

BTECH THEORY SYLLABUS			
SE M	SUBJECTS	SUBJECT CODE	SYLLABUS
3rd	Object Oriented Programming	CCS201	Part-B Unit -4 Dynamic Memory Management using Pointers: Declaring and initializing pointers, Accessing data through pointers, Pointer arithmetic, Memory allocation – Comparison of Static and Dynamic, Dynamic memory management using new and delete operators, Pointer to an object, this pointer, Pointer related problems – Dangling/wild pointers, Null pointer assignment, Memory leak and Allocation failures. Unit-5 Polymorphism and Type Conversion : Concept of binding – Early binding and late binding, Virtual functions, Pure virtual functions, Abstract class, Function overloading, Constructor overloading, Operator Overloading, Rules for overloading operators, Overloading of various operators. Type conversion – Basic type to class type, Class type to basic type, Class type to another class type. Unit-6 Exceptions Handling and File Handling : Review of traditional error handling, Basics of exception handling, Exception handling mechanism, Throwing and catching mechanism, Rethrowing an exception, Specifying exceptions. File streams, Error handling during file operations, Reading/writing of files, accessing records randomly, Updating files.
	Data Structures	CCS102	Sequential and Linked representation of queue, Types of queue- Linear Queue, Circular Dequeue, Priority Queue, Operations on each types of Queues and their algorithms, Applications Queues. Basic terminology, Sequential and linked representations of trees, Tree Traversals, Different Trees- Binary Tree, Binary search tree, Threaded binary tree, AVL tree, B-tree,, Operations on each of the trees. Application of Binary Trees. Representing a heap in memory, Operations on heaps, Application of heap in implementing queue and Heap sort algorithm. Basic terminology, Representation of graphs - Adjacency matrix, Adjacency list. Operations on graph. Traversal of a graph- Breadth first search, Depth first search. Shortest path algorithms - Dijkstra's and Floyd-Warshall algorithm. Minimum spanning tree - Prim and Kruskal. Applications of graphs
	Digital Electronics	ESCS201	Unit-4 Introduction to VHDL (VHSIC Hardware Description Language) : Behavioral – data flow algorithmic and structural description, lexical elements, data objects types, attributes, operators. VHDL coding examples. Unit-5 Combinational logic: Arithmetic circuits, Magnitude Comparator, decoders, encoders, code converters, parity checker, multiplexers, de-multiplexers, and their use in logic synthesis. Implementation of combinational logic using MUX, Hazards in combinational circuits, combinational circuit design examples in VHDL and simulation. Unit-6 Sequential Logic Design: Latches and Flip Flops (SR, D, JK, T), Timing in sequential circuits, Shift register, Counters – synchronous, asynchronous, Modulus and Ring Counters. Sequential circuit design examples in VHDL and simulation.
	Computer Architecture	CCS103	Unit-4 Memory Organization Memory hierarchy, High-speed memories, Main Memory, Cache memory, Associative memory, Memory management techniques Unit-5 Central Processing Unit and Input-Output Organization General register organization, Stack organization, RISC and CISC architecture, I/O interface and types, Modes of transfer, DMA. Unit-6 8085 Microprocessor Architecture and Programming Introduction to microprocessors, 8085 microprocessor architecture Pin Diagram, Bus structure, Addressing modes, Instruction classification, Instruction formats, Data transfer operations, Arithmetic operations, Logical operations, Branch operations, Stack and subroutine operations. Unit-7 Interfacing 8255 Programmable Peripheral Interface, 8259 interrupt controller and 8237 DMA controller.
	Applied Mathematics	BSCS-101	-----

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5th	Artificial Intelligence	PCCS-108	Planning: Basic representation of plans, Partial order planning, Planning in the blocks world, Hierarchical planning, Conditional planning, Representation of time, schedule and resource constraints, Measures, temporal constraints. Uncertainty: Basic probability, Bayes rule and its use, Belief networks, Default reasoning, Fuzzy sets and fuzzy logic; Decision making- Utility theory, Utility functions, Decision theoretic expert systems. Inductive learning: Decision trees, Rule based learning, Current-best-hypothesis search, Least commitment search, Neural networks, Reinforcement learning, Genetic algorithms. Applications: Areas of AI, Natural language processing, Case study of existing expert systems.
	Database Management Systems	PCCS 109	Relational Database Design: Informal design guidelines for Relational Schemas, Functional dependencies, Inference rules for functional dependencies, Equivalence of set of functional dependencies, 2Q Minimal cover, Normal forms based on primary keys- (1stNF, 2ndNF, 3rdNF, 4thNF and 5thNF) Decomposition into normalized relations. Physical Database Design - File structures (Sequential files, Indexing, B tree). [6 Hours] Transaction Management and Concurrency Control: Introduction to Transaction Processing, Transaction and System Concepts, need of concurrency control, ACID properties, Schedules, Characterizing schedules based on recoverability and serializability, Two - phase locking techniques for concurrency control. Database Recovery and Security: Need of recovery, Recovery concepts, Recovery techniques Deferred update, Immediate update, Shadow paging. Database security - Threats to databases, Control measures, Database security and DBA, Discretionary access control based on granting and revoking privileges, Mandatory access control, Introduction to Statistical Database Security, Encryption and decryption
	Formal Language and Automata		Context Free Language: Derivation, Ambiguity, Simplification of context free grammar, normal forms- Chomsky Normal Form, Greibach Normal Form, Pumping lemma Push Down Automata: Description and definition, Acceptance by Push Down Automata, Equivalence of Push Down Automata and context free grammars and languages. Turing Machine: Definition and Model, Representation of Turing Machine, Design of Turing Machine, Variants of Turing Machine, Decidability and recursively enumerable languages, Halting problem, Post correspondence problem.
	Design and Analysis of Algorithms	PCCS-111	Dynamic Programming: Edit distance, matrix chain multiplication. Backtracking: General method, N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles. Application of Graph Traversal Techniques: Representation of graphs, BFS (as a method for SSSP on unweighted graphs), DFS, connected components, topological sorting of DAGs, biconnected components, and strongly connected components in directed graphs. String Matching: Introduction, Brute Force algorithm, Rabin-Karp algorithm, KMP algorithm, Boyer-Moore algorithm. NP Completeness: classes NP, P, NP-complete, and polynomial time reductions, Introduction to approximation algorithms, Absolute approximations, E-approximations.
	Advance Computer Networks	PECS-106	PART B: TCP Protocols: Internet Protocol (IP): service model, global addresses, datagram forwarding in IP, subnetting and classless addressing, Address Translation (ARP), Host Configuration (DHCP), Error reporting (ICMP). Routing: Network as a graph, Distance Vector (RIP), Link state (OSPF), metrics. Inter-domain routing: routing policies, routing protocols (BGP), Intra-domain routing: routing policies, routing protocols (DVMRP). Transport Service and Protocols: User Datagram Protocol (UDP): header format, services, and applications, Transmission Control Protocol (TCP): transport service characteristics; transport protocol: features, segment, TCP connection. Wireless Ad hoc Networks: Mobile Ad hoc Networks (MANETs): features, advantages, routing in MANETs, applications of MANETs, Recent trends in networks: green networking, social networks, software data networks and vehicular ad hoc networks (VANETs).
	Statistics for Data Science	PECS-111	Part B
	Information Retrieval	PECS-116	Cross Language Information Retrieval and Efficiency, Integrating Structured Data and Text: Introduction; Crossing the language barrier; Cross Language retrieval strategies; Cross language utilities. Duplicate Document Detection. Review of the relational model; a historical progression; Information retrieval as a relational application; Semi-structured search using a relational schema. Parallel Information Retrieval and Distributed Information Retrieval: Parallel text scanning; parallel indexing; Clustering and classification; Large parallel systems; A theoretic model of distributed information retrieval; Web search; Result fusion; Other architectures. Multimedia IR: Introduction; data modeling; Query languages; Spatial access methods; A general multimedia indexing approach; One-dimensional time series; Two-dimensional color images.

	System Programming	PECS-125	Linkers and Loaders: Linkers - Relocation of Linking Concept, Design of a Linker, Self-Relocating Programs, Linking of Overlay Structured Programs, Dynamic Linking. Loaders - Different Loading Schemes, Sequential and Direct Loaders, Compile-and-Go Loaders, General Loader Schemes, Absolute Loaders, Relocating Loaders, Linker v/s Loader Scanning and Parsing: Programming Language Grammars, Classification of Grammar, Ambiguity in Grammar Specification, Scanning, Parsing, Top Down Parsing, Bottom up Parsing, Language Processor Development Tools - LEX, YACC Compilers: Causes of Large Semantic Gap, Compiler and its phases - lexical, syntax and semantic analysis, intermediate code generation, code optimization and code generation. Interpreters and Debuggers: Interpreters - Overview of interpreters, Benefits of Interpretation. Types of Errors, Debugging Debuggers. Procedures, Classification of Debuggers, Dynamic/Interactive
7th	Preparation and Analysis of Data	PECS-133	Advanced Data Analysis Techniques: Time series analysis and forecasting, Dimensionality reduction methods (e.g. i.e., PCA, t-SNE etc.), Feature selection and engineering, Ensemble learning techniques (e.g. i.e., random forests, gradient boosting etc.). Data Visualization and Communication: Importance of data visualization in understanding and communicating data, Overview of different types of visualizations (bar charts, line charts, scatter plots, etc.), Principles of effective data visualization (clarity, simplicity, accuracy etc.), Introduction to popular data visualization tools (e.g. i.e., Matplotlib, Seaborn, ggplot2 etc.). Ethical and Legal Considerations: Ethical issues in data analysis and interpretation, Data privacy and confidentiality, Compliance with regulations such as GDPR and HIPAA. Real-World Applications and Case Studies: Application of data preparation
	Datawarehouse and Data Mining	PECS-115	Data Mining Techniques: Introduction to Data Preprocessing, Data Preprocessing Methods, Introduction to Classification, Types of Classification, Input and Output Attributes, Working of Classification, Guidelines for Size and Quality of the Training Dataset, Decision Tree Classifier, Naïve Bayes Method, Cluster Analysis and Association Mining: Cluster Analysis, Applications of Cluster Analysis, Desired Features of Clustering, Distance Metrics: Euclidean distance, Manhattan distance, Chebyshev distance, Major Clustering Methods/Algorithms, Partitioning Clustering, Hierarchical Clustering Algorithms (HCA), Introduction to Association Rule Mining, Defining Association Rule Mining, Representations of Items for Association Mining, The Metrics to Evaluate the Strength of Association Rules, The Apriori Algorithm, Data mining tools, Applications and Case Studies: Introduction to WEKA, Application of, Data Warehousing (Data Visualization) and Data Mining (Web Mining: Web Content Mining, Web Structure Mining, Web Usage mining) Study 1: OLAP for the Fast Food Industry Study 2: Intrusion Detection using kNN classification
	Computer Vision	PECS-121	Feature Detection and Matching: Human Visual System, Feature Matching. Hough transform; From points Matching. Segmentation and Pattern Analysis: Region Splitting and Merging, Edge Based approaches to segmentation, Graph-Cut, K-Means and mixtures of Gaussians, Mean-Shift, MRFs, Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, Applications of Computer Vision: Motion Estimation and Object Tracking, Gesture Recognition, Face and Facial Expression Recognition, Image Fusion.
	Design and Analysis of Advanced Algorithms	PECS-132	Probabilistic Analysis and Randomized Algorithms: The hiring problem, Indicator random variables, randomized algorithms, Probabilistic analysis and further uses of indicator random variables. Flow networks: Introduction to flow networks, The Ford-Fulkerson method, Maximum bipartite matching, Push-relabel algorithms, The relabel-to-front algorithm. Multithreaded Algorithms: Introduction, Dynamic multithreaded programming, The basics of dynamic multithreading: A model for multithreaded execution, Multithreaded matrix multiplication, Multithreaded merge sort.
	Applied Cloud Computing	PECS-135	Databases and Load Balancing: Databases: Relational database, Amazon Relational Database Service (Amazon RDS), Nonrelational database, Amazon DynamoDB, Amazon Redshift, Online Transaction Processing (OLTP), Online Analytic Processing (OLAP), Amazon Aurora, MySQL. Load balancing: Load balancer, Amazon ElastiCache, Data Caching, Elastic Load Balancing, Random Access Memory (RAM) Elastic Beanstalk, CloudFormation, Billing and Support: AWS Elastic Beanstalk, AWS CloudFormation, Stack. Billing and Support: AWS simple monthly calculator, AWS support plan, Consolidated billing. Technical Account Manager (TAM) Emerging Technologies in Cloud and Cloud Optimization: Artificial Intelligence(AI), Machine Learning (ML), Amazon SageMaker, Deep Learning, AWS DeepRacer, AWS DeepLens, Neural network, Blockchain technology. Cloud optimization using AWS Cloud Development Kit (CDK).

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Soft Computing	PECS-122	Fuzzy Logic : Crisp and fuzzy sets, Fuzzy sets – Membership functions, Basic operations, Properties and fuzzy relations, Predicate logic, Fuzzy Decision Making, Fuzzy rule-based system, Fuzzy inference system, Applications of fuzzy logic. Genetic Algorithms : Working principle– Crossover, Mutation, Encoding, Fitness function and Reproduction, Classification of genetic algorithm, Multi-objective genetic algorithm, Application of GA in search and optimization. Nature Inspired Algorithms : Cuckoo Search Algorithm, Fire Fly Algorithm, Fruit Fly Algorithm, Bat Algorithm, Particle Swarm Optimization,	
Web Technologies	PECS-128	Introduction, JavaScript's history and versions, Basic syntax, Variables, Data types, Statements, Operators, Functions, Arrays, Objects, Dialog boxes, JavaScript DOM, JavaScript Validations, Overview of AngularJS and NodeJS, PHP and MySQL: Introduction and basic syntax of PHP, Data types, Variables, Decision and looping with examples, String, Functions, Array, Form processing, Cookies and Sessions Management, E-mail, PHP-MySQL: Connection to server, Creating database, Selecting a database, Listing database, Listing table names, Creating a table, inserting data, altering tables, queries, Deleting database, Deleting data and tables, and Overview of Model View Controller platform, Search Engine Optimization: Deploying a website on server, Search engine optimization and its different types, Web application testing and security, Web APIs	
MTECH THEORY SYLLABUS			
SEM	SUBJECTS	SUBJECT CODE	SYLLABUS
MTECH H IST	Mathematical Foundations of Computer Science	MCS-101	Statistical inference , Classical Methods of estimation (Point Estimation Methods, Method of Moments and Maximum Likelihood), Statistical hypothesis: general concepts Graph Theory : Isomorphism, Planar graphs, graph coloring theorem: Art Gallery problem, Hamilton circuits and Euler cycles, Permutations and Combinations with and without repetition. Techniques to solve combinatorial enumeration problems: Binomial coefficients, Multinomial coefficients.
	Advanced Data Structures	MCS-102	Heaps : Binary Heaps, d-Heaps, Leftist Heaps, Skew Heaps, Binomial Heaps, Fibonacci Heaps. Text Processing : Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The KnuthMorris-Pratt Algorithm, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Tries-Standard Tries, Compressed Tries, Suffix Tries. Multidimensional Searching : One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quad trees, k-D Trees.
	Research Methodology and IPR	MRM 101	Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT. Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.
	Machine Learning	MCS-111	UNIT-IV Artificial Neural Networks: Introduction, Neural network representation, appropriate problems for neural network learning, perceptron, gradient descent and the delta rule, Adaline, Multilayer networks, Derivation of Back propagation rule, back propagation algorithm UNIT-V Bayesian Learning: Introduction, Bayes theorem and concept learning, Maximum likelihood and least squared error hypothesis for predicting probabilities, minimum description length principle, Bayes optimal classifier, Naive Bayes classifier, Bayesian belief networks UNIT-VI Genetic Algorithms: Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning
	Software Engineering Methodologies	MCS-123	-----

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MT EC II 3RD	smart sensors and Internet of Things	MCS-156	UNIT-III Architecture of Smart Sensors: Importance and components, Features, Fabrication of Sensor and Smart Sensor (Electrode fabrication, Screen printing, Photolithography, Electroplating Sensing film deposition: Physical and chemical Vapor, Anodization, Sol-gel). UNIT-IV Interface Electronic Circuit for Smart Sensors and Challenges for Interfacing the Smart Sensor, Usefulness of Silicon Technology in Smart Sensor And Future scope of research in smart sensor. Recent trends in smart sensor in daily life, Evolving sensors and their architecture cum usage.
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