Syllabus for 1st Mid Semester Examination (Aug-Dec'2024)
Department Of CSE

Subject Name & Subject Code	Semester	Syllabus
Object Oriented Programming (PCCS-101)	3rd	Part-A 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. 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.\n\nClasses 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. 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.
Computer Networks (PCCS-102)	3rd	Part-A 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. [6 Hours] 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. [7 Hours] Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction-Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols-Stop and Wait, Go back–N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols- Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA.
Digital Electronics (ESCS-101)	3rd	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. 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. Logic GATES: AND, OR, NOT, NAND, NOR, Exclusive-OR and Exclusive-NOR. Implementations of Logic Functions using gates, NAND-NOR implementations. Study of logic families like RTL, DTL, DCTL, TTL, MOS, CMOS, ECL and their characteristics. Combinational Circuits: Design procedure – Adders, Subtractors, Serial adder/Subtractor, Parallel adder/ Subtractor, Carry look ahead adder, BCD adder, Magnitude Comparator, parity checker, code converters.
Human Values and Professional Ethics (HSMCS-101)	3rd	Unit 1 and Unit 2
Mathematics III (BSCS-101)	3rd	Separation of elementary functions of complex variables, Cauchy-Riemann equations, analytic functions, elementary analytic functions (exponential, trigonometric, logarithm) and their properties, harmonic functions, finding harmonic conjugate.Complex integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof) Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Mobius transformations and their properties,Gauss's elimination method and Gauss's Jordan method.

Artificial Intelligence (PCCS-108)	5th	PART A Introduction: Intelligence, Foundations of artificial intelligence (AI). History of AI, Agents and Environments, Rationality of Agents, Nature and Structure of Agents, Communication among Agents. Problem Formulation and solution: Problem types, States and operators, State space, Uninformed Search Strategies, Informed Search Strategies– Best first search, A* algorithm, Heuristic functions, Iterative deepening A*(IDA), Small memory A*(SMA). Game playing: Perfect Information game, Imperfect Information game, Evaluation function, Minimax algorithm, Alpha-beta pruning. Logical Reasoning: Inference in Propositional logic and First order Predicate logic, Resolution, Logical reasoning, Forward chaining, Backward chaining; Knowledge representation techniques: semantic networks, Frames.
Database Management Systems (PCCS-109)	5th	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. 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. 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. SQL: SQL Data Definition and data types, specifying constraints in SQL, Schema change statements, Basic queries in SQL, Set operations, Aggregate functions and views, Complex queries in SQL, Additional features of SQL.
Formal Language & Automata Theory (PCCS-110)	5th	Finite Automata: Deterministic Finite Automata, Acceptance by Finite Automata, Transition systems, Non-Deterministic Finite Automata, Equivalence of DFA and NDFA, Moore and Mealy machines, Equivalence of Moore and Mealy machine, Minimization of Finite Automata, Applications and limitations of Finite Automata,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. [4 Hours] Regular Grammar: Regular grammars, Regular expressions, Algebraic method using Arden's theorem, Equivalence of Finite Automata and Regular expressions, Properties of regular languages, Pumping lemma.
Design and Analysis of Algorithms (PCCS-111)	5th	Part-A 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. 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.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. 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.
Software Project Management (PECS-101)	5th	Part-A 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 [5 Hours] 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, Staffing pattern, Effect of schedule compression, Putnam's equation, Capers Jones estimating rules of thumb. [6 Hours] Project Scheduling and Risk Management: Project sequencing and scheduling activities, Scheduling resources, Critical path analysis, Network planning, Risk management – Nature and types of risks, Risk planning and control, Risk assessment, Hazard identification, Hazard analysis, PERT and Monte Carlo simulation techniques.
Advanced Computer Networks (PECS-107)	5th	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. 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. Wireless LANs: Introduction: architecture comparison, characteristics, access control. IEEE 802.11: architecture, MAC Sublayer, Physical layer. Bluetooth: architecture and its layers. Switching: Switching and bridging: datagrams, virtual circuit switching, source routing, Switches: Basics, its function, types of switches, Spanning Tree Protocol (STP).
Statistics for Data Science (PECS-113)	5th	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, Special Probability Distributions- Binomial Distribution, Normal Distribution, Poisson Distribution, The Central Limit Theorem, Multinomial Distribution, Hyper geometric Distribution, Uniform Distribution.
Information Retrieval (PECS-119)	5th	Introduction: Introduction, History of IR, Components of IR, The IR Problem, The IR System, The Software Architecture of the IR System, The impact of the web on IR, The role of artificial intelligence (AI) in IR, IR Versus Web Search, Components of a Search engine. Basic IR Models: Boolean and vector-space retrieval models; ranked retrieval; text-similarity metrics; TF-IDF (term frequency/inverse document frequency) weighting; cosine similarity. Experimental Evaluation of IR: Performance metrics: recall, precision, and F-measure; Evaluations on benchmark text collections. Retrieval Utilities, Indexing and Searching: Relevance feedback; clustering; Passage-Based Retrieval; N-Grams, Regression Analysis;

Subject	Sem	Syllabus
		Thesauri; Semantic Networks; Parsing, Searching Introduction; Inverted Files; Other indices for text; Boolean queries; Sequential searching; Structural queries; Compression.
System Programming (PECS-125)	5th	Part-A Overview of System Software: System Software, Application Software, Systems Programming, Recent Trends in Software 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. Language Processors: Fundamentals of Language Processing & Language Specification, Language Processing Activities, Data Structures for Language Processing - Search Data structures, Allocation Data Structures. Introduction to Assembly Language Program: Elements of Assembly Language Programming, A Simple Assembly Scheme, Pass Structure of Assemblers, One-Pass and TwoPass Assemblers with reference to IBM 360 machines. Macro and Macro Processors: Introduction, Macro Definition and Call, Macro Expansion, Nested Macro calls, Advanced Macro Facilities, Design of a Macro Pre-processor, design of a Macro Assembler, Functions of a Macro Processor.
Organizational Behaviour (MCI-103)	5th	----------------------
Constitution of India (MCI-102)	5th	Part A
Preparation and Analysis of Data (PECS-133)	7th	Introduction to data preparation: Overview of the data preparation process, Data types and structures, Data cleaning techniques, Handling missing data and outliers, Data validation and quality assurance methods.Data Collection and Integration: Data collection methods (e.g. i.e., surveys, web scraping, APIs etc.), Data integration techniques for combining data from multiple sources, Data preprocessing for analysis (e.g. i.e., feature scaling, encoding categorical variables etc.), Exploratory data analysis (EDA). Statistical Analysis and Machine Learning: Descriptive statistics and probability distributions, Hypothesis testing and confidence intervals, Regression analysis (linear, logistic) and model interpretation, Classification and clustering algorithms, Model evaluation and validation techniques.
Data Warehouse and Data Mining (PECS-115)	7th	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, Deviation detection, Difference between Data Mining and Machine Learning. 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. 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.
Computer Vision (PECS-121)	7th	Digital Image Formation and Low-Level Processing: Introduction to Computer Vision, Image Formation: Photometric Image Formation, Reflectance Capture and Representation, Image Sensing Pipelining, Sampling and Aliasing, Image Compression; Image Processing: Operations, Linear Filtering, Correlation, Convolution, Image in Frequency Domain, Image Sampling, Visual Features and Representations: Edge Detection, Image Gradients, Canny Edge Detection, More Recent Methods in Edge Detection, Blobs Detection, Corner Detection, Harris Corner Detector; Scale Space and Scale Selection; SIFT, SURF; HoG, LBP
Design and Analysis of Advanced Algorithms (PECS-132)	7th	PART-A Dynamic Programming: Introduction, Elements of dynamic programming: Optimal substructure, Overlapping subproblems, reconstructing an optimal solution, Memoization, 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. Greedy Algorithms: Introduction, Elements of the greedy strategy, An activity-selection problem: The optimal substructure of the activity-selection problem, A recursive greedy algorithm, An iterative greedy algorithm. Greedy versus dynamic programming, Matroids and greedy methods, A task-scheduling problem as a matroid. Amortized Analysis: Introduction, Aggregate analysis, The accounting method, The potential method, Dynamic tables: Table expansion, Table expansion and contraction.
OE* Cloud Computing-II (OECS-114)	7th	Amazon Web Services (AWS) Shared Security Model: Introduction to AWS security model for cloud services, Identity and access management (IAM), Principle of least privilege (PoLP), Denial of service (DoS), Distributed denial of service (DDoS), Watering hole attack, Multi-factor authentication (MFA), Amazon inspector, AWS trusted advisor, Amazon simple storage service (Amazon S3), Amazon elastic block store (Amazon EBS), Amazon relational database service (Amazon RDS) Cloud Services, Instance States and Auto Scaling in Cloud Environments: Cloud service models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and

		Software as a Service (SaaS). Amazon elastic compute cloud (Amazon EC2), EC2 instance states, AWS instance lifecycle, Instance store volumes, Amazon machine image (AMI), IPv4 address and IPv6 address, Elastic IP address, Automatic scaling in cloud environments, Auto scaling groups, Fleet, Launch template, Scale-out and Scale-in. Dynamic Web Servers, Lambda and CloudFormation: Static website, Dynamic website, Amazon CloudFront, Content delivery network (CDN), Edge location, Origin, Distribution, Time to live (TTL), AWS Lambda, CloudFormation template, Infrastructure as code (IaC)
Applied Cloud Computing (PECS-135)	7th	Introduction to Amazon Web Services (AWS) Cloud: AWS Cloud global infrastructure, Cloud Service Models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), Cloud storage. Structure of Cloud: Availability Zone, Edge Location, Origin, Latency, Region. Introduction to AWS Console. [06 Hours] Virtual Servers, Content Delivery and Virtual Storage: Virtual Servers: Amazon Elastic Compute Cloud (Amazon EC2), Domain Name, Domain Name System (DNS), Amazon Simple Storage Service (S3) bucket, Amazon Route 53, Javascript Object Notation (JSON), Dynamic website, Static website. Content Delivery: Amazon CloudFront, AWS Direct Connect, Caching, Content Delivery Network (CDN), Distribution. Virtual Storage: Amazon Simple Storage Service (Amazon S3), Amazon Elastic Block Store (Amazon EBS), Hard Disk Drive (HDD), Solid State Drive (SDD), Input / Output Operations Per second (IOPS). [08 Hours] Cloud Security and Cloud Monitoring: Cloud Security: AWS Identity and Access Management (IAM), Role, User, Security group, Policy, Amazon Inspector, Root User, Credential, Multi-Factor Authentication (MFA), AWS shield, AWS Web Application Firewall (WAF), Distributed Denial of Service (DDoS), AWS Artifact. Cloud Monitoring: Amazon CloudWatch, AWS CloudTrail, AWS Config, Amazon Simple Notification Service (Amazon SNS). [06 Hours]
Soft Computing (PECS-122)	7th	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. Neural Networks: Introduction to Neural Networks, Model of an artificial neuron, Comparison of artificial neural network and Biological neural network, Activation Functions, Recurrent Neural Networks, Neural network models– Perceptron, Adaline and medaline networks, Single layer, Back propagation, Multi-layer networks. Fuzzy Logic: Crisp and fuzzy sets, Fuzzy sets – Membership functions, Basic operations, Properties and fuzzy relations.
Web Technologies (PECS-128)	7th	Introduction: History and evolution of Internet protocols, Internet addressing, Internet Service Provider (ISP), Introduction to WWW, DNS, URLS, HTTP, HTTPS, SSL, Web browsers, Cookies, Web servers, Proxy servers, Web applications. HTML: Introduction to HTML and DHTML, History of HTML, Structure of HTML

		Document: Text Basics, Structure of HTML Document: Images, Multimedia, Links, Audio, Video, Table and Forms, Document Layout, HTML vs. DHTML, Meta tags, and Website structure. Overview and features of HTML5. Style Sheets: Need for CSS, Introduction to CSS, Basic syntax and structure, Types of CSS – Inline, Internal and External CSS style sheets. CSS Properties - Background images, Colors and properties, Text Formatting, Margin, Padding, Positioning, CSS3- Animation, Page structure, Responsive Design, Framework - Twitter Bootstrap

MSE Coordinator(s)

HOD (CSE)