Department of Electronics and communication Engineering

Asansol Engineering College

COURSE OUTCOMES (COs)

Program Name: B. Tech in Electronics and Communication Engineering

FIRST YEAR : 1ST SEMESTER		
Course Name (Code)	**Course Outcomes (COs)**	
	On completion of the course, the students will be able to:	
Chemistry-I (BS-CH-101)	CO1	Explain atomic and molecular structure and analyse Microscopic chemistry in terms of atomic and molecular orbitals.
	CO2	Understand spectroscopic techniques and their applications. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
	CO3	Discuss intermolecular forces and potential energy surfaces.
	CO4	Define the use of free energy in chemical equilibria and illustrate bulk properties and processes using thermodynamic considerations.
	CO5	Generalise periodic properties such as ionization potential, electronegativity and oxidation states.
	CO6	Describe stereochemistry and list major chemical reactions that are used in the synthesis of molecules.
Mathematics –I (BS-M-102)	CO1	Apply the concept and techniques of differential and integral calculus to determine curvature and evaluation of different types of improper integrals.
	CO2	Understand the domain of applications of mean value theorems to engineering problems.
	CO3	Learn different types of matrices, concept of rank, methods of matrix inversion and their applications..
	CO4	Learn concept of series and sequence and test of convergence and summation technique . Application to Taylor's series and Fourier series
	CO5	Defining and describing concept of involute and evolute of a function and its application
	CO6	Learn and apply the concept of eigen values, eigen vectors, diagonalisation of matrices and orthogonalization in inner product spaces for understanding physical and engineering problems.
Basic Electrical	CO1	Understand the basics of electrical circuits, circuit parameters and components
	CO2	Interpret different AC circuits

Engineering (ES-EE-101)	CO3	Develop the knowledge on fundamentals of transformer and its performance
	CO4	Identify the role of different electrical machines
	CO5	Develop knowledge in Power Converters
	CO6	Relate the applications of different switch gear in electrical installations
. Chemistry-I Laboratory (BS-CH-191)	CO1	Estimate the chloride ion in a given water sample by Argentometric method (using chromate indicator solution).
	CO2	Determine the partition coefficient of a substance (acetic acid) between two immiscible liquids (water and n- butanol).
	CO3	Calculate the value of dissolved oxygen present in a given water sample.
	CO4	Examine the strength of a given HCl solution against a standard NaOH solution by help of pH- metric titration method.
	CO5	Experiment the strength of a given HCl solution by the titration against a standard NaOH solution using Conductometric titration method.
	CO6	Establish the viscosity of a liquid at various concentrations by Oswald's Viscometer.
Basic Electrical Engineering Laboratory (ES-EE-191)	CO1	Identify the various electrical meters and instruments.
	CO2	Establish the condition of resonance in R-L-C series and parallel circuit
	CO3	Calibrate the various measuring instruments (like ammeter and wattmeter etc.) to determine instrument error
	CO4	Determine the equivalent circuit parameters of a single phase transformer.
	CO5	Simulate in PSPICE for performing transient analysis of R-L ,R-C, R-L-C series circuit.
	CO6	Calculate the power factor of three phase system by two wattmeter method
Engineering Graphics & Design (ES-ME-191)	CO1	Understand engineering drawing and apply in the field of engineering design
	CO2	Illustrate to the various curves and geometrical construction required for engineering design
	CO3	Construct 2D and 3D views using different projection methods of engineering graphics standards
	CO4	Apply knowledge of projection methods during section of solids, development of surfaces and combination of simple solids
	CO5	Apply engineering graphics software such as AutoCAD for drawing and modelling solid objects

FIRST YEAR : 2ND SEMESTER		
Physics-I (BS-PH-201)	CO1	Describe about the Basic concepts of mechanics
	CO2	Explain interference, diffraction and polarization of light.
	CO3	State the basic principles of LASER and construction of Ruby LASER , He-Ne LASER.
	CO4	Interpret about electromagnetic wave equation, dielectric and magnetic properties of materials.
	CO5	Understand the basics of Quantum Mechanics.
	CO6	Discuss about the basics and applications of Statistical Mechanics
Mathematics –II (BS-M202)	CO1	Learn and apply techniques in line integrals/multiple in practical engineering problems, arranging from quality control and quality assurance to communication theory in electrical engineering etc.
	CO2	understand different techniques to solve linear ODE and their usage in practical probs I engineering.
	CO3	Define and discuss the properties of series : summation methods
	CO4	Learn different tools of differentiation and integration of complex variable that are used with other tools to solve communication theory in engineering etc.
	CO5	Summarize different types of transforms between two demensional planes for analysis physical and engineering probs.
	CO6	apply residue theorem for evaluating definite and improper integrals for solving engineering probs
English (HM-HU-201)	CO1	Interpret English when written and spoken.
	CO2	Catagorize and discove reading and writing skills.
	CO3	Develop their verbal and non- verbal communication skills in expressing themselves.
	CO4	Become more expressive in a global platform.
	CO5	Assess their employability skills by reframing the ability to articulate.
	CO6	Provides them the combination in readiness and preparedness in terms of compiling professional documentation.
Programming for Problem Solving (ES-CS-201)	CO1	Examine fundamentals of computer
	CO2	Understand basic concepts of programming, algorithm and flowchart and analyze the behavior of a program.
	CO3	Understand the concept of decision making, loops, array, function, pointer, structure and file handling
	CO4	Compare the efficiency among various searching and sorting algorithms
	CO5	Write algorithms and programs for different concepts.
Physics-I Laboratory (BS-PH-291)	CO1	Describe the Young's modulus experiment of the material of the rod by flexure method.
	CO2	Demonstrate the of rigidity modulus of the material of the wire by

		statical and dynamical method.
	CO3	Determine an unknown resistance by carry foster bridge method.
	CO4	Calculate the wavelength of a laser source using plane transmission grating by diffraction method.
	CO5	Estimate the wavelength of a source by Newton's ring method.
	CO6	Compute the viscosity of a liquid by poiseuille's method.
Programming for Problem Solving (ES-CS-291)	CO1	Demonstrate about different hardware component of Computer system and their functionality.
	CO2	Apply the concept of decision making, loop, array, function, pointer structure and file handling to model engineering problem.
	CO3	Analyze different public and private test cases.
	CO4	Analyze time and space complexity of various programs.
Workshop/Manufacturing Practices (ES-ME-292)	CO1	Summarize manufacturing and engineering materials, including the importance, applications and safety in different shops for the development of components.
	CO2	Choose suitable tools for different primary manufacturing processes
	CO3	Demonstrate different machine tools and machining processes.
	CO4	Apply knowledge and techniques to make different components using different manufacturing processes.
	CO5	Build different welded joints.
Language Laboratory (HM-HU-291)	CO1	Inculcate within themselves the importance of listening , comprehending and reading, which in turn, fosters communication which ensures empathy, trust, confidence and a better understanding of the subject matter with a wide range of vocabulary, voice modulation, ability to summarize the subject matter with precision respectively.
	CO2	Develops their employability skills by generating the ability to articulate.
	CO3	Develops their analytical skills and inculcates in them power of decision making through interpersonal relationship building.
	CO4	Infuses the managerial skills with sophisticated manners, etiquette, articulate courtesies in terms of interpersonal and telephonic communication.
	CO5	Provides them the corporate readiness and develops team building skills and develops their overall personality.
SECOND YEAR : 3RD SEMESTER		
	CO1	Understand and Apply probability techniques in many practical engineering problems, ranging from quality control and quality assurance to communication theory in electrical engineering etc
	CO2	Learn and Apply Fourier series : vitally used to approximate a periodic waveform in electronics and electrical circuits
	CO3	Learn and Apply Complex analysis is used in many areas of electrical engineering including: Circuit theory (impedance, transfer functions, etc.), Electromagnetism (time-harmonic fields),

Mathematics-III (M-302)	CO4	Describe and understand The discrete Fourier transform and the FFT algorithm. Emphasis is on relating the theoretical principles to solving practical engineering and science problems..
	CO5	Apply PDE and ODE include problems from fluid dynamics, electrical and mechanical engineering, materials science, quantum mechanics, etc. Enhances competency and proficiency as a researcher which provides an edge inindustry.
	CO6	Integral transform allows equations in the "time domain" to be transformed into an equivalent equation in the Complex S Domain.
Numerical Methods (MCS-301)	CO1	Understand basic techniques of numerical methods in practical engineering problems, ranging from quality control and quality assurance to communication theory in electrical engineering etc
	CO2	Learn and Apply interpolation method
	CO3	Learn and Apply methods for solving difficult non linear equations
	CO4	Learn and Apply methods for solving a set of linear simultaneous equations
	CO5	Learn and Apply methods for solving PDE and ODE include problems from fluid dynamics, electrical and mechanical engineering, materials science in industry.
	CO6	Learn and Apply methods for numerical integration
Circuit Theory & Networks (EC-301)	CO1	Outline series and parallel resonating circuit and also they will be also able in mesh current analysis.
	CO2	Demonstrate basics of electrical circuit with node analysis and appreciate electrical network theorems.
	CO3	Analyze circuit using graph theory and they will also learn the working principle of coupled circuit and transients in ac and dc circuit.
	CO4	Apply Laplace Transformation in circuit analysis and compare different two port parameters.
Solid State Device (EC-302)	CO1	Explain the nature of semiconducting materials and the factors that influence the presence of charge carriers.
	CO2	Analyze the characteristics of different semiconductors devices and solve problems.
	CO3	Illustrate the characteristics of Bipolar transistor and solve problems.
	CO4	Solve problems on Field effect transistor.

Signals & Systems (EC-303)	CO1	Able to get knowledge on various signals and its properties.
	CO2	Able to get knowledge on signal transformation using Fourier and Laplace and learn different property of LTI systems.
	CO3	Able to explain concept of sampling.
	CO4	Able to analysis different signals and systems using Z transform and get knowledge on random signals and systems.
Analog Electronic Circuits (EC-304)	CO1	Explain the different characteristics of operational amplifier.
	CO2	State the application of operational amplifier in different electronics circuits.
	CO3	Demonstrate the characteristics of different multivibrator and power amplifier circuits.
	CO4	Analyze different transistor amplifier and oscillator circuits for different applications.
	CO5	Describe different biasing configuration and stability factor of transistor circuit.
	CO6	Outline the characteristics of the filter and classify the different voltage regulator circuits.
Numerical Lab (MCS-391)	CO1	Identify and solve the solutions the various problems belonging to various engineering sectors by approximating through computer programming. Since, in real life some engineering problems frequently arise, for which exact analytical solutions are not available
	CO2	Apply numerical methods and solve complex engineering and scientific problemsthrough computer programming
	CO3	Operate simulation tools and generate effective outcome for the variables whose analytical nature is unknown. Student can generate Game Engines for which simulation tools are very essentials and prediction is required for the possible outcomes.
	CO4	Describe and understand The complex mathematical problems with algorithm. Emphasis is on relating the theoretical principles to solving practical engineering and science problems..
	CO5	Apply PDE and ODE in fluid dynamics, electrical and mechanical engineering, materials science, quantum mechanics, etc. Enhances competency and proficiency as a researcher which provides an edge in industry.
	CO6	Develop and compute of optimal control algorithms and machine learning algorithms.

Circuit Theory & Network Lab (EC-391)	CO1	Classify periodic, exponential, sinusoidal, damped sinusoidal, step, impulse, and ramp signals using MATLAB
	CO2	Identify the Series & Parallel Resonant circuit and network theorems to apply them to laboratory measurements.
	CO3	Solve Transient problems in Series & Parallel R-L, R-C, RLC Circuits & Networks by using PSPICE simulation software for the analysis and design of circuits.
	CO4	Utilize Laplace Transform, different time domain functions, and Inverse Laplace Transformation using MATLAB
	CO5	Explain Impedance (Z), and Admittance (Y) parameters of Two-port networks.
Solid State Devices Lab (EC-392)	CO1	Demonstrate the working of CRO probes and measuring instruments. Identifying the procedure of doing the experiment with different kind of diodes.
	CO2	Examine the characteristics of BJT and FET.
	CO3	Determine different parameters for designing purpose.
	CO4	Analyze properties of mos devices.
	CO5	Discuss to measure and record the experimental data, analyze the results, and prepare a formal laboratory report using software and in hardware.
Signal System Lab (EC-393)	CO1	Classification, realization of signals and systems.
	CO2	Analyse signals from time domain to frequency domain using Fourier series and Fourier transformation with their properties, continuous time signals from time domain to frequency domain using Laplace transformation with their properties.
	CO3	Understanding of sampling theorem with representation and reconstruction of a signal from its samples.
	CO4	Translation and analysis of discrete time signals from time domain to frequency domain using Z transformation with their properties and concept of pole zero.
	CO5	Illustration of random signals and systems with the concept of mean, moment and correlation.
Analog Electronic Circuits Lab (EC-394)	CO1	Understand the different applications of diode circuits such as clipper, clamper, Half wave and full wave rectifier.
	CO2	Summarize the working principal of different voltage regulator circuit such as Zener diode voltage regulator and voltage regulator using regulator IC chip.
	CO3	Examine the frequency response curve two stage RC coupled amplifier, Power amplifier-Class A,B,C,Push-pull.
	CO4	Acquire hands-on experience of conducting various experiments with NE 555 timers like monostable, astable,bistable multivibrator .
	CO5	Explain the different applications of OP-AMP in schimitt trigger, current mirror, level shifter, V to I and I to V converter.

	CO6	Explain the working principle of PLL, VCO, DAC and ADC and function generator using IC
SECOND YEAR : 4TH SEMESTER		
Physics II (PH 401)	CO1	Solve simple and complex problems in vector calculus and apply it in different engineering problems.
	CO2	Illustrate different laws of electrostatics and magneto-statics to solve different engineering problems.
	CO3	Describe the theory of electromagnetism and determine Maxwell's wave equations and its application.
	CO4	Discuss the classical dynamical property of a body and to explain different simple and complex dynamical problems using Lagrangian and Hamiltonian mechanics.
	CO5	Define the classical limit of a body and interpret quantum mechanical behaviour of a body in different potential profile such as step potential, infinite potential well, tunneling effect etc.
	CO6	State phase space, microstate, and macrostate and describe different types of statistics to explain blackbody radiation, Fermi energy, average energy and energy band gap.
Basic Environmental Engineering &Elementary Biology. (CH401)	CO1	Understand the fundamentals of environmental engineering & science in relation to ecological ecosystem, population biology, structure and function of ecosystem and the biodiversity.
	CO2	Define the source of different pollutants due to natural or antropogenic activities and subsequently its degradational impacts on environmental resources.
	CO3	Identify the characteristics of various pollutants coming from different industrial discharge and emissions and effect on health.
	CO4	Develop the knowledge of the remediation methods to control various pollutions through improvement of scientific knowledge including new and innovative technologies.
	CO5	Explain the various laws, rules and regulations to safeguard our environment from different types of pollution.
	CO6	Apply the fundamental principles and management practices in private and public sectors and fulfill the needs of sustainable development.
Values & Ethics in Profession (HU401)	CO1	Undersatnd and think critically and independently about moral issues and apply the same to situations that arise in professional engineering practice.
	CO2	Understand and apply the skill of having a Good Life by incorporating a proper value system.
	CO3	Analyse the sense of professional responsibility.
	CO4	Helps them to evaluate the far reaching impact they have on the society.
	CO5	Engineers are expected to exhibit the highest standards of honesty and integrity, therefore, engineers must be able to predict and perform under a standard of professional behaviour that requires adherence to the highest principles of ethical court.

	CO6	Creates awareness regarding the ethical and social responsibility that they possess towards themselves, their clients and to the society.
EM Theory & Transmission Lines (EC401)	CO1	Define vector calculus and mathematical operators and relate orthogonal co-ordinates
	CO2	Explain the basic principles of Electrostatics and magnetostatic circuits with the help of various Laws.
	CO3	Apply various laws to obtain wave equation and properties of plane wave propagation.
	CO4	Analyze RF transmission line problems using smith chart and classify different transmission lines.
	CO5	Compare different antenna types and its basic properties.
Digital Electronic & Integrated Circuits (EC402)	CO1	Understand the concept of number systems and different logic gates.
	CO2	Analyze to know the simplification of Boolean equations utilizing k-map and tabulation method.
	CO3	Design of various combinational circuits like decoder,encoder,multiplexer,demultiplexer, comparator,adder,subtractor.
	CO4	Design of various sequential circuits like flip flops, registers and counters and practical application of sequential circuit.
	CO5	Design analog to digital and digital to analog convertors.
	CO6	Design logic gates using TTL and CMOS.
Physics II Laboratory (PH491)	CO1	Determine the value of (e/m) using J. J Thomson method.
	CO2	Examine Borh's atomic orbital model and find out the value of excitation potential.
	CO3	Compute the value of energy band gap of a semi conductor.
	CO4	Study and discuss the characteristics of solar cell.
	CO5	Calculate the value of hall co-efficient and carrier concentration of a given semi conductor.
	CO6	Observe the Photoelectric effect using photocell.
Electromagnetic Wave and Transmission Lines Lab (EC491)	CO1	Analyze radiating mechanism of a simple Dipole, folded Dipole and three element Yagi-Uda antenna
	CO2	Compile and solve for solution of various antenna parameters on smith chart.
	CO3	Analyze the radiation mechanism of a Horn antenna using microwave test bench.
	CO4	Compile transmission line parameters and construct it on smith chart.
	CO5	Examine the characteristics of a spectrum analyzer.
Digital Electronic & Integrated	CO1	To understand the concept of designing of different logic gates using universal logic gates.

Circuits Lab (EC492)	CO2	To develop different combinational circuits using digital trainer kit.
	CO3	To construct different sequential circuits digital trainer kit.
	CO4	To analyse Adder circuit using Shift Register and full Adder.
Technical Report Writing & Language Laboratory (HU481)	CO1	Develops in them the importance of listening , comprehending and reading, which in turn, fosters communication which ensures empathy, trust, confidence and a better understanding of the subject matter with a wide range of vocabulary, voice modulation, ability to summarize the subject matter with precision respectively.
	CO2	Develops their employability skills by generating the ability to articulate.
	CO3	Develops their analytical skills and inculcates in them power of decision making through interpersonal relationship building.
	CO4	Infuses the managerial skills with sophisticated manners, etiquette, articulate courtesies in terms of interpersonal and telephonic communication.
	CO5	Provides them the corporate readiness and develops team building skills and develops their overall personality.
THIRD YEAR : 5TH SEMESTER		
Economics for Engineers (HU501)	CO1	Recollecting knowledge regarding the market scenario and provides a mechanism for decision making.
	CO2	Generates in them the understanding and skill of balancing cost, schedule and risk.
	CO3	Asses and apply the benefits and costs associated with engineering projects for accumulating enough capital.
	CO4	Involves analysation and systematic evaluation of the economic benefits of estimated solutions provided to the problems.
	CO5	Helps them to understand and evaluate both micro and macro level changes taking place in the economy and realise its impact upon the industry.
	CO6	Allows those in industry to create strategic decision for their companies.
Analog Communication (EC501)	CO1	Identify the need for modulation, time and frequency domain of different types of amplitude modulated wave, types of AM method to be adopted along with TV signals.
	CO2	Analyze different AM generation and detection techniques.
	CO3	Explain heterodyning principle and working of AM/FM radio receiver.
	CO4	Explain angle modulation, bandwidth of angle modulation and different types of generation and detection method.
	CO5	Examine the importance of multiplexing and its application areas.

	CO6	Justify between the performance of the different modulation methods by comparing their SNR.
Microprocessor& Micr-ocontroller (EC 502**)**	CO1	Explain the architecture of 8085 & 8086 and their internal organization.
	CO2	Implementation of a maintainable assembly language programming of 8085 & 8086 microprocessors.
	CO3	Analyze the architecture, organization and programming of 8051 microcontroller.
	CO4	Illustrate the different support chips, memory and interface with the microprocessors/ microcontroller
CONTROL SYSTEMS (EC503)	CO1	To discuss about the knowledge of transfer function with its relevant example.
	CO2	To illustrate about time response analysis.
	CO3	To determine different types of stability by graphical analysis.
	CO4	To analyze different types of stability by frequency domain analysis.
	CO5	To justify the characteristics of different types of controller & compensators.
	CO6	To illustrate about state space model
Data Structure & C (EC504B**)**	CO1	Identify different linear and non-linear data structures and recognize their needs for various applications. .
	CO2	Analyze best case, average case, worst-case running times of algorithms using asymptotic analysis.
	CO3	Compare the efficiency among various searching and sorting algorithms.
	CO4	Apply combined knowledge of Tree, Graph, algorithms etc. to solve relevant engineering problems.
	CO5	Understand the basic techniques to store and retrieve data through B Tree and B+ Tree, indexing and hashing
Analog communicatio nLaboratory (EC591)	CO1	Illustrate frequency versus amplitude characteristics of VCO
	CO2	Identify the difference between waveforms of modulated signal of AM and FM.

	CO3	Prove and verify sampling theorem using PAM
	CO4	Measure modulation index and side bands power of AM and FM signal.
	CO5	Design circuit for Phase Locked Loop
Microprocess-ors & Microcontroll-ers Lab (EC 592)	CO1	Demonstrate simple assignments using the 8085 basic instruction sets and memory mapping through trainer kit and simulator.
	CO2	Develop 8085 assembly language programs using trainer kit and simulator.
	CO3	Examine the interfacing technique using 8255
	CO4	Develop the fundamentals of 8051 programs using the trainer kit.
Control System Lab (EC593)	CO1	To Familiarize with MATLAB Control System tool Box, MATLAB-SIMULINK tool box & pSPICE.
	CO2	To Determine step response for 1st order & 2nd order system with a unity feedback on CRO & to calculate of control system specifications for variations of system design.
	CO3	To Simulate step response & impulse response for Type-I & Type-II system with unity feedback using MATLAB & pSPICE.
	CO4	To Determine root locus, Bode-plot, Nyquist Plot, using MATLAB control system toolbox for a given 2nd order transfer function & determination of different control system specifications and also approximate transfer function experimentally using Bode Plot.
	CO5	To Evaluate steady-state error, setting time, percentage peak overshoots, gain margin, phase margin with addition of lead compensator in forward path transfer functions using MATLAB & pSPICE.
	CO6	To Determine PI, PD, and PID controller action on 1st order simulated process.
Data Structure	CO1	For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness. Implementation on arrays both 1d and 2d And in 2d array analyze the distance of two elements by memory location in row and column major.
	CO2	For a given search problem (linear and binary search) student will able to implement it. Implementation of linked list single double and circular and various problems related to operations on linked list.
	CO3	Implementations of ADT using both array and linked list. For a given

& C Lab (EC594B)		problem of Stacks, Queues using ADT student will able to implement it and analyze the same to determine the time and computation complexity
	CO4	Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity. Hashing Implementation.
	CO5	Student will able to implement Graph and tree search and traversal algorithms and determine the time and computation complexity.
THIRD YEAR : 6TH SEMESTER		
Principles of Management (HU601)	CO1	Explain the nature, scope and levels of management, functions and roles of a Manager, classification of different planning types and organization structures.
	CO2	Identify CSR, Ethical issues and managerial skills and competencies to solve people related issues with creative solutions.
	CO3	Analyze different alternatives to take business decisions in various business circumstances occuring in different functional areas of a company like finance, Production, markets.
	CO4	Build feasible strategies to develop innovative product or service to remain competitive and sustainable by improving customer satisfaction.
Digital Communication (EC601)	CO1	**Illustrate** Random Variable and its statistical averages, Random process and its classification, Gaussian, Rayleigh and Rician PDF.
	CO2	**Identify the** difference between signal and vector, orthogonality and orthonormality, orthogonal signal space, GSOP, likelihood function and error probability.
	CO3	**Analyze** sampling theorem, PAM**,** PCM, Quantization, Companding, DPCM, DM and ADM.
	CO4	**Explain** line coding techniques and their PSDs, ISI, Nyquist criteria for zero ISI and equalization techniques.
	CO5	**Explain** different coherent binary digital modulation schemes, their generation and detection, signal space diagram, error probability calculation
	CO6	**Explain** different coherent M-ARY digital modulation schemes, their generation and detection, signal space diagram, error probability calculation and PSDs.
Digital Signal Processing (EC602)	CO1	Able to understand various signals and their properties.
	CO2	Able to describe discrete time signal processing and characterization of LTI systems.
	CO3	Able to analyze different signals and systems using Z- transform.

	CO4	Able to explain properties and algorithms for implementation of DFT and FFT.
	CO5	Able to describe filters and their structures and illustrate the design of FIR and IIR filters.
	CO6	Able to introduce the fundamental principles and techniques of digital signal processing for understanding and design new digital signal processing systems for FPGA design.
Telecommunication Systems (EC603)	CO1	Explain Telephone Systems and Transmission Lines.
	CO2	Analyze the characteristics of Subscriber Loop Systems.
	CO3	Illustrate the different Switching System.
	CO4	Illustrate the characteristics Stored Program Control.
	CO5	Examine the problems on Traffic Engineering.
	CO6	Apply telephony in Modems and Their Standards and IP Telephony.
Information Theory & Coding (EC604B)	CO1	Student will be able to measure information, entropy, Shannon limit with channel coding and source coding algorithm.
	CO2	Student will be able to construct channel model with capacity, block codes, equivalent codes and Hamming codes with their generator and check matrix.
	CO3	Student will be able to develop cyclic codes and Golay codes with matrix description using polynomial division algorithm, primitive elements and minimal polynomials.
	CO4	Student will be able to construct various error control codes such as BCH code, convolution code,tree codes, trellis codes, turbo codes with matrix representation.
Object Oriented Programming (EC605A)	CO1	Understand the comparison between object oriented and conventional procedural programming using different features of Object Oriented Programming.
	CO2	Apply the object oriented concept for handling string, Packages and Interfaces.
	CO3	Analyze the advantages and disadvantages of Exception handling.
	CO4	Analyze the inter thread communication using the concept of Multithreading
	CO5	Design interactiveWeb application using Applet.
Seminar (EC681)	CO1	Student will be able to Present technical documents and give oral presentations related to the work completed and improve personality development and communication skills.
	CO2	Student will be able to Explain to approach ethically any multidisciplinary engineering challenges with economic, environmental and social contexts and to set them for future recruitment by potential

		employers.
	CO3	Student will be able to Identify and Apply appropriate well-rehearsed note-taking interactive and timemanagement strategies to their academic studies.
	CO4	Student will be able to Creating audience-centered presentations meeting concrete professional objectives and integrating ethical and legal visual aids.
	CO5	Student will be able to Identify and critically Evaluate the quality of claims, explanation, support, and delivery in public and professional discourse, and understand the factors influencing a speaker's credibility.
Digital Signal Processing Lab (EC692)	CO1	Able to analyze the time and frequency domain signals using Matlab.
	CO2	Able to analyze properties of discrete-time systems such as time-invariance, linearity and stability.
	CO3	Able to understand the basic ideas on linear convolution and circular convolution.
	CO4	Able to understand and perform the operations on filters (digital).
	CO5	Able to understand the basic transformation techniques and find out their phase and magnitude plots also.
Digital Communications Lab (EC691)	CO1	Illustrate Manchester line coding scheme.
	CO2	Identify waveforms of different digital modulation schemes.
	CO3	Examine time division multiplexing (TDM).
	CO4	Prove and verify sampling theorem using Pulse modulation.
	CO5	Design and implement 7-bit PN Sequence.
Object Oriented Programming Lab (EC695A)	CO1	Understand concepts of Object Oriented Programming.
	CO2	Describe the class-object properties, use of objects as parameter and method Returning objects, static variable and methods
	CO3	Apply the string handling concepts.
	CO4	Analyze the reusability properties of object oriented programming and exception handling basics
	CO5	Design the different Program of multithreading, Applet

FOURTH YEAR : 7TH SEMESTER		
Group Discussion (HU-781)	CO1	Develop within themselves the importance of listening , and thinking, which in turn, fosters communication which ensures empathy, trust, confidence and a better understanding of the subject matter with a wide range of vocabulary, voice modulation, ability to summarize the subject matter with precision respectively.
	CO2	Develop their employability skills by generating the ability to articulate.
	CO3	Develop their analytical skills and inculcates in them power of decision making through group discussion.
	CO4	Infuse within themselves managerial skills with sophisticated manners, etiquette, articulate courtesies in terms of interpersonal communication.
	CO5	Provide themselves the corporate readiness and team building skills, thus,developing their overall personality.
Wireless Communication and Networks (EC701)	CO1	Describe cellular mobile network design parameters and various channel assignment schemes.
	CO2	Explain the concept of multipath propagation mechanism with different propagation path loss models.
	CO3	Illustrate modern mobile wireless communication systems and various multiple access techniques with spectral efficiency.
	CO4	Develop various cellular communication networks such as GSM, GPRS with architecture, interfacing, routing and channel organization.
	CO5	Construct 3G mobile CDMA network architecture, interfaces and channels with WLAN (IEEE 802.11) standards and protocols.
	CO6	Explain WiMax architecture, standards and protocols and the concept of mobile internet protocol with routing and mobility management procedure.
Microelectronics & VLSI Designs (EC 702)	CO1	Outline ASIC in the various field of electronics
	CO2	Categorize various steps of fabrication and layout diagram of the transistor and various circuits
	CO3	develop the concept of various combinational and sequential circuits of digital VLSI
	CO4	Explain the various circuits in analog VLSI
RF & Microwave Engg (EC703A)	CO1	To understand and gain complete knowledge of RF and Microwave spectrum and design consideration, field patterns, propagation characteristics of Microwave wave guide, wave guide resonator, Microstrip lines, coplanar waveguide.
	CO2	To build and complete knowledge of high frequency behavior of lumped circuit component and S-matrix representation
	CO3	To build and gain complete knowledge of Microwave Tubes, Microwave amplifier , Oscillators and Microwave
	CO4	Analyze Semiconductor devices such as TED, IMPATT, PIN diode, Microwave BJT,MESFET.

	CO5	Explain Microwave passive components such as Attenuators, Phase shifter, Directional coupler, Bethe-hole coupler, Magic tee, hybrid ring, Circulators, Isolators
	CO6	To discuss about microwave measurement of power, frequency and VSWR, impedance for the analysis and design of circuits
Embedded Systems (EC-704B)	CO1	Explain embedded systems and the different embedded system design technologies.
	CO2	Outline the internal architecture
	CO3	Demonstrate the interfacing of different peripheral devices and Communication Buses
	CO4	Illustrate about Program Modelling Concepts and other programming languages
	CO5	Develop knowledge in Real Time Operating Systems
	CO6	Identify the role of embedded systems application.
Database Management System (EC705C)	CO1	Identify and understand different data models, languages and basic three schema architecture of DBMS.
	CO2	Understand various design issues, components of Entity-Relationship model along with structured query language on relational model.
	CO3	Recognize different anomalies of relational database and identify the techniques to remove the inconsistency through a series of normalization procedures.
	CO4	Apply the knowledge of functional dependency and normalization to design a lossless and FD-preserving relational database with minimum redundancy.
	CO5	Understand the basic properties of transaction processing, Concurrency control and database Recovery techniques and record storage techniques on disk, along with single and multi-levels of indexing.
Project Part I (EC782)	CO1	Identify the problem statement through literature survey for project work
	CO2	Summarizing the conceptual project design through brainstorming
	CO3	Develop design strategy for the project work
	CO4	Apply appropriate modern tools to execute the project work
	CO5	Evaluate application of project work with appropriate societal consideration
	CO6	Develop presentation and interpersonal communication skills through project work
VLSI Design Lab (EC792)	CO1	Outline spice simulation tools
	CO2	Develop various circuits using PSPICE

	CO3	Illustrate EDA tools
	CO4	Develop various circuits using EDA tool
	CO5	Understand layout design tools
RF & Microwave Engineering Lab (EC793A)	CO1	Outline phase and group velocities in a waveguide carrying TE10 Wave from Dispersion diagram [ω−β Plot]
	CO2	Experiment with measurement of an unknown impedance using shift in minima technique using wave guide test bench, measurement of the susceptance of an inductive and or a capacitive window using shift in minima technique and measurement of dielectric constant of a material using waveguide test bench at X-band [III}
	CO3	Understand about the characteristics of a reflex klystron oscillator And Gunn-Oscillator characteristics using X-band wave guide test bench.[II}
	CO4	Understand and solve of coupling factor,Directivity,insertion loss and isolation of a Directional coupler using x-band waveguide test bench set up [III]
	CO5	Examine scattering matrix of a magic tee and E-plane tee/H-plane tee using wave guide test bench at x band[IV]e the Gunn-Oscillator characteristics using X-band wave guide test bench.
Database management System Lab (EC795C)	CO1	Understand the conception of creation of a table, insertion, updating and deletion in the database.
	CO2	Analyze different queries using nested SQL.
	CO3	Understand the concept of PL/SQL.
	CO4	Design queries using Function, Procedure, Cursor, and Trigger
Industrial Training (EC 781)	CO1	Summarize a report based on the experiences and projects carried out demonstrating the ability to apply knowledge of mathematics, science and engineering fundamentals
	CO2	Discover competency in relevant engineering fields through problem identification, formulation and solution.
	CO3	Demonstrate skills in communication, in writing and using multimedia tools
	CO4	Justify the ability to work as an individual and in group with the capacity to be a leader or manager as well as an effective team member.
	CO5	Adapt professional and ethical activities.
FOURTH YEAR : 8TH SEMESTER		
Organizational Behavior (HU801A)	CO1	Generates in them the ability to understand the influence and impact that individuals, groups, and organisational structure have on behaviour within the organisation.
	CO2	Acts as an essential tool for managing effective teams and also helps in understanding and predicting human behaviour in an organisation.
	CO3	Helps them in mastering the ability to adapt to the rapidly changing business cultures that have occurred as a result of a competitive market.

	CO4	Inculcates among the students the ability to handle a new workforce, and cope with the challenges of the new environment.
	CO5	Helps them to enhance their communicating skills by providing them the scope of developing their soft skills.
	CO6	Generates in them the ability to understand elements, such as, adaptability, personality and creativity. Thus, it becomes easier to motivate the employee the way he/she needs to be motivated.
Satellite Communication & Remote Sensing (EC-801C)	CO1	Identify about the necessity of satellite communication and recognize about position and frequency allocation of satellite.
	CO2	Analyze how to launch a satellite in space and examine how atmospheric phenomenon effects on satellite communication.
	CO3	Diagram the basic communication structure of transponder and define modulation technique. Also calculate the power distribution in practice.
	CO4	Illustrate the basic structure and function of remote sensing.
	CO5	Interpret how to modify the quality of image and extract information.
	CO6	Classify the practical application of remote sensing.
Neural network & applications (EC802A)	CO1	To discuss about the fundamental knowledge of neural networks and different types of Learning processes.
	CO2	To illustrate single & multi-layer neurons based on learning rules.
	CO3	To solve different types of network (Radial Basis function network, Wavelet Neural Network) based on learning rules.
	CO4	To analyze different types of network (e.g, Associative Memory Networks, Hopfield Networks, Hamming Network, Self- Organizing maps etc).
	CO5	To justify neural networks on the area of Digital Image Processing, Support Vector machines (SVM) with the help of MATLAB Programming.
Design Lab / Industrial problem related practical training (EC881)	CO1	Understand the working of different types of Multivibrator and schmitt trigger circuits.
	CO2	Analyze the various types of oscillator cuircuits.
	CO3	Analyze various rectifier circuits.
	CO4	Apply the functioning of various ICs based circuits.
Project II (EC882)	CO1	Identify the problem statement through literature survey for project work
	CO2	Summarizing the conceptual project design through brainstorming
	CO3	Develop design strategy for the project work
	CO4	Apply appropriate modern tools to execute the project work

	CO5	Evaluate application of project work with appropriate societal consideration
	CO6	Develop presentation and interpersonal communication skills through project work
Grand Viva (EC893)	CO1	Able to develop knowledge on all subjects related to B. Tech covered in four years.
	CO2	Able to adope on basic concepts of core subjects of B. Tech.
	CO3	Able to focus to apply the knowledge and ideas gained in real world problems and issues.
	CO5	Able to adope efficient oral communication and presentation skills.
	CO6	Able to motivate and gain the confidence and versatility in answering the varieties of questions posed by a group of faculty members in a moderately short duration.