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| Sl No | Semester | Sub Code | Subject Name | Course Outcome (CO) |
| 1 | II | ES-CS201 | Programming for Problem Solving | **Students will be able to:**  •Formulate the simple algorithms for arithmetic and logical problems & translate the algorithms to programs (in C language).  •Test and execute the programs and correct syntax and logical errors.  •Implement conditional branching, iteration, recursion, arrays, pointers, and structures to formulate algorithms and programs.  •Decompose a problem into functions and synthesize a complete program using divide and conquer approach.  •Apply programming to solve matrix addition, multiplication, searching & sorting problems, simple numerical method problems, namely rot finding of function, differentiation of function and simple integration. |
| 2 | II | ES-CS291 | Programming for Problem Solving | **Students will be able to:**  •Formulate the algorithms for simple problems and translate given algorithms to a working and correct program  •Test & execute correct syntax errors as reported by the compilers & logical errors encountered at run time  •Write iterative as well as recursive programs  •Represent data in arrays, strings and structures and manipulate them through a program  •Implement pointers of different types in defining self-referential structures and create, read, and write to and from simple text files. |
| 3 | III | ESC-301 | Analog & Digital Electronics | **Students will be able to:**  •Realize the basic operations of different types of Feedback, Oscillators and Amplifiers.  •Implement the laws of Boolean algebra and basic gate operations to design the digital Systems.  •Design & analyze Combinational & Sequential Logic Circuits.  •Understand basic structure of digital computer, stored program concept and different arithmetic and control unit operations. |
| 4 | III | PCC-CS301 | Data Structure & Algorithm | **Students will be able to:**  •Analyze the given algorithms to determine the time and computation complexity and justify the correctness.  •Solve & Implement the Linear Search and Binary Search problem  •Implement and analyze the given problem of Stacks, Queues, and linked list to determine the time and computation complexity.  •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.  •Implement Graph search and traversal algorithms and determine the time and computation complexity. |
| 5 | III | PCC-CS302 | Computer Organization | **Students will be able to:**  •Realize basic structure of digital computer, stored program concept and different arithmetic and control unit operations.  •Design & analyze different combinational circuits, multiplexer, decoder, encoder etc.  •Perform different operations with sequential circuits.  •Understand memory and I/O operations. |
| 6 | III | BSC-301 | Mathematics-III (Differential Calculus) | **Students will be able to:**  •Express a logic sentence in terms of predicates, quantifiers, and logical connectives.  •Apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction.  •Implement tree and graph algorithms to solve problems  •Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra. |
| 7 | III | HSMC-301 | Economics for Engineers (Humanities-II) | **Students will be able to:**  •Make different economic decisions and estimate engineering costs by applying different cost estimation models.  •Create cash flow diagrams for different situations and use different interest formulae to solve associated problems.  •Take decisions regarding different engineering projects by using various criteria like rate of return analysis, present worth analysis, cost-benefit analysis etc.  •Incorporate the effect of uncertainty in economic analysis by using various concepts like expected value, estimates and simulation.  •Understand the concepts of depreciation, replacement analysis, scope of Finance and the role of financial planning and management, the process of inflation and use different price indices to adjust for its effect and solve associated problems.  •Apply the various concepts of accounting like balance sheet and ratio analysis. |
| 8 | III | ESC-391 | Analog & Digital Electronics Lab | **Students will be able to:**  •Design the different types of Feedback, Oscillators and Amplifiers.  •Implement the laws of Boolean algebra and basic gate operations to design the digital Systems.  •Design & analyze Combinational & Sequential Logic Circuits.  •Design & implement the DAC. |
| 9 | III | PCC-CS391 | Data Structure & Algorithm Lab | **Students will be able to:**  •Know about the basic concepts of Function, Array and Link-list.  •Understand how several fundamental algorithms work particularly those concerned with Stack, Queues, Trees, and various Sorting algorithms.  •Design new algorithms or modify existing ones for new applications.  •Analyze the space & time efficiency of most algorithms. |
| 10 | III | PCC-CS392 | Computer Organization Lab | **Students will be able to:**  •Analyze the behaviour of logic gates  •Design combinational circuits for basic components of computer system and applications.  •Analyze the operational behaviour and applications of various flip-flop  •Design Arithmetic logic units and different types of memory blocks. |
| 11 | III | PCC-CS393 | IT Workshop (Sci Lab/MATLAB/Python/R) | **Students will be able to:**  •Understand the scripting languages.  •Design real life problems and think creatively about solutions.  •Apply a solution in a program using R/Matlab/Python.  •Expose the advanced applications of mathematics, engineering, and natural sciences to program real life problems. |
| 12 | IV | PCC-CS401 | Discrete Mathematics | **Students will be able to:**  •Express a logic sentence in terms of predicates, quantifiers, and logical connectives.  •Derive the solution for a given problem using deductive logic and prove the solution based on logical inference.  •Classify its algebraic structure for a given a mathematical problem.  Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.  •Develop the given problem as graph networks and solve with techniques of graph theory. |
| 13 | IV | PCC-CS402 | Computer Architecture | **Students will be able to:**  •Design basic and intermediate RISC pipelines, including the instruction set, data paths, and ways of dealing with pipeline hazards.  •Understand various techniques of instruction-level parallelism, including superscalar execution, branch prediction, and speculation, in design of high-performance processors.  •State and understand memory hierarchy design, memory access time formula, performance improvement techniques, and trade-offs.  •Realize and compare properties of shared memory and distributed multiprocessor systems and cache coherency protocols. |
| 14 | IV | PCC-CS403 | Formal Language & Automata Theory | **Students will be able to:**  •Write a formal notation for strings, languages, machines and hierarchy of formal languages, grammars, and machines.  •Design finite automata to accept a set of strings of a language.  •Design context free grammars to generate strings of context free language.  •Determine equivalence of languages accepted by Push Down Automata and languages generated by context free grammars.  •Distinguish between computability and non-computability and Decidability and undecidability. |
| 15 | IV | PCC-CS404 | Design and Analysis of Algorithms | **Students will be able to:**  •Analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms for a given algorithms.  •Describe the greedy paradigm, divide-and-conquer paradigm, dynamic-programming paradigm and explain when an algorithmic design situation calls for it.  •Derive and solve recurrence relation.  •Develop the dynamic programming algorithms and analyze it to determine its computational complexity.  •Explain the ways to analyze randomized algorithms (expected running time, probability of error). •Explain what an approximation algorithm is. Compute the approximation factor of an approximation algorithm (PTAS and FPTAS). |
| 16 | IV | BSC 401 | Biology | **Students will be able to:**  •Understand classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical, and ecological.  •Recognize the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring. •Realize all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine.  •Identify microorganisms & DNA as a genetic material in the molecular basis of information transfer.  •Classify enzymes & distinguish between different mechanisms of enzyme action.  •Analyse biological processes at the reductionistic level and thermodynamic principles to biological systems. |
| 17 | IV | MC-401 | Environmental Sciences | **Students will be able to:**  •Understand the natural environment and its relationships with human activities.  •Apply the fundamental knowledge of science and engineering to assess environmental and health risk.  •Develop guidelines and procedures for health and safety issues obeying the environmental laws and regulations.  •Acquire skills for scientific problem-solving related to air, water, noise& land pollution. |
| 18 | IV | PCC-CS492 | Computer Architecture Lab | **Students will be able to:**  •Write & execute the digital logic base program with HDL  •Execute 8-bit Addition, Multiplication, Division operations  •Design & demonstrate 8bit Register, CPU & ALU  •Interface CPU & Memory |
| 19 | IV | PCC-CS494 | Design & Analysis Algorithm Lab | **Students will be able to:**  •Solve problems by applying appropriate algorithms.  •Analyze the efficiency of various algorithms.  •Apply techniques of stacks and queues to solve problems.  •Develop a program that can be solved in many ways using different techniques.  •Identify and evaluate complex problems using principles of mathematics and engineering science. |
| 20 | V | ESC501 | Software Engineer | **Students will be able to:**  •Decompose the given project in various phases of a lifecycle  •Create appropriate process model depending on the user requirements  •Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance  •Analyze various processes used in all the phases of the product  •Apply the knowledge, techniques, and skills in the development of a software product. |
| 21 | V | PCC-CS501 | Compiler Des | **Students will be able to:**  •Understand given grammar specification develop the lexical analyser  •Design a given parser specification design top-down and bottom-up parsers.  •Develop syntax directed translation schemes.  •Develop algorithms to generate code for a target match. |
| 22 | V | PCC-CS502 | Operating System | **Students will be able to:**  •Create processes and threads.  •Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.  •Initiate the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time for a given specification of memory organization.  •Design and implement file management system.  •Evolve the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers for a given I/O devices and OS. |
| 23 | V | PCC-CS503 | Object Oriented Program | **Students will be able to:**  •Specify simple abstract data types and design implementations, using abstraction functions to document them.  •Recognise features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity. •Realize and apply some common object-oriented design patterns and give examples of their use.  •Design applications with an event-driven graphical user interface. |
| 24 | V | HSMC-501 | Introduction to Industrial Management (Humanities III) | **Students will be able to:**  •Interpret given organization structure, culture, climate and major provisions of factory acts and laws.  •Explain material requirement planning and store keeping procedure.  •Plot and analyze inventory control models and techniques.  •Prepare and analyze CPM and PERT for given activities.  •List and explain PPC functions. |
| 25 | V | PEC-IT501A | Theory of Computation | **Students will be able to:**  •Define a system and recognize the behaviour of a system.  •Minimize a system and compare different systems  •Convert Finite Automata to regular expression.  •Analyze equivalence between regular linear grammar & FA.  •Investigate the equivalence of CFL and PDA  •Design Turing Machine. |
| 26 | V | PEC-IT501 | Artificial Intelligence | **Students will be able to:**  •Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.  •Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.  •Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.  •Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks, and other machine learning models. |
| 27 | V | PEC-IT501C | Advanced Computer Architecture | **Students will be able to:**  •Demonstrate concepts of parallelism in hardware/software.  •Discuss memory organization and mapping techniques.  •Describe architectural features of advanced processors.  •Interpret performance of different pipelined processors.  •Explain data flow in arithmetic algorithms  •Development of software to solve computationally intensive problems. |
| 28 | V | PEC-IT501D | Computer Graphics | **Students will be able to:**  •Learn comprehensive introduction about computer graphics system, design algorithms and two-dimensional transformations.  •Familiar with techniques of clipping, three-dimensional graphics, and three-dimensional transformations.  •Perform designing, developing, and testing of modeling, rendering, shading and animation. |
| 29 | V | MC-CS501 | Constitution of India | **Students will be able to:**  •Develop human values, create awareness about law ratification and significance of Constitution  •Comprehend the Fundamental Rights and Fundamental Duties of the Indian Citizen to implant morality, social values, and their social responsibilities.  •Create understanding of their Surroundings, Society, Social problems, and their suitable solutions.  •Familiarize with distribution of powers and functions of Local Self Government.  •Realize the National Emergency, Financial Emergency, and their impact on Economy of the country. |
| 30 | V | ESC591 | Software Engineering Lab | **Students will be able to:**  •Understand the software engineering methodologies involved in the phases for project development.  •Gain knowledge about open-source tools used for implementing software engineering methods.  •Exercise developing product-startups implementing software engineering.  •Learn simple optimization technology |
| 31 | V | PCC-CS592 | Operating System Lab | **Students will be able to:**  •Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc  •Implement CPU scheduling algorithms and Banker’s algorithms used for deadlock avoidance and prevention.  •Apply page replacement and memory management algorithms.  •Categorize the operating system’s resource management techniques, dead lock management techniques, memory management techniques. |
| 32 | V | PCC-CS593 | Object Oriented Programme | **Students will be able to:**  •Apply object-oriented programming concepts in designing programs  •Analyze different dimensions of a problem and provide optimal solutions.  •Apply the advance features of JAVA in designing of projects |
| 33 | VI | PCC-CS601 | Database Management Systems | **Students will be able to:**  •Write relational algebra expressions for that query and optimize the developed expressions for a given query  •Design the databases using E R method and normalization for a given specification of the requirement.  •Construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2 for a given specification.  •Optimize its execution using Query optimization algorithms for a given query for a given query.  •Determine the transaction atomicity, consistency, isolation, and durability for a given transaction-processing system.  •Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling. |
| 34 | VI | PCC-CS602 | Computer Networks | **Students will be able to:**  •Understand how communication works in computer networks and to understand the basic terminology of computer networks  •Realize the role of protocols in networking and to analyze the services and features of the various layers in the protocol stack.  •Describe how signals are used to transfer data between nodes and how packets on the Internet are delivered. |
| 35 | VI | PEC-IT601 A | Advanced Algorithms | **Students will be able to:**  •Analyze the complexity/performance of different algorithms.  •Determine the appropriate data structure for solving a particular set of problems.  •Categorize the different problems in various classes according to their complexity. |
| 36 | VI | PEC-IT601B | Distributed Systems | **Students will be able to:**  •Design trends in distributed systems.  •Apply network virtualization. 3. •Implement remote method invocation and objects. |
| 37 | VI | PEC-IT601C | Signals & Systems | **Students will be able to:**  •Identify the classification of signals in terms of periodic-aperiodic, even – odd, energy-power, Deterministic-random, complex exponential, sinusoidal signals, unit impulse and unit step.  •Determine the mathematical operation on signals and systems using time scaling, time shifting, linearity, causality, time invariance, stability, convolution theorem and Fourier series coefficient with Dirichlet’s conditions.  •Discriminate different spectrum analysis techniques and its analysis and characteristics on LTI system using Fourier transform.  •Analyze the Z-transform with the help of properties of ROC, Poles and Zeros, inverse z-transform using Contour integration - Residue Theorem, Power Series expansion and Partial fraction expansion.  •Understand the application of sampling theorem, types of sampling, reconstruction of a signal from its samples, aliasing effect and the effect of random variable with its properties like distribution & density functions, mean values & moments, concepts of correlation, random processes. |
| 38 | VI | PEC-IT601 D | Image Processing | **Students will be able to:**  •Develop a theoretical foundation of fundamental concepts of image processing.  •Understand the mathematical foundations for image representation, image acquisition, image transformation, and image enhancement.  •Realize the mathematical principles of image restoration, image compression, and image segmentation. |
| 39 | VI | PEC-IT602A | Parallel and Distributed Algorithms | **Students will be able to:**  •Study software components of distributed computing systems. Know about the communication and interconnection architecture of multiple computer systems.  •Recognize the inherent difficulties that arise due to distributed-ness of computing e-sources. •Understanding of networks & protocols, mobile & wireless computing, and their applications to real world problems.  •Familiar with the design, implementation, and security issues of distributed system. |
| 40 | VI | PEC-IT602B | Data Warehousing and Data Mining | **Students will be able to:**  •Understand the basic principles, concepts and applications of data warehousing and data mining.  •Realize Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment  •Acquire a   good knowledge of the fundamental concepts that provide the foundation of data mining. |
| 41 | VI | PEC-IT602C | Human Computer Interaction | **Students will be able to:**  •Differentiate between various software vulnerabilities.  •Know software process vulnerabilities for an organization.  •Monitor resources consumption in a software.  •Interrelate security and software development process. |
| 42 | VI | PEC-IT602D | Pattern Recognition | **Students will be able to:**  •Characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.  •Apply support vector machines, regularized regression algorithms & machine learning toolboxes.  •Understand the concept behind neural networks for learning non-linear functions & foundation of generative models.  •Understand and apply unsupervised algorithms for clustering.  •Realize the inference and learning algorithms for the hidden Markov model with latent variables.  •Acquire knowledge of algorithms for learning Bayesian networks & reinforcement learning algorithms. |
| 43 | VI | OEC-IT601A | Numerical Methods | **Students will be able to:**  •Recall the distinctive principles of numerical analysis and the associated error measures.  •Understand the theoretical workings of numerical techniques. •Apply numerical methods used to obtain approximate solutions to intractable mathematical problems such as interpolation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.  •Select appropriate numerical methods to apply to various types of problems in engineering and science in consideration of the mathematical operations involved, accuracy requirements, and available computational resources. |
| 44 | VI | OEC-IT601 B | Human Resource Development and Organizational Behavior | **Students will be able to:**  •Demonstrate the applicability of the concept of organizational behavior to understand the behavior of people in the organization and the applicability of analyzing the complexities associated with management of individual behavior in the organization.  •Analyze the complexities associated with management of the group behavior in the organization.  Analyse how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.  •Develop the understanding of the concept of human resource management and to understand its relevance in organizations and necessary skill set for application of various HR issues.  •Analyse the strategic issues and strategies required to select and develop manpower resources.  •Integrate the knowledge of HR concepts to take correct business decisions. |
| 45 | VI | PROJ- CS601 | Research Methodology | **Students will be able to:**  •Explain the meaning, objective, motivation, approaches, components, and    significance of research.  •Review the exhaustive literature critically, differentiate between Research Method and Research Methodology, develop the working hypothesis, and formulate the research problem.  •Understand the need for research design, concepts relating to research design and principles of experimental and simulated designs.  •Determine the important sample designs and collect appropriate data through various techniques.  •Analyze the collected data by appropriate techniques and carry out hypothesis testing.  •Prepare the report or thesis in a scholarly manner. |
| 46 | VI | PCC-CS691 | Database Management System Lab | **Students will be able to:**  •Analyze and apply common SQL statements including DDL, DML and DCL statements to perform different operations.  •Design different views of tables for different users and to apply embedded and nested queries.  •Implement a database for a given problem according to well-known design principles that balance data retrieval performance with data consistency. |
| 47 | VI | PCC-CS692 | Computer Networks Lab | **Students will be able to:**  •Aware about various types of cables used in guided media like coaxial cable, optical fiber cable, twisted pair cables and its categories.  •Understand the working of LAN Card, Hub, TELNET and to understand the working difference between straight cable and cross over cable.  •Analyze different protocols used for packet communication like ALOHA Protocol. |
| 48 | VII | PEC-CS701A | Quantum Computing | **Students will be able to:**  •Understand quantum information theory, quantum computation, quantum cryptography, density operators, quantum superposition, entanglement, nonlocality, teleportation, quantum channels, quantum algorithms, measurement theory, Bell inequalities, no-cloning theorems, and related topics.  •Familiar with quantum graph states, topological quantum computation and developing concepts w.r.t quantum machine learning.  •Apply his/her knowledge of quantum information theory, computation, and cryptography to up-and-coming problems.  •Expertise in quantum mechanics with reference to quantum computation and quantum cryptography. |
| 49 | VII | PEC-CS701A | Cloud Computing | **Students will be able to:**  •Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.  •Apply fundamental concepts in cloud infrastructures to understand the trade-offs in power, efficiency, and cost, and then study how to leverage and manage single and multiple datacentres to build and deploy cloud applications that are resilient, elastic, and cost-efficient.  •Discuss system, network and storage virtualization and outline their role in enabling the cloud computing system model.  •Illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS.  •Analyze various cloud programming models and apply them to solve problems on the cloud. |
| 50 | VII | PEC-CS701C | Digital Signal Processing | **Students will be able to:**  •Represent signals mathematically in continuous and discrete-time, and in the frequency domain.  •Analyse discrete-time systems using z-transform.  •Understand the Discrete-Fourier Transform (DFT) and the FFT algorithms.  •Design digital filters for various applications.  •Apply digital signal processing for the analysis of real-life signals. |
| 51 | VI | PEC-CS701D | Multi-agent Intelligent Systems | **Students will be able to:**  •Discuss the notions of the intelligent agent and multi-agent system  •Distinguish basic categories of agents and multi-agent systems  •Identify the basic application areas of intelligent agents and multi-agent systems  •Apply basic multi-agent paradigms to the real-world problem solving  •Employ the basics of the game theory to formulate and solve multi-agent problems  •Construct simple but functional multi-agent systems |
| 52 | VI | PEC-CS701D | Machine Learning | **Students will be able to:**  •Recognize the characteristics of machine learning that make it useful to real-world problems.  •Understand the basic underlying concepts for supervised discriminative and generative learning and concepts of cross-validation and regularization; be able to use them for estimation of algorithm parameters.  •Characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.  •Effectively use machine learning toolboxes.  •Use support vector machines, regularized regression algorithms.  •Understand the concept behind neural networks for learning non-linear functions, unsupervised algorithms for clustering, foundation of generative models, inference and learning algorithms for the hidden Markov model with latent variables, algorithms for learning Bayesian networks and reinforcement learning algorithms. |
| 53 | VII | PEC-CS702A | Neural Networks and Deep Learning | **Students will be able to:**  •Model Neuron and Neural Network, and to analyze ANN learning, and its applications.  •Perform Pattern Recognition, Linear classification.  •Develop different single layer/multiple layer Perception learning algorithms  •Design of another class of layered networks using deep learning principles.  •Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.  •Implement deep learning algorithms and solve real-world problems. |
| 54 | VII | PEC- CS702B | Soft Computing | **Students will be able to:**  •Understand basics of fuzzy system, genetic algorithms & their relations.  •Learn artificial neural n/ws, models & their functions.  •Apply genetic algorithms & artificial neural N/ws as computation tools to solve a variety of problems in various areas of interest ranging from optimization problems to text analytics. |
| 55 | VII | PEC-CS702C | Adhoc –Sensor Network | **Students will be able to:**  •Describe the unique issues in ad-hoc/sensor networks.  •Realize current technology trends for the implementation and deployment of wireless ad-hoc/sensor networks.  •Understand the challenges in designing MAC, routing, and transport protocols for wireless ad-hoc/sensor networks.  •Discuss the challenges in designing routing and transport protocols for wireless Ad-hoc/sensor networks.  •Comprehend the various sensor network Platforms, tools, and applications. |
| 56 | VII | PEC-CS702D | Information Theory and Coding | **Students will be able to:**  •Understand the concepts of information, mutual information and entropy and various source coding techniques.  •Analyse the need for error control techniques in a digital communication system channel model, channel capacity and channel coding techniques.  •Apply linear algebra, concept of Galois field, conjugate roots, minimal polynomial in channel coding techniques for error control. •Generate different error control codes like linear block codes, cyclic codes, BCH codes, and perform error detection and correction. •Design the circuit for different error control coding techniques. |
| 57 | VII | PEC-CS702E | Cyber Security | **Students will be able to:**  •Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure.  •Design, develop, test and evaluate secure software.  •Develop policies and procedures to manage enterprise security risks.  •Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.  •Interpret and forensically investigate security incidents. |
| 58 | VII | OEC-CS701A | Operation Research | **Students will be able to:**  •Define and formulate linear programming problems and appreciate their limitations. •Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained and translate solutions into directives for action.  •Conduct and interpret post-optimal and sensitivity analysis and explain the primal-dual relationship.  •Develop mathematical skills to analyse and solve integer programming and network models arising from a wide range of applications.  •Effectively communicate the ideas, explain procedures, and interpret results and solutions in written and electronic forms to different audiences. |
| 59 | VII | OEC-CS701B | Multimedia Technology | **Students will be able to:**  •Define what is multimedia.  •Discuss the effects of multimedia in your daily life.  •Identify five multimedia components.  •Explain why multimedia is so powerful to increase human-computer interaction.  •Examine multimedia applications in several areas. |
| 60 | VII | OEC-CS701C | Introduction to Philosophical Thoughts | **Students will be able to:**  •Familiar with numerous philosophical concepts  •Understand an elementary idea of the complex framework where Western thought can be developed  •Describe the main historical and theoretical concepts starting from the Greek origins and following the evolutions and differentiations through the centuries. |
| 61 | VII | HSMC 701 | Project Management and Entrepreneurship | **Students will be able to:**  •Describe Entrepreneurship & the steps to establish an enterprise.  •Examine role of entrepreneur in economic development  •Compare and classify types of entrepreneurs  •Explain project Identification, formulation & project evaluation  •Evaluate the entrepreneurial support in India  •Describe        Special    institutions    for    entrepreneurial development and assistance in India |
| 62 | VIII | PEC-CS801A | Signal and Networks | **Students will be able to:**  •Analyze different types of signals  •Understand basics electrical circuits with nodal, mesh analysis and electrical network theorems.  •Apply Laplace Transform for steady state and transient analysis.  •Determine different network functions.  •Appreciate the frequency domain techniques |
| 63 | VIII | PEC-CS801B | Cryptography and Network Security | **Students will be able to:**  •Analyze and design classical encryption techniques and block ciphers.  •Understand and analyze data encryption standard, public-key cryptography, RSA, and other public-key cryptosystems such as Diffie-Hellman Key Exchange, ElGamal Cryptosystem, etc.  •Realize key management and distribution schemes and design User Authentication Protocols.  •Analyze and design hash and MAC algorithms, and digital signatures.  •Design network application security schemes, such as PGP, S/ MIME, IPSec, SSL, TLS, HTTPS, SSH, etc.  •Know about Intruders and Intruder Detection mechanisms, Types of Malicious software, Firewall Characteristics, Types of Firewalls, Firewall Location and Configurations. |
| 64 | VIII |  | Natural Language Processing | **Students will be able to:**  •Understand the approaches to syntax and semantics in Natural Language Processing, the various types of language processors, the elements of formal language theory, the types of grammar, and the computational morphology.  •Realize the basic parsing strategies for context-free grammars, the data structures and algorithms for parsing, and the approaches to ambiguity resolution, generation, and dialogue.  •Explain and apply the fundamental algorithms and techniques in Natural Language Processing. |
| 64 | VIII | PEC-CS801D | Web and Internet Technology | **Students will be able to:**  •Analyze a web page and identify its elements and attributes.  •Create web pages using XHTML and Cascading Style Sheets.  •Build dynamic web pages using JavaScript (Client-side programming).  •Create XML documents and Schemas.  •Build interactive web applications using AJAX. |
| 65 | VIII | PEC-CS801E | Internet of Things | **Students will be able to:**  •Explain the definition and usage of the term “Internet of Things” in different contexts  •Understand the key components that make up an IoT system  •Differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stack  •Apply the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming, and data analysis  •Understand where the IoT concept fits within the broader ICT industry and possible future trends  •Appreciate the role of big data, cloud computing and data analytics in a typical IoT system |
| 66 | VIII | OEC-CS801A | Big Data Analytics | **Students will be able to:**  •Describe big data and use cases from selected business  domains  •Explain NoSQL big data management  •Install, configure, and run Hadoop and HDFS  •Perform map-reduce analytics using Hadoop  •Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics |
| 67 | VIII | OEC-CS801B | Cyber Law and Ethics | **Students will be able to:**  •Identify appropriate and ethical behaviors, legal standards, rights, restrictions, and moral duties when accessing technology systems, digital media, and information technology within the context of today’s society.  •Apply examples of modern compliance in relation to NIST and other applicable standards, laws, and regulations.  •Evaluate the relationship between ethics and law, describe civil disobedience and its relation to ethical hacking, describe criminal penalties related to unethical hacking, and apply the notion of “grey areas” to describe situations where law has not yet caught up to technological innovation.  •Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools. |
| 68 | VIII | OEC-CS801C | Mobile Computing | **Students will be able to:**  •Define mobile technologies in terms of hardware, software, and communications. •Utilize mobile computing nomenclature to describe and analyze existing mobile computing frameworks and architectures. •Evaluate the effectiveness of different mobile computing frameworks. •Describe how mobile technology functions to enable other computing technologies. |
| 69 | VIII | OEC-IT801 | Robotics | **Students will be able to:**  •Explain the fundamentals of robotics, sensors, instrumentation in robotics and its components  •Illustrate the Kinematics and Dynamics of robotics  •Elucidate the need and implementation of related Instrumentation & control in robotics  •Describe the movement of robotic joints with computers/microcontrollers. |
| 70 | VIII | OEC-CS801E | Soft Skill & Interpersonal Communication | **Students will be able to:**  •Exhibit effective interpersonal communication in a variety of settings and de-escalatory behaviours in situations of conflict.  •Demonstrate respect for others’ viewpoints and acknowledgment and validation of the feelings, opinions, and contributions of others.  •Apply active listening skills effectively and perceive the listeners interpersonal needs.  •Establish and identify when using interpersonal communication and maintain proper eye contact while communicating interpersonally.  •Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.  •Become more effective individual through goal/target setting, self-motivation and practicing creative thinking. |
| 71 | VIII | OEC-CS802A | E-Commerce & ERP | **Students will be able to:**  •Analyze the impact of E-commerce on business models and strategy.  •Describe the major types of E-commerce and how procurement and supply chains relate to B2B E-commerce.  •Explain the process that should be followed in building an E-commerce presence.  •Identify the key security threats in the E-commerce environment. |
| 72 | VIII | OEC-CS802B | Micro-electronics & VLSI design | **Students will be able to:**  •Able to describe fabrication steps of IC and construct stick diagram & layout of Logic Gates  •Build upon the theoretical, mathematical, and physical analysis of digital VLSI circuits, for proper understanding of concept, working, analysis and design.  •Design, simulate and analyze any electronic device and circuit.  •Apply the concepts in testing which can help them design a better yield in IC design and tackle the problems associated with testing of integrated circuits at earlier design levels to significantly reduce the testing costs.  •Develop the ability to analyze and design electrical interconnect using equivalent circuit models. |
| 73 | VIII | OEC-CS802B | Economic Policies in India | **Students will be able to:**  •Understand the framework in which the functioning of the economy and economics policies operates.  •Apply the knowledge of economics to solve complex economic problems of the country •Undertake research on various social and economic issues and come out with solutions to perennial problems in this sphere.  •Develop macroeconomic models, which can serve as the workhorse for a fast-growing economy  •Using various econometric and time series techniques evaluate the policies implemented by the government. |