

**BS-CH101 : Chemistry 1 - Year of study 2022-23**

CO	CO TEXT
BS-CH101.1	Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
BS-CH101.2	Rationalise bulk properties and processes using thermodynamic considerations
BS-CH101.3	Distinguish the range of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
BS-CH101.4	Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
BS-CH101.5	Analyse different organic molecule in stereochemical aspect for various purposes.
BS-CH101.6	Synthesise some important drug molecules and its application in various medicinal aspect.

**BS-M102 : Mathematics I - Year of study 2022-23**

CO	CO TEXT
BS-M102.1	Apply the concept integral calculus to determine curvature and evaluation of different types of improper integrals.
BS-M102.2	Understand the domain of applications of mean value theorems, limit and maxima-minima to engineering problems.
BS-M102.3	Learn the tools of power series and Fourier series to analyse engineering problems and apply the concept of sequence and convergence of infinite series in many approximation techniques in engineering disciplines.
BS-M102.4	Apply the knowledge for addressing the real life problems which comprises of several variables or attributes and identify extremum points if different surfaces of higher dimensions and concept of vector differentiation.
BS-M102.5	Understand the concept of determinant and learn different types of matrices, their eigen values, eigen vectors, rank and also their orthogonal

	transformations which are essential for understanding physical and engineering problems.
BS-M102.6	Design and implement mathematical investigations and projects, including data collection, analysis, and interpretation, and apply appropriate mathematical communication and presentation skills.

**ES-EE101 : Basic Electrical Engineering - Year of study 2022-23**

CO	CO TEXT
ES-EE101.1	To understand and analyze basic electrical circuits
ES-EE101.2	Understand the operation of Transformer
ES-EE101.3	To study the working principle of electrical machines
ES-EE101.4	To understand the working of power converters
ES-EE101.5	To introduce the components of low voltages electrical installations
ES-EE101.6	Evaluate and improve electrical systems and performance, and apply appropriate troubleshooting, maintenance, and repair techniques.

**BS-CH191 : Chemistry I Lab - Year of study 2022-23**

CO	CO TEXT
BS-CH191.1	Rationalise inter molecular phenomena using thermodynamic considerations
BS-CH191.2	Understand titrimetric methods of water analysis required for environmental context
BS-CH191.3	Development of physicochemical laboratory methods for the analysis and characterisation of different materials
BS-CH191.4	Evaluate different surface phenomena by adsorption technique.
BS-CH191.5	Estimate essential parameter like oxygen in water by titrimetric method.

BS-CH191.6	Design and implement chemical experiments and investigations, including planning, hypothesis formulation, and experimental design, and apply appropriate communication and presentation skills.
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**ES-EE191 : Basic Electrical Engineering Laboratory - Year of study 2022-23**

CO	CO TEXT
ES-EE191.1	understand the basic demonstration and application of electrical instruments and machines
ES-EE191.2	analyze the response of R-L-C series circuit
ES-EE191.3	determine parameters of transformer equivalent circuit and analyze the operational behaviour of DC machine and three phase induction motor
ES-EE191.4	study the working principles of synchronous generators and power converters
ES-EE191.5	Introduce the components of low voltage electrical installations
ES-EE191.6	Evaluate and improve laboratory performance and outcomes, and apply appropriate feedback, reflection, and self-assessment mechanisms.
ES-EE191.7	

**ES-ME191 : Engineering Graphics & Design(Gr-B) - Year of study 2022-23**

CO	CO TEXT
ES-ME191.1	Get information about the important tools for engineering drawing. This will give student basic knowledge of technical drawings professions and means of communications to others.
ES-ME191.2	Learning how to draw the shapes, angles and lines and others which is essential for engineer
ES-ME191.3	Develop student's imagination and ability to represent the shape size and specifications of physical objects.
ES-ME191.4	Understand the main idea of using dimension for engineering drawing
ES-ME191.5	Explain the principle of projection and sectioning

ES-ME191.6	Understand the intersection, development of surface of body and fasteners
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**BS-PH201 : Physics-I - Year of study 2022-23**

CO	CO TEXT
BS-PH201.1	Ability to know the basic concepts of Mechanics and Oscillation.
BS-PH201.2	Elaborate the concept of Optics and introduction to the principle of LASER.
BS-PH201.3	Ability to understand Electromagnetism, Dielectric and Magnetic properties of materials.
BS-PH201.4	Familiarize with the basic laws of Quantum Mechanics introduction to Schrodinger wave equation.
BS-PH201.5	Evaluate and improve physical skills and understanding, and apply appropriate self-assessment, reflection, and feedback mechanisms.
BS-PH201.6	Analyze and evaluate physical phenomena and systems, and apply appropriate experimental methods and protocols to measure, test, and verify theoretical models and predictions.

**BS-M202 : Mathematics II- Year of study 2022-23**

CO	CO TEXT
BS-M202.1	Learn the methods for evaluating multiple integral and their applications to different physical problems.
BS-M202.2	Understand different techniques to solve first and second order ordinary differential equations with its formulation to address the modelling of systems and problems of engineering sciences.
BS-M202.3	Learn different tools of differentiation and integration of functions of a complex variable and application of different types of transformation between two 2- dimensional planes for analysis of engineering problems.
BS-M202.4	Learn different tools of differentiation and integration of functions of a complex variable, including Cauchy-Riemann equations, contour

	integrals, and power series, and apply them to solve engineering problems.
BS-M202.5	Analyze and evaluate physical systems and phenomena, and apply appropriate mathematical and physical strategies and tools to solve complex problems.
BS-M202.6	Apply appropriate mathematical and analytical techniques to solve first and second order ordinary differential equations, and understand their formulation in modeling systems and problems in engineering sciences.

**ES-CS201 : Programming for Problem Solving - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
ES-CS201.1	Ability to formulate simple algorithms for arithmetic and logical problems.
ES-CS201.2	Ability to translate the algorithms to programs (in C language).
ES-CS201.3	Ability to test and execute the programs and correct syntax and logical errors.
ES-CS201.4	Ability to implement conditional branching, iteration and recursion.
ES-CS201.5	Ability to decompose a problem into functions and synthesize a complete program using divide and conquer approach.
ES-CS201.6	Ability to use arrays, pointers and structures to formulate algorithms and programs.
ES-CS201.7	Ability to apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

**HM-HU201 : English - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
HM-HU201.1	Acquire basic proficiency in English, including reading, listening comprehension, writing, and speaking skills, and demonstrate a basic

	understanding of English grammar, vocabulary, and syntax.
HM-HU201.2	Communicate confidently in English, using appropriate grammar, vocabulary, and syntax, and demonstrate effective speaking and presentation skills in different contexts.
HM-HU201.3	Communicate appropriately in professional and social situations, using appropriate language and tone, and demonstrate effective communication skills in group activities like group discussions, case studies, role play, etc.
HM-HU201.4	Improve teamwork, leadership skills, and problem-solving skills through group activities like group discussions, case studies, role play, etc.
HM-HU201.5	Organize and write business correspondence properly and correctly, using appropriate formats, grammar, vocabulary, and syntax, and demonstrate effective writing and editing skills.
HM-HU201.6	Develop active listening skills, including effective listening strategies, note-taking, and summarizing, and apply these skills to different listening contexts.
HM-HU201.7	Acquire basic proficiency in English including reading and listening

**BS-PH291 : Physics-I Lab - Year of study 2022-23**

CO	CO TEXT
BS-PH291.1	Ability to understand the general property of matters like Viscosity, Young's Modulus and Modulus of Rigidity.
BS-PH291.2	Ability to know Optical property.
BS-PH291.3	Ability to learn Electrical property.
BS-PH291.4	Ability to understand Quantum Physics with the help of experiments like Energy band gap of semiconductor, Planck constant and Characteristics of Solar Photovoltaic cell.
BS-PH291.5	Ability to learn Electricity and Magnetism with the help of experiments like Hall Effect of semiconductors, Specific charge of electron

BS-PH291.6	Develop effective laboratory skills, including experimental design, data collection, analysis, and interpretation, and apply appropriate communication and presentation skills to report and discuss experimental results.
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**ES-CS291 : Programming for Problem Solving - Year of study 2022-23**

CO	CO TEXT
ES-CS291.1	Ability to formulate the algorithms for simple problems
ES-CS291.2	Ability to translate given algorithms to a working and correct program
ES-CS291.3	To be able to correct syntax errors as reported by the compilers
ES-CS291.4	To be able to identify and correct logical errors encountered at run time
ES-CS291.5	To be able to write iterative as well as recursive programs
ES-CS291.6	To be able to represent data in arrays, strings and structures and manipulate them through a program

**ES-ME292 : Workshop/Manufacturing Practices(Gr-B) - Year of study 2022-23**

CO	CO TEXT
ES-ME292.1	Utilise the concept of carpentry shop to make typical jobs.
ES-ME292.2	Construct typical jobs in Smithy, plastic moulding, green sand moulding to build the conception of casting.
ES-ME292.3	Develop the concept of machining making use of Lathe, Milling and Shaping machine by constructing typical jobs.
ES-ME292.4	Develop the concept of joining processes by welding two MS plates, soldering and wiring exercises.
ES-ME292.5	Utilise the concept of fitting and glass cutting and make typical jobs.
ES-ME292.6	Develop an understanding of workshop safety and ethical practices, including understanding basic

	safety guidelines and ethical practices related to the use of workshop tools and materials, and demonstrating these practices in all workshop activities.
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**HM-HU291 : Language Laboratory - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
HM-HU291.1	Demonstrate improvement in listening and speaking skills in English language through regular practice and feedback in language laboratory sessions.
HM-HU291.2	Develop confidence in communication in English language through various exercises and activities.
HM-HU291.3	Enhance professional and social communication skills by participating in group activities like group discussions, case studies and role plays.
HM-HU291.4	Develop problem-solving skills, teamwork and leadership skills through various group activities and exercises.
HM-HU291.5	Demonstrate ability to write business correspondence properly and correctly by practicing different types of business writing and receiving feedback.
HM-HU291.6	Use various language learning resources available in the language laboratory effectively, such as language software, audio and video resources, and online tools, to enhance their language proficiency.

**EC301 : Electronic Devices - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC301.1	Understand the concept of energy bands and current carriers in semiconductors, including bonding forces, Fermi level, carrier concentration, and mobility.
EC301.2	Describe the physical properties and operating characteristics of p-n junctions, Zener diodes, Schottky diodes, and bipolar junction transistors.

EC301.3	Explain the principles of opto-electronics, including photovoltaic effects, photodiodes, phototransistors, LEDs, and semiconductor lasers.
EC301.4	Understand the fabrication process for integrated circuits, including oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, and sputtering.
EC301.5	Develop skills in applying theoretical knowledge to the design and analysis of electronic devices and circuits.
EC301.6	Design and construct simple electronic circuits using diodes, transistors, and other electronic components to demonstrate the practical application of the concepts learned in the course.

**EC302 : Digital System Design - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC302.1	Ability to understand the basic principles of Digital Electronics and digital design techniques.
EC302.2	To understand and examine the structure of various number systems and its application in digital design.
EC302.3	The ability to analyze various logic gates and truth table using Boolean algebra.
EC302.4	The ability to understand, analyze and design various modular combinational circuits with MUX/DEMUX, Decoder, Encoder .
EC302.5	To Design & analyze synchronous sequential logic circuits
EC302.6	The ability to know different types of A/D & D/A conversion technique and logic families such as TTL, ECL, MOS, CMOS.
EC302.7	Ability to understand and explain the hardware language of digital circuits

**EC303 : Signals and System - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
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EC303.1	Ability to explain different types of continuous and discrete time signals, systems their properties.
EC303.2	Ability to analyze signals in order to calculate their frequency spectra, and estimate, classify, assess the effect of a system on signals in terms of frequency content and time domain effects.
EC303.3	Ability to compute impulse response and transfer function of continuous time LTI systems
EC303.4	Represent continuous and discrete systems in different transforms domain
EC303.5	Investigate whether the system is stable
EC303.6	Sampling and reconstruction of a signal

**EC304 : Network Theory - Year of study 2022-23**

CO	CO TEXT
EC304.1	Understand basics electrical circuits with nodal and mesh analysis.
EC304.2	Appreciate electrical network theorems
EC304.3	Apply Laplace Transform for steady state and transient analysis.
EC304.4	Determine different network functions
EC304.5	Appreciate the frequency domain techniques
EC304.6	Develop skills in analyzing and designing various types of electrical networks.

**ES-CS301 : Data Structure & Algorithm (ES) - Year of study 2022-23**

CO	CO TEXT
ES-CS301.1	Differentiate how the choices of data structure & algorithm methods impact the performance of program.
ES-CS301.2	Solve problems based upon different data structure & also write programs.

ES-CS301.3	Identify appropriate data structure & algorithmic methods in solving problem.
ES-CS301.4	Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing
ES-CS301.5	Compare and contrast the benefits of dynamic and static data structures implementations.
ES-CS301.6	Apply fundamental algorithmic concepts, including recursion, divide-and-conquer, and dynamic programming, to solve complex computational problems.
ES-CS301.7	Develop custom data structures and algorithms in procedural programming languages to solve advanced programming problems.

**BS-M301 : Probability & Statistics(BS) - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
BS-M301.1	Learn the ideas of probability and random variables, various discrete and continuous probability distributions with their properties and their applications in physical and engineering environment.
BS-M301.2	Understand the basic ideas of statistics with different characterisation of a univariate and bivariate data set.
BS-M301.3	Apply statistical tools for analysing data samples and drawing inference on a given data set.
BS-M301.4	Develop skills to use probability and statistics in solving engineering problems.
BS-M301.5	Acquire knowledge of different statistical techniques and tools for decision making in engineering projects.

BS-M301.6	Understand the concepts of hypothesis testing, confidence intervals and their applications in engineering research.
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**EC391 : Electronics Devices Lab - Year of study 2022-23**

CO	CO TEXT
EC391.1	Identify and understand electronic components such as resistors, capacitors, diodes, LED, transistors, and FETs & familiarize with laboratory instruments.
EC391.2	Analyze the characteristics of PN junction diodes, Zener diode including their volt-ampere characteristics under forward and reverse bias conditions and their parameters.
EC391.3	Analyze characteristics of BJT in different modes & determine parameters for designing purpose.
EC391.4	Analyze the drain and transfer characteristics of a JFET in common source configuration, and calculate their respective parameters.
EC391.5	understand properties of photoelectronic devices
EC391.6	Ability to measure and record the experimental data, analyze the results, and prepare a formal laboratory report.

**EC392 : Digital System Design Lab - Year of study 2022-23**

CO	CO TEXT
EC392.1	Ability to know the basic principles of Digital Electronics
EC392.2	Ability to know the basic principles of digital design techniques.
EC392.3	Ability to develop Combinational circuits design using logic gates
EC392.4	Ability to develop sequential circuits design using logic gates

EC392.5	Ability to develop Combinational circuits design using PSPICE software and VHDL\Verilog
EC392.6	Ability to develop sequential circuits design using PSPICE software and VHDL\Verilog

**ES-CS391 : Data Structure Lab(ES) - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
ES-CS391.1	Apply standard C language libraries such as stdlib.h, string.h, and math.h to write efficient and effective programs that utilize standard data structures and algorithms.
ES-CS391.2	Write programs in a procedural programming language using standard data structures such as arrays, linked lists, stacks, queues, trees, and graphs to solve practical problems.
ES-CS391.3	Analyze the performance characteristics of standard algorithms such as sorting, searching, and hashing, and compare and contrast their efficiency in different problem domains.
ES-CS391.4	Apply critical thinking and problem-solving skills to identify appropriate data structures and algorithms for solving complex programming problems, and justify choices based on performance characteristics and other relevant criteria.
ES-CS391.5	Demonstrate an understanding of the importance of data structures and algorithms in modern software development and stay updated with the latest research trends and best practices in the field.
ES-CS391.6	Stay updated with the latest research trends and best practices in the field of data structures and algorithms.

**MC-381 : Environmental Science - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
MC-381.1	To understand the natural environment and its relationships with human activities.
MC-381.2	To apply the fundamental knowledge of science and engineering to assess environmental and health risk.
MC-381.3	To develop guidelines and procedures for health and safety issues obeying the environmental laws and regulations.
MC-381.4	Acquire skills for scientific problem-solving related to air, water, noise & land pollution
MC-381.5	Environmental Management, Audit and to apply the laws and protection act of India.
MC-381.6	Analyze the population growth in different perspectives of environmental scenario.

**EC401 : Analog Communication - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC401.1	Able to understand basic concepts in analog communication systems
EC401.2	Able to understand and analyse different modulation and demodulation analog systems
EC401.3	Able to design and comprehend analog communication systems
EC401.4	Understand the concepts of Multiplexing: Time Division Multiplexing (TDM) and Frequency Division Multiplexing (FDM).
EC401.5	Understand the characteristics of noise present in analog systems
EC401.6	Study of signal to Noise Ratio (SNR) performance, of various Analog Communication systems

**EC402 : Analog circuits - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC402.1	Ability to understand the basics principles of diodes and transistors along with solving of basic numericals.
EC402.2	Analyze the characteristics of diodes and transistors and calculate their respective parameters
EC402.3	Ability to design and analyze various rectifier and amplifier circuits
EC402.4	Ability to design sinusoidal and non-sinusoidal oscillators
EC402.5	Ability to design different feedback topologies along with their respective applications.
EC402.6	Ability to understandunderstand the functioning of OP-AMP and design OP-AMP based circuits

**EC403 : Microprocessor and Microcontroller - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC403.1	Do assembly language programming
EC403.2	Do interfacing design of peripherals like, I/O, A/D, D/A, timer etc.
EC403.3	Develop microprocessor based design system
EC403.4	Debugging hardware and software
EC403.5	Develop system using different microcontroiiers
EC403.6	Understand RSIC processors and design ARM microcontroller based systems

**ES-CS401 : Design and Analysis of Algorithm - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
ES-CS401.1	For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms

ES-CS401.2	Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms.
ES-CS401.3	Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation.
ES-CS401.4	Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. For a given problems of dynamic-programming and develop the dynamic programming algorithms, and analyze it to determine its computational complexity.
ES-CS401.5	For a given model engineering problem model it using graph and write the corresponding algorithm to solve the problems.
ES-CS401.6	Explain the ways to analyze randomized algorithms (expected running time, probability of error).
ES-CS401.7	Explain what an approximation algorithm is. Compute the approximation factor of an approximation algorithm (PTAS and FPTAS).

**BS-M401 : Numerical Methods(BS) - Year of study 2022-23**

CO	CO TEXT
BS-M401.1	Ability to analyse error and to understand numerical computation, Interpolation and Numerical integration.
BS-M401.2	Ability to solve system of linear equations and Algebraic equations.
BS-M401.3	Ability to find Numerical solution of ordinary differential equations.

**BS-B401 : Biology for Engineers - Year of study 2022-23**

CO	CO TEXT
BS-B401.1	Describe how biological observations of 18th Century that lead to major discoveries.
BS-B401.2	Convey that classification per se is not what biology is all about but highlight the underlying

	criteria, such as morphological, biochemical and ecological
BS-B401.3	Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring
BS-B401.4	Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine
BS-B401.5	Classify enzymes and distinguish between different mechanisms of enzyme action.
BS-B401.6	Identify DNA as a genetic material in the molecular basis of information transfer.
BS-B401.7	Analyse biological processes at the reductionistic level
BS-B401.8	Apply thermodynamic principles to biological systems.
BS-B401.9	Identify and classify microorganisms.

**EC491 : Analog Communication Lab - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC491.1	Ability to learn concept of amplitude modulation technique (for DSB-SC, DSB-FC, SSB, etc.).
EC491.2	Ability to learn concept of amplitude Demodulation technique (for DSB-SC, DSB-FC, SSB, etc.).
EC491.3	Ability to learn concept of Angle modulation technique (for FM and PM).
EC491.4	Ability to learn concept of Angle Demodulation technique (for FM and PM).
EC491.5	Ability to learn different types of associated the calculation (concept of Measurement of power, modulation index, etc.)
EC491.6	Ability to learn different application areas of analog communication.

**EC492 : Analog Electronic Circuits Lab - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC492.1	Ability to design and test rectifiers, clipping circuits, clamping circuits and voltage regulators.
EC492.2	Ability to compute the parameters from the characteristics of JFET and MOSFET devices
EC492.3	Ability to design, test and evaluate BJT amplifiers in CE configuration
EC492.4	Ability to design and test JFET/MOSFET amplifiers
EC492.5	Ability to design and test a power amplifier
EC492.6	Ability to design and test various types of oscillators

**EC493 : Microprocessor and Microcontroller Lab - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC493.1	Table look up
EC493.2	Copying a block of memory
EC493.3	Shifting a block of memory
EC493.4	Packing and unpacking of BCD numbers
EC493.5	Addition of BCD numbers
EC493.6	Binary to ASCII conversion

**BS-M(CS)491 : Numerical Methods Lab - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
BS-M(CS)491.1	Ability to understand numerical computation, Interpolation and Numerical integration.
BS-M(CS)491.2	Ability to solve system of linear equations and Algebraic equations.
BS-M(CS)491.3	Ability to find Numerical solution of ordinary differential equations.
BS-M(CS)491.4	Ability to apply numerical methods to solve problems in science, engineering, and mathematics.

BS-M(CS)491.5	Ability to compare and contrast different numerical methods and choose appropriate methods based on the problem at hand.
BS-M(CS)491.6	Ability to use programming languages such as MATLAB, Python, or C++ to implement numerical methods and solve problems numerically.

**HS-HU481 : Soft Skill Development Lab - Year of study 2022-23**

CO	CO TEXT
HS-HU481.1	Able to communicate confidently in English, both verbally and in writing, in various personal and professional situations.
HS-HU481.2	Organize and write clear, concise, and grammatically correct business correspondence, including emails, letters, and memos.
HS-HU481.3	Demonstrate appropriate communication in professional and social situations, showing an understanding of cultural and social differences.
HS-HU481.4	Improve teamwork, leadership, and problem-solving skills through group activities such as group discussions, case studies, role play, and other collaborative exercises.
HS-HU481.5	Demonstrate active listening skills, including the ability to ask clarifying questions, provide feedback, and summarize key points.
HS-HU481.6	Develop effective presentation skills, including the ability to organize and deliver clear, engaging, and impactful presentations to different types of audiences.

**EC501 : Electromagnetic Waves - Year of study 2022-23**

CO	CO TEXT
EC501.1	Understand characteristics and wave propagation on high frequency transmission lines
EC501.2	Carryout impedance transformation on TL

EC501.3	Use sections of transmission line sections for realizing circuit elements
EC501.4	Characterize uniform plane wave
EC501.5	Calculate reflection and transmission of waves at media interface
EC501.6	Analyze wave propagation on metallic waveguides in modal form
EC501.7	Understand principle of radiation and radiation characteristics of an antenna

**EC502 : Computer Architecture - Year of study 2022-23**

CO	CO TEXT
EC502.1	Understand basic structure of digital computer, stored program concept and different arithmetic and control unit operations.
EC502.2	Understand basic structure of different combinational circuits multiplexer, decoder, encoder etc.
EC502.3	Explain different operations with sequential circuits.
EC502.4	Understand the memory organisation and memory mapping of different types of memory.
EC502.5	Understand the non pipelined architecture, pipelined architecture and various I/O operations.
EC502.6	Evaluate the trade-offs between different memory hierarchies and their impact on computer performance.

**EC503 : Digital Communication and Stochastic - Year of study 2022-23**

CO	CO TEXT
EC503.1	understand the concept of Stochastic Process in Communication System
EC503.2	Rrepresent various signals in different mathematical forms

EC503.3	Acquire knowledge about operations and issues associated with digitization and information transmission: sampling, encoding, quantization, distortion, channel capacity.
EC503.4	analyze different carrier modulation techniques considering noise aspects
EC503.5	analyze baseband transmission mode of digital data
EC503.6	Ability to determine sampling rate, distortion, and transmission bit rate in a digital communication system
EC503.7	Understand some performance issues for different digital modulation techniques

**EC504 : Digital Signal Processing - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC504.1	Represent signals mathematically in continuous and discrete time and frequency domain
EC504.2	Illustrate digital signals, systems and their significance
EC504.3	Get the response of an LSI system to different signals
EC504.4	Analyse the digital signals using various digital transforms DFT, FFT etc.
EC504.5	Design of different types of digital filters for various applications
EC504.6	Interpret the finite word length effects on functioning of digital filters.

**PE-EC505A : Nano Electronics - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
PE-EC505A.1	Understand the physics of Nano Electronics (Mesophysics and Quantum Physics Concept)
PE-EC505A.2	Understand various aspects of nano-technology
PE-EC505A.3	Understand the concept of Srink Down Approach (CMOS Scaling)

PE-EC505A.4	Understand the design concept of nano components and understand the concept of limit of scaling
PE-EC505A.5	Understand the various Application of Nano Electronics Devices (like Carbon nanotube)
PE-EC505A.6	Leverage advantages of the nano-materials and appropriate use in solving practical problems.

**OE-EC506A : Soft Skill and Interpersonal Communication - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
OE-EC506A.1	Understand the basic concepts and principles of soft skills and interpersonal communication, including active listening, nonverbal communication, and emotional intelligence.
OE-EC506A.2	Analyze and evaluate the communication needs and expectations of different stakeholders, including clients, customers, team members, and supervisors, and apply appropriate communication styles and strategies.
OE-EC506A.3	Develop effective skills and techniques for reading, writing, speaking, and listening, and apply appropriate learning and communication strategies, including LSRW (Listening, Speaking, Reading, Writing) skills.
OE-EC506A.4	Design and implement effective communication plans and presentations, including audience analysis, message development, and media selection, and apply appropriate visual and technological aids.
OE-EC506A.5	Evaluate and improve interpersonal and intercultural communication skills, and apply appropriate conflict resolution, negotiation, and persuasion techniques.
OE-EC506A.6	Develop effective leadership and team-building skills, and apply appropriate motivational and feedback mechanisms to achieve individual and group goals.

**EC591 : Electromagnetic Wave Lab - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC591.1	Understand the standing wave pattern and reflection co-efficient of transmission line terminated by short load at the load end.
EC591.2	Understand the standing wave pattern and reflection co-efficient of transmission line terminated by matched load at the load end.
EC591.3	Understand the properties of Transmission lines using smith chart on MATLAB platform.
EC591.4	Understand the characteristics and radiation pattern of non-directive antennas like dipole and folded dipole antennas.
EC591.5	Understand the characteristics and radiation pattern of directive antennas like yagi-uda and pyramidal horn antennas.
EC591.6	Understand and compare the characteristics of directive and no-directive antennas.

**EC592 : Digital communication Lab - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC592.1	Study of PAM and demodulation.
EC592.2	Study of PCM and demodulation.
EC592.3	Study of delta modulator and demodulator.
EC592.4	Study of BPSK modulator and demodulator
EC592.5	Study of BFSK modulator and demodulator.
EC592.6	Study of ASK modulator and demodulator.

**EC593 : Digital Signal Processing Lab. - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC593.1	Understanding the mathematical operations on Discrete Signals

EC593.2	To understand about the basic signal generation
EC593.3	To learn Fourier Transform Concept
EC593.4	To learn Z-Transform Concept
EC593.5	To find out linear and circular convolution of discrete sequences
EC593.6	To design FIR Filter using different windows

**MC-HU581 : Effective Technical Communication - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
MC-HU581.1	Build proficiency in the English language, including listening, speaking, reading, and writing, for effective professional communication.
MC-HU581.2	Develop effective communication skills for presenting technical concepts and information to both technical and non-technical audiences.
MC-HU581.3	Demonstrate critical thinking and analytical skills to discuss and debate everyday topics, as well as technical topics related to their field of study.
MC-HU581.4	Acquire knowledge of the basics of academic writing, including structure, formatting, citation, and referencing, for writing technical reports, research papers, and other academic documents.
MC-HU581.5	Develop an industry-ready attitude towards professional communication, including effective email communication, presentation skills, and effective communication in a team environment.
MC-HU581.6	Prepare for competitive exams such as TOEFL and IELTS, including developing strategies for test-taking, improving vocabulary and grammar, and practicing exam-style questions.

**EC601 : Control System and Instrumentation - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC601.1	Characterize a system and find its steady state behaviour
EC601.2	Investigate stability of a system using different tests
EC601.3	Design various controllers
EC601.4	Solve linear, nonlinear and optimal control problems
EC601.5	Apply state variable techniques for analysis of linear time invariant systems
EC601.6	Study with CRO, Wave analyser, Spectrum analyser knowing their functional details

**EC602 : Computer Network - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC602.1	Concepts of OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission
EC602.2	Knowledge of Channels, framing, error and flow control techniques.
EC602.3	Understand Network Layer addressing mechanism and Routing protocols Mechanism
EC602.4	Complete idea of Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism
EC602.5	Through knowledge of application Layer and its protocols & Data Security
EC602.6	Understand and analyse future network architecture and protocols

**PE-EC603C : CMOS VLSI Design - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
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PE-EC603C.1	Understand Full-Custom ASIC and Reconfigurable VLSI Design Flow.
PE-EC603C.2	Understand the Electrical Characteristics of MOSFET to Apply for VLSI Circuit/System Design.
PE-EC603C.3	Understand the Different Steps of IC Fabrication Process.
PE-EC603C.4	Understand Transfer, Power-Delay and Noise-Margin (NM) etc. Characteristic of CMOS Logic Circuit.
PE-EC603C.5	Understand Different Static and Dynamic Logic Styles for Combinational and Sequential Circuit Design.
PE-EC603C.6	Understand Physical/Layout Design of CMOS Logic Circuit.
PE-EC603C.7	Familiarize with EDA Tool for VLSI Design.

**EC603D : Information Theory and Coding - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC603D.1	Understand the concept of information and entropy
EC603D.2	Understand Shannon's theorem for coding
EC603D.3	Calculation of channel capacity
EC603D.4	Understand different coding technique
EC603D.5	Apply different coding techniques for communication applications
EC603D.6	Detail idea of Convolution code, Cyclic code

**OE-EC604A : Electronic Measurement & Measuring Instrument - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
OE-EC604A.1	Understand measuring systems block schematics and performance characteristics.

OE-EC604A.2	Describe types of measuring instruments and their specifications.
OE-EC604A.3	Explain the principles of signal analyzers and signal generators.
OE-EC604A.4	Describe the working of oscilloscopes and special-purpose oscilloscopes.
OE-EC604A.5	Understand transducer classification and describe various types of transducers.
OE-EC604A.6	Explain the principles and applications of Wheatstone, Kelvin, and Maxwell bridges for physical parameter measurements.

**HS-HU601 : Economics for Engineers - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
HS-HU601.1	Understand the Principles of Engineering Economy and the Engineering Decision-making process.
HS-HU601.2	Apply the appropriate type of Estimating Model to determine Engineering Cost
HS-HU601.3	Understand the basic concept of Time value of money and apply such formulas to analyze Situations of both Single cash flow and multiple cash flow. Apply such knowledge to Evaluate financial feasibility of different types of investment situations in Engineering Projects.
HS-HU601.4	Understand the causes and Effect of Inflation & Deflation and Use the Price Indexes in Engineering Economic Analysis.
HS-HU601.5	Understand the basic concept of Probability and expected value and of Depreciation and Obsolescence. Also apply the Fundamental methods of calculation of depreciation.
HS-HU601.6	Understand Replacement Analysis Replacement Map and determine Minimum Cost Life of a New Asset.
HS-HU601.7	Understand Accounting Function, Balance Sheet ,Income Statement and apply such knowledge in calculation of Financial Ratios and apply Cost

	Accounting Principles for Direct and Indirect Cost Allocation.
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**EC691 : Control and Instrumentation  
Laboratory - Year of study 2022-23**

CO	CO TEXT
EC691.1	Understand and describe MATLAB control system toolbox.
EC691.2	Analyse the physical systems represented in transfer function.
EC691.3	Describe and design step response for first and second order system with unity feedback.
EC691.4	Analyse the impulse response for types 0, 1 and 2 with unity feedback using MATLAB.
EC691.5	Understand the stability of an Electrical, mechanical and other Physical systems using root-locus, Bode plot, Nyquist plot by MATLAB software.
EC691.6	Design PI, PD and PID controller, compensators using MATLAB software.
EC691.7	Study and analysis of electrical signal with CRO

**EC692 : Computer Network Lab - Year of study 2022-23**

CO	CO TEXT
EC692.1	Familiarization of Network Components

EC692.2	Understand NIC and its Configuration
EC692.3	Configure Wifi-Router
EC692.4	Implement Data flow and control mechanism
EC692.5	Implementation of different topologies
EC692.6	Implement and analyse Static and dynamic routing using Packet tracer

**EC681 : Mini Project/ Electronic Design Workshop - Year of study 2022-23**

CO	CO TEXT
EC681 .1	<b>Define the problem and gather relevant information to formulate a clear project goal and scope.</b>
EC681 .2	<b>Conduct a literature review and analyze prior work in the field to identify potential approaches and solutions to the problem.</b>
EC681 .3	<b>Develop a project plan that outlines the timeline, resources, and deliverables for the project.</b>
EC681 .4	<b>Apply appropriate research methods and tools to collect and analyze data related to the project.</b>
EC681 .5	<b>Communicate project progress and results effectively to stakeholders through written and oral presentations.</b>
EC681 .6	<b>Evaluate the feasibility of the project and identify potential risks and challenges, as well as strategies to mitigate them.</b>
CO	CO TEXT

**PE-EC701 C : Mobile Communication and networks - Year of study 2022-23**

CO	CO TEXT
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PE-EC701 C.1	Understand the working principles of the mobile communication systems.
PE-EC701 C.2	Understand the relation between the user features and underlying technology.
PE-EC701 C.3	Understand multiple access techniques for mobile communication
PE-EC701 C.4	Knowlwdge of different receiver techniques
PE-EC701 C.5	Knowledge of system examples such as GSM, EDGE, GPRS, IS-95, CDMA 2000 and WCDMA
PE-EC701 C.6	Analyze mobile communication systems for improved performance

**PE-EC702B : Digital Image & Video Processing - Year of study 2022-23**

CO	CO TEXT
PE-EC702B.1	Understand, Analyze & Apply different Techniques of Image Quality Enhancement like contrast stretching, image smoothing etc..
PE-EC702B.2	Understand, Analyze & Apply different Techniques of Image Feature Detection like Line Detection, Edge Detection etc
PE-EC702B.3	Understand, Analyze & Apply different Techniques of Image Region Segmentation like Region Growing, Region Splitting & Merging etc.
PE-EC702B.4	Understand, Analyze & Apply different Techniques of Image Compression like Shanon Fano Algo, Lempel Ziv Algo etc
PE-EC702B.5	Understand, Analyze & Apply different Techniques of Morphological Processes.
PE-EC702B.6	Understand, Analyze & Apply different Techniques of Video Processing
PE-EC702B.7	Understand, Analyze & Apply different Mathematical Methods in Image & Video Processing

**PE-EC703A : Embedded System - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
PE-EC703A.1	Understand the basic concepts of embedded systems, including embedded processors and components.
PE-EC703A.2	Gain an overview of the hardware components of embedded systems, including processors, memory, and I/O types.
PE-EC703A.3	Learn about the 8051 architecture and real-world interfacing, as well as advanced processor architectures like ARM.
PE-EC703A.4	Understand the interrupt service mechanism and how it works in embedded systems, including different interrupt sources and interrupt handling mechanisms.
PE-EC703A.5	Develop an understanding of software development in embedded systems, including programming concepts in ALP and high-level languages like C and C++.
PE-EC703A.6	Gain an overview of real-time operating systems (RTOS), including process, interrupt, and memory management, as well as task scheduling using priority-based scheduling, cyclic scheduling, and round-robin scheduling.
PE-EC703A.7	Learn how to design embedded systems using PIC microcontrollers, including an introduction to the Microchip PIC16 family and the PIC16F873 microcontroller.

**OE-EC704A : Web Technology - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
OE-EC704A.1	Design good web pages using different tags, tables, forms, frames and style sheets supported by HTML.
OE-EC704A.2	Implement, compile, test and run Java programs, comprising more than one class, to address a particular software problem.

OE-EC704A.3	Demonstrate the ability to employ various types of selection statements and iteration statements in a Java program.
OE-EC704A.4	Can be able to leverage the object-oriented features of Java language using abstract class and interface.
OE-EC704A.5	Can be able to handle errors in the program using exception handling techniques of Java.
OE-EC704A.6	To design applets as per the requirements with event handling facility.

**EC781 : Industrial Training - Year of study 2022-23**

CO	CO TEXT
EC781.1	Understand the Organizational Structure of a company.
EC781.2	Develop work habits and attitudes necessary for job success (technical competence, professional attitude, organization skills etc.)
EC781.3	Develop bussiness and technical communication skills.
EC781.4	Develop knowledge of contemporary issues
EC781.5	Develop work attitudes necessary for job (professional attitude)
EC781.6	Develop technical report writing skills.
EC781.7	Understand the actual gap between academic and induatry

**EC782 : Project Stage I - Year of study 2022-23**

CO	CO TEXT
EC782.1	Define the problem and gather relevant information to formulate a clear project goal and scope.
EC782.2	Conduct a literature review and analyze prior work in the field to identify potential approaches and solutions to the problem.

EC782.3	Develop a project plan that outlines the timeline, resources, and deliverables for the project.
EC782.4	Apply appropriate research methods and tools to collect and analyze data related to the project.
EC782.5	Communicate project progress and results effectively to stakeholders through written and oral presentations.
EC782.6	Evaluate the feasibility of the project and identify potential risks and challenges, as well as strategies to mitigate them.

**PE-EC801B : Fibre Optic Communication - Year of study 2022-23**

CO	CO TEXT
PE-EC801B.1	Understand the principles fiber-optic communication, the components and the bandwidth advantages
PE-EC801B.2	Understand the properties of the optical fibers and optical components
PE-EC801B.3	Understand operation of lasers, LEDs, detectors (PIN, APD etc) and amplifiers (EDFA, RA etc).
PE-EC801B.4	Understand the characteristics of opto-electronics couplers and multiplexers
PE-EC801B.5	Analyze system performance of optical communication systems
PE-EC801B.6	Design optical networks and understand non-linear effects in optical fibers

**PE-EC802B : Industrial Automation and Control - Year of study 2022-23**

CO	CO TEXT
PE-EC802B.1	select suitable sensor to measure industrial parameters and the different types of actuators and its working. They will be able to design proper signal conditioning circuit to the transducer.
PE-EC802B.2	determine the effect of proportional gain, integral time, derivative gain constant on the system

	performance and will be able to tune the controller using tuning methods, implement PID using electronic , digital, pneumatic and hydraulic methods.
PE-EC802B.3	design the ladder logic to implement any process with given problem statement.
PE-EC802B.4	analyze DCS hardware and its merits/demerits in an industrial automation.
PE-EC802B.5	analyze SCADA hardware and software and its merits/demerits in industrial automation.
PE-EC802B.6	design the complex control scheme to a particular process.

**OE-EC803A : Internet of Things(IoT) - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
OE-EC803A.1	Understand the application areas of IOT.
OE-EC803A.2	Realize the revolution of Internet in Mobile Devices, Cloud
OE-EC803A.3	Understand building blocks of Internet of Things and characteristics
OE-EC803A.4	Design and develop IoT systems by applying knowledge of different components such as sensors, actuators, and communication protocols
OE-EC803A.5	Analyze and evaluate ethical considerations related to the deployment and use of IoT systems, including privacy, security, transparency, and accountability.
OE-EC803A.6	Demonstrate proficiency in using tools and technologies for IoT development, such as microcontrollers, cloud platforms, and data

**OE-EC804B : Microwave Integrated Circuits - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
OE-EC804B.1	Analyze the fabrication techniques of MIC and MMIC , use of active devices with MIC and MMIC, differentiate between MIC and MMIC.
OE-EC804B.2	Analyze and design strip lines and micro strip lines, and model the discontinuities in those lines
OE-EC804B.3	Analyze and design slot lines, fin lines, coplanar lines and coplanar wave-guides
OE-EC804B.4	Design parallel coupled lines for couplers and power divider circuits.
OE-EC804B.5	Differentiate between various measurement techniques associated with planar transmission lines
OE-EC804B.6	Understand the design concept about Microwave Integrated Circuits.

**EC881 : Project Stage II - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC881.1	Refine the project proposal developed in Project Stage 1, including conducting additional research, defining project scope and requirements, and developing a detailed project plan.
EC881.2	Apply project management principles to effectively manage project resources, including time, budget, and personnel, and create project schedules and deliverables.
EC881.3	Utilize appropriate software tools and technologies to design, implement, and test the project, and demonstrate proficiency in the tools and technologies used.
EC881.4	Evaluate project performance and outcomes using appropriate metrics, such as stakeholder satisfaction, quality assurance, and risk management, and make adjustments as necessary.

EC881.5	Develop effective communication skills for presenting project progress and results to project stakeholders, including preparing and delivering presentations, creating project reports, and participating in project meetings.
EC881.6	Apply ethical and professional principles to the project, including ensuring project quality, maintaining data confidentiality, and acknowledging sources of information used in the project.

**EC882 : Grand Viva - Year of study 2022-23**

<b>CO</b>	<b>CO TEXT</b>
EC882.1	Demonstrate a comprehensive understanding of the course material, including key concepts, principles, and applications.
EC882.2	Apply critical thinking skills to analyze and solve problems related to the course material, including demonstrating the ability to integrate multiple concepts and apply them to real-world scenarios.
EC882.3	Communicate effectively, both orally and in writing, about the course material, including presenting a coherent and structured argument, using appropriate terminology and referencing relevant literature.
EC882.4	Identify and evaluate potential areas of further research or exploration related to the course material, including demonstrating an awareness of emerging trends, challenges, and opportunities in the field.
EC882.5	Apply ethical and professional principles to the course material, including demonstrating an understanding of the potential impact of the material on society, and addressing issues of social responsibility, accountability, and transparency.
EC882.6	Reflect on the learning experience and identify areas for personal and professional growth, including identifying strengths and weaknesses, setting goals for future learning, and demonstrating a commitment to lifelong learning.