Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Engineering

SoE & Syllabus 2014

8 Semester

Electronics & Telecommunication Engineering

Update on DEC. 2017

Nagar Yuwak Shikshan Sanstha's

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(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.E. SCHEME OF EXAMINATION 2014

Electronics and Telecommunication Engineering

S. N.	Sub Code	Subject	Contact Hours				CR	% Weightage				ESE Duration
			L	T	P	Total		MSE I	MSE II	TA	ESE	
SEVENTH SEMESTER												
1	ET1401	RF & Microwave	4	0	0	4	4	15	15	10	60	3 Hrs
2	ET1402	**Lab.:** RF & Microwave	0	0	2	2	1			40	60	
3	ET1403	Principles of Image Processing	4	0	0	4	4	15	15	10	60	3 Hrs
4	ET1404	**Lab. :** Principles of Image Processing	0	0	2	2	1			40	60	
5	**Professional Elective-III**		3	0	0	3	3	15	15	10	60	3 Hrs
	ET1405	PE III : Optical Communication										
	ET1407	PE III : Microwave Integrated circuit										
	ET1409	PE III : Communication Networks										
	ET1431	PE III : Analog VLSI										
6	**Lab.:Professional Elective -III**		0	0	2	2	1			40	60	
	ET1406	**Lab. :PE III :** Optical Communication										
	ET1408	**Lab. :PE III :** Microwave Integrated circuits										
	ET1410	**Lab. :PE III :** Communication Networks										
	ET1432	**Lab. :PE III :** Analog VLSI										
7	ET1413	Industrial Training/ CRT	0	0	0	0	2			100		
8	ET1414	Project phase -I	0	0	4	4	4			40	60	
		Total	11	0	10	21	20					
EIGHTH SEMESTER												
1	ET1415	Antenna Theory & Design	4	0	0	4	4	15	15	10	60	3 Hrs
2	ET1416	**Lab.:** Antenna Theory & Design	0	0	2	2	1			40	60	
3	ET1417	CMOS VLSI Design	4	0	0	4	4	15	15	10	60	3 Hrs
4	ET1418	**Lab.:** CMOS VLSI Design	0	0	2	2	1			40	60	
5	**Professional Elective IV**		3	0	0	3	3	15	15	10	60	3 Hrs
	ET1419	PE IV : Power Electronics										
	ET1420	PE IV : Wireless Mobile Communication Systems										
	ET1433	PE IV : Satellite Communication & RADAR Engineering										
	ET1434	PE IV: Biomedical Instrumentation										
	ET1437	PE IV: : Display Technology										
6	**Professional Elective V**		3	0	0	3	3	15	15	10	60	3 Hrs
	ET1422	PE V : Fuzzy Logic & Neural Networks										
	ET1424	PE V : RF Circuit Design										
	ET1426	PE V : Multimedia Communications										
	ET1435	PE V:Advances in Communication										
7	**Lab.: Professional Elective V**		0	0	2	2	1			40	60	
	ET1423	**Lab.: PE V :** Fuzzy Logic & Neural Networks										
	ET1425	**Lab.: PE V :** RF Circuit Design										
	ET1427	**Lab.: PE V :** Multimedia Communications										
	ET1436	**Lab.: PE V:** Advances in Communication										
8	ET1428	Project Phase-II	0	0	8	8	8			40	60	
9	ET1429	Comprehensive Viva-voce	0	0	0	0	3				100	
10	ET1430	Extra/co curricular Activities	0	0	0	0	2			100		
		Total	14	0	14	28	30					

Chairperson	**Version**	**1.01**	**Applicable for AY 2017-18 Onwards**
Dean (Acad. Matters)	**Date of Release**	**Nov. 2017**	

8th **Semester**

ET1415	**Antenna Theory and Design**		L= 4	T = 0	P = 0	Credits = 4
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Course Objective	**Course Outcome**
Students should be able to 1. Learn the basic principles and of antenna parameters. 2. Design and analyze dipole antennas. 3. Design and analyze loop antennas & Arrays. 4. Design and Analyze Travelling wave & Broadband Antennas. 5. Design & Analyze aperture, Reflector and Patch Antennas. 6. Study different antenna measurements.	Students will be able to 1. Find out various parameters of particular antenna. 2. Describe and analyze various parameters for performance measurement of Dipole antenna. 3. Analyze loop antennas & various arrays. 4. Describe various broadband antennas & travelling wave antennas. 5. Analyze Study different antenna measurements. **6.** Perform antenna measurements.

UNIT I : BASIC ANTENNA CONCEPTS:
Types of antennas, Radiation mechanism, Beam solid angle, radiation intensity, Directivity, effective aperture, beam efficiency, Antenna field zones, Polarization, impedance, bandwidth, impedance, effective length, antenna temperature

08Hrs

UNIT II : DIPOLE ANTENNA RADIATION :
Scalar and vector potentials, retarded potentials, field due to a current elements, power radiated and radiation resistance for field due to a dipole, power radiated and radiation resistance, Earth curvature, Half wave dipole antenna radiated fields of short dipole, small loop and helical Antenna, Radiation resistance, Directivity and Design Feature. Half wave dipole: radiated fields and other feature

08Hrs

UNIT III : LOOP ANTENNAS AND ARRAYS:
circular loop ,polygonal loop and ferrite loop antenna**,** circular loop antenna with constant current, Two element array, linear array, N- element array ,uniform ,broad side, end fire ,Non uniform Amplitude antenna array**,** planar and circular array

08Hrs

UNIT IV :
TRAVELING WAVE AND BROAD BAND DIPOLE
Introduction, traveling wave antenna, long wire, V antenna, rhombic antenna, Broadband antennas, Helical antenna, Electric-Magnetic Dipole, Yagi-Uda array of linear Elements, Yagi array of loops.

08Hrs

UNIT V: SPECIAL ANTENNAS:
Aperture Antennas: Rectangular aperture, Circular aperture, Babinet's principle, Horn antenna: conical horn, corrugated Horn, Multimode horn reflector antenna: plane reflector, corner reflector, corner, parabolic, spherical, Patch Antenna

08Hrs

UNIT VI: ANTENNA MEASUREMENTS:
Antenna Range, Radiation Pattern, Gain Measurement, Directivity Measurement, Radiation Efficiency, Impedance Measurement, Current Measurement, Polarization Measurement

08Hrs

Text books:				
1	Antenna Theory Analysis and Design Technology	1982 Third edition	Balanis E.S.	Wiley India
2	Antennas	II edition 1988	John D.Krauss	McGraw-Hill International edition
Reference books:				
1	Electromagnetic waves and Radiating systems	1993	Edward C.Jordan, Keith G.Balmain	Prentice Hall of India 1Td
2	Antennas and Radio Propagation	1985	R.E. Collins	McGraw-Hill

8th Semester

ET1416	Lab. : Antenna Theory and Design	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	Continuous Evaluation	ESE		Total	ESE Duration
	40	60		100	2 Hrs

Course Objective
Students should be able to
1. Measure the performance parameters of various antenna through hardware setup module.
2. Study design different wire antennas & measure its parameters through the use of software.
3. Study design of reflector antennas and broadband antennas & measure its parameters through the use of software.
4. Study design of planar antennas antennas & measure its parameters through the use of software.

Course Outcome
Students will be able to
1. Assemble & Measure various parameters using hardware module.
2. Use software to design different wire antennas.
3. Design and analyze different parameters of reflector antennas through software.
4. Design application specific antenna.

Sr. No.	Experiments based on
1	Dipole
2	Half Wave Dipole
3	Monopole
4	Yagi Antenna
5	Boardside array
6	Endfire array
7	Loop Antenna
8	Crossed Dipole
9	Lock Periodic Antenna
10	Slot Antenna
11	Helix Antenna
12	Microstrip Antenna

8th Semester

ET 1417	CMOS VLSI Design		L= 4	T = 0	P = 0	Credits = 4
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Course Objective
Students should be able to
1. Understand the current trends in CMOS VLSI technologies.
2. Study analysis of the MOS transistor with first order and second order effects.
3. Study the static and dynamic operating principles of inverter circuit.
4. Understand the different CMOS implementation process.
5. Learn the basic structure and operation of combinational and sequential logic circuits.
6. Study dynamic circuits using domino and dynamic logic.

Course Outcome
Students will be able to
1. Apply mathematical methods to analyze CMOS VLSI circuits
2. Design SSI, MSI and LSI CMOS circuits to realize specified digital functions.
3. Apply Lambda design rules to design optimized CMOS layout.
4. Apply various steps for the fabrication of various CMOS circuits
5. Design digital logic circuit using CMOS Technology and verify the functionality, timing, power, area and parasitic effects.
6. Design and analyze BICMOS, dynamic and domino logic circuits.

UNIT-1: Basic MOS Device Physics
General Consideration: MOS as a switch, MOS Structure & Symbols, MOS I/V Characteristics, MOS Enhancement Transistor, Second order effect of MOS: Body Effect, Junction Effect, Gate Leakage Effect, Channel Length Effect, Tunneling Effect, Velocity Modulation, Mobility Variation, Small Signal Modeling of MOSFETs.

08 Hrs

UNIT-2: MOSFET Inverter Characteristics
Resistive Load Inverter, Inverter with n type MOSFET load, Inverter with Active Load, CMOS Inverter, Principle of operation & DC Characteristics, Tri-stated Inverter, Noise Margin Calculation, Logic Design with MOSFETs. Compound Gates in CMOS.

08 Hrs

UNIT-3: Fabrication & Layout of CMOS IC
Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography and twin-tub CMOS process. CMOS Technology: N-well, P-well, Twin Tub Process, Silicon on Insulator (SOI) Process, Layout Design Rules, Physical Design of Logic Gates, Euler's Path, Stick Diagram, Layout, Latch-up Effect.

08 Hrs

UNIT-4: Switching Characteristics & Interconnection Effect
MOS Device Capacitance Estimation, Switching Characteristics: Rise Time, Fall Time, Propagation Delay, Delay Estimation: Propagation Delay, Contamination Delay, Power Dissipation in CMOS: Static & Dynamic Power Calculation, Charge Sharing, Fan-in, Fan-out.

08 Hrs

UNIT-5 : Combinational & Sequential MOS Logic Circuits
Combinational circuit design, static CMOS, Transmission Gate Circuits(TG),Pass Transistor, Multiplexers, Logic Design Using Pass Transistor and TG. Ratio-ed Logic circuits, sequential circuit, Latches and Flip Flops,, Clock Flip-Flop.

08 Hrs

UNIT-6: Advanced Techniques in CMOS Logic Circuits
Complementary Static CMOS, Pseudo NMOS Logic, Dynamic CMOS Logic, CMOS Domino Logic, Zipper Logic, Clocked CMOS Logic, CVSL, Bi-CMOS Logic Family.

08 Hrs

8th Semester

ET 1417	**CMOS VLSI Design**		L= 4	T = 0	P = 0	Credits = 4
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Text books:				
1	Introduction to VLSI Circuits and Systems	First Edition	John P. Uyemura	Wiley Publication
2	Principle of CMOS VLSI Design	2nd Edition, 1994	Neil H. E. Weste, K. Eshraghian	Addison Wesley VLSI Series
Reference books:				
1	CMOS VLSI Design	3rd Edition, 2005	Pucknell , K. Eshraghian	Prentice Hall
2	CMOS Digital Integrated circuits Analysis and Design	Third edition, 2008	Sung-Mo Kang, Yusuf leblebici	TataMc Graw Hill
3	Design of Analog CMOS Integrated Circuits	2001	Razavi, Behzod	McGraw Hill

8th Semester

ET1418	Lab. : CMOS VLSI	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	Continuous Evaluation	ESE		Total	ESE Duration
	40	60		100	2 Hrs

Course Objective
Students should be able to
1. The fundamental principles of VLSI circuit design & layout
2. To provide hands-on design experience using EDA tools.
3. To verify the characteristic of static logic circuit using EDA tools.
4. To verify the behaviour of Dynamic logic circuits using EDA tools.

Course outcomes
Students will be able to
1. Apply mathematical methods to design and simulate CMOS VLSI circuits.
2. Design and simulate SSI, MSI and LSI CMOS circuits to realize specified digital functions using EDA tools.
3. Apply Lambda design rules to design optimized CMOS layout using EDA tools.
4. Design and simulate digital logic circuit using EDA tools to verify the functionality and able to calculate timing, power, area and parasitic capacitance practically.
5. Design and simulate BICMOS, dynamic and domino logic circuits and able to understand the actual behaviour of the logic design.

Sr. No.	Experiments based on
1.	Introduction to EDA Tool.
2.	To study and Plot the transfer characteristics of NMOS and PMOS using EDA Tools
3.	To study and Plot the transfer characteristics of CMOS Inverter using EDA Tools.
4.	To perform the analysis of Basic logic Gates like NAND, NOR, AND, OR using gate level design.
5.	To perform the Gate Level Analysis of Pass Transistor and Transmission Gate.
6.	To study the Gate Level Analysis of Half Adder and Half Subtractor.
7.	To study the Gate Level Analysis of Full Adder and Full Subtractor.
8.	To study the Gate Level Analysis of 4:1 Multiplexer using CMOS and Transmission Gate.
9.	To perform the analysis of Resistive Load Inverter and Pseudo NMOS Inverter.
10.	To study and Design a D Flip-flop.
11.	Mini-project. (For Example: Look Ahead Carry Adder, 4 Bit Parallel Adder)

8th **Semester**

ET1419	**PE IV: Power Electronics**		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Course Objective
Students should be able to
1. Understand the characteristics of different power electronics switches and selection of components for different applications,
2. Learn different types of power devices
3. Understand the switching behavior of power electronics circuits such as DC/DC converters.
4. Learn the role of different type of inverters.

Course Outcome
Students will be able to
1. Analyze and design an AC/DC rectifier circuit.
2. Analyze characteristics of different devices.
3. Design of AC voltage converters and Cycloconverters
4. Analyze and design DC/DC converter circuits.
5. Analyze and design inverter circuits.
6. Demonstrate the application of power electronics to solve real life problems.

UNIT I :
Power Semiconductor Diodes and Circuits, control Characteristics of power devices, power modules, power diodes, reverse recovery, series, shunt connected diodes, Diode Rectifiers—single phase, three phase rectifiers, bride rectifiers, design of rectifiers

06Hrs

UNIT II :
Power Transistors, Switching characteristics of BJT, Power MOSFETs, IGBTs, limitations, Power Thyristors

06Hrs

UNIT III:
Controlled Rectifiers: phase control converter, single phase, three phase converters, AC Voltage Controllers. Principle of ON-OFF control, Phase control, Single phase controllers, three phase controllers, cyclo-converters

06Hrs

UNIT IV :
Turn on Turn off mechanism SCR, Commutation methods of SCR. DC-DC Converters, Step up, step down, thyrister Choppers, design of choppers

0**6Hrs**

UNIT V :
Resonant Pulse Inverters—Series, parallel, resonant inverters, Class E resonant inverter, Pulse width Modulated Inverters: Principle, single phase, Multiple phase, PWM Forced commuted inverters, current source inverters, design of inverter.

06Hrs

UNIT VI:
Power Supplies, SMPS, SM ac power supplies, Gate Drive Circuits- Protection of Devices and Circuits Snubber, reverse recovery transients, Introduction to AC and DC drives.

06Hrs

Text books:				
1	Power Electronics:Circuits,Devices and Applications	Second Edition 1993	M. Rashid	PHI
Reference books:				
1	Power Electronics and its application	Second Edition, 2004	Alok Jain	Penram International Publishing Pvt Ltd

8th Semester

ET 1420	PE IV : Wireless Mobile Communication Systems		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Course Objective
Students should be able to
1. Study cellular concepts and techniques to improve capacity in cellular system.
2. Understand mobile radio environment and its different parameters.
3. Study fundamentals of equalization, diversity & its techniques.
4. Understand the operating principles of various wireless systems & standards.
5. Learn the fundamentals of wireless networking.

Course Outcome
Students will be able to
1. Explain cellular system standards.
2. Describe capacity improvement in cellular systems.
3. Quantify causes and effects of path loss and signal fading on received signal characteristic
4. Describe concept of equalization, diversity & its techniques.
5. Analyze GSM & CDMA systems.
6. Understand the fundamentals of wireless networking.

UNIT I : Introduction to Wireless Communication Systems:
Evolution of Mobile Radio Communications, Mobile Radio Systems around the world. Examples of Wireless Communication Systems, Comparison of common wireless communication systems, trends of cellular radio and personal communications, Second generation (2G) cellular Networks, Third generation (3G) cellular Networks, wireless local loops and LMDS

06Hrs

UNIT II : The Cellular Concept :
Cellular telephone system, frequency reuse, channel assignment and handoff strategies, interference and system capacity, trunking and grade of service, improving capacity in cellular system

06Hrs

UNIT III : Mobile Radio Propagation- Large & Small Scale Path Loss & Fading:
Introduction to Radio Wave Propagation, Reflection, Diffraction, Scattering Practical Link Budget Design Using Path Loss Models, Signal Penetration into Buildings, Ray Tracing & Site Specific Modeling. Small Scale Multipath Propagation, Small Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types Of Small Scale Fading, Rayleigh & Rician Distribution

06Hrs

UNIT IV : Equalization & Diversity:
Fundamentals of equalization, space polarization, frequency and time diversity techniques, space diversity, polarization diversity, frequency and time diversity. RAKE Receiver

06Hrs

UNIT V: Wireless Systems and Standards:
GSM- global system for mobile: services and features, GSM system architecture, GSM radio subsystem, GSM channel types, GSM frame structure, signal processing in GSM, introduction to CDMA digital cellular standard (IS-95)

06Hrs

UNIT VI: Wireless Networking:
Introduction to wireless networks, Differences Between Wireless & Fixed Telephone Networks, Development of wireless networks, Traffic routing in wireless networks, Wireless data services, Common channel signaling, Signaling System No 7.An Example of SS7, SIP -Global Cellular Network Interoperability

06Hrs

Text books:				
1	Wireless Communication – Principles and practice	Second edition	by T S. Rappaport	(Prentice Hall PTR, upper saddle river, New Jersey.)

Reference books:				
1	Wireless digital communication	1995	by Kamilo Feher	PHI
2	Mobile Communications Design fundamentals	1993	by William C. Y. Lee	John Willey
3	Mobile Cellular Communication	2005	by W .C .Y. Lee	Mc Graw Hill
4	The Mobile Radio Propagation channel	1996	by J.D. Parson	John Willey

8th Semester

ET1433	PE IV : Satellite Communication & Radar Engineering		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Course Objective
Students should be able to
1. To become familiar with satellites and satellite services.
2. To understand the satellite Propagation on satellite
3. To understand earth station technology
4. To make the student understand the principles of Radar and its use in military and civilian environment
5. To make the RADAR antennas, Lens antenns & RADAR, Receiver
6. To explain Effects of weather on RADAR

Course Outcome
Students will be able to
1. Analyze satellite services and satellite system
2. Work with Propagation on satellite
3. Describe the Earth station technology
4. Analyze the RADAR range equation and Doppler principle to radars and hence detect moving targets and cluster
5. Analyze RADAR antennas and Reflectors
6. Analyze the effects of satellite on weather

UNIT I : Introduction: Origin of Satellite communication, Current state of satellite communication. Orbital aspect of satellite communication: Orbital mechanism, equation of orbit, locating satellite in orbit, orbital elements, and orbital perturbation. Space craft subsystem: Attitude and orbit control system, Telemetry tracking and command power system, and communication subsystem. Satellite link design: System noise temperature and T / T ratio, down link design, domestic satellite system, uplink design, design of satellite link for specified (C / N).

06Hrs

UNIT II : Propagation on satellite: Earth's path – propagation effects, atmospheric absorption, Scintillation effects, Land and Sea multipath, Rain and ice effects, Rain drop distribution, calculation of attenuation. Rain effects on Antenna noise temperature

06Hrs

UNIT III : Earth Station technology: Earth Station design; antennas tracking, LNA, HPA, RF multiplexing, factors affecting orbit utilization, tracking, equipment for earth station.

06Hrs

UNIT IV :
RADAR Range Equation, CW and FM modulated RADAR, MTI and Pulse Doppler RADAR, Tracking RADAR

06Hrs

UNIT V:
RADAR antennas, parabolic reflector, Scanning field reflector, Lens **antennas**.
RADAR Receivers, Displays and Duplexer, Detection of RADAR; signals in noise

06Hrs

UNIT VI:
RADAR clutter, Effects of weather on RADAR, Detection of targets in Precipitation, Synthetic Aperture RADAR, HF over the Horizon RADAR.

06Hrs

Text books:				
1	Introduction of RADAR system		Skolnik	McGraw Hill
2	Satellite Communication		Dennis Roddy	
Reference books:				
1	Satellite Communications		Varsha Agrawal Anil	Wiley India Pvt Ltd
2	Satellite Communication Systems		M. Richharia	Mcgraw Hill Telecommunications
3	Radar Systems Principle		Harold R.Raemer	

8th Semester

ET1434	PE IV: Bio-medical Instrumentation		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Course Objective
Students should be able to
1. Know the physiology of heart , brain and skin.
2. Understand the basic principles of physical parameters such as blood pressure, heart rate and body temperature.
3. Comprehend the working principle of recording instruments such as ECG,EEG EMG and phonocardiograph.
4. Comprehend the working principle of instrumentation for Blood Pressure, Blood flow , Pulse oximeters, Heart rate , respiration rate ,temperature and hearing Aid.
5. Know the physical concepts of radiography related to X rays.
6. Learn working principles of advanced medical imaging system

Course Outcome
Students will be able to
1. Analyze various parameters using ECG,EEG and EMG
2. Analyze various physical measurements such as blood pressure, heart rate, temperature etc.
3. Measure and analyze various parameters using ECG,EEG EMG and phonocardiograph.
4. Measure and analyze various parameters such as - Blood Pressure, Blood flow rate, Pulse rate, Heart rate, respiration rate and temperature and hearing ability.
5. Interpret the working principle of X-ray equipments
6. Describe working principles of advanced medical imaging systems.

Unit 1 : Cell as bio electric generator:
Heart and Circulatory system, ECG, Brain and nervous system, EEG, Skeletal , Muscle and Skin Systems, EMG
06Hrs

Unit 2 : Physical Measurement
Blood pressure and Flow, Heart rate and Heart sounds, Respiration and temperature
06Hrs

Unit 3 : Recording Instrumentation
Electrodes, Basic Instrumentation, Electrocardiograph, Electroencephalograph Electromyography and Phonocardiograph.
06Hrs

Unit 4 : Measuring Instrumentation
Transducers, Blood Pressure, Blood flow and Pulse oximeters, Heart rate , respiration rate and temperature meters, Audiometer and hearing Aid
06Hrs

Unit 5 : X-rays
X-ray Physics, Fluoroscopy and radiography, X-ray tubes and X-ray Equipments
06Hrs

Unit 6 : Advanced Imaging Systems
Ultrasonic scanner, CT scan, MRI, Endoscope and Electron microscope
06Hrs

Text books:				
1	Biomedical Instrumentation and Measurements	2007	Prentice Hall of India, New Delhi	Cromwell
2	Biomedical Instrumentation	2006	Anuradha Agencies Publishers, Kumbakonam	Arumugam.M.
3	Handbook of Biomedical Instrumentation	2003	Prentice Hall of India, New Delhi	R.B.Khandpur
Reference books:				
1	Introduction to Biomedical Equipment Technology	2004	Pearson Education India, Delhi	Joseph J. Carr and John M. Brown
2	Standard Handbook of Biomedical Engineering & Design	2003	McGraw-Hill Publisher, New York	Myer Kutz
3	Medical Instrumentation – Application & Design	2009	John Wiley and sons Inc, Netherlands	Webster
4	Medical Electronics	2003	ISTE Excel book	Patil A. G.

8th Semester

ET1437	**PE IV : Display Technology**		L=3	T=0	P=0	Credits=3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs.

Course Objective	**Course Outcome**
Students should be able 1. To learn fundamental concepts of different display technologies related to manufacturing techniques and materials selection. 2. To explore specifications required for display technologies 3. To understand properties of Luminescence materials 4. To understand different displays and addressing of displays 5. To learn backplane technology and driver integration 6. To understand properties of materials and its modes	Students will be able to 1. Identify different display technologies and manufacturing processes. 2. Characterize and analyze specifications of display technology. 3. Analyze properties of Luminescence materials 4. Explore design parameters for displays and analyze matrix addressing. 5. Comprehend the fundamentals of backlight unit technologies. 6. Elaborate applications of displays.

UNIT I : Overview of display technologies, information capacity of displays, introduction to different flat panel display technologies. Fundamentals of Photometry, Colorimetry, CIE colorimetry

06Hrs

UNIT II : Characterization and performance of displays: Concepts of aspect ratio, color gamut, contrast and gradation, directional visibility, driving power, efficiency, speed, memory and storage, degradation, resolution, addressability, physiological factors, and measurement instrumentation;

06Hrs

UNIT III : Luminescence and luminescent materials: Physical processes and interactions leading to emission of light, processes responsible for the transfer of energy in luminescent materials, chemistry and preparation of luminescent materials, and emission properties of the prepared materials;

06Hrs

UNIT IV : Basics of matrix addressing of displays: active and passive matrix.
Technical discussion of display technologies: LEDs, OLEDs, LCDs, Active matrix TFT backplanes for OLED and LCD displays. Other displays and associated technologies.

06Hrs

UNIT V: Advanced TFT Backplane Technologies (IGZO, LTPS, etc.) and Driver Integration.
Back Light Unit Technologies (CCFL, LED, QD, etc.)

06Hrs

UNIT VI: Future and New Applications of Displays. Materials for Display – TFT, EL and LC Materials and Modes

06Hrs

Text books:				
1	Liquid crystal flat panel displays: manufacturing science & technology.	W. Mara	2012	Springer, Science & Business Media,
2	Introduction to Flat Panel Displays	Jiun-Haw Lee, David N. Liu, Shin-Tson Wu		Wiley publications
Reference books:				
1	Liquid crystal displays: fundamental physics and technology.	R. H. Chen	2011	John Wiley and Sons
2	Fundamentals of Solid-State Lighting: LEDs, OLEDs, and Their Applications in Illumination and Displays	Vinod Kumar Khanna		CRC press

8th Semester

ET1422	PE V: Fuzzy Logic & Neural Network		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Course Objective
Students should be able to
1. Learn the concepts of Neural network.
2. Understand the supervised and unsupervised algorithms in neural networks.
3. Learn the concepts of Fuzzy sets and logic.
4. Understand fuzzy logic and reasoning, operations and relations.
5. Learn design parameters for fuzzy logic controller.

Course Outcome
Students will be able to
1. Describe neural network architecture and apply single layer supervised algorithms for pattern classification problems.
2. Extract learning rules and apply multilayer supervised algorithms for problems solving.
3. Apply unsupervised algorithms for pattern classification, association problems.
4. Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
5. Prove and Apply fuzzy arithmetic operations and relations for problem solving.
6. Design Fuzzy logic controller for solving real life problems.

UNIT I : Introduction of neural networks, NN Architecture Neural learning and laws, Applications of ANN Evaluation of network,
Supervised Learning : Single layer network : MP neuron, Perceptron, Perceptron training algorithm, LMS algorithm , ADALINE

06Hrs

UNIT II : Supervised Learning :
Multiplayer network: Multilevel Discrimination, Backpropogation Algorithm, Setting the parameter values, Accelerating the learning Process, MADALINE, Recurrent Network, RBF networks

06Hrs

UNIT III : Unsupervised Learning :
Winner Take Network, ART Networks, self-organizing feature maps, Associate Models

06Hrs

UNIT IV :
Overview of Crisp Sets, Concepts of Fuzzy sets, representation of fuzzy sets, extension principle, fuzzy compliments, t-norms and t- conforms

06Hrs

UNIT V:
Fuzzy numbers, arithmetic operation on intervals and on fuzzy sets, lattice of fuzzy numbers, fuzzy equations, fuzzy relations, projections and cylendric extensions, binary fuzzy relations, fuzzy equivalence, compatibility and ordering relations, fuzzy morphism

06Hrs

UNIT VI:
Fuzzy controllers, Defuzzification Methods , Fuzzy Inference Techniques, applications of fuzzy logic in pattern recognition and image processing

06Hrs

Text books:				
1	Fuzzy sets and Fuzzy logic	1995	by George Klir, Bo Yuan	PHI
2	Elements of Artificial Neural Network	1997	K. Mehrotra	MIT Cognet

Reference books:				
1	Neural Networks, a comprehensive foundation	1999	By Simon Haykins	PHI
2	Artificial Neural Networks	2004	By B. Yegnanarayana	PHI
3	Fuzzy Logic & Applications	2003	J. Ross, TMH/Mc	Mc Graw Hill
4	Neural Networks, Fuzzy logic and Genetic Algorithms, Synthesis and applications	2003	By S. Rajsekharan, Vijayalaxmi Pai	PHI Timothy Ross

8th Semester

ET1423	Lab. : PE V: Fuzzy Logic & Neural Network	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	Continuous Evaluation	ESE		Total	ESE Duration
	40	60		100	2 Hrs

Course Objective
Students should be able to
1. Acquaint student with various computing algorithms in FLNN using software tools.
2. Understand operation of basic elements in fuzzy logic and neural network through simulation.
3. Learn development of algorithms to solve real life applications.

Course Outcome
Students will be able to
1. Demonstrate basic concepts fuzzy logic and neural network through simulation.
2. Develop the logic given in problem statement using algorithms in NN and basics of toolbox studied.
3. Develop the logic given in problem statement using operations in fuzzy logic and basics of toolbox studied.
4. Develop real life applications using NN and Fuzzy Logic.

Sr. No.	Experiments based on
1.	Learning Rules and Activation functions in NN
2.	MP Neuron, Hebb Neuron
3.	Perceptron/ LMS/Adaline
4.	Backpropogation Algorithm
5.	Unsupervised Learning:
6.	Fuzzy sets and representation of fuzzy sets
7.	Fuzzy numbers
8.	Arithmetic operation on fuzzy sets
9.	Fuzzy Relations
10.	Fuzzy Controller
11.	Application Development using NN and Fuzzy Logic

8th Semester

ET1424	PE V : R.F. Circuit Design		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Course Objective
Students should be able to
1. Learn fundamentals of RF circuits.
2. Understand the use of HF component in design the RF circuit.
3. Study the bandwidth estimation techniques.
4. Learn the design of high frequency amplifier
5. Understand the concept of CMOS technology in RF circuits.
6. Study the PLL, phase detector principle at high frequency.

Course Outcome
Students will be able to
1. Apply the fundamentals for design of RF circuits.
2. Analyze the HF circuit design and its behavior.
3. Compare the behavior of series and parallel RLC circuit at HF.
4. Distinguish the different bandwidth estimation techniques.
5. Apply the knowledge of CMOS technology for design of supply independent bias circuit.
6. Compare the power amplifier parameters with HF amplifier.

UNIT I :
Introduction, History of wireless Communication, Noncellular wireless Applications, Shannon , Modulations, Propagation, Parallel RLC Tank Circuit, Series RLC Circuit , RLC Network as Impedance Transformer ,Skin Effect, Resistor, Capactor, Inductor, Transformer

06Hrs

UNIT II :
MOSFET Physics, MOS Device Physics in Short Channel Regime , Other Effects, Link Between Lumped and Distributed Regime ,Driving Point impedance at iterated structures , Transmission line , Behavior of finite length Transmission line, Artificial lines

06Hrs

UNIT III :
Review of Smith Chart and S- Parameter, Bandwidth Estimation Techniques , Rise time , Delay , Open Circuit Time Constant , Short Circuit Time constant

06Hrs

UNIT IV :
Introduction to High Frequency Amplifier Design, Zeros as Bandwidth Enhancer , The shunt series Amplifier, Tuned Amplifiers, Neutralization and Unilateralization Cascaded Amplifiers, AM-PM Conversion

06Hrs

UNIT V:
Introduction to Voltage references and Biasing, Review of Diode Behavior, Diodes and Bipolar transistors in CMOS Technology Supply independent bias circuits, Band gap Voltage References, Amplifier linearity, Noise and Noise Figure analysis, Introduction to Mixers

06Hrs

UNIT VI:
Introduction to RF Power Amplifiers, Classification of Power Amplifiers, Modulation of Power Amplifiers, Introduction to Phase lock loops , Linear zed PLL Model, Phase Detector, Sequential Phase Detector, Loop Filters and Charge Pumps

06Hrs

Text books:				
1	The Design of CMOS Radio-Frequency Integrated Circuits	Second Edition	by Thomas H. Lee	The Design of CMOS Radio-Frequency Integrated Circuits
2	RF Circuit Design Theory and Applications		R. Ludwig & P. Bretchko	RF Circuit Design Theory and Applications
Reference books:				
1	Analysis and Design of Analog Integrated Circuits		By Paul R. Gray	Razavi

8th Semester

ET1425	Lab. : PE V: R.F. Circuit Design	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	Continuous Evaluation	ESE		Total	ESE Duration
	40	60		100	2 Hrs

Course Objective
Students should be able to
1. Understand the concept of RF circuit behavior at different HF.
2. Learn various bandwidth estimation techniques
3. Study various plots to analyze results of HF circuits.
4. Study amplifier design and its analysis.

Course Outcomes
Students will be able to
1. Design and simulate the circuit at different frequency levels
2. Analyze different output at various plots
3. Reduce the power requirement and bandwidth of HF circuits.
4. Apply the different concept for designing of HF amplifiers.

Sr. No.	Experiments based on
1	Importing the data files
2	Series RLC circuit
3	Parallel RLC circuit
4	High frequency amplifier design
5	High frequency filters design
6	RF Tuned Amplifier
7	RF Oscillator
8	RF Crystal Oscillator
9	IF Amplifier
10	RF Mixer

8th Semester

ET1426	PE V : Multimedia Communications		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Course Objective
Students should be able to
1. Learn the basics of image data types, file formats and color models used for image and video.
2. Understand various Fundamental concepts in video and audio
3. Get acquainted with various algorithms used for multimedia data compression
4. Understand basic concepts of video compression
5. Learn basic concepts of multimedia communication networks.
6. Understand basic concepts of Content-Based Retrieval in Digital Libraries

Course Outcome
Students will be able to
1. Compare different color models and file formats used for video and audio.
2. Analyze and compare digital/ analog video signal and quantization techniques for digital audio signals.
3. Compare different compression scheme used for image.
4. Compare different compression standards used for video.
5. Describe the multimedia networks communication protocols.
6. Comprehend different steps used in content based image retrieval.

UNIT I :
Fundamental concepts in Text and Image: Multimedia and hypermedia, world wide web,overview of multimedia software tools. Graphics and image data representation graphics/image data types, file formats, Color in image and video: color science, color models in images, color models in video

06Hrs

UNIT II :
Fundamental concepts in video and digital audio: Types of video signals, analog video,digital video, digitization of sound, MIDI, quantization and transmission of audio

06Hrs

UNIT III :
Multimedia data compression: Lossless compression algorithm: DCT, Wavelet- Based Coding, Embedded Zerotree of Wavelet Coefficients Set Partitioning in Hierarchical Trees (SPIHT), Basic Audio Compression Techniques

06Hrs

UNIT IV :
Basic Video Compression Techniques: Introduction to video compression, video compression based on motion compensation, search for motion vectors, MPEG, MPEG2, MPEG4

06Hrs

UNIT V:
Multimedia Networks: Basics of Multimedia Networks, Multimedia Network Communications and Applications : Quality of Multimedia Data Transmission, Multimedia over IP, RTCP,RTP,SIP-Transport of MPEG-4, Media-on Demand(MOD)

06Hrs

UNIT VI:
Content-Based Retrieval in Digital Libraries C-BIRD— A Case Study ,C-BIRD GUI Color Histogram Color Density Color Layout Texture Layout Search by Illumination Invariance Search by Object Model

06Hrs

Text books:

1	Fundamentals of Multimedia	2004	Ze-Nian Li , Mark S Drew	PHI/Pearson Education
2	Multimedia Applications	2004	Steinmetz, Nahrst	Springer

Reference books:

1	Multimedia Communications: Applications, Networks, Protocols and Standards	2001	Fred Halsall	Addison-Wesley

8th **Semester**

ET1427	Lab. : PE V: Multimedia Communications	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	Continuous Evaluation	ESE		Total	ESE Duration
	40	60		100	2 Hrs

Course Objective
Students should be able to
1. Study different color models.
2. Understand transmission of audio using Delta and ADPC modulation technique
3. Understand the concept of dithering.
4. Learn the SPIHT and EZW algorithm.
5. Understand different steps of DCT compression.
6. Study the concept of motion vector.

Course Outcomes
Students will be able to
1. Write program MALTLAB to implement the concept of multimedia.
2. Implement SPIHT, EZW algorithm for image compression technique.
3. Implement DCT for image compression technique.
4. Utilize the concept of motion vector for video compression.

Sr. No.	Experiments based on
1.	Convert given image from one color model to another using inbuilt MATLAB functions and conversion formulae
2.	Write MATLAB program to implement delta modulation and ADPCM
3.	Write MATLAB program to implement DCT image compression scheme and find Root Mean Square Error for different quantization level.
4.	Write MATLAB program to convert given image to its dithered version using 2X2 dithered matrix**.**
5.	Write MATLAB program to implement EZW encoder on given 4X4 matrix of Wavelet coefficient.
6.	Write MATLAB program to decode output of EZW encoder and generate the matrix of Wavelet coefficient.
7.	Write MATLAB program to implement SPIHT encoder on given 4X4 matrix of Wavelet coefficient.
8.	Write MATLAB program to decode output of SPIHT encoder and generate the matrix of wavelet coefficient.
9.	Write MATLAB program to play video file and display any two frames from video.
10.	Write MATLAB program to obtain motion vector using Sequential Search Method.

8th Semester

ET1435	PE V : Advances in Communication		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Course Objective
Students should be able to
1. The fundamental principles of advanced communication system.
2. To introduce fundamentals functions of a telecom switching and digital subscriber access.
3. Learn ISDN protocol & architecture.
4. Understand the working principles of digital telephony.
5. Understand the broadband communication.
6. Understand Basic Probability & Random variables.

Course Outcome
Students will be able to
1. Understand the working principles of digital telephony.
2. Apply his knowledge of switching technologies.
3. Apply his knowledge of ISDN protocol & SONET
4. Model digital subscriber & wireless local loop.
5. Apply the concept of random variables to characterize the signal behavior in communication.
6. Apply the concept of density function to analyze the performance of communication system.

UNIT-1:
Telephony Background
An overview of telephone networks, transmission system, switching system, Signaling, echo cancellation, working principles of telephone, DC (pulse) and DTMF (tone) signaling Traffic analysis Traffic characterization, loss systems, network blocking probabilities, delay systems

06 Hrs

UNIT-2:
Digital switching and networks
Space division switching, time division switching, time space time (TST) switch, space time space (STS) switch, comparison of TST and STS switches, network synchronization, control and management, timing, timing inaccuracies, network synchronization, network control, Network management

06 Hrs

UNIT-3:
ISDN protocol & SONET
Integrated service digital network (ISDN) ISDN overview, ISDN interfaces and functions, user network interface, ISDN protocol architecture, ISDN physical layer: basic user -network interface, primary rate user- network interface, U interface. SONET/SDH: SONET Multiplexing Overview, SONET Frame Formats, SONET Operations

06 Hrs

UNIT-4:
Broadband Communication
ISDN data link layer: LPAD protocol, terminal adaptation, bearer channel data link control, ISDN network layer: basic call control, control of supplementary services,Broadband ISDN (B - ISDN)-Architecture , Protocols Digital subscriber loop (DSL)-ADSL, HDSL, VDSL, Fiber in loop, wireless local loop (WLL)

06 Hrs

UNIT-5:
Basic Probability & Random variables
Introduction, definitions of probability, axioms of probability, Conditional probability, Total probability and Bayes' theorem.
Random variables: Definition, cumulative distribution function (CDF), continuous, discrete and mixed random variables, probability density function (pdf), probability mass function(PMF),properties of distribution functions, Specific random variables: Gaussian, Exponential, Rayleigh, Uniform, Binomial and Poisson distributions

06 Hrs

UNIT-6:
Random processes
Definition, Statistics of stochastic processes, mean, autocorrelation and autocovariance, independent process, Stationary and ergodic processes: strict-sense stationary, wide-sense stationary random processes, transmission of random process through a linear filter - relationship between input and output processes, power spectral density (PSD) - definition and properties, cross spectral densities, Gaussian random process – properties.

06 Hrs

8th Semester

ET1435	PE V: Advances in Communication		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Text books:				
6.	Digital Telephony		JOHN BELLAMY	Wiley Series
7.	Probability, Random Variables and Stochastic Processes		Papoulis, S. U. Pillai,	Tata McGraw Hill
Reference books:				
1	Telecommunication Switching and Networks		Thiagrajan Viswanathan	PHI Publication
2	ISDN and Broadband ISDN with Frame Relay and ATM	4th Edition	William Stalling	Pearson education Asia publication
3	Probability and Random Process for Electrical Engineers		A L Garcia	1. Pearson Education

8th Semester

ET1436	Lab. : PE V: Advances in Communication	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	Continuous Evaluation	ESE		Total	ESE Duration
	40	60		100	2 Hrs

Course Objective

Students should be able to

1. Understand the basics of communication system.
2. Verify the working of ISDN protocol and digital telephony.
3. Understand the concept a telecomm switching and digital subscriber access.
4. Understand the Basics of Probability & Random Process to analyze the communication system.

Course Outcomes

Students will be able to

1. Apply the concept of digital telephony to understand the telecommunication system.
2. Understand the switching network.
3. Apply his knowledge of ISDN protocol & SONET in communication field.
4. Understand and compare different distribution techniques of random variable.

Sr. No.	Experiments based on
1.	Study of DTMF signaling
2.	Study of ISDN protocol
3.	Study of Digital subscriber loop
4.	Study of wireless local loop (WLL).
5.	Study of cumulative distribution function (CDF)
6.	Study of probability density function (pdf)
7.	Study of Binomial and Poisson distributions
8.	Study of power spectral density in AWGN channel
9.	Study of Gaussian random communication system'

8th **Semester**

ET1428	Project Phase-II	L = 0	T = 0	P = 8	Credits = 8

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Course Objectives

1. Work on the defined problem.
2. Define and prepare road map to get a desired output.
3. Gain knowledge about the project.
4. Improve the communication skills and stage daring through effective presentation.
5. Write effective reports and design documentation.

Course Outcome

1. Identify, formulate and analyze complex engineering problems.
2. Apply knowledge to assess health, social, safety and environmental issues.
3. Deal with multidisciplinary and industry based projects.
4. Communicate technical information by means of written reports and presentations.

8th **Semester**

ET1429	**Comprehensive Viva-Voce**		**L = 0**	**T = 0**	**P = 0**	**Credits = 3**
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	--	--	--	100	100	

Course Objectives
To prepare the students for various competitive exams and personal interviews

Course Outcome
The students will be able to demonstrate their technical knowledge which they have learnt throughout the program.

8th Semester

ET1430	Extra/ Co-Curricular Activities		L = 0	T = 0	P = 0	Credits = 2
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
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Course Objectives
To develop the students personality to face the challenges in life.

Course Outcome
The students will be able to demonstrate their technical knowledge which they have learnt throughout the program.