Lovely Professional University, Punjab

Course Code	Course Title	Course Planner	Lectures	Tutorials	Practicals	Credits
ECE213	DIGITAL ELECTRONICS	15978::Sanjeev Sharma	3	1	0	4
Course Weightage	ATT: 5 CA: 25 MTT: 20 ETT: 50	**Exam Category: 13: Mid Term Exam: All MCQ – End Term Exam: MCQ + Subjective**				
Course Orientation	COMPETITIVE EXAMINATION (Higher Education), KNOWLEDGE ENHANCEMENT, PLACEMENT EXAMINATION(Mass Recruiters)					

	TextBooks (T)		
Sr No	**Title**	**Author**	**Publisher Name**
T-1	DIGITAL DESIGN PRINCIPLES AND PRACTICES	JOHN F. WAKERLY	PEARSON

	Reference Books (R)		
Sr No	**Title**	**Author**	**Publisher Name**
R-1	DIGITAL FUNDAMENTALS	THOMAS L. FLOYD , R. P JAIN	PEARSON
R-2	DIGITAL LOGIC DESIGN	MORRIS MANO	PEARSON

Other Reading (OR)	
Sr No	**Journals articles as Compulsary reading (specific articles, complete reference)**
OR-1	http://pioneer.netserv.chula.ac.th/~tarporn/311/HandOut/DmmPPT.pdf ,

Relevant Websites (RW)		
Sr No	**(Web address) (only if relevant to the course)**	**Salient Features**
RW-1	http://www.circuitsgallery.com/2013/01/Binary-Up-Counter.html	binary up counter explanation

Audio Visual Aids (AV)		
Sr No	**(AV aids) (only if relevant to the course)**	**Salient Features**
AV-1	http://www.falstad.com/circuit	Digital circuits animations
AV-2	http://filebox.ece.vt.edu/~jgtront/introcomp/flipflop_noaudio.swf	flip flop animations

Software/Equipments/Databases		
Sr No	**(S/E/D) (only if relevant to the course)**	**Salient Features**
SW-1	Proteus	Circuit design and siimulation tool

LTP week distribution: (LTP Weeks)

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Weeks before MTE	7
Weeks After MTE	7
Spill Over (Lecture)	7

Detailed Plan For Lectures

Week Number	Lecture Number	Broad Topic(Sub Topic)	Chapters/Sections of Text/reference books	Other Readings, Relevant Websites, Audio Visual Aids, software and Virtual Labs	Lecture Description	Learning Outcomes	Pedagogical Tool Demonstration/ Case Study / Images / animation / ppt etc. Planned	Live Examples
Week 1	Lecture 1	Number Systems(Digital Systems)	T-1		L1: Introduction to the course followed by Zero lecture. L2 : Introduction to basic digital circuits	Student will learn the basic details of digital circuits,basic difference between digital and analog circuits	Discussion and lecturing	Logic design using Boolean algebra
		Number Systems(Logic circuits)	T-1 R-2		L1: Introduction to the course followed by Zero lecture. L2 : Introduction to basic digital circuits	Student will learn the basic details of digital circuits,basic difference between digital and analog circuits	Discussion and lecturing	
		Number Systems (Implementation of digital systems)	T-1		L1: Introduction to the course followed by Zero lecture. L2 : Introduction to basic digital circuits	Student will learn the basic details of digital circuits,basic difference between digital and analog circuits	Discussion and lecturing	
	Lecture 2	Number Systems(Digital Systems)	T-1		L1: Introduction to the course followed by Zero lecture. L2 : Introduction to basic digital circuits	Student will learn the basic details of digital circuits,basic difference between digital and analog circuits	Discussion and lecturing	Logic design using Boolean algebra
		Number Systems(Logic circuits)	T-1 R-2		L1: Introduction to the course followed by Zero lecture. L2 : Introduction to basic digital circuits	Student will learn the basic details of digital circuits,basic difference between digital and analog circuits	Discussion and lecturing	
		Number Systems (Implementation of digital systems)	T-1		L1: Introduction to the course followed by Zero lecture. L2 : Introduction to basic digital circuits	Student will learn the basic details of digital circuits,basic difference between digital and analog circuits	Discussion and lecturing	

Week 1	Lecture 3	Number Systems(Data representation and coding)	T-1		Introduction to basic number systems	Student will learn how to represent the decimal numbers by using binary ,octal,hexadecimal systems	Discussion and lecturing	
		Number Systems(Number Systems)	T-1		Introduction to basic number systems	Student will learn how to represent the decimal numbers by using binary ,octal,hexadecimal systems	Discussion and lecturing	
		Number Systems(Codes-Positional number system)	T-1		Introduction to basic number systems	Student will learn how to represent the decimal numbers by using binary ,octal,hexadecimal systems	Discussion and lecturing	
		Number Systems(Binary number system)	T-1		Introduction to basic number systems	Student will learn how to represent the decimal numbers by using binary ,octal,hexadecimal systems	Discussion and lecturing	
Week 2	Lecture 4	Number Systems(Methods of base conversions)	T-1		Conversion from one number system to another number system, octal airthmetics	Student will learn to convert from one number system to another system	Discussions and lecturing	
		Number Systems(Binary arithmetic)	T-1		Conversion from one number system to another number system, octal airthmetics	Student will learn to convert from one number system to another system	Discussions and lecturing	
		Number Systems(octal number system)	T-1		Conversion from one number system to another number system, octal airthmetics	Student will learn to convert from one number system to another system	Discussions and lecturing	
		Number Systems(Octal arithmetic)	T-1		Conversion from one number system to another number system, octal airthmetics	Student will learn to convert from one number system to another system	Discussions and lecturing	
	Lecture 5	Number Systems (Representation of signed numbers)	T-1		Representation of hexadecimal number systems and signed numbers	Student will learn to convert from decimal to hexadecimal number system and signed numbers representation	Discussion and lecturing	

Week 2	Lecture 5	Number Systems(Fixed numbers)	T-1		Representation of hexadecimal number systems and signed numbers	Student will learn to convert from decimal to hexadecimal number system and signed numbers representation	Discussion and lecturing	
		Number Systems (Hexadecimal number system)	T-1		Representation of hexadecimal number systems and signed numbers	Student will learn to convert from decimal to hexadecimal number system and signed numbers representation	Discussion and lecturing	
		Number Systems (Hexadecimal arithmetic)	T-1		Representation of hexadecimal number systems and signed numbers	Student will learn to convert from decimal to hexadecimal number system and signed numbers representation	Discussion and lecturing	
	Lecture 6	Number Systems(Binary coded decimal codes)	T-1 R-2		Error detecting codes and parity codes	Students will learn how to detect the errors using parity codes and gray codes	Discussion and lecturi ng	Cable tv,satellite communication
		Number Systems(Gray codes)	T-1 R-2		Error detecting codes and parity codes	Students will learn how to detect the errors using parity codes and gray codes	Discussion and lecturi ng	Cable tv,satellite communication
		Number Systems(Error detection code)	T-1 R-2		Error detecting codes and parity codes	Students will learn how to detect the errors using parity codes and gray codes	Discussion and lecturi ng	Cable tv,satellite communication
		Number Systems(Parity check codes)	T-1 R-2		Error detecting codes and parity codes	Students will learn how to detect the errors using parity codes and gray codes	Discussion and lecturi ng	Cable tv,satellite communication
		Number Systems(Floating point numbers)	T-1 R-2		Error detecting codes and parity codes	Students will learn how to detect the errors using parity codes and gray codes	Discussion and lecturi ng	Cable tv,satellite communication
Week 3	Lecture 7	Number Systems(Hamming code)	T-1		Representation of hamming code for error detection	Student will learn how to frame the hamming code for error detection	lecturing and discussion	satellite communication
	Lecture 8	Number Systems(Error correction code)	T-1 R-1		Error correction by using hamming code	Student will learn how to correct the errors by using hamming code	lecturing and discussion	

Week 3	Lecture 9	Introduction to Combinational Logic Circuits(Basic Logic Operations)	T-1	AV-1	Lecture will explain the three basic logic functions AND OR and NOT and its use to build any combinational digital logic circuit	As a result of this Students will be able to design combinational circuits by understanding these basic gates	Discussion and brainstorming	Designing of combinational circuits
		Introduction to Combinational Logic Circuits(Boolean Algebra and Basic Postulates)	T-1	AV-1	Lecture will explain the three basic logic functions AND OR and NOT and its use to build any combinational digital logic circuit	As a result of this Students will be able to design combinational circuits by understanding these basic gates	Discussion and brainstorming	Designing of combinational circuits
		Introduction to Combinational Logic Circuits(Standard representationof logic functions-SOP forms and POS forms)	T-1	AV-1	Lecture will explain the three basic logic functions AND OR and NOT and its use to build any combinational digital logic circuit	As a result of this Students will be able to design combinational circuits by understanding these basic gates	Discussion and brainstorming	Designing of combinational circuits
		Introduction to Combinational Logic Circuits(Study of logic gates and Synthesis of logic gates using Universal gates)	T-1	AV-1	Lecture will explain the three basic logic functions AND OR and NOT and its use to build any combinational digital logic circuit	As a result of this Students will be able to design combinational circuits by understanding these basic gates	Discussion and brainstorming	Designing of combinational circuits
Week 4	Lecture 10	Introduction to Combinational Logic Circuits(Logic Expression Minimization using Karnaugh-map (upto 4 variables) and Quine-McCluskey tabular method)	T-1	AV-1	Graphical representation of logic function truth table	As a result of this students will learn Input combination for any cell can be easily determined and circuit simplification	Lecturing and discussion	To reduce complexity of circuit
	Lecture 11	Introduction to Combinational Logic Circuits(Logic Expression Minimization using Karnaugh-map (upto 4 variables) and Quine-McCluskey tabular method)	T-1	AV-1	Graphical representation of logic function truth table	As a result of this students will learn Input combination for any cell can be easily determined and circuit simplification	Lecturing and discussion	To reduce complexity of circuit
	Lecture 12	Introduction to Combinational Logic Circuits(Decoders, Encoders)	T-1 R-2	SW-1 AV-1	Coding the output of decoder into fewer bits like using encoder, decoder and parity circuits	As a result of this student will learn How to minimize the output before sending it on channel	Simulation and lecturing	Entering any information to the computer through keyboard

Week 4	Lecture 12	Introduction to Combinational Logic Circuits(Parity circuits)	T-1 R-2	SW-1 AV-1	Coding the output of decoder into fewer bits like using encoder, decoder and parity circuits	As a result of this student will learn How to minimize the output before sending it on channel	Simulation and lecturing	Entering any information to the computer through keyboard
Week 5	Lecture 13	Introduction to Combinational Logic Circuits(Adders, Subtractors, Comparators)	T-1 R-1	SW-1	Implementations of Adders and Subtractors and comparators	As a result of this students will learn How to design and perform addition operation in ALU using Digital circuits	Simulation and lecturing	Calculators
	Lecture 14	Introduction to Combinational Logic Circuits(Multiplexers and Demultiplexers)	T-1 R-2	SW-1	Circuits used to handle different input and output variables for MUX, De-MUX	As a result of this Digital circuits used to combine the data on a single channel and how to simplify the circuit designing	Simulation and lecturing	TDMA and FDMA in mobile communication.
	Lecture 15	Introduction to Logic Families(Analog to Digital Converter)	R-1		Basic Types of Analog to Digital & Digital to Analog Converter	Students will learn the techniques of data conversion	Lecturing and discussion	Data conversion in communication system and entering any information to the computer and processing
		Introduction to Logic Families(Digital to Analog Converter)	R-1		Basic Types of Analog to Digital & Digital to Analog Converter	Students will learn the techniques of data conversion	Lecturing and discussion	Data conversion in communication system and entering any information to the computer and processing
Week 6	Lecture 16	Introduction to Logic Families(Analog to Digital Converter)	R-1		Basic Types of Analog to Digital & Digital to Analog Converter	Students will learn the techniques of data conversion	Lecturing and discussion	Data conversion in communication system and entering any information to the computer and processing
		Introduction to Logic Families(Digital to Analog Converter)	R-1		Basic Types of Analog to Digital & Digital to Analog Converter	Students will learn the techniques of data conversion	Lecturing and discussion	Data conversion in communication system and entering any information to the computer and processing

Week 6	Lecture 17	Introduction to Logic Families(Introduction to different logic families)	T-1 R-1	SW-1	Basic parameters and knowledge of old logic families which were replaced with latest	As a result of this students will learn understanding of group of compatible ICs with the same logic levels and supply voltages	Brain storming and lecturing	Old cellphones and new smart cellphones
	Lecture 18	Introduction to Logic Families(Structure and operations of TTL, MOS and CMOS logic families)	T-1 R-1	OR-1	TTL gate with totem pole output,gate implementation using MOS, CMOS	As a result of this students will understand the use of TTL, NMOS and PMOS for designing different gates	Brainstorming and discussion	
Week 7	Lecture 19	Introduction to Logic Families(Structure and operations of TTL, MOS and CMOS logic families)	T-1 R-1	OR-1	TTL gate with totem pole output,gate implementation using MOS, CMOS	As a result of this students will understand the use of TTL, NMOS and PMOS for designing different gates	Brainstorming and discussion	
		SPILL OVER						
Week 7	Lecture 20				Spill Over			
	Lecture 21				Spill Over			
		MID-TERM						
Week 8	Lecture 22	Introduction to Sequential Logic Circuits(Basic sequential circuits: SR-latch,D-latch,D flip-flop,JK flip- flop, T flip-flop)	T-1 R-1	AV-2	Explanation of basic latch and flip-flops circuits and its working	As a result of this student will understand Basic working of SET RESET latch and flip-flops, its limitations and applications	Brainstorming and lecturing	Any digital storage device eg. Hard disks etc.
	Lecture 23	Introduction to Sequential Logic Circuits(Basic sequential circuits: SR-latch,D-latch,D flip-flop,JK flip- flop, T flip-flop)	T-1 R-1	AV-2	Explanation of basic latch and flip-flops circuits and its working	As a result of this student will understand Basic working of SET RESET latch and flip-flops, its limitations and applications	Brainstorming and lecturing	Any digital storage device eg. Hard disks etc.
	Lecture 24	Introduction to Sequential Logic Circuits(Conversion of basic flip-flops)	T-1 R-1	AV-2	Conversion from one flip-flop to other flip-flops and use of excitation table to do conversions	Design and conversion of flip-flops using the excitation table	Lecturing, animation and discussion	

Week 9	Lecture 25	Introduction to Sequential Logic Circuits(Conversion of basic flip-flops)	T-1 R-1	AV-2	Conversion from one flip-flop to other flip-flops and use of excitation table to do conversions	Design and conversion of flip-flops using the excitation table	Lecturing, animation and discussion	
	Lecture 26	Introduction to Sequential Logic Circuits(state machine and state diagram)	T-1 R-2	AV-2	Application of state machine to design sequential circuit and sequence detector	As a result of this students will learn basics of state machines	Brainstorming and lecturing	
	Lecture 27	Introduction to Sequential Logic Circuits(state machine and state diagram)	T-1 R-2	AV-2	Application of state machine to design sequential circuit and sequence detector	As a result of this students will learn basics of state machines	Brainstorming and lecturing	
Week 10	Lecture 28	Introduction to Sequential Logic Circuits(Analysis of state machines using basic flip-flops)	T-1 R-2	AV-2	Application of state machine to design sequential circuits state diagram and state table	As a result of this students will understand the designing of state machines like basic flip flop	Brainstorming and lecturing	
	Lecture 29	Sequential Logic Circuits Applications(Registers: Operation of all basic Shift Registers)	T-1 R-1	AV-2	Introduction of all basic kinds of shift registers eg. SISO, SIPO, PISO, PIPO.	Design of shift registers using combinations of D-type flip-flops.	Lecturing and discussion	
	Lecture 30	Sequential Logic Circuits Applications(Registers: Operation of all basic Shift Registers)	T-1 R-1	AV-2	Introduction of all basic kinds of shift registers eg. SISO, SIPO, PISO, PIPO.	Design of shift registers using combinations of D-type flip-flops.	Lecturing and discussion	
Week 11	Lecture 31	Sequential Logic Circuits Applications(Counters: Design of Asynchronous and Synchronous counters)	T-1 R-1	RW-1	design a clocked sequential circuit asynchronous and synchronous counters	As a result of this student will learn to design counters and use them in real time applications	Lecturing and discussion	Any digitized parking area with counter
	Lecture 32	Sequential Logic Circuits Applications(Counters: Design of Asynchronous and Synchronous counters)	T-1 R-1	RW-1	design a clocked sequential circuit asynchronous and synchronous counters	As a result of this student will learn to design counters and use them in real time applications	Lecturing and discussion	Any digitized parking area with counter
	Lecture 33	Sequential Logic Circuits Applications(Counters: Design of Asynchronous and Synchronous counters)	T-1 R-1	RW-1	design a clocked sequential circuit asynchronous and synchronous counters	As a result of this student will learn to design counters and use them in real time applications	Lecturing and discussion	Any digitized parking area with counter
Week 12	Lecture 34	Sequential Logic Circuits Applications(Counters: Design of Asynchronous and Synchronous counters)	T-1 R-1	RW-1	design a clocked sequential circuit asynchronous and synchronous counters	As a result of this student will learn to design counters and use them in real time applications	Lecturing and discussion	Any digitized parking area with counter

Week 12	Lecture 35	Sequential Logic Circuits Applications(Ring counter and Johnson ring counter)	T-1 R-2	RW-1	Design of Ring counter and Twisted Ring counter	As a result of this student will learn to design counters and how to combine the flip-flops to get shifting also through these counters	Lecturing and discussion	
	Lecture 36	Memory and Programmable Logic(Read-only memory)	T-1 R-1	OR-1	ROM architecture,Types and its applications, basic building blocks of RAM Cell and its internal structure	As a result of this students will learn Internal structure of ROM with its applications and difference between RAM and ROM	Brainstorming and lecturing	
		Memory and Programmable Logic(Read/Write memory-SRAM and DRAM)	T-1 R-1	OR-1	ROM architecture,Types and its applications, basic building blocks of RAM Cell and its internal structure	As a result of this students will learn Internal structure of ROM with its applications and difference between RAM and ROM	Brainstorming and lecturing	
Week 13	Lecture 37	Memory and Programmable Logic(PLAs and their applications)	T-1 R-1	OR-1	How to realize any SOP Logic expression using two level AND OR device on PROM, PAL and PLA	As a result of this students will get to know about applications of PROMs, PLAs and PALs	Brainstorming and lecturing	
		Memory and Programmable Logic(Sequential PLDs and their applications)	T-1 R-1	OR-1	How to realize any SOP Logic expression using two level AND OR device on PROM, PAL and PLA	As a result of this students will get to know about applications of PROMs, PLAs and PALs	Brainstorming and lecturing	
	Lecture 38	Memory and Programmable Logic(PLAs and their applications)	T-1 R-1	OR-1	How to realize any SOP Logic expression using two level AND OR device on PROM, PAL and PLA	As a result of this students will get to know about applications of PROMs, PLAs and PALs	Brainstorming and lecturing	
		Memory and Programmable Logic(Sequential PLDs and their applications)	T-1 R-1	OR-1	How to realize any SOP Logic expression using two level AND OR device on PROM, PAL and PLA	As a result of this students will get to know about applications of PROMs, PLAs and PALs	Brainstorming and lecturing	

Week 13	Lecture 39	Memory and Programmable Logic(Introduction to field programmable gate arrays, PALs and their applications)	T-1 R-1	OR-1	Logic cell array and its design	As a result of this students will learn How to increase the effective size and to add more functionality in a single programmable device	Brainstorming and lecturing	
Week 14	Lecture 40	Memory and Programmable Logic(Introduction to field programmable gate arrays, PALs and their applications)	T-1 R-1	OR-1	Logic cell array and its design	As a result of this students will learn How to increase the effective size and to add more functionality in a single programmable device	Brainstorming and lecturing	
		SPILL OVER						
Week 14	Lecture 41				Spill Over			
	Lecture 42				Spill Over			
Week 15	Lecture 43				Spill Over			
	Lecture 44				Spill Over			
	Lecture 45				Spill Over			

Scheme for CA:

CA Category of this Course Code is:A0203 (2 best out of 3)

Component	Weightage
Project - Design project	50
Test	50
Test	50

Details of Academic Task(s)

Academic Task	Objective	Detail of Academic Task	Nature of Academic Task (group/individuals)	Academic Task Mode	Marks	Allottment / submission Week
Project - Design project	To test design skills of students	Mini project to design digital circuit on hardware, Group size not more than 4	Group	Offline	30	4 / 12
Test 1	To test the knowledge about subject taught upto the delivered lectures	Analytical and design based questions	Individual	Offline	30	4 / 5
Test 2	To test the knowledge about subject taught upto the delivered lectures	Analytical and design based questions	Individual	Offline	30	10 / 11

Plan for Tutorial: (Please do not use these time slots for syllabus coverage)

Tutorial No.	Lecture Topic	Type of pedagogical tool(s) planned (case analysis,problem solving test,role play,business game etc)
Tutorial1	Implemetation of digital systems	Problem Solving
Tutorial2	Binary number system and codes	Problem Solving
Tutorial3	Error detection and correction code	Problem Solving
Tutorial4	Number system airthmetic	Problem Solving
Tutorial5	Test	Test
Tutorial6	Combinational logic system and boolean algebra	Problem Solving
Tutorial7	Multiplexer and decoder function implementations	Problem Solving
After Mid-Term		
Tutorial8	Sequential Logic systems and Flip-flop.	Problem Solving
Tutorial9	Analysis of different flip-flop	Case Analysis
Tutorial10	Analysis and design of state machines	Problem Solving
Tutorial11	Test	Test
Tutorial12	Questions on Registers and Counter.	Problem Solving
Tutorial13	Multiple choice Questions on designing of synchronous and asynchronous counter.	Problem Solving
Tutorial14	Analysis and questions of PLA , PAL & P-ROM,digital instruments	Problem Solving

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