S.No	Program	Semester	Subject Name and Code	Subject Code	Course Coordinator(s)	Syllabus for MSE-II
1	B.Tech.	4th	Discrete Mathematics	PCCS-103	Dr. Manpreet Kaur Mand Pf. Shailja Sharma Dr. Amit Jain Dr. Preetkamal Singh	 Algebraic Structures and Morphism : Algebraic structures with one binary operation, Properties of an operation, Congruence relation, Semi groups, Monoids, Groups, Substructures, Cyclic groups, Cosets, Normal subgroups, Dihedral groups, Permutation Groups. Homomorphism and isomorphism of groups, Applications of groups. Algebraic structures with two binary operation, Rings – Introduction, Abelian ring, Ring with unity, Multiplicative inverse, Subrings, Homomorphism of rings. Integral Domain, Ideals. Boolean Algebra: Boolean algebra, Boolean sub-algebra, Boolean rings, Application of Boolean algebra (Logic implications, Logic gates, Karnaugh-map). Graphs and Trees: Graphs – Definition, degree, Connectivity, path, cycle, Directed and undirected, Sub Graph, Biconnected component and Articulation points. Eulerian chains and cycles, Hamiltonian chains and cycles, Shortest paths algorithms – Dijkstra'salgorithm, Warshall's algorithm. Rooted trees, Spanning tree algorithms – Kruskal's algorithm. Graph coloring, Map Coloring, Chromatic number, Planar graphs, Euler's formula, Isomorphism and homomorphism of graphs, Applications of graph theory.
2	B.Tech.	4th	Computer Architecture & Microprocessor	PCCS-104	Dr. Preetkamal Singh Pf. Khushi Pf. Lakhvir Kaur Pf. Paramveer Kaur	 Microprocessor Architecture: Introduction to microprocessors, 8085 microprocessor architecture – Bus structure, Register organization. Programming with 8085: Addressing modes, Instruction classification, Instruction formats, Data transfer operations, Arithmetic operations, Logical operations, Branch operations, Stack and subroutine operations, looping, counting and indexing operations. Interfacing: Memory and I/O mapped I/O, Programmable interfaces – 8255 programmable peripheral interface, 8259 interrupt controller, and 8237 DMA controller. Microprocessor Applications: Interfacing of keyboards and seven segment LED display, Study of traffic light system, stepper motor controller.
3	B.Tech.	4th	Operating System	PCCS-105	Pf. Amanpreet Singh Brar Dr. Daljit Singh Pf. Harkomalpreet Kaur Pf. Kamaljeet Kaur	Deadlocks: Introduction to deadlocks, Conditions for deadlock, Resource allocation graphs, Deadlock prevention and avoidance, Deadlock detection and recovery. Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging, Segmentation. File Management: Concept of File, Access methods, File types, File operation, Directory structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. Secondary Storage: Disk structure, Disk scheduling – FCFS, SSTF, SCAN, C-SCAN, LOOK, CLOOK, Disk Management, Disk Formatting, Boot blocks, Bad blocks.
4	B.Tech.	4th	Data Structure	PCCS-106	Pf. Shailja Pf. Meetali Pf. Palak Sood Dr. Sita Rani Pf. Harshim	Linked Lists, Trees, Graphs, Heaps, Searching and Sorting
5	B.Tech.	4th	Software Engineering	PCCS-107	Pf. Jasdeep Kaur Dr. Kiran Jyoti Pf. Manjot Kaur Gill Dr. Inderjeet Singh Dr. Hardeep Singh Kang	Software Design: Modular design– Coupling, Cohesion and abstraction, Function oriented design– Data flow diagrams, Structure chart, Object oriented design–Objects and object classes, Relationships between classes, User interface design. Coding & Testing: Coding standards and code reviews, Testing – Need of testing, Unit testing, Integration testing, System testing, White-Box testing, Black-box testing, Alpha, Beta and acceptance testing, Smoke testing, Sanity testing, Regression testing, Cyclometric Complexity. Verification and validation. Maintenance and Re-engineering: Software maintenance, Software re-engineering, Reverse engineering, Forward engineering, PSP and Six sigma.

6	B.Tech.	4th	Environmental Sciences	MCCS-101	Pf. Jasleen Kaur (IT) Pf. Palwinder Kaur (IT) Pf. Manjot Singh Bedi (ME) Pf. Bhupinder Singh Dhillon (ME) Pf. Prem Singh (ME)	Biodiversity and its conservation: Introduction- Definition- genetics, species and ecosystem diversity, Biogeographical classification of India, Value of biodiversity- competitive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, national and local level, India as a mega diversity nation, Hot spots of biodiversity, Threats to biodiversity- habitat loss, poaching of wildlife, man wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity- in-situ and exsitu conservation of biodiversity. Environmental Pollution: Definition, causes, effects and control measures of – Air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear hazards, Solid waste management- Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, case studies. Social issues and the Environment: From unsustainable to sustainable development, Water conservation, rain water harvesting, water shed management, Resettlement and rehabilitation of people- its problems and concerns, case studies, Environmental Ethics- issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies, Environmental protection act, Air (prevention and control of pollution) act, Water (prevention and control of pollution) act, Wildlife protection act, Forest conservation act.
7	B.Tech.	6th	Compiler Design	PCCS-112	Dr. Diana Nagpal Dr. Sita Rani	Intermediate Code Generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Translationof Expressions, Type Checking, Control Flow, Backpatching, Switch-Statements, Intermediate Code for Procedures.Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code ,Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization ,Register Allocation and Assignment.Machine-Independent Optimizations: The Principal Sources of Optimization, Introduction to Data-Flow Analysis,Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.
8	B.Tech.	6th	Computer Graphics	PCCS-113	Dr. Parminder Singh Pf. Maninder Kaur	 2D Viewing and Clipping: The viewing pipeline, Window-to-viewport transformation, Point clipping, Line clipping algorithms – Cohen-Sutherland, Liang-Barsky, Nicholl-Lee-Nicholl. Polygon clipping algorithms –Sutherland-Hodgeman, Weiler-Atherton. Curve and text clipping. 3D Transformations and Viewing: 3D geometric transformations – Scaling, Rotation, Translation, Reflection, Shear. Composite transformations, 3D viewing, Viewing pipeline, Parallel projections, perspective projections, classifications of projections. Visible-Surface Detection: Classification of visible-surface detection algorithms. Techniques for efficient visible-surface algorithms–Back face detection, Depth-buffer method, A-buffer method, Scan line method, Depth sorting method, BSP tree Method, Area-subdivision method, Octree Methods, Raycasting method. Surface Rendering: Light sources, Surface lighting effects, Illumination models, Polygon rendering methods – Constant-intensity shading, Gouraud shading, Phong shading, Fast Phong shading.
9	B.Tech.	6th	Machine Learning	PCCS-114	Dr. Priyanka Arora Dr. Kamaldeep Kaur	 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, Initialization, Training & Validation. 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. Genetic Algorithms: Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning. Design and Analysis of Algorithms: Study of factors and responses related with experimentation, Hypothesis testing, performance analysis, Evaluation measures-bootstrapping & cross-validation, ROC curve.

10	B.Tech.	6th	Cloud Computing-I	OECS-113	Pf. Harkomalpreet Kaur	Databases and Load Balancing: Databases: Relational database, Amazon Relational Database Service (Amazon RDS), Amazon DynamoDB, Nonrelational database, 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: Machine Learning (ML), Artificial Intelligence (AI), Amazon SageMaker, Deep Learning, AWS DeepRacer, AWS DeepLens, Neural network, Blockchain technology. Cloud optimization using AWS Cloud Development Kit (CDK).
11	B.Tech.	6th	Software Testing & Quality Assurance	PECS-102	Dr. Daljit Singh	Quality Assurance: The software quality challenge, Meaning of software quality, Software quality factors, Software Quality Lessons Learned, The components of the software quality assurance system, Pre-project software quality components: Contract Review, Development and quality plans, SQA components in the project life cycle: Integrating quality activities in the project life cycle, Assuring the quality of software quality infrastructure components, Assuring the quality of external participants' contributions, CASE tools, Software quality infrastructure components, Pareto Principles, Total Quality Management, Ishikawa's Seven Basic Tools [9 Hours] Software Quality Assurance Management components of software quality: Project progress control, Software quality metrics, Costs of software quality, Standards, certification and assessment: Quality management standards, SQA project process standards – IEEE software engineering standards, Management and tis role in software quality assurance, The SQA unit and other actors in the SQA system, Inspection as an Up-Front Quality Technique, Software Audit Methods, Software Safety and Its Relation to Software Quality Assurance, SQA for Small Projects, Development Quality Assurance, Quality Management in IT, Introduction to ITIL, Software Quality Assurance Metrics, Software Benchmarks and Baselines
12	B.Tech.	6th	Network Security & Cryptography	PECS-108	Pf. Satinderpal Singh	Modern Symmetric-key Ciphers: Modern Block cipher, components of block cipher, two classes of product cipher, Feistal structure, Data Encryption Standard (DES). Modern stream ciphers, Advanced Encryption Standard (AES), Stream ciphers – RC4. Public Key Cryptography and RSA: Symmetric – Key vs Asymmetric-key cryptosystems, Principles of public key cryptosystems, RSA algorithm and its attacks, Diffie Hellman Key Exchange. Data Integrity and Authentication: Message: Hash function (SHA-I), Message Authentication (MD5), Digital Signature: services, attacks on digital signature, RSA Digital signature scheme. Internet Security Protocols: General structure of Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET), Email Security: Pretty Good Privacy (PGP), IP Security – Overview, IP security architecture modes, security protocols: Authentication header(AH) and Encapsulation security payload (ESP).
13	B.Tech.	6th	Advanced Database Management System	PECS-114	Pf. Jasdeep Kaur	Object-Oriented DBMS: Introduction Advanced Database Applications, Weakness of RDBMS, Storing Objects in Relational Database. Next- Generation Database Systems, OODBMS Perspectives, Persistence, Issues in OODBMS, Advantages and Disadvantages of OODBMS, Object- Oriented Database Design, Comparison of ORDBMS and OODBMS. Distributed Databases and Client-Server Architectures: Distributed Database Concepts, Data Fragmentation, Replication, and Allocation techniques for Distributed Database Design. Types of Distributed Databases Systems, Query Processing in Distributed Databases, Overview of Concurrency Control and Recovery in Distributed Databases. Overview of Data Warehousing and OLAP: Introduction, Characteristics of Data Warehouses, Data Modeling for Data Warehouses, Building a Data Warehouse, Typical Functionality of a Data Warehouse, Data Warehouse versus Views, Problems and Open Issues in Data Warehouses. Data Mining Concepts: Overview of Data Mining, Commercial Data Mining Tools. Emerging Database Technologies and Applications: Mobile Databases, Multimedia Databases, Geographical Information Systems (GIS), Genome Data Management.

14	B.Tech.	6th	Natural Language Processing	PECS-120	Pf. Goldendeep Kaur	Syntactic Analysis: Introduction to parsing, Basic parsing strategies, Top-down parsing, Bottom-up parsing, Dynamic programming – CYK parser, Issues in basic parsing methods, Earley algorithm, Parsing using Probabilistic Context Free Grammars. Semantic Analysis: Lexical semantics, Lexemes, Relations among lexemes and their senses, WordNet, Word Sense Disambiguation – Supervised and Un-supervised approaches. Information Extraction – Introduction to Named Entity Recognition and Relation Extraction. Pragmatics: Discourse, Discourse structure. Dialogue – Acts, structure, conversational agents. Language generation, Architecture for generation.
15	B.Tech.	6th	Java Programming	PECS-126	Dr. Inderjit Singh	 Exception Handling: Concepts of exception handling, Exception types, Using try, catch, throw, throws and finally, Java's built in exceptions, Creating own exception subclasses. Multithreading: Java thread life cycle, Creating threads, Using isAlive() and join(), Synchronization, Inter thread communication, Suspending, resuming, stopping threads. Event Handling: Delegation event model, Event classes, Sources of events, Event listeners, Handling mouse and keyboard events, Adapter classes, Inner classes. The AWT class hierarchy, User interface components – Labels, Button, Canvas, Scrollbars, Text components, Check box, Check box groups, Choices. Lists panels – Scrollpane, Dialogs, Menubar, Graphics. Understanding layout managers – Flow Layout, BorderLayout, GridLayout and CardLayout. Applets: Basics of applets, Differences between applets and applications, Life cycle of an applet, Types of applets, The HTML applet tag, Creating applets, Passing parameters to applets.
16	B.Tech.	6th	Cyber Security	PCCS-115	Dr. Vivek Thapar Dr. Amandeep Kaur Sohal Dr. Kapil Sharma	 Micro ATM, e-wallet and POS Security: Security of Micro ATMs, e-wallet Security Guidelines, Security Guidelines for Point of Sales (POS), Cyber Security Exercise, Cyber Security Incident Handling, Cyber Security Assurance. Social Engineering, Threat Landscape and Techniques: Social Engineering, Types of Social Engineering, How Cyber Criminal Works, How to prevent for being a victim of Cyber Crime, Cyber Security Threat Landscape, Emerging Cyber Security Threats, Cyber Security Techniques, Firewall. Information Recovery Tools: Recovering from Information Loss, Destroying Sensitive Information, CCleaner for Windows, Various Case Studies.
17	B.Tech.	8th	Software Metrics	PECS-105	Dr. Kiran Jyoti	Component-based system: Metrics for object-oriented systems, Object-oriented analysis and design and its characteristics. MOOD metrics: Component-based metrics and its characteristics and various component-based suites. Dynamic Metrics: Runtime Software Metrics, Extent of Class Usage, Dynamic Coupling, Dynamic Cohesion, and Data Structure Metrics. Software Quality: Concepts of software quality, software quality control and software quality assurance, evolution of SQA, major SQA activities and issues, zero defect software. Software Quality Assurance: SQA techniques; Management review process, technical review process, walkthrough, software inspection process, configuration audits, and document verification.
18	B.Tech.	8th	Block Chain Technology	PECS-113	Pf. Jagdeep Kaur	Distributed Consensus II: Consensus Algorithms: Proof of Work, Proof of Stake, Delegated Proof of Stake, Proof of Activity, Comparison among them. Ethereum: Public consortium blockchain: Introduction of Ethereum, Ethereum account, Ethereum network, Ethereum client, Ethereum gas, Ethereum virtual machine, Ethereum block, header, Ether, smart contracts. Blockchain use cases: Applications in finance: settlements, KYC, capital markets, insurance; supply chain: provenance of goods, visibility, trade supply chain finance, invoice management discounting; government: digital identity, land registration; medical information systems.

19	B.Tech.	8th	Parallel and Distributed Algorithms	PECS-129	Pf. Harshim	Synchronous Parallel Processing: Introduction, Example-SIMD Architecture and Programming Principles, SIMD Parallel Algorithms, Data Mapping and scheduling in array processors. [6 Hours] Distributed Algorithms: Definition, Issues, Goals, Types of distributed systems, Distributed System Models and complexity measures, Distributed Graph algorithms, Safety, liveness, termination, logical_ time and event ordering, Global state and snapshot algorithms, Mutual exclusion. Synchronization: Clock Synchronization, Logical Clocks, Election Algorithms, Mutual Exclusion, Distributed Mutual Exclusion-Classification of mutual Exclusion Algorithm; Lamport Algorithm, Ricart- Agrawala's Algorithm, Maekawa's Algorithm, Token Based Algorithms: Suzuki-Kasami's Broadcast Algorithms, Singhal's Heurastic Algorithm, Raymond's Tree based Algorithm, Comparative Performance Analysis.
20	B.Tech.	8th	Big Data	PECS-118	Pf. Himani Sharma (IT)	Big Data Management: In-database Analytics – Introduction to NoSQL– Aggregate data models, Graph databases, Graph-less databases, Distribution models, Introduction to HBase, MongoDB, and Cassandra. Business Analytics: Decision making in business analytics, Business analytics in practice – Financial analytics, Healthcare analytics, Sport and web analytics. Categorization of analytics methods and models – Descriptive analytics, Predictive analytics, Perspective analytics. Analytical Methods and Case studies: Linear regression, Logistic regression, K-Means clustering, Decision tree classification. Case studies: Social data analytics, Recommendation engines, Customer analytics.
21	B.Tech.	8th	Applied Cloud Computing	PECS-135	Dr. Vivek Thapar	Distributed Algorithms: Definition, Issues, Goals, Types of distributed systems, Distributed System
22	B.Tech.	8th	Internet of Things	PECS-112	Dr. Amandeep Kaur Sohal	 IoT Reference Architecture: Getting Familiar with IoT Architecture, Various architectural views of IoT such as Functional, Information, Operational and Deployment, Constraints affecting design of IoT, Technical design Constraints. Domain specific applications of IoT: Home automation, Industry applications, Surveillance applications, Environmental and Agriculture applications, Other IoT applications. Developing IoT solutions: Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi Implementation of IoT with Arduino and Raspberry, Cloud Computing, Fog Computing, Connected Vehicles, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IoT.
23	M.Tech.	2nd	Advance Algorithms	MCS-103	Pf. Manjot Kaur Gill	time and event ordering, Global state and snapshot algorithms, Mutual exclusion.
24	M.Tech.	2nd	Soft Computing	MCS-104	Dr. Priyanka Arora	Fuzzy Logic: Concept of fuzziness, Fuzzy vs crisp, Crisp sets, Operations on crisp sets, Properties of crisp sets, Fuzzy sets, Features of fuzzy sets, Basic fuzzy set operations, Properties of fuzzy sets, Fuzzy relations, Fuzzy membership functions, linguistic hedges, Fuzzy rule-based system, De-fuzzification methods, Fuzzy extension principle . Algorithms and Multi-objective Optimization: Concept of natural evolution, Generation of population, Encoding, Fitness Function, Reproduction, Crossover, Mutation, probability of crossover and probability of mutation, convergence. Concept of multi-objective optimization problems (MOOPs), Multi-Objective Evolutionary Algorithm (MOEA), NonPareto approaches to solve MOOPs, Pareto-based approaches to solve MOOPs, Some applications with MOEAs.

25	M.Tech.	2nd	Network Security	MCS-133	Dr. Amit Jain	Trusted Intermediaries: Public Key infrastructures, Certification authorities and key distribution centers, Kerbero Network security: Firewalls, Network intrusion detection, Transport security: Mechanisms of TLS, SSL, IPSec: IPsec: AH and ESP, IPsec: IKE, Electronic Mail Security: Distribution lists, Establishing keys, Privacy, source authentication, message integrity, non-repudiation, proof of submission, proof of delivery, message flow confidentiality, anonymity, Pretty Good Privacy (PGP) S/MIME, Web Security: SQL injection, XSS, etc. Software security and buffer overflow Malware types and case studies. Other Topics: Biometric authentication, Secure E- Commerce (ex. SET), Smart Cards, Security in Wireless Communication. Recent trends in IOT security, IDS and Biometric.
26	M.Tech.	2nd	Information Storage and Management	MCS-144	Pf. Jaswant Singh Taur	Information Availability & Monitoring: Reasons for planned/unplanned outages and the impact of downtime, Impact of downtime. Differentiate between business continuity (BC) and disaster recovery (DR), RTO and RPO, Identification of single points of failure in a storage infrastructure and solutions to mitigate these failures, Architecture of backup/recovery and the different backup/ recovery topologies, replication technologies and their role in ensuring information availability and business continuity. Securing Storage and Storage Virtualization: Information Security, Critical security attributes for information systems, Storage security domains, Analyze the common threats in each domain. Storage Virtualization: Forms, Configurations and Challenges. Types of Storage Virtualization: Block-level and File-Level.