K.S.R.M. COLLEGE OF ENGINEERING

(UGC-AUTONOMOUS)

Kadapa, Andhra Pradesh, India– 516 003

Approved by AICTE, New Delhi & Affiliated to JNTUA, Ananthapuramu.

An ISO 14001:2004 & 9001: 2015 Certified Institution

Proposed Course Structure (R20) – IV Year

			Semester-VII						
S.No.	**Code**	**Course Name**	**Category**	**L**	T	**P**	**IM**	**EM**	**Credits**
1.	2004701	**Professional Elective Course – III** Nano Electronics	PE	3	0	0	40	60	3
	2004702	Digital Image and Video Processing							
	2004703	MEMS							
2.	2004704	**Professional Elective Course – IV** Wireless Communication	PE	3	0	0	40	60	3
	2004705	DSP Processors and Architectures							
	2004706	RF System Design							
3.	2004707	**Professional Elective Course – V** Low Power VLSI	PE	3	0	0	40	60	3
	2004708	Biomedical Instrumentation							
	2004709	RADAR and Satellite Communication							
4.		**Open Elective-I**	OE	3	0	0	40	60	3
5.		**Open elective – II**	OE	3	0	0	40	60	3
6.	2004710	**Job oriented elective – II** Pattern Recognition	OE	3	0	0	40	60	3
	2004711	Advanced Computer Networks							
	2004712	Robotic Process Automation							

7.	20MC713	Mobile Application Development (**Skill oriented course – V**)	SC	1	0	2	40	60	2
8.	2004714	Evaluation of Industry Internship	PR				100		3
Total									**23**

		Semester-VIII					
S.No	Code	Course Name	Category	L-T-P	IM	EM	Credits
1.	2004801	Project work / Internship	PR	-	40	60	12
Total							12

Course Title	NANO ELECTRONICS				B. Tech. VII Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2004701	**PEC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	--	--	3	40	60	100
Mid Exam Duration: 90Min					**End Exam Duration: 3Hrs**			

Course Objectives:

- To study the basics of nano-technology.
- To understand the structural models of nano devices.
- To understand the fabrication methods and nano sensors.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Apply electron theory, quantum of conductance in the field of Nano-electronics and nano sensors in the field of bio-sensing.
CO 3	Analyze the physical characteristics of nano structures, materials and Carbon nano tubes.
CO 4	Compare the performance of various fabrication techniques of nano scale devices

UNIT I

Introduction: Classification of Nanostructures, Electronic properties of atoms and solids: Isolated atom, Bonding between atoms, Giant molecular solids, Free electron models and energy bands, crystalline solids, Periodicity of crystal lattices, Electronic conduction, effects of nanometer length scale, Fabrication methods: Top down processes, Bottom up processes methods for templating the growth of nanomaterials, ordering of nanosystems.

UNIT II

Characterization: Classification, Microscopic techniques, Field ion microscopy, scanning probe techniques, diffraction techniques: bulk and surface diffraction techniques.

Inorganic semiconductor nanostructures: Overview of semiconductor physics. Quantum confinement in semiconductor nanostructures: quantum wells, quantum wires, quantum dots, super-lattices, band offsets, electronic density of states

UNIT III

Fabrication techniques: Requirements of ideal semiconductor, epitaxial growth of quantum wells, lithography and etching, cleaved-edge over growth, growth of vicinal substrates, strain induced dots and wires, electrostatically induced dots and wires, Quantum well width fluctuations, thermally annealed quantum wells, semiconductor nanocrystals, collidal quantum dots, self-assembly techniques.

UNIT IV

Carbon Nanostructures: Carbon molecules, Carbon Clusters, Carbon Nanotubes, application of Carbon Nanotubes.

UNIT V

Nano sensors: Introduction, what is Sensor and Nano sensors? What makes them Possible? Order From Chaos, Characterization, Perception, Nano sensors Based on Quantum Size Effects, Electrochemical Sensors, Sensors Based On Physical Properties, Nano biosensors, Smart dust Sensor for the future.

TEXT BOOKS:

1. Robert Kelsall, Ian Hamley and Mark Geoghegan, "Nanoscale Science and Technology", John Wiley, 2007.

2. Charles P Poole, Jr, Frank J Owens, "Introduction to Nanotechnology", John Wiley, Copyright 2006, Reprint 2011.

3. T Pradeep, "Nano: The essentials-Understanding Nanoscience and Nanotechnology", TMH.

REFERENCE BOOKS:

1. William A Goddard III, Donald W Brenner, Sergey E. Lyshevski and Gerald J Iafrate, "Hand Book of Nanoscience Engineering and Technology", CRC press, 2003.

Course Title	DIGITAL IMAGE AND VIDEO PROCESSING				B. Tech. ECE VII Sem			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2004702	**PEC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	--	3	40	60	100
Mid Exam Duration: 90Min					**End Exam Duration: 3Hrs**			

Course Objectives:

- To study the image fundamentals and transforms necessary for image processing
- To learn the concepts of filtering in spatial and frequency domain
- To study different image compression techniques
- To understand image segmentation algorithms and Object recognition.
- To study video basics and motion estimation techniques

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Compute various image and video processing parameters
CO 2	Describe image filtering, segmentation and compression
CO 3	Compare different Color models, enhancement techniques, motion estimation techniques
CO 4	Apply the concepts of image and video processing techniques in various applications.
CO 5	Analyze coding and motion estimation methods in video processing.

UNIT-I

Introduction: Fundamentals of Image Processing: Digital image fundamentals, Applications of image processing, Image Sampling and Quantization, relationship between pixels. Relationship between pixels - neighbors of a pixel, Adjacency, Connectivity, Regions and boundaries, distance measures, Mathematical tools in digital image processing – Array versus matrix operations, Linear and Nonlinear Operations, Arithmetic operations, geometrical spatial transformations and image registration.

Color Images, Color models–RGB, CMYK, HSI;

UNIT-II

Image Enhancement: Spatial domain methods: Point processing, Histogram processing, Fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters.

Frequency domain methods: Basics of filtering in frequency domain, General approach for operating in the linear transform domain, 2-D DFT and Properties, image smoothing, image sharpening, Homomorphic filtering, LOG filters.

UNIT-III

Image Compression: Redundancies in images, Fidelity criteria, Image compression models, Error free compression – Variable length coding, Huffman coding, Arithmetic coding, LZW coding, Bit-plane coding, loss less and lossy predictive coding, Discrete cosine Transform, Transform coding, Image Compression standards.

Image Segmentation: Point, Line and Edge detection, Edge linking and boundary detection, Thresholding, Region based segmentation – Region growing, Region splitting and merging.

UNIT-IV

Introduction to Video processing : Definition of video signal, Analog and digital video, Spatial and temporal sampling, Video signal formats ,Video standards, Video coding basics, Need for video coding, Elements of a video coding system, Intraframe coding, Interframe coding, Three-Dimensional Coding, Interframe Predictive Coding, Frame differencing, Motion compensated prediction.

UNIT-V

Motion Estimation in Video Coding : Search Algorithms for Motion Estimation, Principle of Block Matching Algorithm, Full Search Algorithm, Fast Block Matching Algorithms- Two-Dimensional Logarithmic Search Algorithm, Three-Step Search Algorithm, Cross Search Algorithm, One-at-a-Time Search Algorithm, Proposed Modified Algorithms- New One-at-a-Time Algorithm, Modified Three-Step Search Algorithm.

Text Books:

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education 3rd edition 2008.
2. Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India.2nd edition 2004.
3. M. Tekalp , Digital Video Processing – Prentice Hall International
4. Shilpa Metkar and Sanjay Talbar "Motion Estimation Techniques for Digital Video Coding" Springer, 2013

Reference Books:

1. Scotte Umbaugh, Digital Image Processing and Analysis - Human and Computer Vision Application with CVIP Tools –2nd Ed, CRC Press, 2011.
2. Jayaraman, S. Esakkirajan and T. Veerakumar, Digital Image Processing, Tata McGraw Hill Education, 2011.
3. Ed. Al Bovik ,"Handbook of Image and Video Processing", 2nd Edition, Academic Press, 2000.
4. Vipula Singh, Digital Image Processing with MATLAB and LabView, Elsevier.

Course Title	Micro Electro-Mechanical Systems				B. Tech. ECE VII Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2004703	**PEC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	-	--	3	40	60	100
Mid Exam Duration: 90Min					**End Exam Duration: 3Hrs**		

Course Objectives:

- Introduction to MEMS and micro fabrication
- To study the essential material properties
- To study various sensing and transduction technique
- To know various fabrication and machining process of MEMS
- To know about the polymer and optical MEMS

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Apply the sensors and polymers in MEMS for different applications.
CO 2	Compare Mechanical Properties of various Mems Materials
CO 3	Analyze various sensors and actuators, Bulk and Surface Micro-Machining.
CO 4	Design MEMS for various applications

UNIT-I

INTRODUCTION TO MEMS AND MICRO FABRICATION: History of MEMS Development, Characteristics of MEMS-miniaturization - Micro electronics integration - Mass fabrication with precision. Micro fabrication - Microelectronics fabrication process- Silicon based MEMS processes- new material and fabrication processing- points of consideration for processing.

UNIT-II

ELECTRICAL AND MECHANICAL PROPERTIES OF MEMS MATERIALS: Conductivity of semiconductors, crystal plane and orientation, stress and stain – definition – relationship between tensile stress and stain- mechanical properties of silicon and thin films, Flexural beam bending analysis under single loading condition- Types of beam- deflection of beam-longitudinal stain under pure bending- spring constant, torsional deflection, intrinsic stress, resonance and quality factor.

UNIT-III

SENSING AND ACTUATION: Electrostatic sensing and actuation-parallel plate capacitor – Application-Inertial, pressure and tactile sensor- parallel plate actuator- comb drive. Thermal sensing and Actuations-thermal sensors-Actuators- Applications- Inertial, Flow and Infrared sensors. Piezo resistive sensors- piezo resistive sensor material- stress in flexural cantilever and membrane- Application-Inertial, pressure, flow and tactile sensor.

PIEZOELECTRIC SENSING AND ACTUATION: piezoelectric material properties-quartz-PZT-PVDF –ZnO- Application-Inertial, Acoustic, tactile, flow-surface elastic waves. Magnetic actuation- Micro magnetic actuation principle- deposition of magnetic materials-Design and fabrication of magnetic coil.

UNIT-IV

BULK AND SURFACE MICRO-MACHINING: Anisotropic wet etching, Dry etching of silicon, Deep reactive ion etching (DRIE), Isotropic wet etching, Basic surface micromachining process- structural and sacrificial material, stiction and antistiction methods, Foundry process.

UNIT-V

POLYMER AND OPTICAL MEMS: Polymers in MEMS- polymide-SU-8 liquid crystal polymer(LCP)-PDMS-PMMA-Parylene- Flurocorbon, Application-Acceleration, pressure, flow and tactile sensors. Optical MEMS-passive MEMS optical components-lenses-mirrors-Actuation for active optical MEMS.

Text books:

1. Chang Liu, "Foundations of MEMS", Pearson International Edition, 2006.
2. Julian W.Gardner, Vijay K Varadhan, "Microsensors, MEMS and Smart devices", John Wiley & sons, 2001.

References:

1. Gaberiel M.Rebiz, "RF MEMS Theory,Design and Technology", John Wiley & Sons,2003.
2. Charles P.Poole, Frank J.Owens, "Introduction to nanotechnology" John Wiley & sons, 2003.

Course Title	Wireless Communications					B. Tech. ECE VII Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2004704	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration:90Min					End Exam Duration: 3Hrs			

Course Objectives:

- To understand the design of a Wireless Communication system Concepts.
- To understand Broadband Wireless Channel Modeling, fundamentals of UWB.
- To study the various digital signaling techniques and Cellular mobile communication.
- To understand the concepts of OFDM and MIMO.
- To understand the multiple Access techniques and architecture for different Wireless Systems.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand 3G/4G Standards, Diversity, Cellular Communication. OFDM, MIMO OFDM.
CO 2	Apply basic principles to compute BER, Codes for CDMA and channel capacity.
CO 3	Analyze the characteristics of various Wireless Communication channels, Various channel models,
CO 4	Compare various channel characteristics, Multiple access schemes, various receivers and 3G/4G standards.
CO 5	Design Channel models, Receivers and MIMO Diversity

UNIT-I

Wireless Communications and Diversity: Introduction to 3G/4G Standards, Wireless Channel and Fading, Rayleigh Fading and BER of Wired Communication, BER for Wireless Communication, Introduction to Diversity, Multi-antenna Maximal Ratio Combiner, BER with Diversity, Spatial Diversity .

UNIT-II

Broadband Wireless Channel Modeling: Wireless Channel and Delay Spread, Coherence Bandwidth of the Wireless Channel, ISI and Doppler in Wireless Communications.

UWB (Ultra wide Band): UWB Definition and Features, UWB Wireless Channels, UWB Data Modulation, Uniform Pulse Train, Bit Error Rate Performance of UWB.

UNIT-III

Cellular Communication: Introduction to Cellular Communications, Frequency reuse, Multiple Access Technologies, Cellular Processes Call Setup, Handover etc., Telegraphic Theory.

CDMA: Introduction to CDMA, Walsh codes, Variable tree OVSF, PN Sequences, Multipath diversity, RAKE Receiver, CDMA Receiver Synchronization.

UNIT-IV

OFDM: Introduction to OFDM, Multicarrier Modulation and Cyclic Prefix, Channel model and SNR performance, OFDM Issues – PAPR, Frequency and Timing Offset Issues.

MIMO: Introduction to MIMO, MIMO Channel Capacity, SVD and Eigen modes of the, MIMO Channel , MIMO Spatial Multiplexing – BLAST, MIMO Diversity – Alamouti, OSTBC, MRT, MIMO - OFDM.

UNIT-V

3G and 4G Wireless Standards- GSM, GPRS, WCDMA, LTE, WiMAX

Text Books:

1. Aditya K. Jagannatham, "Principles of Modern Wireless Communication Systems", Publisher-McGraw Hill, 2017.

2. William C. Y. Lee, "Mobile Communications Engineering", Mc Graw Hill Publications,1997.

References:

1. Theodore Rapp port, " Wireless Communications: Principles and Practice", Prentice Hall, 2010.

2. Ezio Biglieri, "MIMO Wireless Communications", Cambridge University Press, 2009.

Course Title	DSP Processors and Architectures				B. Tech. ECE VII Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2004705	**PEC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	0	3	40	60	100
Mid Exam Duration:90Min					**End Exam Duration: 3Hrs**		

Course Objectives:

- To understand theory of different filters and algorithms
- To understand theory of multirate DSP, solve numerical problems and write algorithms
- To understand theory of prediction and solution of normal equations
- To know applications of DSP at block level.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand Aspects of architectures.
CO 2	Analyze Memory mapped accelerators
CO 3	Analyze DSP algorithms.
CO 4	Map the algorithms to architectures
CO 5	Design programmable systems

UNIT-I

DSP System Models: Introduction- Review of digital logic, Timing and Power in digital circuits, Quality metrics and bounds - Implementation Costs and Metrics, Architecture cost components, Examples of Architectures, Multi-objective Optimization.

Number representation- Scientific notation and Floating point

FIR and IIR Implementation: FIR filter, Serial FIR filter architectures, Simple programmable architecture, Block diagrams and SFGs, Dataflow Graphs, Iteration period, FIR filter iteration period, IIR filter iteration period, Computation Model.

UNIT-II

Dedicated hardware and transforms – Implementation, Constraint analysis for IPB computation, Motivational examples for IPB, General IPB computation, Sample period calculation, Parallel architecture, Odd-even register reuse, Power consumption, Pipelining, Pipelining FIR filter, Time-invariant systems, Valid pipelining examples, Feed forward cutsets, Balanced pipeline, Retiming basic concept, Example and uses of retiming

Resource sharing: adder example, Changing iteration period, Hardware assumptions and constraint analysis, Mathematical formulation, Examples with formulation, Example: Biquad filter, Hardware architecture, Review biquad folding sets, Complete biquad hardware.

UNIT-III

Scheduling: Obtaining a folding schedule, ASAP schedule, Utilization Efficiency, ALAP schedule, Iteration period bound and scheduling, Retiming for scheduling, Blocked schedules, Overlapped schedules, improved blocked schedule, Allocation, Binding and Scheduling, Heuristic approaches to scheduling, Mathematical formulation, ILP formulation, List scheduling, Hardware model, Force Directed Scheduling.

UNIT-IV

Programmable Systems: Software Compilation, Optimization Examples, Loop optimizations, Software pipelining, FFT Optimization, CPUs and FPGAs, FFT on FPGA board, Understanding ELF files

UNIT-V

Memory and Communication Systems: On-chip communication basics, Many-to-Many communication, AXI bus handshaking, HW accelerator for FPGA, DMA and arbitration, Network-on-chip basics, NoC - topologies and metrics, NoC– routing, NoC - switching and flow control,

Specialized Architectures: Systolic Arrays – Background, CORDIC algorithm, Parallel implementation of FIR filters, Unfolding Transformation, Look ahead Transformation, Introduction to GPUs and Matrix multiplication

Text Books:

1. KK Parhi, "VLSI Digital Signal Processing Systems: Design and Implementation", Wiley, NY, 1999.
2. Lars Wanhammar, Academic Press, 1999.

Reference Books:

1. Peter Pirsch, "Architectures for Digital Signal Processing", 2nd edition, John Weily, 2007
2. B. Venkataramani and M. Bhaskar, "Digital Signal Processors, Architecture, Programming and Applications", 2 Edition, TMH, 2004.
3. Jervis, "Digital Signal Processing- A practical approach", 4th edition, Pearson Education,2004.

Course Title	RF SYSTEM DESIGN				B. Tech. ECE Vll Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2004706	**PEC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	--	3	40	60	100
Mid Exam Duration: 90Min					**End Exam Duration: 3Hrs**		

Course Objectives:

- To learn the importance and issues in the design of RF
- To design RF filter and RF amplifier
- To study about the characteristics of oscillators, mixers, PLL, wireless synthesizers and detector

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand different RF Components such as Passive components, Microstrip Transmission Line.
CO 2	Design RF Amplifiers-High gain, Low gain Minimum Noise Amplifiers.
CO 3	Design of RF Oscillators.
CO 4	Design of RF Converters, Mixers.
CO 5	Design of Matching networks for RF Circuits.

UNIT-I

RF systems: basic architectures, Transmission media and reflections, Maximum power transfer, Passive RLC Networks - Parallel RLC tank, Q, Series RLC networks, matching, Pi match, T match, Passive IC Components, Interconnects and skin Effect, Resistors, capacitors, Inductors

UNIT -II

Review of MOS devices, **Distributed Systems**- transmission lines, reflection coefficient, The wave equation, examples, Lossy transmission lines, Smith charts – plotting gamma

High Frequency Amplifier Design - Bandwidth estimation using open-circuit time constants, Bandwidth estimation using short-circuit time constants, Rise time, delay and bandwidth, Zeros to enhance bandwidth, Shunt-series amplifiers ,tuned amplifiers, Cascaded amplifiers.

UNIT- III

Noise- Thermal noise, flicker noise review, Noise figure, **LNA Design** - Intrinsic MOS noise

Parameters, Power match versus noise match, Large signal performance, design examples & Multiplier based mixers. **Mixer Design** – Sub sampling mixers.

UNIT -IV

RF Power Amplifiers - Class A, AB, B, C Amplifiers, Class D, E, F amplifiers, RF Power amplifier design examples.

Voltage controlled oscillators – Resonators, Negative resistance oscillators

UNIT –V

Phase locked Loops - Linearized PLL models, Phase detectors, charge Pumps, Loop filters, PLL design Examples. **Frequency synthesis and oscillators**- Frequency division, integer-N synthesis, Fractional frequency synthesis.

Phase noise - General considerations, Circuit examples. **Radio architectures** - GSM radio architectures, CDMA, UMTS radio architectures

Text Books:

1. Thomas H. Lee, "The Design of CMOS Radio-Frequency Integrated Circuits", Cambridge University Press, 2004.
2. Behzad Razavi, "RF Microelectronics", Prentice Hall, 1997.

Reference Books:

1. Ellinger, Frank, "Radio Frequency Integrated Circuits and Technologies", Springer, 2008.
2. Cam Nguyen, "Radio Frequency Integrated Circuit Engineering",John Wiley & Sons, 2015.

Course Title	LOW POWER VLSI DESIGN				B. Tech. ECE VII Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2004707	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	--	3	40	60	100
Mid Exam Duration: 90Min					End Exam Duration: 3Hrs		

Course Objectives:

- To study the concepts of device behavior and modeling
- To study the concepts of low voltage, low power logic circuits.
- To identify the power dissipation mechanisms in various MOS logic styles
- To familiarize suitable techniques to reduce power dissipation, power optimization and power estimation.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand leakage sources and reduction techniques.
CO 2	Analyze power consumption and distribution in digital circuits.
CO 3	Apply Power minimization techniques in designing the low power circuits
CO 4	Design Low Power Memories

UNIT-I

Technology & Circuit Design Levels: Sources of power dissipation in digital ICs, degree of freedom, recurring themes in low-power, emerging low power approaches, dynamic dissipation in CMOS, effects of Vdd & Vt on speed, constraints on Vt reduction, transistor sizing & optimal gate oxide thickness, impact of technology scaling, technology innovations.

UNIT-II

Low Power Circuit Techniques: Power consumption in circuits, flip-flops & latches, high capacitance nodes, energy recovery, reversible pipelines, high performance approaches.

UNIT-III

Low Power Clock Distribution: Power dissipation in clock distribution, single driverVersus distributed buffers, buffers & device sizing under process variations, zero skew Vs.Tolerable skew, chip & package co-design of clock network.

UNIT-IV

Logic Synthesis for Low Power estimation techniques: Power minimization techniques, low power arithmetic components- circuit design styles, adders, multipliers.

UNIT-V

Low Power Memory Design: Sources & reduction of power dissipation in memory subsystem, sources of power dissipation in DRAM & SRAM, low power DRAM circuits, low power SRAM circuits.

Text Books

1. Jan M. Rabaey & Massous Pedram, "Low Power Design Methodologies", KluwerAcademic, 2002
2. Kaushik Roy, Sharat Prasad, "Low power CMOS VLSI circuit design", John WileysonsInc.,2000.
3. J.B.Kulo and J.H Lou, "Low voltage CMOS VLSI Circuits", Wiley, 1999.

Reference Books:

1. A.P.Chandrasekaran and R.W.Broadersen, "Low power digital CMOS design",Kluwer,1995
2. Gary Yeap, "Practical low power digital VLSI design", Kluwer, 1998.

Course Title	BIO-MEDICAL INSTRUMENTATION				B. Tech. ECE VII Sem.			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2004708	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	3	40	60	100
Mid Exam Duration: 90Min					End Exam Duration: 3Hrs			

Course Objectives:

- To understand the functioning of Human Cell and its electrical characteristics.
- To get sufficient knowledge about cardiovascular measurement and circulatory System of heart
- To get familiarize with pace makers and Defibrillators
- To understand about the electrical hazards that may occur during the usage of medical instruments

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the functioning of Medical Instrumentation System, Human Cell and its electrical characteristics
CO 2	Describe Organization of cell, various potentials and bio-electrodes.
CO 3	Analyze the functioning of cardiovascular measurement and circulatory System of heart
CO 4	Apply protective mechanisms for Patient electrical safety

UNIT I

Components of Medical Instrumentation System: Bio-amplifier, Static and dynamic characteristics of medical instruments. Bio-signals and characteristics. Problems encountered with measurements from human beings.

UNIT II

Sources of Bioelectric Potentials: Resting and action Potentials, Propagation of Action Potentials, the bioelectric potentials, electrode theory, biopotential electrodes-micro electrodes, skin surface electrodes, needle electrodes, biochemical transducers-reference electrode, the pH electrode.

UNIT III

The Cardiovascular System: The heart and Cardiovascular System, Electrocardiography, measurement of blood pressure, measurement of blood flow and cardiac output,Pacemaker, Defibrillator.

UNIT IV

Measurements in the Respiratory System: The Physiology of the Respiratory System, Test and Instrumentation for Mechanics of Breathing, Gas exchange and Distribution, Respiratory therapy equipment.

Biotelemetry: Introduction to Biotelemetry, physiological parameters Adaptable to Biotelemetry, the components of biotelemetry system, Applications of telemetry in patient care.

UNIT V

Electrical safety of medical equipment: Types of hazards, natural protective mechanism, leakage current, patient isolation, hazards in operation rooms, grounding conditions in hospital environment.

Text Books:

1. Biomedical Instrumentation and Measurements – Leslie Cromwell and F.J. Weibell, E.A. Pfeiffer, PHI, 2nd Ed, 1980.
2. Medical Instrumentation, Application and Design – John G. Webster, John Wiley, 3rd Ed., 1998.

Reference Books:

1. Principles of Applied Biomedical Instrumentation – L.A. Geoddes and L.E. Baker, John Wiley, 1975.
2. Hand-book of Biomedical Instrumentation – R.S. Khandpur, TMH, 2nd Ed., 2003.
3. Biomedical Telemetry – Mackay, Stuart R., John Wiley, 1968.
4. Biomedical Instrumentation- M. Armugam,Anuradha agencies publications.

Course Title	RADAR AND SATELLITE COMMUNICATION				B. Tech. ECE Vll Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2004709	**PEC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	--	3	40	60	100
Mid Exam Duration: 90Min					**End Exam Duration: 3Hrs**		

Course Objectives:

- The goal of the course is to introduce students to the fundamentals of radar and satellite communication.
- To provide an understanding of the basic concepts, operation, and modern radar systems.
- To familiarize with basic concepts related to satellite Communication. Understand Sub-Systems of Satellites and Launches.
- To know about the parameters affecting the Satellite System Performance.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Apply Radar range equation for calculating various Radar parameters.
CO 2	Compare various radars and their characteristics.
CO 3	Describe the Orbital aspects of Satellite Communication.
CO 4	Describe Spacecraft, Earth station and Multiple access techniques.
CO 5	Design satellite links for specified C/N.

UNIT-I

Introduction to Radar: Introduction to radar, Radar block diagram and operation, Radar frequencies, Applications of radar, Radar range equation, Prediction of range performance, Minimum detectable signal, Receiver noise, Probability density function, SNR, Integration of radar pulses, Radar cross-section of targets, PRF and range ambiguities,

UNIT -II

Radar Technology: Doppler Effect, CW radar, FM CW radar, Multiple frequency CW radar. MTI radar- Delay line canceller, Range gated doppler filters, Blind speeds, Staggered PRF, Tracking radar-sequential lobing, conical scan, Monopulse: amplitude comparison and phase comparison methods, Radar displays.

UNIT- III

Orbital aspects of Satellite Communication: Introduction to geo-synchronous and geo-stationary satellites, Kepler's laws, Locating the satellite with respect to the earth, Sub-satellite point, Look angles, Mechanics of launching a synchronous satellite, Orbital effects, Indian scenario in communication satellites

UNIT -IV

Spacecraft and Earth station: Satellite subsystems- Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system, Spacecraft antennas, Multiple access techniques, comparison of FDMA, TDMA, and CDMA. Earth station equipments, tracking systems.

UNIT -V

Satellite link design: Introduction to satellite link design, basic transmission theory, system noise temperature and G/T ratio, design of downlink and uplink, design of satellite links for specified C/N

Text Books:

1. Merrill I.Skolnik, "Introduction to Radar Systems", 2nd edition-TMH 1980.
2. Pratt, John Wiley, "Satellite communications",3rd edition, 2019.
3. Dennis Roddy, "Satellite Communications", 2nd Edition, 1996

Reference Books:

1. Robert M.Gagliardi, - satellite communication systems, CBS Publications
2. M Richharia "Satellite Communication System", CBS Publications
3. K. K Sharma "Introduction to Radar Systems", 3rd edition.

Course Title	PATTERN RECOGNITION				B. Tech. VII Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2004710	**PEC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	--	--	3	40	60	100
Mid Exam Duration: 90Min					**End Exam Duration: 3Hrs**		

- To Study the parametric and linear models for classification
- To Design neural network and SVM for classification
- To Develop machine independent and unsupervised learning techniques.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Apply parametric and linear models for classification.
CO 2	Apply Probability theory in pattern recognition.
CO 3	Develop machine independent and unsupervised learning techniques.
CO 4	Design neural network and SVM for classification

UNIT I

Introduction to Pattern Recognition: Problems, applications, design cycle, learning and

adaptation, examples, Probability Distributions, Parametric Learning - Maximum likelihood and Bayesian Decision Theory- Bayes rule, discriminant functions, loss functions and Bayesian error analysis

UNIT II

Linear models for classification: Discriminant functions, Two and multiple classes, Fisher's linear discriminant, Fisher's discriminant for multiple classes, The perceptron algorithm.

UNIT III

Neural Network: Perceptron, multi-layer perceptron, back propagation algorithm, error surfaces, practical techniques for improving back propagation, additional networks and training methods.

UNIT IV

Linear discriminant functions: Decision surfaces, two-category, multi-category, minimum squared error procedures, the Ho-Kashyap procedures, linear programming algorithms, Support vector machine.

UNIT V

Algorithm independent machine learning: Lack of inherent superiority of any classifier, bias and variance, re-sampling for classifier design.

Unsupervised learning and clustering: k-means clustering, fuzzy k-means clustering, hierarchical clustering

Text Books:

1. Richard O. Duda, Peter E. Hart, David G. Stork, “Pattern Classification”, 2nd Edition John Wiley & Sons, 2001.
2. C. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006.

Reference Books:

1. Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, “The Elements of Statistical Learning”, 2nd Edition, Springer, 2009.
2. Shai Shalev-Shwartz, Shai Ben-David, “Understanding Machine Learning”, Cambridge University Press, 2014.

Course Title	ADVANCED COMPUTER NETWORKS				B. Tech. ECE VII Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2004711	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	3	40	60	100
Mid Exam Duration: 90 Min					End Exam Duration: 3Hrs			

Course Objectives:

1. To give the concepts of various network reference models and their layers
2. To introduce cryptography

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Describe OSI and TCP/IP reference models and various types of networks.
CO 2	Understand the functionality of various layers of reference models.
CO 3	Classify the routing protocols and analyze how to assign the IP addresses for the given network.
CO 4	Identify types of transmission media with real time applications.
CO 5	Analyze the functionality of various protocols.

UNIT-I

Types of Networks: Reference Models-OSI reference model, TCP/IP reference model, OSI vs TCP. Network hardware architecture topologies, devices, Introduction to types of networks-optical networks, sensor networks.

UNIT-II

Physical Layer: Transmission media, Guided and Unguided transmission media, communication Satellites.

Data Link layer: Design Issues, Error detection and Correction, Elementary and sliding window Data link protocols

UNIT-III

MAC & Network layers: Media Access Protocols, carrier senses multiple access, collision free protocols, Ethernet, Wireless LANs-Types.

Network layer: Network Layer design issues- Routing Algorithms, IPV4 and IPV6 protocols.

UNIT-IV

Transport Layer: Transport services, Elements of Transport protocols, simple Transport protocols-UDP-TCP- performance Issues.

UNIT-V

Application Layer: DNS, E-mail, WWW, multimedia.

Introduction to Cryptography: Basic concepts, firewalls.

Text Books:

1. Andrew S. Tanenbaum , "Computer Networks ", 4th Edition, Pearson Education.

2. S. Keshav, “An Engineering Approach to Computer Networks”, International Student Edition, Addisson Wesley.

Reference Books:

1. Behrouz A.Forouzan “ Data communication and Networking”, Tata McGraw-Hill,2004
2. James F.Kurose and Keith W.Ross,” Computer Networking: A Top-Down approach featuring the Internet”, Pearson Education, 3rd Edition 2003.

Course Title	Robotic Process Automation				B. Tech. ECE VII Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2004712	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	3	40	60	100
Mid Exam Duration: 90 Min					End Exam Duration: 3Hrs		

Course Objectives:

- To understand Robotic process automation, Image, Text and Data Tables Automation.
- To describe types of variables, Control Flow and data manipulation techniques.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Describe RPA, where it can be applied and how it's implemented.
CO 2	Describe the different types of variables, Control Flow and data manipulation techniques.
CO 3	Identify and understand Image, Text and Data Tables Automation.
CO 4	Describe how to handle the User Events and various types of Exceptions and strategies.
CO 5	Understand the Deployment of the Robot and to maintain the connection.

UNIT-I

INTRODUCTION TO ROBOTIC PROCESS AUTOMATION:

Scope and techniques of automation, Robotic process automation - What can RPA do?, Benefits of RPA, Components of RPA, RPA platforms, The future of automation.

RPA BASICS:

History of Automation - What is RPA - RPA vs Automation - Processes & Flowcharts - Programming Constructs in RPA - What Processes can be Automated - Types of Bots - Workloads which can be automated - RPA Advanced Concepts - Standardization of processes - RPA Development methodologies - Difference from SDLC - Robotic control flow architecture - RPA business case - RPA Team - Process Design Document/Solution Design Document - Industries best suited for RPA - Risks & Challenges with RPA - RPA and emerging ecosystem.

UNIT-II

RPA TOOL INTRODUCTION AND BASICS:

Introduction to RPA Tool - The User Interface - Variables - Managing Variables - Naming Best Practices - The Variables Panel - Generic Value Variables - Text Variables - True or False Variables - Number Variables - Array Variables - Date and Time Variables - Data Table Variables - Managing Arguments - Naming Best Practices - The Arguments Panel - Using Arguments - About Imported Namespaces - Importing New Namespaces- Control Flow - Control Flow Introduction - If Else Statements - Loops - Advanced Control Flow - Sequences - Flowcharts - About Control Flow - Control Flow Activities - The Assign Activity - The Delay Activity - The Do While Activity - The If Activity - The Switch Activity - The While Activity - The For Each Activity - The Break Activity - Data Manipulation - Data Manipulation Introduction - Scalar variables, collections and Tables - Text Manipulation - Data Manipulation - Gathering and Assembling Data

UNIT-III

ADVANCED AUTOMATION CONCEPTS & TECHNIQUES: Recording Introduction - Basic and Desktop Recording - Web Recording - Input/Output Methods - Screen Scraping - Data Scraping - Scraping advanced techniques - Selectors - Defining and Assessing Selectors - Customization -

Debugging - Dynamic Selectors - Partial Selectors - RPA Challenge - Image, Text & Advanced Citrix Automation - Introduction to Image & Text Automation - Image based automation - Keyboard based automation - Information Retrieval - Advanced Citrix Automation challenges - Best Practices - Using tab for Images - Starting Apps - Excel Data Tables & PDF - Data Tables in RPA - Excel and Data Table basics - Data Manipulation in excel - Extracting Data from PDF - Extracting a single piece of data - Anchors - Using anchors in PDF.

UNIT-IV

HANDLING USER EVENTS & ASSISTANT BOTS, EXCEPTION HANDLING:

What are assistant bots? - Monitoring system event triggers - Hotkey trigger - Mouse trigger - System trigger - Monitoring image and element triggers - An example of monitoring email - Example of monitoring a copying event and blocking it - Launching an assistant bot on a keyboard event.

EXCEPTION HANDLING:

Debugging and Exception Handling - Debugging Tools - Strategies for solving issues - Catching errors.

UNIT-V

DEPLOYING AND MAINTAINING THE BOT:

Publishing using publish utility - Creation of Server - Using Server to control the bots - Creating a provision Robot from the Server - Connecting a Robot to Server - Deploy the Robot to Server - Publishing and managing updates - Managing packages - Uploading packages - Deleting packages

TEXT BOOKS:

1. Alok Mani Tripathi, "Learning Robotic Process Automation", Packt Publishing, 2018.
2. Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston, "Introduction to Robotic Process Automation: a Primer", Institute of Robotic Process Automation,1st Edition 2015.

REFERENCES:

1. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant", Independently Published, 1st Edition 2018.

2. Srikanth Merianda,"Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation", Consulting Opportunity Holdings LLC, 1st Edition 2018.

3. Lim Mei Ying, "Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes", Packt Publishing, 1st Edition 2018.

WEB REFERENCES:

1. https://www.uipath.com/rpa/robotic-process-automation
2. https://www.academy.uipath.com