NRI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

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Department of Electronics and Communication Engineering

Course Structure for B.Tech

R20 (20, 21& 22 Batches)

II-I Courses

MATHEMATICS-III:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Interpret the physical meaning of different operators such as gradient, curland, divergence
CO2	Estimate the work done against a field, circulation and fluxusing vector calculus
CO3	Apply Cauchy-Riemann equations to complex functions inorder to determine whether a given continuous function is analytic
CO4	Find the differentiation and integration of complex functions used in engineering problems and make use of the Cauchy residue theorem to evaluate certain integrals
CO5	Write the infinite series expansion of complex function by apply Taylor's, Maclaurin's/Laurant's series
CO6	Identify solution methods for partial differential equations that model physical process

ELECTRONIC DEVICE AND CIRCUITS:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Demonstrate the operation, V-I characteristics, parameters of P-N diode in differentmodes
CO2	Understand the operations, V-I characteristics and applications of Zener diode and special diodes in different modes and evaluate the performance of various rectifiersand filters with relevant expressions
CO3	Describe the construction, principle of operation of Transistors with their V-Icharacteristics in different configurations.
CO4	Describe the construction, principle of operation of Field Effect Transistors with their V-I characteristics in different configurations.
CO5	Chose the biasing and stabilization techniques for BJT and JFET with necessaryexpressions
CO6	Describe the construction, principle of operation of MOS Field Effect Transistors withtheir V-I characteristics in different configurations.

SWITCHING THEORY & LOGIC DESIGN:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Classify different number systems and apply to generate various codes.

CO2	Use the concept of Boolean algebra in minimization of switching functions
CO3	Design different types of combinational logic circuits.
CO4	Design combinational logic circuits using different types of Programmable Logic.
CO5	Apply knowledge of flip-flops in the design of Registers and counters.
CO6	Construct the state diagrams with the knowledge of Mealy and Moore conversions,state machines using various flip flops.

SIGNAL AND SYSTEM:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand the basic concepts of signals and systems and differentiate variousclassifications of signals and systems.
CO2	Analyze the frequency domain representation of signals using Fourier concepts.
CO3	Classify the systems based on their properties and determine the response of LTIsystems
CO4	Analyze Linear systems in time and frequency domain and understand the properties of convolution.
CO5	Perform sampling and reconstruction of signals with the help of Nyquist criterion andunderstand the properties of co relation
CO6	Transform continuous time signals into complex frequency domain by applying Laplace Transforms and discrete time signals by applying Z – Transforms.

RANDOM VARIABLES AND STOCHASTIC PROCESS:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Identifying the basic concepts of probability and Probability functions.
CO2	Understand the concepts of expectation and moment generating functions.
CO3	Implementing the joint density function and distribution functions to the multiplerandom variables.
CO4	understanding the operations joint moments and joint characteristic functions onmultiple random variables.
CO5	Understand the concept of random processes, and characterize the random processes inthe time domain.
CO6	Apply the theory of stochastic processes to analyze linear systems with random inputs

ELECTRONIC DEVICE AND CIRCUITS LAB:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Analyze the characteristics of the diodes in forward and reverse bias
CO2	To interpret the Diode application as rectifier and to analyze Half wave and full waverectifiers with filter action.
CO3	Analyze and understand the characteristics of BJT and FET in CE and CS configuration respectively.
CO4	Study and analyze the characteristics of UJT and SCR
CO5	Understand how to measure the parameters of the signal by using CRO
CO6	Apply knowledge to calculate the Q-point of the Transistor and to construct amplifiersusing BJT and FET

SWITCHING THEORY & LOGIC DESIGN LAB:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Analyze the truth tables of different Logic Gates
CO2	Design Various combinational Circuits with minimal SOP functions
CO3	Apply knowledge to Verify the truth tables of Decoders and Demultiplexers
CO4	Design a 4-bit ring counter and Johnson's counter using D Flip–Flops/JK Flip Flop
CO5	Understand the operation of 4-bit Universal Shift Register for different Modes ofoperation
CO6	Apply knowledge Construct 7 Segment Display Circuit Using Decoder and 7Segment LED

BASIC SIMULATION LAB:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand mathematical description and representation of different continuous anddiscrete time signals and sequences.
CO2	Perform operations on signals, computation of Energy and power of on signals &sequences, and extracting Even, odd, Real and Imaginary parts of signals and sequences,
CO3	Understand the convolution, auto and cross correlation operators for continuous anddiscrete time system.
CO4	Develop input output relationship for linear shift invariant system and to computestep, Sinusoidal and impulse responses
CO5	Understand and resolve the signals in frequency domain using Fourier transforms. develop the ability to analyze the systems in s- domain by waveform synthesisusing Laplace transforms.
CO6	Verify sampling theorem and identification of poles and zeroes for a given transferfunction.

ELECTRONIC CIRCUIT DESIGN:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Analyze the electronic circuit rules and its parameter calculations.
CO2	Develop the simulation process in the design of Electronic Circuits.
CO3	Interpret the PCB design and various processes involved
CO4	Explore in-depth core knowledge in the and fabrication of Printed Circuit Boards
CO5	Apply assembling and testing of the PCB based electronic circuits
CO6	Design single side PCB for power supplies of various devices.

II-II Courses

ANALOG COMMUNICATIONS:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand and analyze the modulation and demodulation outputs of AMand DSB-SC circuits.
CO2	Analyze the outputs of FM modulation and demodulation circuits.
CO3	Verify the characteristics of diode detector and AGC circuits.
CO4	Verify the outputs of Pulse modulation and demodulation circuits such as PAM, PWM and PPM.
CO5	Demonstrate the verification of sampling theorem and radio receivercharacteristics.
CO6	Explain the characteristics of radio receiver and pre-emphasis and de- emphasis circuits.

ANALOG COMMUNICATION LAB:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand and analyze the modulation and demodulation outputs of AM, DSB-SC.
CO2	Analyze the outputs of FM modulation and demodulation circuits.
CO3	Verify the characteristics of diode detector, PLL and AGC circuits.
CO4	Verify the outputs of Pulse modulation and demodulation circuits such as PAM, PWM and PPM.
CO5	Demonstrate the verification of sampling theorem.
CO6	Explain the characteristics of radio receiver and pre-emphasis and de- emphasis circuits.

ANALOG AND PULSE CIRCUITS:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Design and analysis of small signal high frequency transistor amplifier using BJTand FET
CO2	Design and analysis of multistage amplifiers using BJT and FET and Differentialamplifier using BJT
CO3	Derive the expressions for frequency of oscillation and condition for oscillation ofRC and LC oscillators and their amplitude and frequency stability concept
CO4	Know the classification of the power amplifiers and their analysis with performancecomparison
CO5	Derive the expressions for RC circuits for various inputs
CO6	Design and analysis of different types of multivibrators

ANALOG AND PULSE CIRCUIT LAB:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Construct the RC phase shift oscillator using transistors for different frequencies.
CO2	Design Colpitt's oscillator using transistors for different frequencies.
CO3	Estimate frequency response of two stage RC coupled amplifier.
CO4	Understand the characteristics of power amplifiers and multivibrators.
CO5	Draw the characteristics of series and shunt feedback amplifiers.
CO6	Understand the characteristics of linear and non linear wave shaping circuits.

EMWTL:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Interpret and apply the static electrostatic fields with respect to coordinate systems.
CO2	Analyze and demonstrate the static magnetic fields in real time applications.
CO3	Formulate the Maxwell's Equations in different forms with time considerations.
CO4	Formulate the theory of electromagnetic waves in free space with practicalapplications.
CO5	Evaluate and Relate wave propagation characteristics in different conducting andnon-conducting media.
CO6	Demonstrate the reflection and Refraction of EM waves at normal and obliqueincidences.

MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Use the theory of managerial economics, demand, production analysis & forecastingtheories
CO2	Analyze of production markets & pricing strategies & cost price functions to managemarkets & break-even-point
CO3	Develop an ability to identify, formulate & solve engineering problems by applyingthe knowledge of managerial economics
CO4	Theorize the features and types of Industrial organization
CO5	Enhance their capabilities in the interpretation of balance sheet that are followed inindustries, organizations & institutes
CO6	Apply financial analysis, capital budgeting techniques in evaluating various investment opportunities

PYTHON PROGRAMMING:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Upon successful completion of this course, students will be able to

CO2	Understand Python syntax and semantics and be fluent in the use of Python flowcontrol and Functions
CO3	Develop, run and manipulate Python programs using Core data structures like Lists,Dictionaries, and use of Strings Handling methods
CO4	Develop, run and manipulate Python programs using File Operations and searchingpattern using regular expressions
CO5	Interpret the concepts of object-oriented programming using Python
CO6	Understand the numbers, math's function, strings, list, tuples, and dictionaries in pythons

VHDL PROGRAMMING LAB:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Distinguish logic gates for design of digital circuits
CO2	Design different types of Combinational logic circuits
CO3	Design different types of sequential logic circuits
CO4	Analyze the operation of flip-flops
CO5	Apply knowledge of flip-flops in designing of Registers and Counters
CO6	Analyze the operation of RAM and ALU

III-I Courses

LINEAR AND DIGITAL INTEGRATED CIRCUITS:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Analyze different types of differential amplifiers and to discuss AC, DC characteristics of op-amp.
CO2	Build various linear and non-linear applications using op-amp operating with negative and positive feedback in closed loop configuration.
CO3	Experiment with various active filters.
CO4	Explain the fundamental frequency of monostable and astable multivibrators using IC555 timer.
CO5	Conclude the applications of PLL and A/D and D/A converters.
CO6	Identify the importance and applications of different types of digital ICs.

ANTENNAS AND WAVE PROPAGATION:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand the basic antenna radiation parameters and radiation mechanism of single wire & two wire antennas with current distribution analysis.
CO2	Quantify the radiation fields and power radiated by dipole antennas also analyze their radiation characteristics using mathematical approach.
CO3	Illustrate the different types of arrays and their radiation patterns with both mathematical and geometrical analysis.
CO4	Understand the geometry and working principle of operation of non-resonant radiators and microstrip antennas with qualitative analysis.
CO5	Illustrate techniques for antenna parameter measurements and analyze various types of Microwave Antennas.
CO6	Identify and distinguish the characteristics of different modes of radio wave propagation in the atmosphere with both qualitative and quantitative treatment.

DIGITAL COMMUNICATION:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Apply the knowledge of statistical theory of communication and understand the basics of digital communication systems
CO2	Analyze the performance of digital modulation techniques for generation, detection and digital representation of the signal
CO3	Explore the probability of error for various digital modulation techniques with the help of random variables and filters
CO4	Integrate and apply the basics of information theory to the communication and compute entropy, information rate of the source
CO5	Understand and analyze the source coding techniques and channel capacity.
CO6	Compute and analyze different error control coding schemes for reliable transmission of digital information over the channel

COMPUTER ORAGANISATION AND ARCHITECTURE:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand the basics, evolution and architecture of the computer.
CO2	Analyze the machine instructions and how to write programs and calculate the effective address of an operand by addressing modes.
CO3	Demonstrate the relationship between the software and the hardware and to understand concepts of control unit and all arithmetic operations.
CO4	Analyze the concept of I/O organization and design how to interface i/o devices.
CO5	Demonstrate the memory organization and understand the concept of cache mapping techniques.
CO6	Understand the principles of operation of multiprocessor systems.

BIO-MEDICAL ENGINEERING:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Demonstrate Man – Instrumentation system and different problems encountered in measuring the living system and able to analyze different types of bioelectric potentials with resting and action potential.
CO2	Explain the working of various Electrodes and Transducers using Transduction principles for obtaining Bio electric potentials.
CO3	Demonstrate the anatomy of physiological systems and the measurements of various tests for Cardiovascular system, ECG, heart sound, Blood Pressure, blood flow and cardiac output and experiment with Plethysmography.
CO4	Illustrate the anatomy of physiological systems and the measurements of various tests using instrumentation for mechanism of breathing with Respiratory Therapy Equipment.
CO5	Recognize the importance of patient monitoring system and explain the design, Principle & working of various Therapeutic and Prosthetic devices.
CO6	Describe the basic principle and applications of various medical imaging systems and importance of Bio Telemetry for patient care and patient safety in medical equipment's and also able to identify the methods to prevent shock hazards from electrical equipment and express the working of different types of recorders and monitors.

DATA STRUCTURES:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Ability to illustrate the concepts of algorithm apply the learning concepts to design data
CO2	Analyze and implement operations on linked list and demonstrate their applications
CO3	Ability to design applications using stacks and queues and implements various types of queues
CO4	Ability to analyze and implement operations on trees
CO5	Ability to demonstrate various operations on binary search trees and its applications
CO6	Ability to evaluate the properties and operations on graphs and implement the graph

INTELLECTUAL PROPERTY:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Classify intellectual property rights, cyber-crimes and understand the importance of ipr
CO2	Categorize subject matters of copyrights, understand the registration process of copyrights and effect of infringement
CO3	Analyze patent requirements and its registration formalities and effect of infringement
CO4	Analyze functions of Trademark and its registration formalities and effect of infringement under Trademark Act
CO5	Understand the importance of trade secrets and how to maintain trade secrets
CO6	Pave the way for the students to catch up Intellectual Property as an career option

LINEAR AND DIGITAL INTEGRATED CIRCUITS LAB:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand the basics of Op-Amp (IC 741), timer (IC 555) and PLL (IC 565).
CO2	Design, analyze various applications of Op-amp 741 IC.
CO3	Designs multivibrator circuits using IC555 and determine the frequency of oscillation and time delay.
CO4	Understand the characteristics of PLL.
CO5	Design various combinational circuits using various digital Integrated Circuits.
CO6	Design various sequential circuits using various digital Integrated Circuits.

DIGITAL COMMUNICATIONS LAB:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand the Time-Division Multiplexing systems, and verify the output of pulse code modulation and demodulation.
CO2	Analyze the output of differential pulse code modulation and demodulation and verify the delta modulation.
CO3	Analyze the outputs of different digital modulation techniques-FSK, PSK.
CO4	Interpret the outputs of DPSK modulation and demodulation.
CO5	Analyze the outputs of source encoder and decoder, linear block codes, convolution codes and binary cyclic codes.
CO6	Perform and analyze the output of companding circuit.

INTERNET OF THINGS LAB:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand the concept of Internet of Things
CO2	Implement interfacing of various sensors with Arduino/Raspberry Pi.
CO3	Demonstrate the ability to transmit data wirelessly between different devices.
CO4	Design the mobile applications for controlling the devices.
CO5	Show an ability to upload/download sensor data on cloud and server.
CO6	Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks

INTERNSHIP:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Acquire on job the skills, knowledge, and attitude, which are requisite to constitute a professional identity.
CO2	Engage in applied professional-level work under supervision of a professional in the field.
CO3	Exhibit evidence of increased content knowledge gained through practical experience.
CO4	To deal with industry-professionals and ethical issues in the work environment.
CO5	Explain how the internship placement site fits into their broader career field.
CO6	Evaluate the internship experience in terms of their personal, educational and career needs.

III-II Courses

MICROPROCESSOR AND MICROCONTROLLERS:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand the architecture of 8086 microprocessor and their operation.
CO2	Demonstrate programming skills in assembly language for 8086 microprocessors.
CO3	Analyze various interfacing techniques and apply them for the design of processor based systems.
CO4	Interface external peripherals and I/O devices and program the 8086 microprocessor.
CO5	Understand the architecture of 8051 microcontroller and their operation and programming skills for 8051.
CO6	Understand the concepts of ARM Processor.

DIGITAL SIGNAL PROCESSING:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand the representation of different Discrete time signals and apply the difference equations concept in the analysis of discrete time systems
CO2	Interpret and explore the concepts of Discrete Fourier Transforms and Fast Fourier Transforms for various Discrete Time Signals and Sequences.
CO3	Use FFT algorithm for solving DFT of sequence
CO4	Design the Digital IIR Filters from the analog filters using frequency transformations and FIR filters using windowing techniques.
CO5	Construct the basic structures of Digital FIR and IIR systems.
CO6	Apply the signal processing concepts on programmable Digital Signal Processors.

VLSI DESIGN:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Demonstrate a clear understanding of CMOS fabrication flow and technology scaling.
CO2	Apply the design Rules and draw layout of a given logic circuit.
CO3	Understand the scaling factors determining the characteristics and performance of MOS circuits in silicon.
CO4	Understand the switch logic and gate logic.
CO5	Apply the concepts in testing which can help them design a better yield in IC design.
CO6	Analyze the FPGA architecture , design flow and CPLD architecture.

OPTICAL COMMUNICATIONS:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand the overview of optical fiber communication and classify the types of optical fibers, analyze cylindrical fibers using mathematical equations.
CO2	Design the optical fibers using various materials and to illustrate various attenuation losses.
CO3	Illustrate various dispersion models Apply splicing techniques on fibers and choose low loss connectors to minimize joint losses.
CO4	Analyze different types of optical sources and photo detectors, External quantum efficiency, and analyze signal transmission, receiver operation and error sources of optical fiber.
CO5	Evaluate the power coupled in to optical fibres and Measurement of Attenuation and Dispersion, Eye pattern.
CO6	Design optical system with budget analysis and to classify principles and types of WDM.

EMBEDDED SYSTEMS:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand the basic concepts of embedded system.
CO2	Analyze the different hardware components used to design the embedded system.
CO3	Design various approaches for embedded firmware.
CO4	Design RTOS for an embedded system design.
CO5	Understand the fundamental issues in hardware software co design.
CO6	Understand the IDE and various tools used in implementing the embedded system.

RADAR SYSTEMS:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Acquire the knowledge of Radar system to apply and to design required parameters for a RADAR system and to derive the RADAR Equation.
CO2	Analyze the working principle of CW and Frequency Modulated Radar and their applications.
CO3	Understand the principle of MTI and pulse Doppler Radar and analyze MTI Radar parameters and their limitations.
CO4	Acquire the knowledge of phase array antennas used for transmission and reception in RADAR.
CO5	Analyze different types of tracking RADARs and to study different types of Radar receivers and displays.
CO6	Explore the detection of Radar signals in the presence of noise and analyze the performance of matched filter receiver and its characteristics.

INDUSTRIAL ROBOTICS:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Explain the basic concepts and components of industrial robotics and automation
CO2	Judge the knowledge about robot actuators and feedback components.
CO3	Analyze the motion of robot and manipulator kinematics.
CO4	Analyze the general considerations of path description and generation.
CO5	Analyze the motion of robot joints,straight line and skew.
CO6	Utilize knowledge about the image processing. machine vision and robotic applications.

PROFESSIONAL ETHICS AND HUMAN VALUES:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand moral values, work ethics, respect others and develop civic virtue.
CO2	Understand ethical responsibilities of the engineer's different professional roles.
CO3	Demonstrate knowledge to become a social experimenter on framing of the problem and determining the facts.
CO4	Create awareness about safety, risk & risk benefit analysis and knowledge on intellectual property rights.
CO5	Develop knowledge about global issues creating awareness on computer and environmental ethics.
CO6	Analyze ethical problems in research and give a picture on weapons development.

VLSI LAB:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Design, implement, and simulate Basic logic gates using S. Edit of Tanner EDA toll and Micro wind using at back end
CO2	Simulate and synthesize Universal gates using Tanner EDA tool and Micro wind.Simulate circuits within a Tanner EDA tool and compare to design specifications.
CO3	Design, implement, and simulate circuits using Tanner EDA and Micro wind tool.
CO4	Design Digital logic Counters using Tanner EDA Tools and Implement Using Micro wind Tool.
CO5	Design RAM Cell using Tanner EDA Tools and Implement Using Micro wind Tool.
CO6	Understand various design rules to obtain the CMOS logic circuits.

DIGITAL SIGNAL PROCESSING LAB:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Make use of a software tool to generate various discrete time signals and perform different operations on them.
CO2	Examine Linear and Circular Convolution of discrete time signals.
CO3	Evaluate the Discrete Fourier Transform of a signal and its inverse.
CO4	Analyze the Frequency response of IIR Filters using Butterworth and Chebyshev Approximations.
CO5	Analyze the Frequency Response of FIR filters using windowing techniques.
CO6	Illustrate the Decimation and Interpolation processes on a given Sequence.

MICROPROCESSOR AND MICROCONTROLLER LAB:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Develop the assembly language Programmes for 8086 Microprocessor
CO2	Use the cross compiler such as MASM to verify and simulate the 8086 codes
CO3	Develop the assembly language Programmes for 8051 Microcontroller.
CO4	Use Keil to verify and simulate the 8051 Programming
CO5	Use various interfacing circuits for Real world and practical Applications.
CO6	Analyze the performance of various interface techniques for the computing circuits.

SENSOR & INSTRUMENTATIONS LAB:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understanding the concept of measurement system
CO2	Identifying concepts in common methods for converting a physical parameter into an electrical quantity.
CO3	Applying concepts in advances in transducers for various engineering applications.
CO4	Choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc.
CO5	Applying knowledge on advanced sensor which related to detect the enhanced parameters using sensors.
CO6	Set up testing strategies to evaluate performance characteristics of different types of sensors and transducers and develop professional skills in acquiring and applying the knowledge outside the classroom through design of a real-life instrumentation system

IV-I Courses

DATA COMMUNICATION AND COMPUTER NETWORKS:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Demonstrate different network models for networking links OSI, TCP/IP and get knowledge about various communication techniques, methods and protocol standards.
CO2	Analyze data link layer services, compare and classify medium access control protocols
CO3	Demonstrate network service models, virtual circuits and routing mechanism
CO4	Analyze the internet protocol addressing in internet using IPV4 & IPV6 format
CO5	Determine the relationship between transport and network layer, understand connection and and connection less services in transport layer.
CO6	Determine application layer services and client server protocols

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand the fundamental concepts of instrumentation and characteristics of measuring systems. Describe different types of meters and understanding the operation of meters.
CO2	Analyze Different types of signal generators and signal analyzers and their working principles.
CO3	Interpret the basic principle of Oscilloscope, measurement of parameters using CRO and understand different types of CRO probes.
CO4	Understand the working of different types of special purpose oscilloscopes.
CO5	Explore the different types of A.C. and DC Bridges, Q meters, Counters and their operations
CO6	Demonstrate the different types of transducers and their principles and operations.

DIGITAL IMAGE PROCESSING:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand the fundamentals of image processing
CO2	Study transforms and introduce different intensity transformation functions and filtering techniques in spatial domain to enhance quality of image
CO3	Introduce different filtering techniques in frequency domain filters
CO4	Study different noise models and apply filters to estimate degradation and restore images
CO5	Explain the concept of color image processing To discuss various compression techniques.
CO6	Apply morphological and segmentation techniques for processing images

SATELLITE COMMUNICATION:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand the historical background of satellite communication and analyze different frequency allocation of satellites communication
CO2	Ability to calculate the orbital mechanics, determination of satellite orbits , orbital effects and launching methods
CO3	Ability to develop AOCS, commands, monitoring power systems and developments of antennas
CO4	Able to design antennas to provide Uplink and Down link Frequency and analyze multiple access techniques like TDMA, CDMA,FDMA
CO5	Ability to design different kinds of transmitter and receiver antennas, design and develop Satellite for real time applications
CO6	Ability to learn the concepts of Radio and Satellite Navigation system and GPS location principles, DGPS

MACHINE LEARNING:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Explain the fundamental usage of the concept Machine Learning system.
CO2	Able to form clusters based on Distance models and demonstrate on various regression Technique.
CO3	Analyze the Ensemble Learning Methods.
CO4	Explain Linear and Non-Linear Support Vector Machine (SVM) Classification.
CO5	Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
CO6	Discuss the Artificial Neural Networks Neural Network training and Fundamentals concepts of Activation functions.

DATABASE MANAGEMENT SYSTEM:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Understand the database management system structure
CO2	Apply as relational algebra to find solutions to a broad range of queries.
CO3	Create applications using various normal forms, functional dependencies
CO4	Ability to validating and identifying anomalies
CO5	Explain the principle of transaction management design.
CO6	Understands and applies indexing mechanisms in databases

ENGINEERING PROJECT MANAGEMENT:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Attain knowledge on planning and scheduling of various projects
CO2	learn and apply the knowledge of Networks in project planning
CO3	Analysis by PERT
CO4	Analysis by CPM
CO5	Optimization of the cost
CO6	Evaluation of the project by using various methodologies.

UNIVERSAL HUMAN VALUES - II: UNDERSTANDING HARMONY:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Describe more aware of themselves, and their surroundings (family, society, nature)
CO2	Illustrate more responsibility in life, and in handling problems with sustainable solutions
CO3	Handle problems with sustainable solutions, while keeping human relationships and human nature in mind.
CO4	Exhibit critical ability and become sensitive to their commitment towards their understanding of human values, human relationship and human society.
CO5	Exhibit sensitivity to their commitment towards what they have understood (human values, human relationship and human society)
CO6	Apply what they have learnt to their own self in different day-to-day settings in real life.

EMPLOYABILITY SKILLS:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Compare and differentiate between formal and informal communication.
CO2	Take part in and manage interpersonal communication.
CO3	Solve the Arithmetic and Reasoning Problems as fast as possible and as simple as possible.
CO4	Exhibits good analytical skills and aptitude skills.
CO5	Perform well in all competitive exams like RRB, SSC, GROUPS, and BANKING and clear the aptitude section of exams for higher education like CAT, GMAT, and GRE etc…
CO6	Make use of the techniques of effective communication in letter and report preparation.

MICROWAVE & RF COMMUNICATION LAB:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Demonstrate the characteristics of Reflex Klystron.
CO2	Measure vthe negative Resistance characteristics of the Gunn diode.
CO3	Calculate the attenuation, frequency, and wavelength of given microwave component using Microwave Bench Setup.
CO4	Analyze the characteristics of the multihole Directional Coupler.
CO5	Perform the characteristics of various optical sources and measure different losses occur in optical fiber link.
CO6	Determine the spectral components of given frequency band using Spectrum Analyzer

INTERNSHIP:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Acquire on job the skills, knowledge, and attitude, which are requisite to constitute a professional identity.
CO2	Engage in applied professional-level work under supervision of a professional in the field.
CO3	Exhibit evidence of increased content knowledge gained through practical experience.
CO4	To deal with industry-professionals and ethical issues in the work environment.
CO5	Explain how the internship placement site fits into their broader career field.
CO6	Evaluate the internship experience in terms of their personal, educational and career needs.

IV-II Courses

MAJOR PROJECT:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	Demonstrate skill and knowledge of current information and technological tools and techniques specific to the professional field of study
CO2	Design and construct a hardware and software system, component, or process to meet desired needs.
CO3	Identify, analyze, and solve problems creatively through sustained critical investigation.
CO4	Discussion and critical thinking about topics of current intellectual importance
CO5	Ability to understand advanced technology and research in engineering.
CO6	Develop presentation and technical writing skills.

COMMUNITY SERVICE PROJECT:

Course Outcomes:

Upon successful completion of this course, students will be able to:	
CO1	To learn the application of knowledge in real world problems
CO2	Assess and improve upon their own cultural competency skills.
CO3	Demonstrate ethical conduct and professional accountability while working in a team for the benefit of society
CO4	Demonstrate understanding of therapeutic models of helping.
CO5	Understand the stages of helping, including exploration, insight, and action.
CO6	Develop applied helping skills to facilitate change in individuals, families, and groups.

Signature of HOD