COURSE	COURSE	SEMESTER	COURSE NAME	SYLLABUS
M.Tech.	ELECTIVE	1st	Advances in Computer Network (MCS-114)	Overlay networks, flat routing protocols (DHTs), and peer-to-peer architectures. OSPF and BGP Routing Protocols.TCP Improvements and Extensions, Performance issues, TCP Congestion Control –fairness, scheduling and Delay modeling, QoS issues, differentiated services, Transport layer in Wireless Networks.Network Security principles, Security related issues in wireless networks, Public and Private Key Cryptography, Key distribution protocols. Digital Signatures and digital certificates.
M.Tech.	REGULAR	1st	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.
M.Tech.	REGULAR	1st	Research Methodology and IPR (MRM-101)	Unit 3: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee Unit 4: 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. Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. Unit 6: 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.
M.Tech.	ELECTIVE	1st	Advances in Computer Network (MCS-114)	Overlay networks, flat routing protocols (DHTs), and peer-to-peer architectures. OSPF and BGP Routing Protocols. TCP Improvements and Extensions, Performance issues, TCP Congestion Control –fairness, scheduling and Delay modeling, QoS issues, differentiated services, Transport layer in Wireless Networks.Network Security principles, Security related issues in wireless networks, Public and Private Key Cryptography, Key distribution protocols. Digital Signatures and digital certificates
M.Tech.	ELECTIVE	1st	Data Warehouse and Data	UNIT IV, V and VI
M.Tech.	REGULAR	1st	Advanced Data	Unit III, Unit IV, Unit V
B.Tech.	REGULAR	3rd	Object Oriented Programmin	Unit -4 Dynamic Memory Management using Pointers, Unit-5 Polymorphism and Type Conversion, Unit-6 Exceptions Handling and File Handling

B.Tech.	REGULAR	3rd	Digital Electronics (ESCS-101)	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. 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.
B.Tech.	REGULAR	3rd	Digital Electronics (ESCS-101)	Unit-4 Introduction to VHDL (VHSIC Hardware Description Language), Behavioural – data flow algorithmic and structural description, lexical elements, data objects types, attributes, operators. VHDL coding examples. 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.
B.Tech.	REGULAR	3rd	Computer Architecture	Part B (Full)
B.Tech.	ELECTIVE	5th	Cryptography and Network Security (ECS-103)	Pseudorandom number generation, Stream ciphers and RC4 with weaknesses.Public Key Cryptography and Data Integrity, Principles of public key cryptography, Symmetric vs asymmetric cryptosystems, RSA algorithm, Diffie–Hellman key exchange. Hash functions - SHA-2 and SHA-3. Message Authentication Codes - HMAC, authenticated encryption (GCM overview). Digital signatures - RSA., Key Management and Authentication Mechanisms:Key management and distribution, Public Key Infrastructure and X.509 certificates, User authentication mechanisms, IEEE 802.1X authentication framework (supplicant, authenticator, authentication server), Kerberos overview.Key Network Security Protocols and Cloud Security:Transport Layer Security (TLS), HTTPS and SSH. Wireless security - IEEE 802.11i. Email security - PGP and S/MIME (overview), IP Security (IPsec architecture). Overview of Cloud Security - cloud service models, security challenges. Quantum threats to classical cryptography, Overview of Latticebased Cryptography.

B.Tech.	REGULAR	5th	Software Engineering (CCS-112)	Unit-4 Software Project Management Project Management Concepts – Managing People, Product, Process and Project. Process and Project Metrics – Size oriented metrics, Function oriented metrics, Empirical estimation, Heuristic estimation and Analytical estimation, Project monitoring and control– Work breakdown structure, Activity chart, Gantt charts, PERT charts, Critical Path Method, Risk management- Identification, Analysis, Planning and Monitoring, RMMM Plan. Unit-5 Software Design and Coding Software Design Principles, Software design concepts – Abstraction, Architecture, Modularity, Functional Independence, Refinement, Refactoring, Function oriented design – Flow modeling through Data Flow Diagram and Data Dictionary, Data Modeling through E-R Diagram, Structure chart, Object-Oriented Design Concepts – objects and object classes. Coding standards, code inspection, code walkthrough and code reviews. Unit-6 Software Testing and Maintenance Introduction to Software Testing, Types of Software Testing - Unit Testing, Integration Testing, System Testing, Test Planning and Test Cases, Test Automation, Software Verification and Validation, Software maintenance, Software re-engineering, Reverse engineering, Forward engineering, Challenges in Legacy Systems, Software Updates and Version Control
B.Tech.	REGULAR	5th	Design and Analysis of Algorithms (CCS-113)	Unit-5 Dynamic Programming Introduction to dynamic programming and application of the algorithm to solve multistage graphs with Forward and backward approach, edit distance, matrix chain multiplication, All pairs shortest path problem using Floyd-Warshall algorithm and 0/1 Knapsack problem. Unit-6 String Matching Introduction, Brute Force algorithm, Rabin-Karp algorithm using Hashing Technique, KMP algorithm with π Table, Boyer-Moore algorithm using Bad Match table and Good Suffix heuristic. Unit-7 Backtracking General method, N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles. Unit-8NP Completeness Classes NP, P, NP- Hard, NP-complete and polynomial time reductions, Introduction to approximation algorithms, Absolute approximations, E-approximations, Travelling salesperson problem with NPcomplete, SAT (Boolean Satisfiability Problem) to IND-SET (Independent Set Problem) reduction. IND-SET to Vertex Cover, 2-approximation algorithm for Vertex Cover.

B.Tech.	ELECTIVE	5th	Data Warehousing and Business Intelligence (ECS-102)	Unit-3 Introduction to Data Mining: Introduction to Data Mining, Data Mining operations and techniques, The Data Mining Process, The Knowledge Discovery Process, Data Warehousing v/s Data Mining, Defining Association Rule Mining, Representations of Items for Association Mining, The Metrics to Evaluate the Strength of Association Rules, The Apriori Algorithm. Unit-4 Introduction to Business Intelligence : Definitions of BI, A brief history of BI, The Architecture of BI, Styles of BI, The Benefits of BI, Intelligence creation and Use, BI governance. Unit-5 BI Implementation and Advanced BI : BI user Community, Key performance indicators and performance metrics, KPI identification from business objectives, KPI hierarchy- Strategic vs Tactical vs Operational, Lagging vs Leading KPIs, KPI interpretation (trends, thresholds, exceptions), Common KPI pitfalls (vanity metrics, misalignment), Developing or acquiring BI systems, Justification and Cost-Benefit Analysis, Security and protection of privacy, Major tools and techniques of BI, Connecting BI systems to databases and other enterprise systems, Limitations of traditional BI, Future of BI, Online social networking: Basics and examples, Collaborative Decision Making. Unit-6 Business Intelligence Applications : Marketing models including Relational Marketing, Sales force Management, Logistic and production models including Supply chain optimization, optimization models for logistics planning, Business case studies such as Retention in telecommunications, Social Media & Brand Sentiment Analysis, E-commerce Funnel & Website Analytics, Customer Segmentation for Business Strategy, Cross-selling in the retail industry, Logistics planning in food industry.
B.Tech.	ELECTIVE	5th	Generative AI (ECS-	Part B
B.Tech.	ELECTIVE	5th	Cryptography and Network Security (ECS-103)	Pseudorandom number generation, Stream ciphers and RC4 with weaknesses., Public Key Cryptography and Data Integrity-Principles of public key cryptography, Symmetric vs asymmetric cryptosystems, RSA algorithm, Diffie–Hellman key exchange. Hash functions - SHA-2 and SHA-3. Message Authentication Codes - HMAC, authenticated encryption (GCM overview). Digital signatures - RSA. Key Management and Authentication Mechanisms-Key management and distribution, Public Key Infrastructure and X.509 certificates, User authentication mechanisms, IEEE 802.1X authentication framework (supplicant, authenticator, authentication server), Kerberos overview. Key Network Security Protocols and Cloud Security-Transport Layer Security (TLS), HTTPS and SSH. Wireless security - IEEE 802.11i. Email security - PGP and S/MIME (overview), IP Security (IPsec architecture). Overview of Cloud Security - cloud service models, security challenges. Quantum threats to classical cryptography, Overview of Lattice based Cryptography.
B.Tech.	REGULAR	5th	Theory of Computation (CCS-110)	Unit-4 Context Free Language ,Unit-5 Push Down Automata , Unit-6 Turing Machine Linear Bounded Automata

B.Tech.	ELECTIVE	5th	Object Oriented Analysis and Design using UML (ECS-105)	Unit-4 Behavioral Modeling 8(L) hrs Interaction diagrams - Notations, Conditional messaging, Branching, Time constraints, Sequence diagram, Collaboration diagram and Activity diagrams. Signal events, call events, time events, and change events, modeling a family of signals, Modeling exceptions, Handling events in active and passive, State Machines, transitions, and activities, Modeling the lifetime of an object, Creating wellstructured algorithms, Active objects, processes and threads, Modeling multiple flows of control, Modeling inter process communication, Building thread-safe abstractions. Unit-5 Architectural Modeling Modeling a Client/Server System, Modeling a Fully Distributed System, Systems, subsystems, models, and views, Modeling the architecture of a system, Modeling systems of systems, Organizing the artifacts of development. Advanced UML Concepts UML Extensibility- Stereotypes, Tagged Values, Constraints, UML Profiles, Modeling Concurrency and Threads, Modeling Large-Scale Systems, UML in Iterative & Agile development, Tool-based UML modeling.
B.Tech.	REGULAR	5th	Cyber Security (CCS-111)	Unit 4 : Fundamentals of security protocols and secure communication, conceptual study of SSL/TLS for protecting data in transit, functional aspects of IPsec in network-layer security, working principles of SSH for secure remote system access, role of HTTPS in securing web-based communication, fundamental mechanism of Kerberos authentication, essential features of secure email systems (PGP and S/MIME), core ideas behind wireless security standards (WPA, WPA2, WPA3), common challenges and limitations of widely used security protocols, network security techniques (firewalls, IDS/IPS), malware detection and prevention techniques, vulnerability assessment and penetration testing, incident response and recovery techniques, security monitoring, logging, and policy implementation. Unit 5: Cyber ethics principles, ethical issues in cyberspace, privacy and data protection concerns, psychological aspects of attackers, user and victim behavior, principles and responsibilities of ethical hacking, social engineering awareness and prevention, organizational security culture and human responsibility. Unit 6 : Real-world cyber security case studies, analysis of cyber-attacks, lessons learned from incidents, preventive strategies, legal and ethical implications of major cyber security incidents.
B.Tech.	ELECTIVE	7th	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, Maximumbipartite 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.
B.Tech.	ELECTIVE	7th	Soft Computing (PECS-122)	Part B

B.Tech.	ELECTIVE	7th	Applied Cloud Computing (PECS-135)	Database and Load balancing: Relational database, Amazon Relational Database Service, Nonrelational database, Amazon DynamoDB, Amazon Redshift, Online Transaction Processing, Online Analytic Processing, Amazon Aurora, MySQL. Load balancing: Load balancer, Amazon ElastiCache, Data Caching, Elastic Load Balancing, Random Access Memory 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 Emerging Technologies in Cloud and Cloud Optimization: Artificial Intelligence, Machine Learning, Amazon SageMaker, Deep Learning, AWS DeepRacer, AWS DeepLens, Neural network, Blockchain technology. Cloud optimization using AWS Cloud Development Kit
B.Tech.	ELECTIVE	7th	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, Unsupervised, 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
B.Tech.	ELECTIVE	7th	Software Defined Networks (PECS-109)	The Open Flow Specification: Overview: Open Flow Switch, Open Flow Controller, Open Flow Protocol, the controller-switch Secure channel, Open Flow basics: Ports and Port Queues, Flow Table, Packet Matching, Actions and Packet Forwarding, Messaging Between Controller and Switch and its examples, Open Flow Limitations. SDN Data and Control plane: SDN data plane: Data plane Functions, Data plane protocols, SDN Control Plane: SDN Control Plane Architecture: Control Plane Functions, Southbound Interface, Northbound Interface, Routing, ITU-T Model- OpenDaylight-REST- Cooperation and Coordination Among Controllers. SDN Application Plane: SDN Application Plane Architecture: Northbound Interface, Network Applications, User Interface- Network Services Abstraction Layer: Abstractions in SDN, SDN in the Data Center: Data Center Definition, Data center demands, Tunneling Technologies for Data center, Path technologies in the data center, Ethernet Fabrics in the data Center, SDN use Cases in Data Center: Overcoming Current Network Limitations, Adding, Moving, and Changing Resources, Failure Recovery, Traffic Engineering and Path Efficiency.

B.Tech.	REGULAR	7th	Data Warehouse 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.
B.Tech.	ELECTIVE	7th	Web Technologies (PECS-128)	JavaScript: 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