Sharnbasva University, Kalaburagi

Scheme of Teaching and Examination2022-23

[As per NEP, Outcome Based Education(OBE) and Choice Based Credit System(CBCS) Scheme]

(Effective from the academic year 2022-23)

Programme:B.Tech: Electronics and Communication Engineering

VII SEMESTER

Sl. No.	Course Code		Course Title	Teaching Department	Teaching Hours/week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	PCC	22EC71	Computer Networks	ECE	3			3	50	50	100	03
2	PCC	22EC72	Mobile Communication and Networks	ECE	3			3	50	50	100	03
3	PCC	22EC73	Digital Image Processing	ECE	3			3	50	50	100	03
4	PEC	22EC74X	Professional Elective Course-IV	ECE	3			3	50	50	100	03
5	OEC	22XX75X	Open Elective Course-III	ECE	4			3	50	50	100	04
6	PCC	22ECL76	Computer Networks Laboratory	ECE			2	3	50	50	100	01
7	PCC	22ECL77	Digital Image Processing Laboratory	ECE			2	3	50	50	100	01
8	PEC	22ECL78X	Professional Elective Course-IV Laboratory	ECE			2	3	50	50	100	01
9	PW	22PRJ79	Project-VII	ECE			2	3	50	50	100	01
10	HSS	22HSM710	Industrial Psychology and Organizational Behaviour	Humanities	1			3	50	50	100	01
Total					**17**	**0**	**8**	**30**	**500**	**500**	**1000**	**21**

Note: PCC-Professional Core Course, PEC-Professional Elective Course, OEC-Open Elective Course, PW-Project Work, HSS-Humanity and Social Science, AEC- Ability Enhancement Course, OC-Online Course.

Project(PRJ): A batch of 4 to 5 students (Same branch or different branches) with a guide, may undertake one project (1 hour of theory/tutorial or two hours of practice /activities.

Professional Elective Course-4			
Course code under 22EC74X	**Course Title**	**Course code under 22ECL78X**	**Course Title**
22EC741	Power Electronics	22ECL781	Power Electronics Laboratory
22EC742	Low Power VLSI Design	22ECL782	Low Power VLSI Design Laboratory

Open Elective Course-3	
Course code under 22XX75X	**Course Title**
22EC751	E-Waste Management
22EC752	Domestic Electronics Equipment Maintenance
22EC753	Research Methodology

AICTE Activity Points : In case students fail to earn the prescribed activity points, Eighth semester Grade Card shall be issued only after earning the Required activity points. Student shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

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Scheme of Teaching and Examination2022-23

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(Effectivefromtheacademicyear2022-23)

Programme: B.Tech:Electronics and Communication Engineering

VIII SEMESTER

Sl. No.	Course Code		Course Title	Teaching Department	Teaching Hours/week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	Project	22PRJ81	Research Project / Field Project - VIII	ECE	0	0	16	3	50	50	100	08
2	Internship	22ECI82	Internship	ECE	0	0	12	3	50	50	100	06
Total					**0**	**0**	**30**	**06**	**100**	**100**	**200**	**14**

Note:PCC-Professional Core Course,PEC-ProfessionalElectiveCourse,OEC-OpenElectiveCourse,PW-ProjectWork,HSS-HumanityandSocialScience, AEC-Ability Enhancement Course.

Project(PRJ): A batch of 4 to 5 students (Same branch or different branches) with a guide, may undertake one project (1 hour of theory/tutorial or two hours of practice /activities.

Note: Project-8 Manufacturable and marketable project / Research project/Field Project.

COMPUTER NETWORKS

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]
SEMESTER-VII

Subject Code	22EC71	CIE Marks	50
Number of Lecture Hour/Week	3L	SEE Marks	50
Total Number of Lecture Hours	40 Hours	Exam Hours	03

CREDITS-03

Course Objectives: This course will enable students to:

- Understand the layering architecture of OSI reference model and TCP/IP protocol suite.
- Understand the protocols associated with each layer.
- Learn the different networking architectures and their representations.
- Learn the various routing techniques and the transport layer services.

Modules	Teaching Hours
Module -1	
Introduction: Data Communications: Components, Representations, Data Flow. **Networks**: Physical Structures, Network Types: LAN, WAN, Switching, The Internet. **Network Models:** Protocol Layering: Scenarios, Principles, Logical Connections, TCP/IP Protocol Suite: Layered Architecture, Layers in TCP/IP suite, Description of layers, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing, The OSI Model: OSI Versus TCP/IP. Text 1: 1.1,1.2,1.3,2.1,2.2,2.3.	**08 Hours**
Module -2	
Data-Link Layer: Introduction: Nodes and Links, Services, Categories' of link, Sublayers, Link Layer addressing: Types of addresses, ARP. **Data Link Control (DLC)**: services, Framing, Flow and Error Control, Data Link Layer Protocols: Simple Protocol, Stop and Wait protocol, Piggybacking. **Media Access Control:** Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA. Controlled Access: Reservation, Polling, Token Passing, Channelization. Text 1: 9.1,9.2,11.1,11.2,12.1,12.2,12.3.	**08 Hours**
Module -3	
Connecting Devices: Hubs, Switches, Routers. **Virtual LANs:** Membership, Configuration, Communication between Switches and Routers, Advantages. **Network Layer:** Introduction, Network Layer services: Packetizing, Routing and Forwarding, Other services, Packet Switching: Datagram Approach, Virtual Circuit Approach, IPV4 Addresses: Address Space, Classful Addressing, Classless Addressing, DHCP, Network Address Resolution, Forwarding of IP Packets: Based on destination Address and Label. Text 1: 17.1, 17.2,18.1,18.2,18.4,18.5	**08 Hours**
Module -4	
Network Layer Protocols: Internet Protocol (IP): Datagram Format, Fragmentation, Options, Security of IPv4 Datagrams, ICMPv4: Messages, Debugging tools, ICMP checksum. Mobile IP: Addressing, Agents, Three Phases, **Unicast Routing:** Introduction, Routing Algorithms: Distance Vector Routing, Link State Routing, Path vector routing, Unicast Routing Protocol: Internet Structure, Routing Information Protocol, Open Shortest Path First, Border Gateway Protocol Version 4. Text 1: 19.1,19.2,19.3, 20.1,20.2,20.3	**08 Hours**

Module-5	
Transport Layer: Introduction: Transport Layer Services, Connectionless and Connection oriented Protocols, **Transport Layer Protocols:** Simple protocol, Stop and wait protocol, Go-Back-N Protocol, Selective repeat protocol, **User Datagram Protocol**: User Datagram, UDP Services, UDP Applications, **Transmission Control Protocol:** TCP Services, TCP Features, Segment, Connection, State Transition diagram, Windows in TCP, Flow control, Error control, TCP congestion control. Text 1: 23.1, 23.2,24.1, 24.2, 24.3	**08 Hours**

Course Outcomes: At the end of the course, the students will be able to:

CO1- Demonstrate the fundamental principles of computer networking and the significance of layered network architecture in facilitating communication.

CO2- Identify and analyze the protocols and services associated with the Data Link layer in networking.

CO3- Describe the protocols and functions of the Network layer and their impact on data transmission and routing.

CO4- Analyze and design routing protocols, and evaluate the packet routing process using various routing algorithms.

CO5- Recognize the protocols and services of the Transport layer, and explain their role in supporting communication processes across the network.

Text Books:

1. Data Communications and Networking , Forouzan, 5th Edition, McGraw Hill, 2016
ISBN: 1-25-906475-3

Reference Books:

1. Computer Networks, James J Kurose, Keith W Ross, Pearson Education, 2013, ISBN: 0-273-76896-4

2. Introduction to Data Communication and Networking, Wayarles Tomasi, Pearson Education, 2007, ISBN:0130138282

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	1	-	-	-	-	-	-	-	-	-	-	3	-	-

MOBILE COMMUNICATION AND NETWORKS

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]
SEMESTER-VII

Subject Code	22EC72	CIE Marks	50
Number of Lecture Hour/Week	3L	SEE Marks	50
Total Number of Lecture Hours	40 Hours	Exam Hours	03

CREDITS-03

Course Objectives: This course will enable students to:

- Understand the issues involved in mobile communication system design and analysis.
- Understand the concept of frequency reuse.
- Understand the characteristics of wireless channels.
- Know the fundamental limits on the capacity of wireless channel.

Modules	**Teaching Hours**
Module -1	
Cellular concepts- Cell structure, frequency reuse, cell splitting, channel assignment, handoff, interference, capacity, power control; Wireless Standards: Overview of 2G 3G, 4G and 5G cellular mobile standards.	**08 Hours**
Module -2	
Signal propagation- Propagation mechanism, reflection, refraction, diffraction and scattering, large scale signal propagation and lognormal shadowing. Fading channels- Multipath and small-scale fading- Doppler shift, statistical multipath channel models, narrowband and wideband fading models, power delay profile, average and rms delay spread, coherence bandwidth and coherence time, flat and frequency selective fading, slow and fast fading, average fade duration and level crossing rate. Capacity of flat and frequency selective channels..	**08 Hours**
Module -3	
Multiple access schemes-FDMA, TDMA, CDMA and SDMA. Modulation schemes- BPSK, QPSK and variants, QAM, MSK and GMSK, multicarrier modulation, OFDM.	**08 Hours**
Module -4	
Antennas: antennas for mobile terminal, monopole antennas, PIFA, base station antennas and arrays. Receiver structure- Diversity receivers- selection and MRC receivers, RAKE receiver, equalization: linear-ZFE and adaptive, DFE. Transmit diversity Altamonte scheme. MIMO and space time signal processing, spatial multiplexing, diversity/multiplexing tradeoff.	**08 Hours**
Module-5	
Performance measures- Outage, average snr, average symbol/bit error rate. System examples- GSM, EDGE, GPRS, IS-95, CDMA 2000 and WCDMA, 3G, 4G and 5G mobile communications.	**08 Hours**

Course Outcomes: After studying this course, students will be able to:

CO1-Understand cellular concepts and signal propagation in mobile communication
CO2- Explain the evolution of cellular technologies.
CO3-Analyze the modulation and multiple access schemes.
CO4-Apply the multicarrier modulation techniques for advanced wireless communication systems design.
CO5-Analyze the multiple antenna transmission and reception techniques.

Text/Reference Books

1. Erik Dahlman , 4G, LTE-Advanced Pro and The Road to 5G
2. Sassan Ahmadi, 5G NR: Architecture, Technology, Implementation, and Operation of 3GPP New

Radio Standards Hardcover – 1 June 2019
3. Vijay K. Garg, “Wireless Communication and Networking”, Elsevier, Morgan Kaufmann, Reprinted 2012.
4. Vijay K. Garg, J.E.Wilkes, “Principle and Application of GSM”, Pearson Education, Fifth Impression 2008
5. T.S.Rappaport, “Wireless Communications Principles and Practice”, PHI, II Edition, 2006.
6. William Lee ,”Mobile Cellular Telecommunications: Analog and Digital Systems”, McGraw Hill Education

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-

DIGITAL IMAGE PROCESSING

[As per NEP, Outcome based Education (OBE), and Choice Based Credit System (CBCS) Scheme]
SEMESTER- VII

Course Code	22EC73	CIE Marks	50
Number of Lecture Hour/Week	3L	SEE Marks	50
Number of Lecture Hours	40	Exam hours	03

CREDITS-03

Course Objectives: Students will be taught to:

- Understand the fundamentals of digital image processing.
- Understand the image transforms used in digital image processing.
- Understand the image enhancement techniques used in digital image processing.
- Understand the image restoration techniques and methods used in digital image processing.
- Understand the Morphological Operations used in digital image processing.

Module -1	**Teaching Hours**
Digital Image Fundamentals: What is Digital Image Processing?, Origins of Digital Image Processing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception, Image Sensing and Acquisition. **(Text: Chapter 1and Chapter 2: Sections 2.1to 2.2, 2.6.2)**	08 Hours
Module -2	
Image Enhancement in the Spatial Domain: Image Sampling and Quantization, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations. Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters (Text:Chapter2: Sections 2.3 to 2.62, Chapter3: Sections3.2 to3.6)	08 Hours
Module -3	
Frequency Domain: Preliminary Concepts, The Discrete Fourier Transform (DFT) of TwoVariables, Properties of the 2-DDFT, Filtering in the Frequency Domain, Image Smoothing and Image Sharpening Using Frequency Domain Filters, Selective Filtering. (Text: Cbapter4: Sections 4.2, 4.5 to 4.10)	08 Hours
Module -4	
Restoration: Noise models, Restoration in the Presence of Noise Only using Spatial Filtering and Frequency Domain Filtering, Linear, Position-Invariant degradations Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error(Wiener) Filtering, Constrained Least Squares Filtering. (Text: Chapter 5: Sections 5.2, to 5.9)	08 Hours
Module -5	
Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing. Color Image Processing**:** Color Fundamentals, Color Models, Pseudo color Image Processing. (Text: Chapter 6: Sections 6.1 to 6.3 Chapter 9: Sedions9.1 to 9.3)	08 Hours

Course Outcomes: After studying this course, students will be able to:

CO1-Ability to define the fundamental concepts of digital image processing and to recognize different image processing applications.

CO2- Ability to apply image processing techniques in both the spatial domain.

CO3-Study and analysis of image enhancement in frequency domain.

CO4-Investigate the various noise models and image restoration techniques.

CO5-Ability to learn color image processing and morphological image processing.

Text Books:

1. Digital Image Processing- Rafel C Gonzalez and Richard E. Woods, PHI 3rd Edition 2010.

Refrence Books:

1. Digital Image Processing- S.Jayaraman, S. Esakkirajan,T. Veerakumar, TataMcGrawHill2014.
2. Fundamentals of Digital Image Processing- A K. Jain, Pearson 2004.
3. Image Processing analysis and Machine vision with Mind Tap by Milan Sonka and Roger Boile, Cengage Publications, 2018.

COURSE OUTCOME AND REVISED BLOOM'S TAXONOMY LEVEL MAPPING (Y/N)						
COURSE OUTCOME	**Remember L1**	**Understand L2**	**Apply L3**	**Analyze L4**	**Evaluate L5**	**Create L6**
CO1	Y	Y	N	N	N	N
CO2	Y	Y	N	N	N	N
CO3	Y	Y	Y	N	N	N
CO4	Y	Y	Y	Y	N	N
CO5	Y	Y	Y	Y	Y	Y

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note:1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

POWER ELECTRONICS

[As per NEP, Outcome based Education (OBE), and Choice Based Credit System (CBCS) Scheme]
SEMESTER-VII

Subject Code	22EC741	CIE Marks	50
Number Lecture Hour/Week	3L	SEE Marks	50
Number of Lecture Hours	40	Exam Hours	03

CREDITS-03

Course Objectives The objectives of the course is to enable students to:

- Understand the working of various power devices.
- Study and analysis of thyristor circuits with different triggering techniques.
- Learn the applications of power devices in controlled rectifiers, converters and inverters.
- Study of power electronics circuits under different load conditions.

Modules	Teaching Hours
Module -1 : Introduction & Power Transistors	
Introduction - Applications of Powe,r Electronics, Power Semiconductor Devices, Control Characteristics of Power Devices, types of Power Electronic Circuits. Power Transistors: Power BJTs: Steady state characteristics. Power MOSFETs: device operation, switching characteristics, IGBTs: device operation, output and transfer characteristics. (Text 1)	**08 Hours**
Module -2 : Thyristors	
Thyristors - Introduction, Principle of Operation of SCR, Static Anode-Cathode Characteristics of SCR, Two transistor model of SCR, Gate Characteristics of SCR, Turn-ON Methods, Turn-OFF Mechanism, Turn-OFF Methods: Natural and Forced Commutation . Gate Trigger Circuit: Resistance Firing Circuit, Resistance capacitance firing circuit. (Text 2)	**08 Hours**
Module -3 : Controlled Rectifiers & AC Voltage Controllers	
Controlled Rectifiers - Introduction, principle of phase controlled converter operation, Single phase full converters, Single phase dual converters. AC Voltage Controllers - Introduction, Principles of ON-OFF Control, Principle of Phase Control, Single phase control with resistive and inductive loads. (Text 1)	**08 Hours**
Module -4 : DC-DC Converters	
DC-DC Converters - Introduction, principle of step-down operation and it's analysis with RL load, principle of step-up operation, Step-up converter with a resistive load, Performance parameters, Converter classifications. (Text 1)	**08 Hours**
Module-5 : Pulse Width Modulated Inverters	
Pulse Width Modulated Inverters- Introduction, principle of operation, performance parameters, Single phase bridge inverters, voltage control of single phase inverters, current source inverters, Variable DC-link inverter. (Text 1)	**08 Hours**

Course Outcomes: After studying this course, students will be able to:

CO- Analyze the I-V characteristics of SCR, DIAC and TRIAC.

CO2- Analyze the characteristics of MOSFET, IGBT and UJT.

CO3- Construct and demonstrate the operation of AC voltage controller and differentiate its various configurations.

CO4- Design controllers for dc-dc converters in voltage and peak-current mode

CO5- Apply the different modulation techniques to pulse width modulated inverters and identify the harmonic reduction methods.

Text Books :

1. Mohammad H Rashid, Power Electronics, Circuits, Devices and Applications, 3rd/4th Edition, Pearson Education Inc, 2014, ISBN: 978-93-325-1844-5.
2. M.D Singh and K B Khanchandani, Power Electronics, 2nd Edition, Tata Mc- Graw Hill, 2009, ISBN: 0070583897.

Reference Books :

1. L. Umanand, Power Electronics, Essentials and Applications, John Wiley India Pvt. Ltd, 2009.
2. Dr. P. S. Bimbhra, "Power Electronics", Khanna Publishers, Delhi, 2012.

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):
Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	**3**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	**3**	**3**	**3**	**-**	**-**	**-**	2	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

LOW POWER VLSI DESIGN

[As per NEP, Outcome based Education (OBE), and Choice Based Credit System (CBCS) Scheme]

SEMESTER-VII

Subject Code	22EC732	CIE Marks	50
Number Lecture Hour/Week	3L	SEE Marks	50
Number of Lecture Hours	40	Exam Hours	03

CREDITS-03

Course Objectives: This course will enable students to:

- Know the basics and advanced techniques in low power design which is a hot topic in today's market where the power plays a major role.
- Describe the various power reduction and the power estimation methods.
- Explain power dissipation at all layers of design hierarchy from technology, circuit, logic, architecture and system.
- Apply State-of-the art approaches to power estimation and reduction.
- Practice the low power techniques using current generation design style and process technology

Modules	Teaching Hours
Module -1	
Introduction: Need for low power VLSI chips, charging and discharging capacitance, short circuit current in CMOS leakage current, static current, basic principles of low power design, low power figure of merits.	08 Hours
Module -2	
Simulation Power Analysis: SPICE circuit simulation, discrete transistor modeling and analysis, gate level logic simulation, architecture level analysis, data correlation analysis in DSP systems, Monte Carlo simulation.	08Hours
Module -3	
Probabilistic Power Analysis: Random logic signals, probability & frequency, probabilistic power analysis techniques, signal entropy.	08 Hours
Module -4	
Circuit: Transistor and gate sizing, equivalent pin ordering, network restructuring and reorganization, special latches and flip flops, low power digital cell library, adjustable device threshold voltage.	08 Hours
Module -5	
Logic: Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic (Text 1). **Architecture and System:** Power and Performance Management, Switching Activity Reduction, Parallel Architecture with Voltage Reduction, Flow Graph Transformation.	08 Hours

Course outcomes After studying this course, students will be able to

CO1-Identify and analyze the various sources of power dissipation in CMOS circuits.

CO2- Analysis of power for discrete, gate level and architecture level using SPICE simulation.

CO3- Analysis of probabilistic power techniques and power estimation using signal entropy.

CO4-Design and optimize circuit networks by applying restructuring and reorganization techniques to meet low-power objectives.

CO5-Apply strategies to minimize switching activity for improved energy efficiency and design gate reorganization techniques to boost circuit efficiency and lower power consumption.

Text Book:

1. Gary K. Yeap, "Practical Low Power Digital VLSI Design", Kluwer Academic, 1998.

Reference Books:

1. Kaushik Roy, Sharat Prasad, "Low-Power CMOS VLSI Circuit Design" Wiley, 2000
2. A.P.Chandrasekaran and R.W.Broadersen, "Low power digital CMOS design", Kluwer Academic,1995. 3. A Bellamour and M I Elmasri, " Low power VLSI CMOS circuit design", Kluwer Academic,1995.
3. Jan M.Rabaey, MassoudPedram, "Low Power Design Methodologies" Kluwer Academic, 2010.

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	3	2	-	-	-	-	2	-	-	-	-	-	3	-	-
CO2	2	3	-	-	-	-	2	-	-	-	-	-	3	-	-
CO3	2	3	2	-	-	-	2	-	-	-	-	-	3	-	-
CO4	2	3	3	-	-	-	2	-	-	-	-	-	3	-	-
CO5	2	3	3	-	-	-	2	-	-	-	-	-	3	-	-

E-WASTE MANAGEMENT [NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme] SEMESTER-V			
Subject Code	22EC751	CIE Marks	50
Number Lecture Hour/Week	4L	SEE Marks	50
Number of Lecture Hours	50	Exam Hours	03
CREDITS-04			

Course Objectives: This course will enable students to:

- This course covers an extensive review of e-waste management in India.
- Focus on the evolution of legal frameworks in India and the world, it presents impacts and outcomes; challenges and opportunities; and management strategies and practices to deal with e-waste.
- Pan-India initiatives and trajectories of law-driven initiatives for effective ewaste management along with responses from industries and producers.
- Mitigate e-waste management issues, and helps to generate employment.
- 5. Start E-waste recycling plants, with this the demand for employees with all levels of qualification and skills also increases.

Module -1	**Teaching Hours**
Sustainable development and e-waste management**:** Importance of electrical and electronic equipment in a nation's development, and e-waste as toxic companion of digital era, I: Let's understand e-waste, II: E-waste statistics: quantities, collection and recycling, E-waste categories and harmonising statistics, III: An overview on status of e-waste related legislation across the globe; IV: UN initiatives for e-waste management: creating partnerships and achieving Agenda 2030; V: Indian scenario: e-waste generation, collection and recycling.	10 Hours
Module -2	
Extended producer responsibility: a mainstay for e-waste management: Evolution of concept of 'extended producer responsibility', EPR applied for waste management and extended for e-waste, management, EPR: goals, implementation, and challenges for e-waste management, EPR implemented for e-waste management under the existing regulatory frameworks in different countries, Role of a PRO prescribed in regulatory framework, Considerations for successful implementation of EPR, Challenges in implementation of EPR for e-waste management, Impact of EPR, EPR and e-waste management in India. Toxicity and impacts on environment and human health: Toxicity, recycling, and regulations, I: Environmental concerns, II: Human health concerns.	10 Hours
Module -3	
Treating e-waste, resource efficiency, and circular economy: Safe environment, resource use, and circular economy, Circular economy: recycling, resource recovery, and resource efficiency, Potentials of urban mining in circular economy, Recycling and resource efficiency related challenges to the circular economy, Urban mining, recycling, resource use, resource efficiency, and circular economy in India. E-waste management through legislations in India: I: Historical backdrop of regulatory regime for e-waste in India, II: E-waste (management) Rules, 2016 and E-waste (management) Amendment Rules, 2018, III: Analysing performance of EPR and CPCB as regulatory mechanisms, IV: Legal cases and judicial directives.	10 Hours
Module -4	
Strategies and initiatives for dealing with e-waste in India: I:Overview of pan-India initiatives for dealing with e-waste during 2000 and 2012, II: Law-driven e-waste management – initiatives by the government, non-government agencies, and judiciary.	10 Hours

Module -5	
Moving towards horizons: I: Legal and judicial domain, II: Economic concerns, III: Environment concerns, IV: Recycling culture/recycling society	10 Hours

Course outcomes: After studying this course, students will be able to:

CO1-Understand the existing discourse on e-waste and its management, statistics across the world, opportunities, and challenges w.r.t. regulatory framework, SDGs, CE, and LCIA (Life Cycle Impact Assessment) and MFA (Material Flow Analysis), Indian scenario.

CO2-Describe EPR, a regulatory framework for achieving specified goals across different countries and impacts on environment and human health.

CO3-Explain themes in the context of resource use and sustainable development. Urban mining, informal sector operations and need for resource use policy, financial support for recycling infrastructure building, etc. in Indian context and also explain to what extent – different aspects of e-waste management have been incorporated in the existing regulatory framework in comparison with international legislatures.

CO4-Identify and infer pan-Indian initiatives dealing with e-waste management, ranging from building knowledge base through research and social action by different stakeholders to technological and legal advancements, and industrial initiatives. Analyse roadmap for the Agenda 2030.

CO5-Use opportunities and challenges around four domains: legal and judicial domain; economic concerns; recycling culture/society; and environment concerns.

Reference Books:

1. Varsha Bhagat Gangulay, 'E-Waste Management', Taylor and Francis, 2022.
2. https://link.springer.com/book/10.1007/978-3-030-14184-4 3.
3. https://rajyasabha.nic.in/rsnew/publication_electronic/E-Waste_in_india.pdf
4. https://greene.gov.in/wp-content/uploads/2018/01/E-waste-Vol-II-E-waste-Management-
5. Manual.pdf •https://nptel.ac.in/courses/105105169

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	-	-	-	-	-	3	3	2	-	-	-	2	-	-	3
CO2	-	-	-	-	-	3	3	2	-	-	-	2	-	-	3
CO3	-	-	-	-	-	3	3	2	-	-	-	2	-	-	3
CO4	-	-	-	-	-	3	3	2	-	-	-	3	-	-	3
CO5	-	-	-	-	-	3	3	3	-	-	-	3	-	-	3

DOMESTIC ELECTRONICS EQUIPMENT MAINTENANCE

[NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-VII

Subject Code	22EC752	CIE Marks	50
Number Lecture Hour/Week	4L	SEE Marks	50
Number of Lecture Hours	50	Exam Hours	03

CREDITS-04

Course Objectives: This course will enable students to:

- Understand the working principle of domestic equipments.
- Identify the common faults that occurs in the domestic equipment.
- Understand the electronics peripheral components of the equipment
- Able to carry out minor repairs in the equipments.
- 5. Understand the technical specifications of the equipments.

Module -1	**Teaching Hours**
Microwave Oven: Working, parts, Common faults and their troubleshooting: Microwave does not heat, runs then stops, buttons do not work, plate do not spin, bulb does not turn ON during operation, sparking inside, shuts OFF after few seconds. Demonstrate the working of microwave oven.	10 Hours
Module -2	
Geyser: Construction and working, parts and types. Common faults and their troubleshooting: Dripping geyser overflow, overheating, steam or hot water escaping from overflow, water leaking through the ceiling, no hot water, water not hot enough, poor hot water pressure. Demonstrate the working of Geyer.	10 Hours
Module -3	
Induction Cooker: Construction and working, parts and types. Common faults and their troubleshooting: Cooker fuse blown, cooker buttons not working, cook top shuts off while cooking, food not get cooked or heated properly, overheating and uneven heating, display keep flashing, weird noises, crackling, fan noise, humming sound, clicking. Demonstrate the working of induction cooker.	10 Hours
Module -4	
Refrigerator: Working, electrical wiring diagram, types of refrigerator. Common faults and their troubleshooting: Fridge not cooling, fridge not defrosting, leaking water, freezing food light not working, freezer is cooled but fridge stays warm, dead refrigerator, not enough cooling, keeps running, leakage, makes noise. Replacement procedure for: seal (gasket), evaporator fan motor, PTC relay, thermostat, compressor, bulb. Demonstrate the working of refrigerator.	10 Hours
Module -5	
Air Conditioner: Working, electrical wiring diagram, types. Common Faults and their Trouble shooting: Faults in following parts of AC: Filter, thermostat, refrigerant leaks, breakers, capacitors, compressor, evaporator coils, condenser coils, and warm contactor. General faults : AC unit has an odour, shuts ON and OFF repeatedly, does not blow cold air, repeatedly tripping a circuit breaker, indoor unit is leaking water inside the room, outdoor unit is making an unusually loud sound, room is not getting cold enough, AC not turning ON. Demonstrate the working of air conditioner.	10 Hours

Course outcomes: After studying this course, students will be able to:

CO1-Comprahend the working principle of domestic electronics equipments.

CO2-Apply the concept common faults to identify the faults and carryout the minor repairs in the domestic equipment.

CO3-Analyze a given scenario and use appropriate techniques to repair the domestic electronics equipments.
CO4-Demonstrate the working of various domestic electronics equipments.
CO5-Investigate the working principle of various other domestic electronics equipments available in the literature and submit the report in a team.

Reference Books:

1. R. G. Gupta, "Electronic instruments and systems: Principles, maintenance and troubleshooting," TMH, 2001.
2. R. S. Khandpur, "Troubleshooting Electronic Equipment: Includes Repair & Maintenance," TMH, 2013.
3. G. C. Loveday, "Electronic fault diagnosis," Pearson Education, 1994

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**2**	**-**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	**3**	**3**	**-**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	**3**	**3**	**-**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	**3**	**3**	**-**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	**3**	**3**	**-**	**-**	**-**	**2**	**2**	**-**	**3**	**3**	**-**	**-**	**3**	**-**	**-**

RESEARCH METHODOLOGY

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER-I

Subject Code	21RM15	CIE Marks	50
Number Lecture Hour/Week	03	SEE Marks	50
Number of Lecture Hours	40	Exam Hours	03

CREDITS-02

Course objectives:

- To give an overview of the research methodology and explain the technique of defining a research problem.
- To explain the functions of the literature review in research.
- To explain carrying out a literature search, its review, developing theoretical and conceptual frameworks and writing a review.
- To explain various research designs and their characteristics.
- To explain the details of sampling designs, and also different methods of data collections.
- To explain the art of interpretation and the art of writing research reports.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India.	**08 Hours**	**L1,L2**
Module -2		
Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration. **Reviewing the literature:** Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.	**08 Hours**	**L1,L2**
Module -3		
Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. **Design of Sample Surveys:** Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.	**08 Hours**	**L1,L2, L3**
Module-4		
Data Collection: Collection of Primary Data, Collection of data through questionnaires, Collection of data through schedules, Difference between questionnaires and schedules, Some other methods of data collection, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.	**08 Hours**	**L1, L2, L3**
Module-5		
Interpretation and Report Writing: Meaning of Interpretation,	**08 Hours**	**L1, L2, L3**

Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.		

Course outcomes:At the end of the course the student will be able to:

CO1-Discuss research methodology and the technique of defining a research problem

CO2-Understand the functions of the literature review in research, carrying out a literature search.

CO3-Awareness about various research designs and their characteristics.

CO4-Understand the significance of data collection in research.

CO5-Describe art of interpretation and art of writing research reports.

Textbooks:

1. Research Methodology: Methods and Techniques C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.
2. Research Methodology step-by- Research Methodology step-by- Ranjit Kumar, SAGE Publications Ltd, 3rd Edition, 2011.
3. Study Material (For the topic Intellectual Property under module 5) Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body under an Act of Parliament, September 2013.

Reference Books:

1. Research Methods: the concise knowledgebase Trochim, Atomic Dog Publishing 2005.
2. Conducting Research Literature Reviews: From the Internet to Paper, Fink A Sage Publications 2009.

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO3
CO1	-	-	-	-	-	-	1	3	3	3	-	-	-	-	**3**
CO2	-	-	-	-	-	-	1	3	3	3	-	-	-	-	**3**
CO3	-	-	-	-	-	-	1	3	3	3	-	-	-	-	**3**
CO4	-	-	-	-	-	-	1	3	3	3	-	-	-	-	**3**
CO5	-	-	-	-	-	-	2	3	3	3	-	-	-	-	**3**

COMPUTER NETWORKS LAB

[NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-VII

Subject Code	22ECL76	CIE Marks	50
Number Lab practice Hour/Week	02	SEE Marks	50
Total Number of Hours	24	Exam Hours	03

CREDITS-01

Course Objectives: This course will enable students to:

- Choose suitable tools to model a network and understand the protocols at various OSI reference levels.
- Design a suitable network and simulate using a Network simulator tool.
- Simulate the networking concepts and protocols using C/C++ programming.
- Model the networks for different configurations and analyze the results.

Laboratory Experiments

PART-A:

Implement the following in C/C++

1. Write a program for a HLDC frame to perform the Bit stuffing.
2. Write a program for a HLDC frame to perform the Character stuffing.
3. Write a program for Distance vector algorithm to find suitable path for transmission.
4. Implement Dijkstra's algorithm to compute the shortest routing path.
5. For the given data, use CRC-CCITT polynomial to obtain CRC code. Verify the program for the cases
   a. Without error
   b. With error
6. Implementation of Stop and Wait Protocol.
7. Implementation of Sliding Window Protocol.
8. Write a program for congestion control using leaky bucket algorithm.

PART-B:

Simulation experiments using NS2/ NS3/ OPNET/ NCTUNS/ NetSim/QualNet or any other equivalent tool

1. Implement a point to point network with four nodes and duplex links between them. Analyze the network performance by setting the queue size and varying the bandwidth.
2. Implement a four node point to point network with links n0-n2, n1-n2 and n2-n3.
Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP/UDP.
3. Implement Ethernet LAN using n (6-10) nodes. Compare the throughput by changing the error rate and data rate.
4. Implement Ethernet LAN using n nodes and assign multiple traffic to the nodes and obtain congestion window for different sources/ destinations.
5. Implementation of Link state routing algorithm.

Course Outcomes: After studying this course, the students will be able to:

CO1-Develop a strong foundation in applying theoretical concepts by designing /simulating the experiment.

CO2- Utilize laboratory instruments/simulation tools to build and test experiments.

CO3-Analyse experimental data/simulation results and interpret findings to draw meaningful conclusions.

CO4-Learn to work effectively in teams while identifying and correcting faults in electronic circuits/programs.

CO5-Manage time effectively in a simulation/laboratory environment, balancing experimental work, data collection, and report writing within specified deadlines.
Reference Book 1. Data Communications and Networking , Forouzan, 5th Edition, McGraw Hill, 2016 ISBN: 1-25-906475-3. 2. Computer Networks, James J Kurose, Keith W Ross, Pearson Education, 2013, ISBN: 0-273-76896

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO2	**2**	**3**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**-**
CO5	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**-**	**-**	**3**	**-**

POWER ELECTRONICS LAB

[NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-VII

Subject Code	22ECL771	CIE Marks	50
Number Lecture Hour/Week	02	SEE Marks	50
Number of Practical Hours	24	Exam Hours	03

CREDITS-01

Any five experiments from the below list must be simulated using the spice-simulator.

Course objectives: This laboratory course enables students to get practical experience in design, assembly, testing and evaluation of:

1. SCR, DIAC Static characteristics
2. Static characteristics of MOSFET and IGBT
3. Controlled Rectifiers
4. SCR Turn off & UJT firing circuit circuits.
5. Voltage (Impulse) commutated choppers.
6. AC voltage controllers & controlled rectifiers.
7. Speed control of universal & stepper motor.

Experiments

1. Static characteristics of SCR and DIAC.
2. Static characteristics of MOSFET and IGBT
3. Controlled HWR and FWR using RC triggering circuit
4. SCR turn off using
    a. LC circuit
    b. ii) Auxiliary Commutation
5. UJT firing circuit for HWR and FWR circuits.
6. Generation of firing signals for thyristors/ trials using digital circuits/ microprocessor.
7. AC voltage controller using triac – diac combination.
8. Single phase Fully Controlled Bridge Converter with R and R-L loads.
9. Voltage (Impulse) commutated chopper both constant frequency and variable frequency operations.
10. Speed control of universal motor.
11. Speed control of stepper motor.

Course Outcomes: After studying this course, the students will be able to:

CO1-Develop a strong foundation in applying theoretical concepts by designing /simulating the experiment.

CO2-Utilize laboratory instruments/simulation tools to build and test experiments.

CO3- Analyse experimental data/simulation results and interpret findings to draw meaningful conclusions.

CO4-Learn to work effectively in teams while identifying and correcting faults in electronic circuits/programs.

CO5-Manage time effectively in a simulation/laboratory environment, balancing experimental work, data collection, and report writing within specified deadlines.

Text Books :

1. Mohammad H Rashid, Power Electronics, Circuits, Devices and Applications, 3rd/4th Edition, Pearson Education Inc, 2014, ISBN: 978-93-325-1844-5.

2. M.D Singh and K B Khanchandani, Power Electronics, 2nd Edition, Tata Mc- Graw Hill, 2009, ISBN: 0070583897.

Reference Books :

1. L. Umanand, Power Electronics, Essentials and Applications, John Wiley India Pvt. Ltd, 2009.
2. Dr. P. S. Bimbhra, "Power Electronics", Khanna Publishers, Delhi, 2012.

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	3	2	3	-	-	-	-	-	-	-	-	-	-	3	-
CO2	2	3	1	-	3	-	-	-	-	-	-	-	-	3	-
CO3	2	3	2	-	-	-	-	-	-	-	-	-	-	3	-
CO4	2	3	2	-	-	-	-	3	3	2	-	-	-	3	-
CO5	2	2	2	-	-	-	-	3	-	3	3	-	-	3	-

LOW POWER VLSI DESIGN LAB

[NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-VII

Subject Code	22ECL772	CIE Marks	50
Number Lab practice Hour/Week	02	SEE Marks	50
Total Number of Hours	20	Exam Hours	03

CREDITS-01

Course Objectives: This course will enable students to:

- Understand the different parameters which are going to effect on power.
- Understand the different types of power dissipations.
- Learn different types of low power VLSI designs techniques.
- Learn the use of different EDA tools.
- Understand the design and realization of CMOS Digital circuits.

Laboratory Experiments

Following Experiments to be done using Mentor Graphics/Cadence Tool/ Spice Tool

Design, simulate and estimate the power dissipation for following circuits using

a) Conventional CMOS techniques.

1. Inverter
2. NAND and NOR
3. XOR/ XNOR

b) MTCMOS techniques.

4. D-Latch
5. NAND and NOR
6. XOR/ XNOR

c) DTCMOS techniques.

7. Inverter

d) compare static NOR and dynamic NOR

e) Glitch free AND circuit.

f) D-latch using clock gating.

Course Outcomes: After studying this course, the students will be able to:

CO1-Develop a strong foundation in applying theoretical concepts by designing /simulating the experiment.

CO2-Utilize laboratory instruments/simulation tools to build and test experiments.

CO3-Analyse experimental data/simulation results and interpret findings to draw meaningful conclusions.

CO4-Learn to work effectively in teams while identifying and correcting faults in electronic circuits/programs.

CO5-Manage time effectively in a simulation/laboratory environment, balancing experimental work, data collection, and report writing within specified deadlines.

Reference Book

1. Gary K. Yeap, “Practical Low Power Digital VLSI Design”, Kluwer Academic, 1998.

2. Kaushik Roy, Sharat Prasad, “Low-Power CMOS VLSI Circuit Design” Wiley, 2000
3. A.P.Chandrasekaran and R.W.Broadersen, “Low power digital CMOS design”, Kluwer Academic,1995. 3. A Bellamour and M I Elmasri, “ Low power VLSI CMOS circuit design”, Kluwer Academic,1995.
4. Jan M.Rabaey, MassoudPedram, “Low Power Design Methodologies” Kluwer Academic, 2010.
5. Sung-Mo Kang and Yusuf Leblebici “CMOS Digital Integrated Circuits”

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):
Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	3	2	3	-	-	-	-	-	-	-	-	-	-	3	-
CO2	2	3	1	-	3	-	-	-	-	-	-	-	-	3	-
CO3	2	3	2	-	-	-	-	-	-	-	-	-	-	3	-
CO4	2	3	2	-	-	-	-	3	3	2	-	-	-	3	-
CO5	2	2	2	-	-	-	-	3	-	3	3	-	-	3	-

DIGITAL IMAGE PROCESSING LAB

[As per NEP, Outcome based Education (OBE), and Choice Based Credit System (CBCS) Scheme]

SEMESTER-VII

Course Code	22ECL78	CIE Marks	50
Number of Lecture Hour/Week	2P	SEE Marks	50
Number of Lecture Hours	24	Credits	03

CREDITS-01

Course Objectives: Students will be taught to:

- To introduce the concepts of image processing.
- To expose students to basic concepts such as distance and connectivity, image transformation, point operation, analysis of colour image processing.
- To introduce the concepts of Image Compression techniques.
- To expose students to basic edge detection techniques.

LIST OF EXPERIMENTS

1. Simulation and Display of an Image, Negative of an Image(Binary & Gray Scale)
2. Implementation of Relationships between Pixels
3. Implementation of Transformations of an Image
4. Contrast stretching of a low contrast image, Histogram, and Histogram Equalization
5. Display of bit planes of an Image
6. Display of FFT(1-D & 2-D) of an image
7. Computation of Mean, Standard Deviation, Correlation coefficient of the given Image
8. Implementation of Image Smoothening Filters(Mean and Median filtering of an Image)
9. Implementation of image sharpening filters and Edge Detection using Gradient Filters
10. Image Compression by DCT,DPCM, HUFFMAN coding
11. Implementation of image restoring techniques
12. Implementation of Image Intensity slicing technique for image enhancement
13. Canny edge detection Algorithm

Course Outcomes: After studying this course, the students will be able to:

CO1-Develop a strong foundation in applying theoretical concepts by designing /simulating the experiment.

CO2-Utilize laboratory instruments/simulation tools to build and test experiments.

CO3-Analyse experimental data/simulation results and interpret findings to draw meaningful conclusions.

CO4-Learn to work effectively in teams while identifying and correcting faults in electronic circuits/programs.

CO5-Manage time effectively in a simulation/laboratory environment, balancing experimental work, data collection, and report writing within specified deadlines.

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING(1/2/3):
Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	3	2	3	-	-	-	-	-	-	-	-	-	-	3	-
CO2	2	3	1	-	3	-	-	-	-	-	-	-	-	3	-
CO3	2	3	2	-	-	-	-	-	-	-	-	-	-	3	-
CO4	2	3	2	-	-	-	-	3	3	2	-	-	-	3	-
CO5	2	2	2	-	-	-	-	3	-	3	3	-	-	3	-

PROJECT-VII [As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme] SEMESTER-VII			
Subject Code	22PRJ79	CIE Marks	50
Number Lecture Hour/Week	2P	SEE Marks	50
Total Number of Lecture Hours	24	Exam Hours	03
CREDITS-01			

Course Objectives: Students will be taught to:

- Get exposure about the electronics hardware and various software tools.
- Design the working model of the open ended problem.
- Understand concepts of Packaging.
- Understand the latest technology trends in the PCB design.
- Prepare technical documentation of the project.

STUDENTS WILL BE GIVEN A OPEN ENDED PROBLEM OF THE SOCIETY AND ASKED TO SOLVE BY DESIGNING AND IMPLEMENTING THE SYSTEM IN TEAM.

Course outcomes: After studying this course, students will be able to:

CO1-Apply the knowledge of electronics hardware and software components to solve the real time problems of the society.

CO2-Analyze the various existing solutions available to solve the real time problem and propose the best solution.

CO3-Design and implement the system to solve the real time problem of the society.

CO4-Conduct investigations on the output and prepare the technical documentation of the designed system in a team.

CO5-Use the modern tool available like advanced hardware and software tools.

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**2**	**-**	**-**	**2**	**2**	**-**	**-**	**3**	3	**-**	**3**	**-**	**3**	**-**
CO2	**3**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**-**
CO3	**3**	**3**	**3**	**2**	**3**	**2**	**2**	**-**	**3**	**3**	**2**	**3**	**-**	**3**	**-**
CO4	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**-**	**3**	**-**
CO5	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**-**	**3**	**-**

INDUSTRIAL PSYCHOLOGY AND ORGANISATIONAL BEHAVIOUR

[As per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]

SEMESTER-VII

Subject Code	22HSM710	CIE Marks	50
Number of Lecture Hour/Week	01	SEE Marks	50
Total Number of Lecture Hours	20	Exam Hours	03

CREDITS-01

Course Objectives: This course will enable students to:

- Relating human psychology to science
- Understand the human psychology
- Understand the nature of organization and organization models
- Understand the human social communication
- Understand the leadership qualities

Modules	Teaching Hours
Module -1	
Introduction to I/O psychology: Major fields of I/O psychology, brief history of I/O psychology, employment of I/O psychology, ethics in I/O psychology. (Chapter-1)	**3 Hours**
Module -2	
Organisational communication: Types of organizational communication, interpersonal communication, improving employee communication skills. (Chapter-11)	**3 Hours**
Module -3	
Leadership : Introduction, personal characteristics associated with leadership, interaction between the leadership and the situation specific leader skills, leadership where we are today. (Chapter-12)	**5 Hours**
Module -4	
Group behaviour- teams and conflicts Group dynamics, factors affecting group performance, individual versus group performance, group conflicts. (Chapter-13)	**5 Hours**
Module-5	
Stress management: Dealing with the demands of life and work, stress defined, predisposition to stress, sources of stress, consequences of stress, stress reduction intervention related to life /work issues. (Chapter-15)	**4 Hours**

Course Outcomes: At the end of this course, students would be able to

CO1-Comprehend the knowledge and concepts of human psychology
CO2-know the importance of psychology
CO3-have insight into individual and group behavior
CO3-deal with people in better way
CO4-motivate groups and build groups

Text Book: Michael G.Aamodt, Industrial/Organizational Psychology: An Applied Approach, 6th Edition, Wadsworth Cengage Learning, ISBN: 978-0-495-60106-7.

Reference Books:

1. Blum M.L. Naylor J.C., Horper & Row, Industrial Psychology, CBS Publisher, 1968
2. Luthans, Organizational Behaviour, McGraw Hill, International, 1997
3. Morgan C.t.,King R.A.,John Rweisz &John Schoples, Introduction to Psychology, McHraw Hill, 1966
4. Schermerhorn J.R.Jr., Hunt J.G &Osborn R.N., Managing, Organizational Behaviour, John Willy

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	3	2	2	2	3	2	3	-	-	3
CO2	-	-	-	-	-	3	2	3	3	3	2	3	-	-	3
CO3	-	-	-	-	-	2	2	3	3	3	3	3	-	-	3
CO4	-	-	-	-	-	3	2	3	3	3	3	3	-	-	3
CO5	-	-	-	-	-	3	3	3	3	3	3	3	-	-	3

RESEARCH PROJECT/FIELD PROJECT-8 [As per Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme] SEMESTER-VIII			
Subject Code	22PRJ81	CIE Marks	50
Total No. of implementation weeks	16P	SEE Marks	50
		Exam Hours	03
CREDITS-8			

Course Objectives: Students will be Guided to:

- Understanding about the Project and its components.
- Introduction of the project selected.
- Detailed literature survey of the project and understand concepts of problem identification.
- Design and development of Proposed Methodology.
- Implementation of the proposed methodology and thesis document preparation.

STUDENTS WILL BE GIVEN A OPEN ENDED PROBLEM OF THE SOCIETY AND ASKED TO SOLVE BY DESIGNING AND IMPLEMENTING THE SYSTEM INDIVIDUALLY

Course outcomes: After studying this course, students will be able to:

CO1- Apply the knowledge of electronics hardware and software components to solve the real time problems of the society.

CO2-Analyze the various existing solutions available to solve the real time problem and propose the best solution.

CO3-Design and development of proposed methodology based on the societal needs, environmental friendly.

CO4-Use the modern tool available like advanced hardware and software tools to implement the proposed methodology and make it use for society and prepare a document and submit.

CO5-Publish the proposed work in the peer reviewed Journal

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):
Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	3	**-**	**3**	**-**	**3**	**-**
CO2	**3**	**3**	**3**	**3**	**3**	**1**	**2**	**3**	**3**	**3**	**2**	**3**	**-**	**3**	**-**
CO3	**3**	**3**	**3**	**-**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**3**	**-**
CO4	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**-**	**3**	**-**
CO5	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**-**	**3**	**-**

INTERNSHIP [As per Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme] SEMESTER-VIII			
Subject Code	22ECI82	CIE Marks	50
Total No. of implementation/training weeks	12P	SEE Marks	50
		Exam Hours	03

CREDITS-06

Course Objectives: Students will be taught to:

- Learn to appreciate work and its function in the economy.
- Develop work habits and attitudes necessary for job success.
- Develop communication, interpersonal and other critical skills in the job interview process.
- Build a record of work experience.
- Acquire employment contacts leading directly to a full-time job following graduation from college.

Students has to carry out the internship OF 12 weeks in the industry.

Course outcomes: After studying this course, students will be able to:

CO1-Apply the knowledge of electronics hardware and software components to solve the real time problems of the society.

CO2-Analyze the various existing solutions available to solve the real time problem and propose the best solution.

CO3-Design and implement the system to solve the real time problem of the society.

CO4-Conduct investigations on the output and prepare the technical documentation of the designed system in a team.

CO5-Use the modern tool available like advanced hardware and software tools.

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	PO.1	PO.2	PO.3	PO.4	PO.5	PO.6	PO.7	PO.8	PO.9	PO.10	PO.11	PO.12	PSO.1	PSO.2	PSO.3
CO1	3	-	-	-	3	3	2	-	-	-	-	3	-	3	-
CO2	2	3	2	2	-	2	2	-	-	-	-	3	-	3	-
CO3	2	2	3	2	-	2	2	-	-	-	-	3	-	3	-
CO4	-	-	-	-	-	-	-	2	3	3	2	3	-	3	-
CO5	-	-	-	-	3	-	-	2	-	-	-	3	-	3	-