LESSON PLAN – 2025-2026

DISCIPLINE: ETC	**SEMESTER : 5th**	**NAME OF THE TEACHING FACULTY: ANURAG SETHY**
SUBJECT: VLSI AND EMBEDDED SYSTEM	**NO.OF DAYS/PER WEEK CLASS ALLOTTED : 4**	**SEMESTER FROM DATE: 14/07/2025 TO DATE: 15/11/2025 NO.OF WEEKS:15**
WEEK	**CLASS DAY**	**THEORY TOPICS**
1ST	1ST	HISTORICAL PERSPECTIVE- INTRODUCTION
	2ND	CMOS DIGITAL CIRCUITS TYPES
	3RD	INTRODUCTION TO MOS TRANSISTOR& BASIC OPERATION OF MOSFET.
	4TH	STRUCTURE AND OPERATION OF MOSFET (N-MOS ENHANCEMENT TYPE)
2ND	1ST	STRUCTURE AND OPERATION OF MOSFET
	2ND	MOSFET V-I CHARACTERISTICS
	3RD	WORKING OF MOSFET CAPACITANCES.
	4TH	MODELLING OF MOS TRANSISTORS INCLUDING BASIC CONCEPT THE SPICE LEVEL-1 MODELS, THE LEVEL-2 AND LEVEL-3 MODEL.
3RD	1ST	FLOW CIRCUIT DESIGN PROCEDURES
	2ND	VLSI DESIGN FLOW & Y CHART
	3RD	DESIGN HIERARCHY, VLSI DESIGN STYLES-FPGA, GATE ARRAY DESIGN
	4TH	STANDARD CELLS BASED, FULL CUSTOM
4TH	1ST	SIMPLIFIED PROCESS SEQUENCE FOR FABRICATION
	2ND	BASIC STEPS IN FABRICATION PROCESSES FLOW
	3RD	FABRICATION PROCESS OF NMOS TRANSISTOR
	4TH	FABRICATION PROCESS OF NMOS TRANSISTOR
5TH	1ST	CMOS N-WELL FABRICATION PROCESS FLOW
	2ND	CMOS N-WELL FABRICATION PROCESS FLOW
	3RD	MOS FABRICATION PROCESS BY N-WELL ON P-SUBSTRATE
	4TH	CMOS FABRICATION PROCESS BY P-WELL ON N-SUBSTRATE
6TH	1ST	LAYOUT DESIGN RULES,
	2ND	STICK DIAGRAMS OF CMOS INVERTER
	3RD	BASIC NMOS INVERTERS,
	4TH	WORKING OF RESISTIVE-LOAD INVERTER
7TH	1ST	INVERTER WITH N-TYPE MOSFET LOAD – ENHANCEMENT LOAD, DEPLETION N-MOS INVERTER
	2ND	ENHANCEMENT LOAD, DEPLETION N-MOS INVERTER
	3RD	CMOS INVERTER – CIRCUIT OPERATION
	4TH	CMOS INVERTER CHARACTERISTICS
8TH	1ST	INTERCONNECT EFFECTS AND DELAY TIME DEFINITIONS
	2ND	CMOS INVENTOR DESIGN
	3RD	DELAY CONSTRAINTS – TWO SAMPLE MASK LAY OUT FOR P-TYPE SUBSTRATE

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	4TH	DEFINE STATIC COMBINATIONAL LOGIC ,WORKING OF STATIC CMOS LOGIC CIRCUITS (TWO-INPUT NAND GATE)
9TH	1ST	DEFINE STATIC COMBINATIONAL LOGIC ,WORKING OF STATIC CMOS LOGIC CIRCUITS (TWO-INPUT NAND GATE)
	2ND	CMOS LOGIC CIRCUITS (NAND2 GATE)
	3RD	CMOS TRANSMISSION GATES(PASS GATE)
	4TH	COMPLEX LOGIC CIRCUITS - BASICS
10TH	1ST	CLASSIFICATION OF LOGIC CIRCUITS BASED ON THEIR TEMPORAL BEHAVIOUR
	2ND	SR FLIP LATCH CIRCUIT,
	3RD	SR FLIP LATCH CIRCUIT,
	4TH	CLOCKED SR LATCH ONLY
11TH	1ST	CMOS D LATCH.
	2ND	BASIC PRINCIPLES OF DYNAMIC PASS TRANSISTOR CIRCUITS
	3RD	BASIC PRINCIPLES OF DYNAMIC PASS TRANSISTOR CIRCUITS
	4TH	DRAM
12TH	1ST	SRAM
	2ND	FLASH MEMORY
	3RD	Design Language (SPL & HDL)& HDL & EDA tools & VHDL and packages Xlinx
	4TH	Design Language (SPL & HDL)& HDL & EDA tools & VHDL and packages Xlinx
13TH	1ST	Design strategies & concept of FPGA with standard cell based design
	2ND	VHDL DESIGN SYNTHESIS USING FPGA
	3RD	RASBERRY PI
	4TH	Embedded Systems Overview,list of embedded systems,characteristics ,example – A Digital Camera
14TH	1ST	Embedded Systems Technologies--Technology – Definition
	2ND	-Technology for Embedded Systems -Processor Technology - IC Technolog
	3RD	Design Technology-Processor Technology
	4TH	General Purpose Processors – Software,
15TH	1ST	Basic Architecture of Single Purpose Processors – Hardware
	2ND	Application – Specific Processors,Microcontrollers,Digital Signal Processors(DSP)
	3RD	IC Technology- Full Custom / VLSI,Semi-Custom ASIC (Gate Array & Standard Cell), PLD (Programmable Logic Device)
	4TH	Basic idea of Arduino

U.C.P.E.S. BERHAMPUR

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGG

ACADEMIC LESSON PLAN FOR WINTER SEMESTER-2025-26 (w.e.f. 14-7-2025 to 15-11-2025)

NAME OF THE FACULTY	SRI SATYA NARAYAN PANIGRAHI	DEPT	ETC		
SEMESTER	5th	SUBJECT	Analog & Digital Communication		
NO. OF PERIODS PER WEEK	5	TOTAL WEEK	18(14-7-2025 to 15-11-2025		
END SEMESTER EXAM	80	INTERNAL TEST	20		
TOTAL MARKS	100				

WEEK	PERIOD	UNIT/ CHAPTER	TOPIC TO BE COVERED
1st	1st	ELEMENTS OF COMMUNICATION SYSTEMS	Concept of elements of communication process
	2nd		Source of information and communication channels
	3rd		Classification of communication process
	4th		Modulation process
	5th		Need of modulation
2nd	1st		Classification of modulation process
	2nd		Analog and digital signal
	3rd		Concept of signal
	4th		Classification of signal
	5th		Bandwidth limitations
3rd	1st	AMPLITUDE MODULATION SYSTEM	Amplitude modulation
	2nd		Generation of amplitude modulation
	3rd		Linear diode detector and square law detector
	4th		Phase locked loop
	5th		SSB signal
4th	1st		Ring modulator
	2nd		Synchronous detection
	3rd		Synchronous detection method
	4th		Concept of balanced modulator
	5th		Concept of balanced modulator
5th	1st		Expression of AM modulation
	2nd		DSB SC signal
	3rd		DSBSC signal
	4th		VSB modulation
	5th		VSB modulation
6th	1st	ANGLE MODULATION SYSTEM	Concept of angle modulation
	2nd		Types of angle modulation
	3rd		Basic principles of frequency modulation
	4th		Expression of FM modulation
	5th		Explain phase modulation
7th	1st		Difference between FM and PM modulation
	2nd		Working principles of armstrong method
	3rd		Working principles of forster seeley method
	4th		Working principles of foster seeley method
	5th		Block diagram of ratio detector

	1st		Classification of radio receiver.
	2nd		Definition of selectivity, sensitivity, noise and fidelity

8th	3rd	AM & FM TRANSMITTER & RECEIVER	working principles of AM transmitter
	4th		Concept of frequency convention
	5th		RF and IF amplifier
9th	1st		S/ N ratio
	2nd		Block diagram of superheterodyne radio receiver
	3rd		Working of FM transmitter and receiver
	4th	ANALOG TO DIGITAL CONVERSATION & PULSE MODULATION SYSTEM	Concept of sampling theorem
	5th		Nyquist rate and aliasing
10th	1st		Sampling techniques
	2nd		Generation and detection of PAM
	3rd		Generation and detection of PPM
	4th		Generation and detection of PWM
	5th		Quantization of signals
11th and 12 th	1st		Quantization errors
	2nd		Generation and detection of PCM system
	3rd		Companding in PCM and Vocoder
	4th		Operation of time division multiplexing
	5th		Generation and detection of delta modulation
13th and 14th	1st		Block diagram of DPCM
	2nd		Detection of DPCM
	3rd		Comparison between PCM and DPCM
	4th		Comparison between DM and ADM
	5th		Application of PCM
15th and 16 th	1st	DIGITAL MODULATION TECHNIQUES	Basic concepts of Multiplexing
	2nd		Difference between FDM and TDM
	3rd		Advantages of digital communications systems
	4th		Digital modulation technique
	5th		Generation AND Detection of ASK
17th	1st		Generation and detection of FSK
	2nd		Generation and detection of PSK
	3rd		Generation and detection of QPSK
	4th		Working of T1 carrier system
	5th		Spread spectrum and applications
18th	1st		Working principles of DS SS and FH SS
	2nd		Bit, Baud, symbol and channel capacity
	3rd		Application of different modulation schemes
	4th		Types of MODEM
	5th		Application of MODEM

SUBJECT:	Wave Propagatoin and Broadband Communication Engg(Th4)			**A.Y: 2025-26**
SEM:	3	**DURATION**	14-07-2025 TO 15-11-2025	
Faculty Name:		Deepika Panda(Lect ETC)	**Dept:**	ETC

Week No.	Class No.	Unit & Topic	Hours	Remarks
	1. WAVE PROPAGATION & ANTENNA.			**[12 Periods]**
1	1	Effects of environments such as reflection, refraction, interference, diffraction, absorption and attenuation (Definition only)	1	Discussion on EM Wave Spectrum and Definition of effects
	2	Classification based on Modes of Propagation-Ground wave, Ionosphere	1	Discussion on Frequecny ranges and Ground wave propagation
	3	Sky wave propagation, Spacewave propagation	1	Explanation, Applications
	4	Definition – critical frequency, max. useable frequency, skip distance, fading	1	Definitions with diagrams
2	5	Definition – Duct propagation & Troposphere scatter propagation actual height and virtual height	1	Explanation, Applications
	6	Radiation mechanism of an antenna-Maxwell equation	1	Explanation
	7	Definition - Antenna gains, Directive gain, Directivity, effective aperture, polarization, input impedance,	1	Definitions with diagrams
	8	Definition-efficiency, Radiator resistance, Bandwidth, Beam width, Radiation pattern	1	Definitions with diagrams
3	9	Antenna -types of antenna: Mono pole and dipole antenna and omni directional antenna	1	Illustraion and explaination and applications
	10	Operation of following antenna with advantage & applications. a) Directional high frequency antenna :Yagi & Rohmbus only	1	Illustraion and explaination and applications
	11	Operation of following antenna with advantage & applications. b) UHF &Microwave antenna.: Dish antenna (with parabolic reflector) & Horn antenna	1	Illustraion and explaination and applications
	12	Basic Concepts of Smart Antennas-Concept and benefits of smart antennas	1	Illustraion and explanation and applications
	2. TRANSMISSION LINES.		**[10 periods]**	

4	13	Fundamentals of transmission line.	1	Discussion and checking on previous knowledge
	14	Equivalent circuit of transmission line ,General equivalent circuit &RF equivalent circuit	1	Explanation
	15	Derive equation for primary & secondary constant of X-mission line.	1	Derivation, explanation
	16	Derive equation for primary & secondary constant of X-mission line.	1	Derivation, explanation
5	17	Characteristics impedance, simple numerical	1	Definitions and numerical solving
	18	Reflection coefficient, simple numerical.	1	Definitions and numerical solving
	19	Standing wave – SWR, VSWR	1	Definitions and numerical solving
	20	Quarter wave & half wavelength line	1	Explanation
6	21	Impedance matching & Stubs – single & double	1	Explanation
	22	Losses in transmission line	1	Explanation
	3. TELEVISION ENGINEERING		**[13 periods]**	
	23	State and explain the following terms.- Aspect ratio, Rectangular Switching. Flicker,Resolution,	1	Definition with examples
	24	State and explain the following terms.- Resolution, Video bandwidth, Interlaced scanning	1	Explanation
7	25	State and explain the following terms.- Composite video signal, Synchronization pulses	1	Explanation
	26	Draw the block diagram of TV transmitter and explain the function of each block.	1	Explanation with blcok diagram
	27	Draw the block diagram of TV transmitter and explain the function of each block.	1	Explanation with blcok diagram
	28	Draw the block diagram of Monochrome TV Receiver and explain the function of each block.	1	Explanation with blcok diagram
	29	Draw the block diagram of Monochrome TV Receiver and explain the function of each block.	1	Explanation with blcok diagram
	30	Colour TV signals (Luminance Signal & Chrominance Signal,(I & Q,U & V Signals)	1	Explanation

8	31	Types of Televisions by Technology-cathode-ray tube TVs, Plasma Display Panels, Digital Light Processing (DLP),Liquid Crystal Display (LCD),Organic Light-Emitting Diode (OLED) Display, Quantum Light-Emitting Diode (QLED) – only Comparison based on application	1	Detailed comparison
	32	Types of Televisions by Technology-cathode-ray tube TVs, Plasma Display Panels, Digital Light Processing (DLP),Liquid Crystal Display (LCD),Organic Light-Emitting Diode (OLED) Display, Quantum Light-Emitting Diode (QLED) – only Comparison based on application	1	Detailed comparison
9	33	Discuss the principle of operation - LCD display, Large Screen Display	1	Explanation
	34	CATV systems & Types & networks	1	Explanation
	35	Explain (Digital TV Signals, Transmission of digital TV signals & Digital TV receivers Video programme processor unit.	1	Explanation
	4. MICROWAVE ENGINEERING			**[15 periods]**
	36	Define Microwave Wave Guides.	1	Explanation
10	37	Discuss propagation of EM wave through wave guide with TE&TM modes.	1	Explanation with diagram
	38	Discuss propagation of EM wave through wave guide with TE&TM modes.	1	Explanation with diagram
	39	Explain the operation of rectangular wave gives and its advantage.	1	Explanation with diagram
	40	Explain the operation of rectangular wave gives and its advantage.	1	Explanation with diagram
11	41	Explain circular wave guide.	1	Explanation with diagram
	42	Discuss the operational Cavity resonator.	1	Explanation with diagram
	43	Discuss the operational Cavity resonator.	1	applications and types
	44	Discuss the operational of Directional coupler	1	Explanation with diagram
12	45	Discuss the operational of Isolators & Circulator.	1	Explanation with diagram
	46	Discuss the principle of operational of two Cavity Klystron.	1	Explanation with diagram
	47	Discuss the principle of Travelling Wave Tubes	1	Explanation with diagram

	48	Discuss the principle of Cyclotron	1	Explanation with diagram
13	49	Discuss the principle of Tunnel Diode	1	Explanation with diagram
	50	Discuss the principle of Gunn Diode	1	Explanation with diagram
	5. BROADBAND COMMUNICATION			**[10 periods]**
	51	Fundamental concepts Components of Broadband communication system,	1	Fundamentals and recap
	52	Network architecture of Broadband communication system,	1	Explanation with diagram
14	53	Cable broadband data network architecture, importance	1	Explanation with diagram
	54	future of broadband telecommunication internet based network.	1	Fundamentals discussion
	55	SONET(Synchronous Optical Network)-Signal frame components	1	Explanation with diagram
	56	SONET(Synchronous Optical Network)-topologies advantages applications,and disadvantages	1	applications, advantages and disadvantages
15	57	ISDN - ISDN Devices interfaces, services,	1	Tyeps and the need
	58	ISDN - ISDN Devices Architecture, applications	1	Explanation with diagram
	59	BISDN -interfaces & Terminals,	1	Explanation with diagram
	60	BISDN - protocol architecture applications	1	Explanation with diagram

SUBJECT:	POWER ELECTRONICS AND PLC		A.Y: 2025-26
SEM:	3	DURATION	14-07-2025 TO 15-11-2025
Faculty Name:	PRAKASH CHANDRA SETHI(Sr Lect ETC)	Dept:	ETC

Week	Class No.	Unit & Topics	Subtopics / Content	Hours	Remarks
1	UNIT-I: CONSTRUCTION AND WORKING OF POWER ELECTRONIC DEVICES				
	1	Introduction to Power Electronics	Applications & need for PE	1	Lecture
	2	Power Diode	Construction, VI characteristics	1	Diagram, Q&A
	3	SCR	Construction, operation, VI characteristics	1	Chart, Explanation
	4	DIAC & TRIAC	Working and characteristics	1	Device model
2	5	Power MOSFET	Construction, working	1	Animation, Notes
	6	GTO & IGBT	Characteristics and Applications	1	Comparative chart
	7	SCR – Two Transistor Analogy	Working & triggering	1	Diagram-based
	8	SCR – Gate & Switching Characteristics	Turn-on, turn-off behavior	1	Graphical explanation
3	9	SCR – Turn ON Methods	Gate triggering methods	1	Lecture
	10	SCR – Turn OFF Methods	Line, Forced, Load, Resonant	1	Block diagrams
	11	SCR Ratings	Voltage & current ratings	1	Data sheet reading
	12	SCR Protection	OV, OC, Gate protection	1	Discussion
4	13	Snubber Circuit Design	Layout & purpose	1	Circuit drawing
	UNIT-II: THE WORKING OF CONVERTERS, AC REGULATORS AND CHOPPERS.				
	14	Firing Circuits – General Layout	Components & working	1	Circuit chart
	15	R and RC Firing Circuits	Principle & behavior	1	Board explanation
	16	UJT and Ramp Triggering	Working & waveforms	1	Graphs
5	17	Phase Angle Control	Principle & application	1	Board work
	18	Semi Converter	Single quadrant control	1	Diagram
	19	Full Converter	Two quadrant control	1	Numerical
	20	Dual Converter	Basics of four quadrant control	1	Lecture
6	21	1-Phase Half-Wave Controlled Converter	R and RL load	1	Waveform analysis
	22	Freewheeling Diode	Function & need	1	Practical demo
	23	1-Phase Fully Controlled Converter	R and RL load	1	Examples
	24	3-Phase Half-Wave Converter	R load analysis	1	Diagram
7	25	3-Phase Fully Controlled Converter	Circuit & working	1	Problem-solving
	26	1-Phase AC Regulator	Working principle	1	Lecture
	27	Step-Up Chopper	Operation & waveform	1	Chalk & Talk
	28	Step-Down Chopper	Applications	1	Real-world example
8	29	Chopper Control Modes	Control strategies	1	Illustration
	30	4-Quadrant Chopper	Operation & application	1	Simulation
	UNIT-III: THE INVERTERS AND CYCLO-CONVERTERS				
	31	Inverter Classification	Types overview	1	Lecture
	32	Series & Parallel Inverter	Working principle	1	Diagram
9	33	Single Phase Bridge Inverter	Circuit & operation	1	Circuit analysis
	34	Cyclo-converter Principle	Basic idea	1	Simple model
	35	Step-Up Cyclo-converter	Working explanation	1	Chart
	36	Step-Down Cyclo-converter	Operation and control	1	Q&A

10	37	Applications of Cyclo-converters	Industrial examples	1	Use-case
	UNIT-IV: APPLICATIONS OF POWER ELECTRONIC CIRCUITS				
	38	Applications of PE Circuits	Overview	1	Class discussion
	39	DC Motor Speed Factors	Affecting parameters	1	Tabular
	40	DC Shunt Motor Control	Using converters	1	Numerical
11	41	DC Motor Control using Chopper	Performance curve	1	Lecture
	42	AC Motor Speed Factors	List and effect	1	Brainstorming
	43	AC Voltage Regulator for Speed Control	Concept	1	Practical
	44	V/f Control using Inverter	Block diagram	1	PPT
12	45	UPS – Block Diagram	Functioning of UPS	1	Explain with sketch
	46	Battery Charger using SCR	Diagram & working	1	Diagram
	47	SMPS – Working	Step-by-step process	1	Multimedia
	48	SMPS – Applications	Usage in systems	1	Assignment
13	**UNIT-V: PLC AND ITS APPLICATIONS**				
	49	PLC Introduction	Need, use, structure	1	Talk + Notes
	50	PLC Block Diagram	Parts and functions	1	Board drawing
	51	PLC Advantages & Applications	Where and why PLC?	1	Case studies
	52	PLC Contact Types	NO, NC, Latch, Branching	1	Explanation
14	53	Ladder Logic Basics	AND, OR, NOT diagrams	1	Hands-on
	54	Ladder Diagrams – Complex	NAND, NOR combinations	1	Practice
	55	PLC Timers	TON, TOFF, Retentive	1	Simulation
	56	PLC Counters	CTU, CTD	1	Virtual lab
15	57	Ladder using Timer/Counter	Real examples	1	Practice session
	58	DOL and Star-Delta Ladder	Logic development	1	Task-based
	59	Staircase/Traffic/Temp Control	Ladder programming	1	Activity
	60	SCADA/DCS/DDC – Basics	Concepts and overview	1	Summary, Review