

S.No.	Semester	Course	Course Code	Syllabus for MST-1
1	3 rd	Object Oriented Programming	PCCS-101	<p>Object-Oriented Programming Concepts: Introduction, Comparison between procedural programming paradigm and object-oriented programming paradigm, Features of object-oriented programming: Encapsulation, Class, Object, Abstraction, Data hiding, polymorphism, and Inheritance. Introduction of object-oriented design.</p> <p>Data Types, Operators, and Control Structures: Basic data types, Derived data types, Keywords, Identifiers, Constants and variables, Type casting, Operators, and Operator precedence. Control Structures: if statement, switch-case, for, while and do-while loops, break and continue statement.</p> <p>Classes and Objects: Implementation of a class, creating class objects, Operations on objects, Relationship among objects, Accessing class members, Access specifiers, Constructor and destructor, Types of constructors, Static members, Empty classes, Nested classes, Local classes, Abstract classes, Container classes.</p> <p>Functions, Arrays, and String Handling: Function components, Default arguments, passing parameters, Function prototyping, call by value, call by reference, Return by reference, Inline functions, Friend functions, Static functions, Recursion, Array declaration, Types of arrays, Array of objects, String handling.</p>
2		Computer Networks	PCCS-102	<p>Part-A (Module 1) Data Communication Components: Representation of data and data flow, Various Network Topologies, Protocols and Standards, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing-Frequency division, Time division and Wave division, Concepts on spread spectrum, OSI model, TCP/IP reference model and their comparison.</p> <p>(Module 2) Physical Layer: Concept of analog and digital systems, Transmission Media, Transmission impairments and Data rate limits-Nyquist formula, Shannon formula, Switching- Circuit, Message and Packet switching</p>
3		Digital Electronics	ESCS-101	<p>Number Systems: Binary, Octal, Decimal, Hexadecimal. Number base conversions, 1's, 2's, rth's complements, signed Binary numbers. Binary Arithmetic, Binary codes: Weighted BCD, Gray code, Excess 3 code, ASCII – conversion from one code to another.</p> <p>Boolean Algebra: Boolean postulates and laws – De-Morgan's Theorem, Principle of Duality, Boolean expression – Boolean function, Minimization of Boolean expressions – Sum of Products(SOP), Product of Sums (POS), Minterm, Maxterm, Canonical forms, Conversion between canonical forms, Karnaugh map Minimization.</p>

				Logic GATES: AND, OR, NOT, NAND, NOR, Exclusive-OR and Exclusive-NOR. Implementations of Logic Functions using gates, NAND-NOR implementations.
4		Human Values and Professional Ethics	HSMCS-101	<p>Ethics and values: Importance of Ethics and values, Difference between moral, ethics and values, Nature of Values, The Structure of Value Relations , Integrity, Work ethics, Service learning, Virtues, Respect for others, Living peacefully, caring , Sharing , Honesty, Courage, Valuing time, Cooperation, Commitment, Empathy, Self confidence, Challenges in the work place, spirituality.</p> <p>Value education: Need for value education, Basic guidelines, Self Exploration, Values in family and Harmony in existence, Values across cultures.</p> <p>Personality and behavior development: God and scientific attitude, positive thinking, Integrity and discipline, punctuality, Aware of self destructive habits, Association and cooperation,</p>
5		Mathematics-III	BSCS-101	Unit-1, Unit-3, Unit-4
6	5 th	Artificial Intelligence	PCCS-108	First 3 modules (Introduction, Problem Formulation and Solution, Game Playing)
7		Organization Behaviour	MCI-103	<p>Unit-1 Organizational Behavior: what managers do, Definition of OB, contributing disciplines to OB, challenges and opportunities for OB. Foundations of Individual Behavior: biographical characteristics, Learning, Attitude, Personality: Determinants of Personality, Perception: Meaning & Attribution Theory.</p> <p>Unit-2 Motivation: Definition & Process of Motivation, Theories of Motivation, Application of Motivation. Job Satisfaction: Nature & Significance of Job Satisfaction, Leadership: Meaning & Theories of Leadership; Leadership in Indian Culture; Nature & Signification of Leadership; Transactional Analysis, Life Position, Johari Window, Emotional Intelligence and Intellectual Intelligence.</p>
8		Software Project Management	PECS-101	<p>Introduction to Project Management: The characteristics of software projects, Objectives of project management: time, cost and quality, Basics of Project Management, Stakeholders, Stages of Project, The Feasibility Study, Cost-benefit Analysis, Planning, Project Execution, Project and Product Life Cycles, Project Management Knowledge areas, Project Management Tools & Techniques, Project success factors, role of project manager</p> <p>Project Evaluation and Planning: Activities in Software project management, Project evaluation – Cost benefit analysis, Cash flow forecasting, Cost benefit evaluation techniques, Risk evaluation. Project planning – Stepwise project planning, Software processes and process models. Project costing, COCOMO II</p>
9		Advanced Computer Networks	PECS-106	Part-A

				<p>Introduction: Basics, History of Internet, Requirements: perspectives, scalable connectivity, cost effective resource sharing, support for common services, manageability, network architecture: layering and protocols, Internet architecture, network performance: bandwidth, latency, high-speed networks, application performance needs.</p> <p>Internetworking: half and full duplex, Ethernet at physical layer: standard Ethernet, fast Ethernet, gigabit Ethernet, Ethernet cabling-straight-through, crossover and rolled cable, Data encapsulation. Ethernet at data link layer: CSMA, CSMA/CD and CSMA/CA.</p> <p>Wireless LANs: Introduction: architecture comparison, characteristics, access control.</p> <p>IEEE 802.11: architecture, MAC Sublayer, Physical layer. Bluetooth: architecture and its layers.</p> <p>Switching: Switching and bridging: datagrams, virtual circuit switching, source routing, Switches: Basics, its function, types of switches, Spanning Tree Protocol (STP), Virtual LANs (VLANs): purpose, memberships, configuration, connection between switches, advantages, types of VLANs: static and dynamic.</p>
10	Statistics for Data Science	PECS-113		<p>Random Variables and Probability Distributions: Random Variables, Discrete Probability Distributions, Distribution Functions for Random Variables, Distribution Functions for Discrete Random Variables, Continuous Random Variables, Joint Distributions, Independent Random Variables, Change of Variables, Probability Distributions of Functions of Random Variables, Convolutions, Conditional Distributions, Applications to Geometric Probability.</p> <p>Special Probability Distributions- Binomial Distribution, Normal Distribution, Poisson Distribution, Uniform Distribution, Multinomial Distribution</p> <p>Introduction to Statistics: Population and sample, parameters and statistics, Simple descriptive statistics- Mean, Median, Quantiles, percentiles, and quartiles, Variance and standard deviation, Standard errors of estimates, Interquartile range.</p> <p>Correlation: Definition of Correlation, Types of Correlation, Scatter Diagram Method, Karl Person's Correlation Coefficients, Correlation Coefficients for Bivariate frequency distribution, Probable error for Correlation Coefficients, Rank Correlation Coefficient.</p>
11	Information Retrieval	PECS-119		Introduction, Basic IR model, Experimental evaluation of IR, Relevance feedback, Boolean queries
12	System Programming	PECS-125		Overview of System Software: System Software, Application Software, Systems Programming, Recent Trends in Software

				<p>Development, Levels of System Software, Evolution of Operating Systems, Operating System & Kernel, Functions of Operating System, Machine Structure, Evolution of components of a programming system -Assembler, Loader, Macros, Compiler.</p> <p>Language Processors: Fundamentals of Language Processing & Language Specification, Language Processing Activities, Data Structures for Language Processing - Search Data structures, Allocation Data Structures.</p> <p>Introduction to Assembly Language Program: Elements of Assembly Language Programming, A Simple Assembly Scheme, Pass Structure of Assemblers, One-Pass and Two-Pass Assemblers with reference to IBM 360 machines.</p>
13		Database Management Systems	PCCS-109	<p>Introduction to Database Concepts: Introduction, Database systems versus file systems, Difference between Database and non-database system, Characteristics of Database Approach, Advantages and Disadvantages of Using DBMS. Data base users and administrators, Schemas and Instances, DBMS Architecture, components of a database system, Data Independence, Database Language and Interfaces, Classification of Database Management Systems. Introduction to NoSQL database.</p> <p>Entity Relationship Model: Data models, Entity types, Entity sets, Attributes and keys, Relationship types, Relationship sets, Roles and structural constraints, Weak entity types, Design choices for ER conceptual design, Comparison of Models.</p> <p>Relational Model: Relational model concepts, Constraints, Update operations, Transaction and dealing with constraint violations. Relational Algebra –Unary relational operations, Operations from Set theory, Binary relational operations, DIVISION operation and additional relational operations. Relational Calculus – Tuple relational calculus and Domain relational calculus, Queries related to Relational Algebra and Relational Calculus.</p>
14		Formal Language & Automata Theory	PCCS-110	<p>Finite Automata: Deterministic Finite Automata, Acceptance by Finite Automata, Transition systems, Non-Deterministic Finite Automata, Equivalence of DFA and NDFAs, Moore and Mealy machines, Equivalence of Moore and Mealy machine, Minimization of Finite Automata, Applications and limitations of Finite Automata.</p> <p>Formal Languages: Basics of strings, Alphabets, grammar, Formal language, Chomsky classification of languages, Languages and their relation, Operations on languages, Closure properties of language classes.</p>
15		Design and Analysis of Algorithms	PCCS-111	<p>Introduction: Algorithms, Algorithm Specification, Performance Analysis: Space complexity, Time complexity, Asymptotic Notations- Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), and Little-oh notation (o), Mathematical analysis of Non-Recursive and recursive Algorithms with examples.</p>

				<p>Divide and Conquer: General method, solving recurrences using recurrence trees, repeated substitution, statement of Master Theorem, applications – Binary search, Merge sort, Quick sort, Strassen’s Matrix Multiplication, Finding the maximum and minimum.</p> <p>Greedy Algorithms: Greedy choice, optimal substructure property, minimum spanning trees-Prims and Kruskals, Dijkstra shortest path using arrays and heaps, fractional knapsack, Travelling salesperson problem and Huffman coding.</p> <p>Dynamic Programming: Introduction to dynamic programming and application of the algorithm to solve multistage graphs, edit distance, matrix chain multiplication, All pairs shortest path problem and Knapsack problem.</p>
16	7 th	Agile Software Development	PECS-103	<p>Introduction: Need of Agile software development, agile context– Manifesto, Principles, Methods, Values, Roles, Artifacts, Stakeholders, and challenges. Business benefits of software agility.</p> <p>Project Planning: Recognizing the structure of an agile team– Programmers, Managers, Customers. User stories– Definition, Characteristics and content. Estimation– Planning poker, Prioritizing, and selecting user stories with the customer, projecting team velocity for releases and iterations.</p>
17		Software Defined Networks	PECS-109	<p>Introduction: Historical Background of Software Defined Networking (SDN), The SDN Approach: Requirements, Characteristics of Software-Defined Networking, The Modern Data Center, Traditional Switch Architecture: Data Control and Management Planes, Centralized and Distributed Control and Data Planes.</p> <p>Software Defined Networking (SDN): The need of SDN, Fundamental Characteristics of SDN, SDN Operation, SDN Devices: Flow Tables, SDN software switches, hardware SDN devices, SDN Applications.</p> <p>Network Functions Virtualization: Background and motivation for NFV- Virtual Machines- NFV Concepts: Simple example of use of NFV, NFV Principles, High-Level NFV Framework, NFV Benefits and Requirements-NFV Reference Architecture.</p>
18		Data Warehouse and Data Mining	PECS-115	<p>Introduction to Data Warehousing and Data Mining: Historical developments in data warehousing, Defining data warehousing, Data warehouse architecture, Benefits of data warehousing, Data Granularity, The Information Flow Mechanism, Metadata, Two Classes of Data, The Lifecycle of Data, Data Flow from Warehouse to Operational Systems, Data Warehouse v/s Data Mining, Data Mining Applications, Data Mining Process, Data Mining Techniques, Predictive modelling, Database segmentation, Link analysis,</p>

				<p>Deviation detection, Difference between Data Mining and Machine Learning.</p> <p>The Building Blocks of a Data Warehouse: Data Warehouse: The Need for an Operational Data Store (ODS),Operational Data Store, Data Marts: Comparative Study of Data Warehouse with OLTP and ODS, Data Warehouse Schema, Introduction to Data Warehouse Schema: Dimension, Measure, Fact Table, Multi-dimensional view of data, Star Schema, Snowflake Schema, Fact Constellation Schema (Galaxy Schema) , Comparison among Star, Snowflake and Fact Constellation Schema.</p> <p>Online Analytical Processing: Introduction to Online Analytical Processing, Defining OLAP, OLAP applications, Features of OLAP, OLAP Benefits, Strengths of OLAP, Comparison between OLTP and OLAP, Differences between OLAP and data mining.</p>
19		Computer Vision	PECS-121	Part-A - Digital Image Formation and Low- level processing, Visual Features and Representations- Point and line detection
20		Advanced Algorithm Design and Analysis	PECS-127	<p>Dynamic Programming: Introduction, Elements of dynamic programming: Optimal substructure, Overlapping subproblems, Reconstructing an optimal solution, Memorization.</p> <p>Rod cutting: Recursive top-down implementation, Using dynamic programming for optimal rod cutting, Subproblem graphs. Matrix-chain multiplication, Longest common subsequence, Optimal binary search trees.</p> <p>Greedy Algorithms: Introduction, Elements of the greedy strategy , An activity-selection problem: The optimal substructure of the activity-selection problem</p>
21		Object Oriented Design using UML	PECS-104	First 3 Modules (Introduction, System and Process, Various UML Diagrams and Relationships)
22		Wireless Sensor Networks	PECS-110	<p>Introduction to wireless communication: Fundamentals of wireless communication technology, the electromagnetic spectrum radio propagation, characteristics of wireless channels: Path loss, fading, interference, Doppler effect, Transmission rate constraints. Modulation Techniques, Multiple Access Techniques, wireless LANs, PANs, WANs, and MANs.</p> <p>Wireless Sensor Networks: History of Wireless Sensor Networks, Introduction to Wireless sensor networks, Key definitions, Unique constraints and challenges, Differentiate between traditional networks and wireless sensor networks, advantages of ad-hoc/sensor network, Design issues and challenges in wireless sensor networks</p> <p>Basic Wireless Sensor Technology: Introduction, Sensor Node Technology, Architecture of a wireless sensor Network, Node architecture, Protocol stack, Communication in wireless sensor</p>

				network: flooding, gossiping, data dissemination and Data Aggregation
23	Cloud Computing	PECS-117		<p>Cloud Computing Fundamentals: Evolution of cloud computing, Overview of computing paradigms: Distributed computing, Parallel computing, Cluster computing, Grid computing, Utility computing, Edge Computing, Fog Computing, and Cloud computing. The NIST model of cloud computing, Benefits and challenges of cloud computing, Big Data, Internet of things (IoT). Introduction to Mobile cloud computing.</p> <p>Cloud Concepts and Technologies: Virtualization: Definition, Characteristics and benefits of virtualization, Virtualization and cloud computing, Types of virtualization, and Load balancing</p>
24	Soft Computing	PECS-122		<p>Introduction: Introduction to soft computing, Definition and importance, Evolution of soft computing, Difference between Hard and Soft computing, Requirement of Soft computing, Usefulness and applications.</p> <p>Neural Networks: Introduction to Neural Networks, Model of an artificial neuron, Comparison of artificial neural network and Biological neural network, Activation Functions, Neural network models– Perceptron, Single layer, Back propagation, Multi-layer networks.</p>
25	Web Technologies	PECS-128		Part-A
26	Business Information Systems	Open elective		<p>(Module 1) Introduction to Business Information System: Introduction to Information System, Impact of IS in Business, Transformation from Old to Digital Economy, Acquiring Information system, Components of IS, Resources that support BIS, Types of BIS, E-business system.</p> <p>(Module 2) Business Development of Data Systems- Overview of Hardware and Software, Networks, Network Components, Telecommunication and Internet, Scenario in India, Networking Technologies- Wi-Fi, WiMax, NextGen mobile networks, Data Capture and Computer Input / Output devices.</p> <p>(Module 3) Data Resource Management: Differentiating Data and Information, Traditional Processing Systems, Functionalities of Database approach and its advantages and disadvantages, Components of database environment, Concepts of Data Warehousing, Data Mining and Tools, OLAP, Data Visualization, Data Centers, Fabric Data Centers, Server Farms, Big data overview, V's of big data, Drivers of big data, Big data ecosystem and a New Approach to Analytics.</p>
27	Cloud Computing	Open elective		<p>Module-I AWS Security Model</p> <p>Module-II Shared Security</p> <p>Module-III Cloud Services and Instance Types</p> <p>Module-IV Dynamic Web Server-I</p> <p>Module-V Dynamic Webserver-II</p>

28	M.Tech. 3 rd sem	Data Preparation and Analysis	MCS- 155	<p>Introduction to Data Analysis :Problem definition , Data preparation, Implementation of the analysis , Deployment of the results, Data sources , Data understanding, Data preparation, Tables and graphs.</p> <p>Exploratory Analysis:Descriptive statistics-Central tendency , Variation, Shape.Inferential statistics- Confidence intervals , Hypothesis tests, Chi-square, One way analysis of variance. Comparative statistics Visualizing relationships Correlation coefficient(r), Correlation analysis for more than two variables.</p> <p>Grouping:Introduction,Clustering: Hierarchical agglomerative clustering, K means clustering. Associative rules: Grouping by value combinations, Extracting Rules from groups. Decision trees :Tree generation , Splitting criteria.</p>
29	M.Tech.	Project Management	Open elective	<p>UNIT-I Concept of Project and Project Management: Definition, Characteristics, Project Management, Meaning and Scope, Types, Project Identification and Screening, Role of Project manager, Project life-cycle.</p> <p>Project Appraisal: Technical appraisal, Environmental appraisal, Economic and market appraisal, Organizational or Managerial appraisal, Financial Appraisal: Project cost estimation and working capital requirements, Sources of funds, Capital Budgeting and Budgeting controls for projects.</p> <p>UNIT-II Cost Benefit Analysis: Cost-Benefit Evaluation Techniques: Payback method, Accounting rate of return, Internal rate of return, Net present value method, Net terminal value method, Multiple internal rate of return, Earned Value analysis. Projected balance sheet, Projected income statement, Projected funds and cash flow statements, Preparation of detailed project report.</p>