Identification	**Subject (code, title, credits)**	ETR 320 Digital electronics-6 ECTS credits	
	Department	Physics and Electronics	
	Program (undergraduate, graduate)	Undergraduate	
	Term	Fall 2022	
	Instructor	Ahmad Asimov ph.D	
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	Phone:	+994124211093 (daxili255)	
	Classroom/hours	302N Monday /Wednesday	
	Office hours	Tuesday: 15:00-16:00/ Thursday: 15:00-16:00	
Prerequisites			
Language	English		
Compulsory	Compulsory		
Required textbooks and course materials	John F. Wakerly, Digital Design: Principles and Practices, 5/e, Pearson, 2018 William Kleitz, Digital Electronics, Prentice Hall International Inc.		
Course outline	The purpose of the course is to teach principles of digital electronics. Among the topics discussed are number systems, codes, logic gates, Boolean statements, combinational logic, flip-flops, counters, shift registers, memory and storage, and integrated circuit technologies. Students should be able to analyze, and design combinational and sequential circuits.		
Course objectives	To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits. Verifying and analyzing the practical digital circuits. Understanding the minimization of logic expression and designing combinational and sequential digital circuits		
Learning outcomes	On successful completion of this course students will be able to: 1. Perform basic arithmetic calculations in binary, decimal and hexadecimal; 2. Analyze and synthesize combinational logic circuits; 3. Analyze the basic operation of memory cell and its limitations in circuit designing. 4. Program a microcontroller to control a simple physical system and to perform simple digital transformations to an analog signal; 5. Select, justify and use appropriate input and output devices and controllers for simple digital systems;		
Teaching methods	**Lecture**		☑
	Group discussion		☑
	Experiential exercise		☑
	Quiz, Classroom Exams		☑
Evaluation	**Methods**	**Date/deadlines**	**Percentage (%)**
	Midterm Exam		30
	Attendance	At the each lesson	5
	Quizzes	4 quizzes during the semester	20
	Activity	During the semester	5
	Final Exam		40
	Total		100

Policy	▪ **Preparation for class** The structure of this course makes your individual study and preparation outside the class extremely important. The lecture material will focus on the major points introduced in the text. Reading the assigned chapters and having some familiarity with them before class will greatly assist your understanding of the lecture. After the lecture, you should study your notes and work relevant problems and cases from the end of the chapter and sample exam questions. • **Withdrawal (pass/fail)** This course strictly follows grading policy of the School of Science and Engineering. Thus, a student is normally expected to achieve a mark of at least 60% to pass. In case of failure, he/she will be required to repeat the course the following term or year. ▪ **Cheating/plagiarism** Cheating or other plagiarism during the Quizzes, Mid-term and Final Examinations will lead to paper cancellation. In this case, the student will automatically get zero (0), without any considerations. ▪ **Professional behavior guidelines** The students shall behave in the way to create favorable academic and professional environment during the class hours. Unauthorized discussions and unethical behavior are strictly prohibited. • **Quizzes** There will be a quiz examination per two weeks. The quizzes will be announced in the classroom two weeks before. Quiz is from homework problems. The homework problems will be selected from questions and problems in the end of each chapter. The No. of homework problems will be announced after finishing each chapter. There will be 4 quizzes during the semester . The quizzes will be announced in the classroom two weeks before and will relate to homework. • **Attendance** Students who attend the whole classes will get 5 marks. for two absence student loses 1 mark. • **Activity** Students who will be active during discussion of past lessons will be awarded with one activity mark.

Tentative Schedule

Week	Date/Day (tentative)	Topics	Textbook
1	19.09.22 26.09.22	Introduction: Characteristics of digital systems, Number systems, arithmetical operations with binary numbers Fundamentals of Boolean Algebra Axioms and theorems	Chapter 1
2	03.10.22 10.10.22	Logic functions, representation, canonical and standard forms. Introduction to Logic Gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR and their combinations. Design of adder, subtractors, comparators, code converters, encoders, decoders, multiplexers and de-multiplexers, Function realization using gates & multiplexers.	Chapter 2
3	17.10.22 24.10.22	Timing diagrams, propagation delays, hazards, minimization of logic functions, essential/sufficient prime implicants, prime implicant chart	Chapter 3

4	31.10.22 07.11.22	Incomplete functions, don't cares, general functions, prime implicants using Quine-McCluskey, ICs, half adder, full adder, subtraction, multiplexers	Chapter 4
5	14.11.22	Midterm	
6	21.11.22	Sequential Logic Analysis and Design Flip-Flops, Latches and Their Applications. Demultiplexers, decoders, programmable logic devices (PLDs): PLAs, PALs, FPGAs	Chapter 5
7	28.11.22 05.12.22	Feedback connections. Introduction to Latches and Flip flops – SR, D, JK and T. Design of synchronous sequential circuits – Counters, shift registers. Finite State Machines	Chapter 6
8	12.12.22 19.12.22	Semiconductor Memories. Introduction and classification of ROM, ROM organization, Static and Dynamic RAM, DRAM Refreshing	Chapter 7
9	26.12.22	Representative circuits for cells using BJT and FET's, Timing diagrams of memories, Memory expansion using IC's, Flash memory, CCD, Magnetic Memories.	Chapter 8
		Final Exam