



FACULTY OF ARCHITECTURE & TOWN PLANNING

Aror University

Fall 2024

Applied Physics

Course Title:	Applied Physics
Course Code:	CSC214
Credit Hours:	(2+1)
Course Instructor:	Muzaffar Hussain
Electronic mail:	muzaffar.faculty@aror.edu.pk

Description:

Digital Logic Design (DLD) is a branch of electronics that deals with the study and design of digital circuits—systems that use signals having only two states: 0 (Low / OFF), 1 (High / ON).

It provides the foundation of modern computers, microprocessors, and digital systems. In this subject, we learn how basic electronic components, like logic gates, can be combined to perform logical decisions, arithmetic operations, data storage, and communication tasks.

Aim and Objectives

Understand the difference between analog and digital systems, binary digits, and logic levels. Apply number systems and conversions (binary, octal, decimal, hexadecimal) in digital circuit design.

Analyze basic logic gates, Boolean algebra, and simplification techniques.

Design combinational logic circuits such as adders, subtractors, multiplexers, demultiplexers, encoders, and decoders.

Construct sequential circuits such as latches, flip-flops, counters, and registers.

Implement digital circuits using Karnaugh maps (K-maps) and other minimization techniques. Relate the use of digital logic to real-life applications in computer systems, communication, and AI.

Develop problem-solving skills for troubleshooting and debugging digital systems.

Utilize simulation tools and laboratory experiments to validate theoretical concepts in a practical setting.

Assessment Criteria:

S. No	Assessment Activities	Percentage	Total Activities
1.	Quizzes/ Assignments (2 Quizzes & 2 Assignments)	30%	4
2.	Mid Term Exam	30%	1
3.	Final Exam	40%	1



FACULTY OF ARCHITECTURE & TOWN PLANNING

Week	LEC#	Sub-Topic	Reference	% Course Covered
Week-1	LEC-1	<ul style="list-style-type: none"> • Introduction to the Class & Subject • Introductory Analog and Digital Concepts • Binary digits 	Floyd Thomas Prentice Hall,USA.	3%
	LEC-2	<ul style="list-style-type: none"> • Logic levels • Digital waveform (periodic and non-periodic) • Basic Logic Operations. 	Floyd Thomas Prentice Hall,USA.	6%
Week-2	LEC-3	<ul style="list-style-type: none"> • Number Systems and conversions (Binary, Decimal, Hexadecimal, Octal) 	Floyd Thomas Prentice Hall,USA.	9%
	LEC-4	<ul style="list-style-type: none"> • Signed Numbers, • Arithmetic Operations with Signed Numbers 	Floyd Thomas Prentice Hall,USA.	12%
Week-3	LEC-5	<ul style="list-style-type: none"> • Binary Arithmetic, • Digital Codes (Gray Code, Alphanumeric Codes, Unicode) • Error Codes (Parity Method for Error Detection and Cyclic Redundancy Check) 	Floyd Thomas Prentice Hall,USA.	16%
	LEC-6	<ul style="list-style-type: none"> • Logic Gates • Truth Table 	Floyd Thomas Prentice Hall,USA.	18%
Week-4	LEC-7	<ul style="list-style-type: none"> • Boolean Algebra, • Apply the basic laws and rules of Boolean Algebra to simplify Boolean expressions DE Morgan's theorems. 	Floyd Thomas Prentice Hall,USA.	22%
	LEC-8	<ul style="list-style-type: none"> • Sum-of-Product (SOP) and the Product-of Sum (POS) expressions • converting a Boolean expression to a truth table and vice versa. 	Floyd Thomas Prentice Hall,USA.	25%
Week-5	LEC-9	<ul style="list-style-type: none"> • The Karnaugh Map • simplification using Karnaugh Map • The Karnaugh Map Examples 	Floyd Thomas Prentice Hall,USA.	28%
	LEC-10	<ul style="list-style-type: none"> • Quine McCluskey Method 	Floyd Thomas Prentice Hall,USA.	31%
Week-6	LEC-11	<ul style="list-style-type: none"> • Combinational Logic Analysis 	Floyd Thomas Prentice Hall,USA.	34%
	LEC-12	<ul style="list-style-type: none"> • Basic Combinational Logic Circuits 	Floyd Thomas Prentice Hall,USA.	38%



FACULTY OF ARCHITECTURE & TOWN PLANNING

Week-7	LEC-13	<ul style="list-style-type: none"> Implementing Combinational Logic 	Floyd Thomas Prentice Hall,USA.	41%
	LEC-14	<ul style="list-style-type: none"> The Universal Property of NAND and NOR Gates 	Floyd Thomas Prentice Hall,USA.	44%
Week-8	LEC-15	<ul style="list-style-type: none"> Combinational Logic Using NAND and NOR Gates 	Floyd Thomas Prentice Hall,USA.	47%
	LEC-16	<ul style="list-style-type: none"> Pulse Waveform Operation. 	Floyd Thomas Prentice Hall,USA.	50%
Week-9	LEC-17	<ul style="list-style-type: none"> Functions of Combinational Logic Half and Full Adders Parallel Binary Adders 	Compton Floyd Thomas Prentice Hall,USA.	53
	LEC-18	<ul style="list-style-type: none"> Ripple Carry and Look-Ahead Carry Adders Comparators 	Floyd Thomas Prentice Hall,USA.	56
Week-10	LEC-19	<ul style="list-style-type: none"> Decoders Encoders Code Converters 	Floyd Thomas Prentice Hall,USA.	59
	LEC-20	<ul style="list-style-type: none"> Multiplexers (Data Selectors) Demultiplexers Parity Generators/Checkers. 	Floyd Thomas Prentice Hall,USA.	63
Week-11	LEC-21	<ul style="list-style-type: none"> Latches, Flip-Flops, and Timers Latches: Introduction S-R Latch 	Floyd Thomas Prentice Hall,USA.	66
	LEC-22	<ul style="list-style-type: none"> Gated S-R Latch Gated D-Latch. 	Floyd Thomas Prentice Hall,USA.	69
Week-12	LEC-23	<ul style="list-style-type: none"> Flip Flops: S-R Flip Flop J-K Flip Flop 	Floyd Thomas Prentice Hall, USA.	72
	LEC-24	<ul style="list-style-type: none"> D-Flip Flop T-Flip Flop Applications 	Floyd Thomas Prentice Hall,USA.	75
Week-13	LEC-25	<ul style="list-style-type: none"> Shift Register Operations Types of Shift Register Data I/Os 	Floyd Thomas Prentice Hall,USA.	78
	LEC-26	<ul style="list-style-type: none"> Bidirectional Shift Registers Shift Register Counters Shift Register Applications. 	Floyd Thomas Prentice Hall,USA.	81
Week-14	LEC-27	<ul style="list-style-type: none"> Counters 	Floyd Thomas Prentice Hall,USA.	84



FACULTY OF ARCHITECTURE & TOWN PLANNING

	LEC-28	<ul style="list-style-type: none">Finite State MachinesAsynchronous Counters	Floyd Thomas Prentice Hall,USA.	88
Week-15	LEC-29	<ul style="list-style-type: none">Synchronous CountersUp/Down Synchronous Counters	Floyd Thomas Prentice Hall,USA.	91
	LEC-30	<ul style="list-style-type: none">Cascaded CountersCounter Applications	Floyd Thomas Prentice Hall,USA.	94
Week-16	LEC-31	Final Review and Exam Preparation	Floyd Thomas Prentice Hall,USA.	97
	LEC-32	Course Wrap-up and Final Discussion	Floyd Thomas Prentice Hall,USA.	100
	Final term			