements, signed numbers, binary codes 3. Boole algebra, Boole functions 4. Canonical and standard forms, logic operations and gates 5. Simplification with Karnaugh maps, don't care conditions 6. Combinational logic circuits 7. Adders, Magnitude comparators, decoder 8. Encoder, multiplexer 9. Sequential circuits 10. Flip-flops 11. Registers and counters 12. The processor's internal structure: bus (Datapath) and control 13. Datapath design 14. Datapath design

Teaching and Learning Methods

(These are examples. Please fill which activities you use in the course)

Weekly theoretical course hours: 3
Weekly tutorial hours: 2
Reading Activities
Internet browsing, library work Designing and
Preparation of Midterm and Midterm Exam
Final Exam and Preparation for Final Exam

Assessment Criteria

	Numbers	**Total Weighting (%)**
Midterm Exams	1	30
Assignment	0	0
Application	12	30
Projects	0	0
Practice	0	0
Quiz	0	0
Percent of In-term Studies (%)		60
Percentage of Final Exam to Total Score (%)		40
Attendance	-	-

Workload

Activity	**Total Number of Weeks**	**Duration (weekly hour)**	**Total Period Work Load**
Weekly Theoretical Course Hours	14	3	42
Weekly Tutorial Hours	14	2	28
Reading Tasks	11	2	22
Studies	10	3	30
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	1	13	13
Final Exam and Preparation for Final Exam	1	15	15
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		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	Assoc. Prof. Hasan Şakir Bilge bilge@gazi.edu.tr