COMPUTER SCIENCE / COMPUTER APPLICATIONS

Course Structure and Syllabi for Pre Ph.D Programme

SUBJECT – 1

S.No	Course Code	Title of the Course
1	24CMGT01T	Research Methodology

SUBJECT - 2

S.No	Course Code	Title of the Course
1	24CMGT02T	Research and Publication Ethics

SUBJECT – 3

Choose any **one** subject from the following list

S.No	Course Code	Title of the Course
1	24CCSA01T	Software Engineering
2	24CCSA02T	Computer Networks
3	24CCSA03T	Database Management Systems
4	24CCSA04T	Computer Organization
5	24CCSA05T	Operating Systems

SUBJECT – 4

Choose any **one** subject from the following list

S.No	Course Code	Title of the Course
1	24CCSA06T	Artificial Intelligence
2	24CCSA07T	Machine Learning
3	24CCSA08T	Data Science
4	24CCSA09T	Block Chain Technologies
5	24CCSA0AT	Cryptography And Network Security
6	24CCSA0BT	Service Oriented Architecture
7	24CCSA0CT	Cloud Computing

8	24CCSA0DT	Mobile Computing
9	24CCSA0ET	Internet of Things
10	24CCSA0FT	Data Warehousing and Mining
11	24CCSA0GT	Software Testing Methodologies
12	24CCSA0HT	Big Data Analytics
13	24CCSA0IT	Deep Learning
14	24CCSA0JT	Neural Networks

SOFTWARE ENGINEERING (24CCSA01T)

UNIT I:

SOFTWARE AND SOFTWARE ENGINEERING: The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths.

PROCESS MODELS: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Evolutionary Process Models, The Unified Process.

AGILE DEVELOPMENT: Agility, Agility and the Cost of Change, Agile Process, Extreme Programming, Other Agile Process Models.

UNIT II:

UNDERSTANDING REQUIREMENTS: Requirements Engineering, Establishing the groundwork, Eliciting Requirements, Building the requirements model, Negotiating Requirements, Validating Requirements.

SOFTWARE REQUIREMENTS & ENGINEERING PROCESS: Functional and Non-Functional Requirements, Requirements elicitation and analysis, Requirements validation Requirements management.

SYSTEM MODELING: Context models, Behavioral models, Data models, Object models.

UNIT III:

DESIGN CONCEPTS: Design with Context of Software Engineering, The Design Process, Design Concepts, Modular decomposition styles, Design Evolution.

ARCHITECTURAL DESIGN: Software Architecture, Architecture Styles, Architectural Design, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow.

COMPONENT-LEVEL DESIGN: Component, Designing Class-Based Components, Conducting Component-level Design, Component Level Design for WebApps, Designing Traditional Components.

UNIT IV:

USER INTERFACE DESIGN: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design.

WEBAPP DESIGN: WebApp Design Quality, Design Goal, A Design Pyramid for WebApps, WebApp Interface Design, Content Design, Navigation Design.

UNIT V:

SOFTWARE TESTING STRATEGIES: A strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging.

TESTING CONVENTIONAL APPLICATIONS: Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basic Path testing, Control Structure Testing, Black-Box Testing, Model-based Testing, Testing for Specialized Environments, Test-Case Design.

TEXT BOOK:

1. Roger S. Pressman , "Software engineering A Practitioner's Approach" , Seventh Edition, McGraw Hill International Education.

REFERENCE BOOKS:

1. Ian Sommerville , Software Engineering, Ninth Edition, Pearson.
2. Pankaj Jalote, Software Engineering, A Precise Approach, Wiley India.
3. Deepak Jain, Software Engineering, Principles and Practices, Oxford University Press.
4. Yingxu Wang, Software Engineering Foundations, Auerbach Publications.
5. R.J. Leach , Introduction to Software Engineering, CRC Press.

COMPUTER NETWORKS (24CCSA02T)

UNIT I

INTRODUCTION: Networks, Network Types, Internet History, Standards and Administration, Network Models: Protocol Layering, TCP/IP Protocol Suite, The ISO Model.

THE PHYSICAL LAYER: Transmission media: Introduction, Guided Media, Unguided Media, Switching: Introduction, Circuit Switched Networks, Packet Switching.

UNIT II

THE DATA LINK LAYER: Introduction, Link layer addressing, Error detection and Correction: Cyclic codes, Checksum, Forward error correction, **DATA LINK CONTROL:** DLC Services, Data link layer protocols, HDLC, Point to Point Protocol, **MEDIUM ACCESS CONTROL:** Random Access, Controlled Access, Channelization, Connecting devices and virtual LANs: Connecting Devices.

UNIT III

THE NETWORK LAYER: Network layer design issues, Routing algorithms, Congestion Control algorithms, Quality of service, Internetworking.

THE NETWORK LAYER IN THE INTERNET: IPV4Addresses, IPV6, Internet Control Protocol.

UNIT IV

THE TRANSPORT LAYER: The Transport Service, Elements of Transport Protocols**,** Connection Management.**THE INTERNET TRANSPORT PROTOCOLS**: UDP, TCP.

UNIT V

THE APPLICATION LAYER: Introduction, WWW and HTTP, FTP, e-mail, Domain Name System, SNMP.

TEXT BOOKS:

1. Behrouz A. Forouzan, "Data communications and networking, ,5th edition ,Mc Graw Hill Education.
2. Andrew S. Tanenbaum, "Computer Networks", 5th edition, Wetherall, Pearson.

REFERENCE BOOKS:

1. Bhushan Trivedi , Data Communication and Networks , Oxford.
2. Douglas E. Comer, "Internetworking with TCP/IP – Principles, protocols, and architecture, 5th edition,PHI.
3. Peterson, Davie, Elsevier, "Computer Networks", 5th Edition.
4. Chawan- Hwa Wu,Irwin, "Introduction to Computer Networks and Cyber Security", CRC Publications.
5. Comer, "Computer Networks and Internets with Internet Applications

DATABASE MANAGEMENT SYSTEMS (24CCSA03T)

UNIT-I

INTRODUCTION : Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages - DDL, DML, Database Architecture, Database Users and Administrators, History of Data base Systems.

INTRODUCTION TO DATA BASE DESIGN : ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.

RELATIONAL MODEL: Introduction to the Relational Model - Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views Destroying/ altering Tables and Views.

UNIT-II

RELATIONAL ALGEBRA AND CALCULUS: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus - Tuple relational Calculus- Domain relational calculus - Expressive Power of Algebra and calculus.

FORM OF BASIC SQL QUERY: Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set - Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values - Logical connectives - AND, OR and NOT - Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Databases.

UNIT-III

INTRODUCTION TO SCHEMA REFINEMENT: Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS**,** **NORMAL FORMS** - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Loss less join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design - Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

UNIT-IV

TRANSACTION MANAGEMENT - Transaction Concept - Transaction State - Implementation of Atomicity and Durability - Concurrent - Executions - Serializability - Recoverability - Implementation of Isolation - Testing for serializability.

CONCURRENCY CONTROL - Lock - Based Protocols - Timestamp Based Protocols - Validation – Based Protocols - Multiple Granularity.

RECOVERY SYSTEM-Failure Classification-Storage Structure-Recovery and Atomicity - Log – Based Recovery - Recovery with Concurrent Transactions - Buffer Management - Failure with loss of nonvolatile storage - Advance Recovery systems - Remote Backup systems.

UNIT-V

OVERVIEW OF STORAGE AND INDEXING: Data on External Storage, File Organization and Indexing - Clustered Indexes, Primary and Secondary Indexes, Index data Structures - Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

TREE STRUCTURED INDEXING: Intuitions for tree indexes, Indexed Sequential Access Methods(ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

HASH BASED INDEXING: Static Hashing, Extendable hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS:

1. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, 3rd Edition ,McGrawHill Education.
2. A.Silberschatz, H.F. Korth, S.Sudarshan , Data base System Concepts, VI edition, McGraw Hill Education.

REFERENCE BOOKS:

1. Ramez Elmasri, Shamkat B. Navathe, Database Systems, 6th edition, Pearson Education.
2. Peter Rob & Carlos Coronel , Database Systems Concepts, Cengage Learning.
3. C.J. Date, Introduction to Database Systems, Pearson Education.
4. G.K. Gupta, Database Management Systems, McGraw Hill Education

COMPUTER ORGANIZATION (24CCSA04T)

UNIT I

BASIC STRUCTURE OF COMPUTER: Computer Types, Functional Units, Basic operational Concepts, Bus Structure, Software, Performance, Multiprocessors and Multicomputer.

DATA REPRESENTATION: Data Types – Number Systems, Octal and Hexadecimal Numbers, Decimal Representation, Complements – (r-1)'s Complement, (r)'s Complement, Subtraction of Unsigned Numbers, Floating-point representation, BCD codes, Gray codes.

DIGITAL LOGIC CIRCUITS AND DIGITAL COMPONENTS: Digital Computers, Logic Gates, Boolean algebra – Complement of a Function, Map Simplification – Product-of-Sums Simplification, Don't-Care Conditions, Combinational Circuits – Half-Adder, Full-Adder, Flip-Flops – SR Flip-Flop, D Flip-Flop, JK Flip-Flop, T Flip-Flop, Sequential Circuits – Flip-Flop Input Equations, State Table, State Diagram, Integrated Circuits, Decoders, Encoders, Multiplexers.

UNIT II

MEMORY ORGANIZATION: Memory Hierarchy, Main Memory – RAM and, ROM Chips, Memory Address Map, Memory Connection to CPU, Memory Technology, ROM PROM, EEPROM, Flash Memory, RAM Technologies, Auxiliary Memory – Magnetic Disk, Magnetic Tape, Associative Memory-Hardware Organization, Match Logic, Read Operation and Write Operation, Cache Memory-Associative Mapping, Direct Mapping, Set-Associative Mapping.

UNIT III

BASIC CENTRAL PROCESSING UNIT ORGANIZATION: Introduction, General Register Organization – Control Word, Examples of Micro operations, Stack Organization – Register Stack, Memory Stack, Reverse Polish Notation, Evaluation of Arithmetic Expressions, Instruction Formats – Three-address Instructions, Two-address Instructions, One-address Instructions, Zero-address Instructions, Addressing Modes, Data Transfer and Manipulation – Data Transfer Instructions, Data Manipulation Instructions, Arithmetic Instructions, Logical and Bit Manipulation Instructions, Shift Instructions.

UNIT IV

PIPELINE AND VECTOR PROCESSING: Parallel Processing – Loosely Coupled and tightly Coupled Computers, Amdahl's Law and Example, Pipelining – General Considerations, Arithmetic Pipeline, Instruction Pipeline – Example: Four-Segment Instruction Pipeline, Pipeline Hazards, RISC pipeline - Example: Three-Segment Instruction Pipeline, Delayed Load, Delayed Branch, Vector Processing –

Vector Operations, Matrix Multiplication, Memory Interleaving, Supercomputers, Array Processors – Attached Array Processor, SIMD Array Processor.

UNIT V

LARGE COMPUTER SYSTEMS: Forms of Parallel Processing, Array Processors, The Structure of General Purpose, Interconnection Networks.

MICRO PROGRAMMED CONTROL: Control Memory, Address Sequencing – Conditional Branching, mapping of Instruction, Subroutines, Micro program Example – Computer Configuration, Microinstruction Format, Symbolic Microinstructions, The Fetch Routine, Design of Control Unit – Micro program Sequencer.

INPUT-OUTPUT ORGANIZATION: Peripheral Devices – ASCII Alphanumeric Characters, Modes of Transfer – Example of Programmed I/O, Interrupt-Initiated I/O, Priority Interrupts – Daisy- Chaining Priority, Parallel Priority Interrupt, Direct Memory Access (DMA) – DMA controller, DMA Transfer, Input- Output process or (IOP) - CPU-IOP Communication.

TEXT BOOK:

1.M. Morris Mano. Computer System Architecture, 3rd Edition. Pearson Education.

REFERENCE BOOKS:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky. Computer Organization, 6th Edition, McGrawHill.
2. William Stallings. Computer Organization and Architecture, 7th Edition, Pearson.
3. Sivarama P.Dandamudi. Fundamentals of Computer Organization and Design, Springer Int. Edition.

OPERATING SYSTEMS (24CCSA05T)

UNIT I

OPERATING SYSTEM INTRODUCTION: Operating System Definition, Evolution of Operating Systems- Simple, Batch, Multi Programmed, Time-Shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System Calls, Types of System Calls.

UNIT II

PROCESS AND CPU SCHEDULING: Process Concepts- The Process, Process State, Process Control Block.

PROCESS SCHEDULING- Scheduling Queues, Schedulers, Context Switch, Preemptive Scheduling, Dispatcher, Scheduling Criteria, Scheduling Algorithms,

PROCESS COORDINATION: Process Synchronization, the Critical-Section Problem, Semaphores, Classic Problem of Synchronization

UNIT III

DEADLOCKS: System model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.

UNIT IV

MEMORYMANAGEMENT: Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table,

Segmentation, Demand Paging, Performance of Demand Paging, Page Replacement Algorithms.

FILE SYSTEM INTERFACE: The Concept of a File, Access methods, Directory Structure, Allocation methods, Disk Scheduling algorithms.

UNIT V

ROTECTION: System Protection- Goals of Protection, Principles of Protection, Access Matrix

SECURITY: - The Security Problem, Program Threats, System and Network Threats, user authentication, Firewalling.

TEXT BOOKS:

1. Abraham Silberchatz, Peter B. Galvin. Operating System Principles, 8 th Ed,Wiley Student Edition.
2. Andrew S Tanenbaum. Modern Operating Systems. 3rd EdPearson/ PHI.

REFERENCE BOOKS:

1. R. Elmasri, A.G.Carrick and D.Levine. Operating Systems. MGH.
2. A.S. Godbole, Operating Systems, 2ndEd ,TMH.
3. W. Stallings, Operating Systems-Internal and Design Principles, 6th Ed, Pearson Education.

ARTIFICIAL INTELLIGENCE (24CCSA06T)

UNIT I

FOUNDATIONS OF AI: What is AI, History of AI, Strong and weak AI, The State of the Art.

INTELLIGENT AGENTS: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT II

SOLVING PROBLEMS BY SEARCHING: Problem – Solving Agents, Example Problems, Searching for Solutions, uniformed search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.

UNIT III

KNOWLEDGE REPRESENTATION: Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information, The Internet Shopping World.

UNIT IV

LEARNING FROM EXAMPLES: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Learner Models, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning.

UNIT V

LEARNING PROBABILISTIC MODELS: Statistical Learning, Learning with Complete data, Lear1qning with Hidden variables: The EM Algorithm.

TEXT BOOKS :

1. Stuart J. Russell & Peter Norvig , “Artificial Intelligence A Modern Approach– Pearson.
2. Kevin Knight & Shivashankar B Nair , Artificial Intelligence”, Elaine Rich,– McGraw Hill Education.

REFERENCE BOOKS:

1. Nils J. Nilsson: “Principles of Artificial Intelligence” ,Elsevier.

MACHINE LEARNING (24CCSA07T)

UNIT I

INTRODUCTION: Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT II

NEURAL NETWORKS AND GENETIC ALGORITHMS: Neural Network Representation – Problems – Perceptron's – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

UNIT III

BAYESIAN AND COMPUTATIONAL LEARNING: Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning.

UNIT IV

INSTANCE BASED LEARNING: K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Bases Functions – Case Based Learning.

UNIT V

ADVANCED LEARNING: Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning

TEXT BOOK:

1. Tom M. Mitchell, Machine Learning –- MGH

REFERENCE BOOK:

1. Stephen Marsland, Taylor & Francis, Machine Learning: An Algorithmic Perspective.

DATA SCIENCE (24CCSA08T)

UNIT I

FUNDAMENTALS OF DATA SCIENCE: Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Supervised Versus Unsupervised Learning, Regression Versus Classification Problems, Assessing Model Accuracy, Measuring the Quality of Fit, The Bias-Variance Trade-of, The Classification Setting.

UNIT II

MAINTENANCE OF DATA, DATA COLLECTION AND MANAGEMENT: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data sources.

UNIT III

DATA ANALYSIS: Classification, Logistic Regression, Linear Discriminant Analysis, A Comparison of Classification Methods, Logistic Regression, LDA, QDA, and KNN, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

UNIT IV

DATA VISUALIZATION: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, mapping variables to encodings, Visual encodings. Data Wrangling: Data Acquisition, Data Formats, Imputation, The split-apply-combine paradigm.

UNIT V

DATA SCIENCE-APPLICATIONS: Applications of Data Science, Bokeh (Python), Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

TEXT BOOKS:

1. Alberto Boschetti, Luca Massaron, “Python Data Science Essentials”, 2nd Edition, Packt Publications.
2. Davy Cielen, Arno Meysman, Mohamed Ali, “Introducing Data Science, Big Data, Machine Learning, and more, using Python tools”, First Edition, Manning Publications.

REFERENCE BOOKS:

1. SinanOzdemir, Principles of Data Science, Packt Publishing Ltd .
2. Joel Grus, Data Science from Scratch, Oreilly media.

BLOCK CHAIN TECHNOLOGIES (24CCSA09T)

UNIT-I

BLOCK CHAIN: Distributed systems, the history of block chain, introduction to block chain, CAP theorem and block chain, Benefits and limitations of block chain.

DECENTRALIZATION: Decentralization using block chain, Methods of decentralization, Routes to decentralization, Block chain and full ecosystem decentralization, Smart contract, Decentralized organizations, Decentralized autonomous organizations, Decentralized autonomous corporations, Decentralized autonomous societies, Decentralized applications, Platforms for decentralization.

UNIT-II

CRYPTOGRAPHY AND TECHNICAL FOUNDATIONS: Introduction, Cryptography, Confidentiality, Integrity, Authentication, Cryptographic primitives, Cryptographic primitives, Public and private keys, Financial markets and trading.

UNIT-III

BITCOIN: Bitcoin, Transactions, Blockchain, Bitcoin payments, Bitcoin programming and the command- line interface, Bitcoin improvement proposals (BIPs). Alternative Coins: Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin.

UNIT-IV

SMART CONTRACTS: History, Definition, Ricardian contracts.

ETHEREUM : Introduction, Ethereumblockchain, Elements of the Ethereumblockchain, Precompiled contracts, Accounts, code Block.

UNIT-V

HYPERLEDGER: Projects, Hyperledger as a protocol, Fabric, Hyperledger Fabric, Sawtoothlake, Corda

TEXT BOOK:

1. Imran Bashir, “Mastering Blockchain” Packt Publishing Ltd.

REFERENCE BOOKS:

1. Josh Thompson, „Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming“, Create Space Independent PublishingPlatform.
2. Melanie swan, “Blokchain blueprint for a new economy”, O“REILLY.
3. Andreas Antonopoulos, The internet of money.
4. Paul Vigna& Michael J. Casey, The age of cryptocurrency.

CRYPTOGRAPHY & NETWORK SECURITY (24CCSA0AT)

UNIT I

INTRODUCTION TO SECURITY: Security Concepts, Security Attacks, Security Services and Mechanisms, A model for network Security,

CLASSICAL ENCRYPTION TECHNIQUES: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor machines, steganography.

UNIT II

BLOCK CIPHERS AND DES: Traditional Block Cipher Structure, DES, DES Example, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles. AES: Finite Field Arithmetic, AES Structure, AES Transformation Functions, AES Example, AES Implementation.

BLOCK CIPHER OPERATION: Multiple Encryption and Triple DES, electronic code book mode, cipher block chaining mode, cipher feedback mode, output feed back mode, counter mode, Pseudorandom Number Generation and Stream Ciphers: Principles and Pseudorandom Number Generation, Pseudorandom Number, Generators, Pseudorandom Number Generation using a Block Cipher, Stream, Ciphers, RC4.

UNIT –III:

PUBLIC-KEY CRYPTOGRAPHY AND RSA: Principles of Public-Key Cryptosystems, the RSA algorithm. Attacks and counter measure on RSA, Improvements on RSA.

OTHER PUBLIC-KEY CRYPTOSYSTEMS: Diffie-Hellman Key Exchange, ElGamal Cryptosystem, Elliptic Curve Arithmetic Elliptic Curve Cryptography, Cryptographic Hash Functions: Applications of Cryptographic Hash functions, Two Simple Hash Functions, Requirements and Security, Hash Functions based on Cipher Block Chaining, SHA.

UNIT –IV:

MESSAGE AUTHENTICATION CODES: Requirements, functions, MACs, security of MACs, HMAC.

DIGITAL SIGNATURES: El Gamal Digital Signature, Schnorr digital signature, DSS.

KEY MANAGEMENT AND DISTRIBUTION: Symmetric key distribution using symmetric encryption, symmetric key distribution using asymmetric encryption, distribution of public keys, X.509 Certificates, Public-Key Infrastructure.

USER AUTHENTICATION PROTOCOLS: Remote User Authentication Principles, Remote User Authentication using Symmetric Encryption, Kerberos, Remote User Authentication Using Asymmetric Encryption.

UNIT –V:

TRANSPORT-LEVEL SECURITY: Web Security issues, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH),Electronic Mail.

SECURITY: Pretty Good Privacy, S/MIME, Domain Keys Identified Mail.

IP SECURITY: IP Security Overview, Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange, Cryptographic Suites.

TEXT BOOKS:

1. William Stallings, Cryptography and Network Security Principles and Practice, 7th edition, Pearson Education.
2. William Stllings, " Network Security Essentials: Applications and Standards", 7th edition, Pearson Education.

REFERENCE BOOKS:

1. Bruce Schneier , Applied Cryptography: Protocols, Algorithms and Source Code in C, Second Edition, John Wiley & Sons, Inc.,.
2. Hamid R. Nemati and Li Yang, "Applied Cryptography for Cyber Security and Defense: Information Encryption and Cyphering", IGI Global .

SERVICE ORIENTED ARCHITECTURE (24CCSA0BT)

UNIT I

INTRODUCTION: Origin of SOA- characteristics of SOA- Comparing SOA to client-server and distributed internet architectures- structure of SOA- interrelation of SOA components- principles of service orientation.

UNIT II

WEB SERVICES AND LAYERS: Service descriptions- messaging with SOAP- message exchange patterns- coordination- atomic transactions- business activities- orchestration- choreography- service layer abstraction-application service layer- business service layer- orchestration service layer.

UNIT III

SOA DEVELOPMENT: Service oriented analysis- business-centric SOA- deriving business services- service modeling- service oriented design- WSDL basics- SOA composition guidelines- entity- centric business service design- application service design- task centric business service design.

UNIT IV

SOA PLATFORM BASICS: SOA support in J2EE- Java API for XML based web services (JAX-WS)- Java architecture for XML binding (JAXB)- Java API for XML registries (JAXR)- Java API for XML based RPC (JAX-RPC)- web services interoperability technologies (WSIT)- SOA support in .NET- common language runtime- ASP.NET web forms- ASP.NET web services- web services enhancements (WSE).

UNIT V

WS-BPEL BASICS: WS-coordination overview- WS-choreography- WS-policy- WS-security.

TEXT BOOKS

1. Thomas Erl**,** **"**Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education.
2. Newcomer, Lomow, "Understanding SOA with Web Services", Pearson Education.

REFERENCE BOOKS:

1. Thomas Erl, "SOA Principles of Service Design", The Prentice Hall Service-Oriented Computing Series from Thomas Erl
2. SandeepChatterjee, James Webber, "Developing Enterprise Web Services,An Architect's Guide" Pearson Education
3. Dan Woods and Thomas Mattern, "Enterprise SOA Designing IT for Business Innovation",First Edition

CLOUD COMPUTING (24CCSA0CT)

UNIT-I

INTRODUCTION TO CLOUD COMPUTING: The Evolution of cloud computing – Hardware Evolution- Internet Software Evolution – Server Virtualization – Web Services Deliver from the cloud– Communication- as-a-service–Infrastructure-as-a-service–Monitoring-as-a-service–Platform- as-a-Service - Software-as- a-service – Building Cloud Network.

UINIT- II

FEDERATION IN THE CLOUD: Presence in the cloud – Privacy and its Relation to cloud-Based Information Systems– Security in the cloud – Common Standards in the cloud-End-User Access to the cloud Computing.

UNIT-III

INTRODUCTION: Advancing towards a Utility Model – Evolving IT infrastructure – Evolving Software Applications – Continuum of Utilities- Standards and Working Groups- Standards Bodies and Working Groups- Service Oriented Architecture- Business Process Execution Language- Interoperability Standards for Data Center Management – Utility Computing Technology- Virtualization – Hyper Threading – Blade Servers- Automated Provisioning- Policy Based Automation- Application Management – Evaluating Utility Management Technology – Virtual Test and development Environment – Data Center Challenges and Solutions – Automating the Data Center.

UNIT-IV

SOFTWARE UTILITY APPLICATION ARCHITECTURE : Characteristics of a SaaS – Software Utility Applications – Cost Versus Value – Software Application Services Framework – Common Enablers – Conceptual view to Reality – Business profits – Implementing Database System for Multitenant Architecture.

UNIT-V

OTHER DESIGN CONSIDERATION: Design of a Web Services Metering Interface – Application Monitoring Implementation – A Design for an update and Notification Policy – Transforming to Software as a Service – Application Transformation Program – Business Model Scenarios – Virtual Services for Organizations – The Future

TEXT BOOK:

1. Guy Bunker and Darren Thomson, Delivering utility Computing, John Wiley & Sons Ltd.

REFERENCES BOOKS

1. John W. Rittinghouse and Ames F. Ransome, Cloud Computing Implementation , Management and security, CRC press & Francis Group, Boca Raton London New York.
2. Alfredo Mendoza, Utility Computing Technologies, Standards, and Strategies Artech House INC.

MOBILE COMPUTING (24CCSA0DT)

UNIT I

INTRODUCTION TO MOBILE COMMUNICATIONS AND COMPUTING: Mobile Computing (MC): Introduction to MC, novel applications, limitations, and architecture. GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.(Wireless) Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

UNIT II

MOBILE NETWORK LAYER: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).Mobile Transport Layer : Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

UNIT III

DATABASE ISSUES: Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues. Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

UNIT IV

MOBILE AD HOC NETWORKS (MANETS): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

UNIT V

PROTOCOLS AND TOOLS: Wireless Application Protocol-WAP. (Introduction, protocol Architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

TEXT BOOK:

1. Jochen Schiller, “Mobile Communications”, second edition ,Addison-Wesley.

REFERENCE BOOKS:

1. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley.

2. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", Cambridge University Press,

INTERNET OF THINGS (24CCSA0ET)

UNIT I

INTRODUCTION - Internet of Things, Design Principles for Connected Devices, Web Thinking for Connected Devices, Internet Principles, IP, TCP - IP Protocol Suite, UDP, IP Address, MAC Address, TCP and UDP Ports, Application Layer Protocols.

UNIT II

PROTOTYPING: Prototypes and Production Cloud , Open Source vs Closed Source, Tapping into the Community – Prototyping Embedded Devices, Electronics, Embedded Computing Basics, Ardunio, Raspberry Pi, Beagle Bone Black, Electronic Imp.

UNIT III

PROTOTYPING THE PHYSICAL DESIGN: Laser Cutting , 3D Printing, CNC Milling, Repurposing and Recycling, Prototyping Online Components, New API, Real Time Reactions, Other Protocols.

UNIT IV

TECHNIQUES FOR WRITING EMBEDDED CODE : Memory Management, Performance and Battery life, Libraries, Debugging .

BUSINESS MODELS : Models, Funding an Internet of Things Startup.

UNIT V

MOVING TO MANUFACTURE : Designing Kits , Designing Printed Circuit Boards , Manufacturing Printed Circuit Boards, Mass Producing the case and other Fixtures , Scaling up Software Ethics, Characterizing the Internet of Things, Control Environment Solutions.

TEXT BOOK:

1. Adrian Mcewen and Hakin Cassimally, “Designing The Internet of Things” Wiley Publications .

REFERENCE BOOKS:

1. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1stEdition, VPT.

2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, A Press Publications.

DATA WAREHOUSING AND MINING.(24CCSA0FT)

UNIT I

INTRODUCTION: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT II

DATA WAREHOUSE AND OLAP TECHNOLOGY FOR DATA MINING: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining. Data Cube Computation and Data Generalization: Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.

UNIT III

MINING FREQUENT PATTERNS, ASSOCIATIONS AND CORRELATIONS: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining, Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule- Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Method

UNIT IV

CLUSTER ANALYSIS INTRODUCTION : Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.

UNIT V

MINING STREAMS, TIME SERIES AND SEQUENCE DATA: Mining Data Streams, Mining Time-Series Data, Mining Sequence Patterns in Transactional Databases, Mining Sequence Patterns

in Biological Data, Graph Mining, Social Network Analysis and Multi relational Data Mining, Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

TEXT BOOKS:

1. Jiawei Han and Micheline Kamber ,Data Mining: Concepts and Techniques, , Morgan Kaufmann Publishers, Second Edition, Elsevier.

2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar , Introduction to Data Mining –, Pearson Education.

REFERENCE BOOKS:

1. Arun K Pujari ,Data Mining Techniques, , Second Edition, Universities Press.
2. Sam Aanhory& Dennis Murray , Data Warehousing in the Real World, Pearson Edn, Asia.
3. K.P.Soman, S.Diwakar,V.Ajay , Insight into Data Mining PHI.

SOFTWARE TESTING METHODOLOGIES (24CCSA0GT)

UNIT I

INTRODUCTION, BASICS OF SOFTWARE TESTING: Testing Principles, Goals, Testing Life Cycle, Phases of Testing,Defects, Defect Life Cycle, Defect Report, Test Plan(IEEE format), Importance of testing in software production cycle.

UNIT II

INTRODUCTION, NEED OF BLACK BOX TESTING: Black box testing Concept, Requirement Analysis, Test case design criteria, Testing Methods, requirement based testing, Positive & negative testing, Boundary value analysis, Equivalence Partitioning class, state based or graph based, cause effect graph based, error guessing, documentation testing & domain testing, design of test cases. Black-Box testing.

UNIT III

INTRODUCTION, NEED OF WHITE BOX TESTING: Testing types, Test adequacy criteria, static testing by humans, Structure - logic coverage criteria, Basis path testing, Graph metrics, Loop Testing, Data flow testing, Mutation Testing, Design of test cases. Testing of Object oriented systems, Challenges in White box testing.

UNIT IV

TEST ORGANIZATION: Structure of testing, Measurement tools, testing metrics: Type of metric – Project, Progress, Productivity, Metric plan, Goal Question metric model, Measurement in small & large system. Other Software Testing: GUI testing, Validation testing, Regression testing, Scenario testing, Specification based testing, Ad-hoc testing, Sanity testing, Smoke testing, Random Testing.

UNIT V

SOFTWARE QUALITY: Quality attribute, Quality Assurance, Quality control & assurance, Methods of quality management, Cost of quality, Quality management, Quality factor, Quality management & project management.

TEXT BOOKS:

1. Ron Patton , Software Testing, Second Edition , Pearson Education.

2. M.G. Limaye ,Software Testing Principles and Tools, TMG Hill Publication.

REFERENCE BOOKS:

1. Metric and Model in Software Quality Engineering, By Stephen H Kan, Pearson Education

2. Effective methods for Software Testing by William Perry , Willey Publication.

3. Dorothy Graham and Erik Van Veenendaal, Foundation of Software Testing,

BIG DATA ANALYTICS (24CCSA0HT)

UNIT-I

INTRODUCTION TO BIG DATA: Introduction to Big Data Platform – Challenges of Conventional System – Intelligent data analysis – Nature of Data – Analytic Processes and Tool – Analysis vs Reporting – Modern Data Analytic Tool – Statistical Concepts: Sampling Distributions – Re-Sampling – Statistical Inference – Prediction Error.

UNIT- II

MINING DATA STREAMS: Introduction To Stream Concepts – Stream Data Model and Architecture - Stream Computing – Sampling Data in a Stream – Filtering Stream – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window – Real time Analytics Platform(RTAP) Applications – Case Studies – Real Time Sentiment Analysis, Stock Market Predictions.

UNIT – III

HADOOP: History of Hadoop- The Hadoop Distributed File System – Components of Hadoop – Analyzing the Data with Hadoop – Scaling Out – Hadoop Streaming – Design of HDFS- Java interfaces to HDFS, Basics- Developing a Map Reduce Application – How Map Reduce Works – Anatomy of a Map Reduce Job run – Failures – Job Scheduling – Shuffle and Sort – Task Execution – Map Reduce Types and Formats – Map Reduce Features.

UNIT – IV

HADOOP ENVIRONMENT: Setting up a Hadoop Cluster – Cluster specification – Cluster Setup and Installation –Hadoop Configuration – Security in Hadoop – Administering Hadoop – HDFS – Monitoring – Maintenance – Hadoop Benchmarks –Hadoop in the Cloud.

UNIT –V

FRAMEWORKS: Applications on Big Data Using Pig and Hive – Data Processing operators in Pig – Hive Services – HiveQL – Querying Data in Hive – fundamentals of HBase and Zookeeper – IBM Info Sphere Big Insights and Streams. Visualization - Visual data analysis techniques, interaction techniques; Systems and applications

TEXT BOOKS:

1. Michael Berthold, David J.Hand, Intelligent Data Analysis, Spingers.

2. Tom White, Hadoop: The Definitive Guide Third Edition, O‟reilly Media.

REFERENCE BOOKS:

1. Bill Franks, Taming the Big Data tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & sons.

2. Jiawei Han, MichelineKamber, Data Mining Concepts and Techniques, Second Edition.

DEEP LEARNING (24CCSA0IT)

UNIT – I

INTRODUCTON TO DEEP LEARNING: History of Deep Learning: Basics: Biological Neuron, Idea of computational units, McCulloch– Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability. Convergence theorem for Perceptron Learning Algorithm.

UNIT – II

FEEDFORWARD NETWORKS: Feedforward Networks: Multilayer Perceptron, Gradient Descent, Backpropagation, Empirical Risk Minimization, regularization, auto encoders.

UNIT-III

CONVOLUTIONAL NETWORKS: Convolutional Networks: The Convolution Operation - Variants of the Basic Convolution Function - Structured Outputs - Data Types - Efficient Convolution Algorithms - Random or Unsupervised Features- LeNet, AlexNet

UNIT- IV

RECURRENT NEURAL NETWORKS: Recurrent Neural Networks: Bidirectional RNNs - Deep Recurrent Networks Recursive Neural Networks - The Long Short-Term Memory and Other Gated RNNs.

UNIT-V

DEEP GENERATIVE MODELS: Deep Generative Models: Boltzmann Machines - Restricted Boltzmann Machines - Introduction to MCMC and Gibbs Sampling- gradient computations in RBMs - Deep Belief Networks- Deep Boltzmann Machines.

APPLICATIONS: Large-Scale Deep Learning - Computer - Speech Recognition - Natural Language Processing.

TEXT BOOKS:

1. Seth Weidman, Deep Learning from Scratch: Building with Python from First Principles, O'REILLY.

2. Ian Good fellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press.

REFERENCE BOOKS:

1. Nikhil Buduma ,Fundamentals of Deep Learning, O'REILLY.

2. Nikhil Buduma, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly publications.

NEURAL NETWORKS (24CCSA0JT)

UNIT I

INTRODUCTION : History of Neural Networks, Structure and function of biological and artificial neuron, models of a neuron, Neural network architectures, Neural learning, Learning laws Applications of neural networks to solve tasks such as clustering and pattern association, Evaluation of Networks.

UNIT II

SUPERVISED LEARNING-I : Single layer networks: Supervised and unsupervised learning, Perceptron's, Linear separability, Perceptron training algorithm, Guaranty of success, Modifications, Support vector classification

UNIT III

SUPERVISED LEARNING-II : Multi layer networks: Multi level discrimination, Preliminaries, Backpropagation algorithm, Classification using Backpropagation, setting the parameter values,Radial basis functions, Support vector machines, Probabilistic neural network, Polynomial networks

UNIT IV

UNSUPERVISED LEARNING : Winner - Take - all networks, Learning vector quantizes, Counter propagation networks, Adaptive Resonance Theory, Topologically organized networks, Distance based learning, Principal component analysis networks.

UNIT V

ASSOCIATIVE MEMORIES : Non iterative procedures for association, Hopfield networks, Boltzmann Machines, Hetero-associators, Applications of Neural Networks: Optimization, Travelling salesperson, Applications in Pattern recognition and image processing.

TEXT BOOK:

1. Kishan Mehrotra, Chelkuri K. Mohan, Sanjeev Ranka – Elements of Artificial Neural Networks Penram.

REFERENCE BOOKS:

1. J.M. Zurada - Introduction to Artificial Neural Systems, Jaico Publications.
2. Rajasekharan and Pai - Neural Netwroks, Fuzzy Logic and Genetic algorithms: synthesis and applications, PHI Publication.