

Ph.D. Course work

Pre-Ph.D. Examination Syllabus



**DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS,
K L UNIVERSITY,
VADDESWAREM - 522502, ANDHRA PRADESH, INDIA.**

Pre-PhD Subjects List LTPS: 4-0-0-0

S.NO	PAPER 1	SUBJECT CODE
1	Research Methodology	21RES104

S.NO	PAPER 2	SUBJECT CODE	PAPER 3	SUBJECT CODE
1	Software Development and Quality Assurance	22CSA101	Hadoop and Bigdata	22CSA201
2	Network Systems and Protocols	22CSA102	Applied Artificial Intelligence	22CSA202
3	Database Management Systems	22CSA103	Data Analytics	22CSA203
4	Operating Systems	22CSA104	Applied Machine Learning	22CSA204
5	Object Oriented Programming	22CSA105	Problem Solving using Python Programming	22CSA205
6	Data Structures	22CSA106	Securing Web Systems and Networks	22CSA206
7	Design and Analysis of Algorithms	22CSA107	Distributed Databases	22CSA207
8	IoT Development and Connectivity	22CSA108	The Joy of Computing using R programming	22CSA208
9	Soft Computing Techniques and Applications	22CSA109	Applied Deep Learning	22CSA209
10	Advances in Computing	22CSA110	Cloud Infrastructure with Services	22CSA210
11	Mobile Computing using Cloud	22CSA111	Service Management in Cloud Computing	22CSA211
12	Data Warehousing and Data Mining	22CSA112	Data Management in Cloud Computing	22CSA212
13	Principles of Software Reliability	22CSA113	Securing Cloud Computing Environments	22CSA213

22CSA101: SOFTWARE TESTING AND QUALITY ASSURANCE

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

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. 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. 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. 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, Adhoc testing, Sanity testing, Smoke testing, Random Testing. Software quality, Quality attribute, Quality Assurance, Quality control & assurance, Methods of quality management, Cost of quality, Quality management, Quality factor, Quality management & project management.

Textbooks:

1. Software Testing, Second Edition By: Ron Patton, Pearson Education ISBN-13: 978-0-672-32798-8
2. Software Testing Principles and Tools By M.G. Limaye TMG Hill Publication, ISBN 13:978-0-07-013990-9

References:

1. Metric and Model in Software Quality Engineering, By Stephen H Kan, Pearson Education ISBN 81-297-0175-8
2. Effective methods for software testing by William Perry, Willey Publication, ISBN 81-265-0893-0
3. Foundation of software testing by Dorothy Graham, Erik Van Veenendaal. CENGAGE learning, ISBN 978-81-315-0218-1

22CSA102: NETWORK SYSTEMS AND PROTOCOLS

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Introduction :- Networks, Network Types, Network Models :-The Protocol Layering , TCP/IP Protocol Suite, The OSI Model, Physical Layer :- Transmission Media - Guided Media, Un-Guided Media Data-Link Layer: Introduction to Data-Link Layer - Introduction, Link-Layer Addressing. Error Detection and Correction - Introduction, Cyclic Redundancy Check. Data Link Control (DLC) - DLC Services. Media Access Control (MAC) - Random Access, Controlled Access. Network Layer: Introduction to Network Layer - Network-Layer Services, Packet Switching, Network-Layer Performance, IPv4 Addresses, Forwarding of IP Packets. Next Generation IP- IPv6 Addressing, The IPv6 Protocol. Network-Layer Protocols - Internet Protocol (IP), Unicast Routing - Introduction, Routing Algorithms- Distance vector and Link State Routing, Unicast Routing Protocols. Transport Layer: Introduction to Transport Layer-Introduction, Transport-Layer Protocols. Transport Layer Protocols-Introduction, User Datagram Protocol(UDP), Transmission Control Protocol(TCP) Application Layer: Standard Client-Server Protocols-World Wide Web and HTTP, FTP, Electronic Mail, Telnet, Secure Shell (SSH), Domain Name System (DNS)

Text Books:

Data Communications and Networking, Behrouz A. Forouzan, Fifth Edition, McGrawHill

Reference Books:

Computer Networking A Top-Down Approach, James F. Kurose, Keith W. Ross, Sixth Edition, Pearson Education

Computer Networks - A Systems Approach, Larry L. Peterson, Bruce S. Davie, Fifth Edition, Morgan Kaufmann

22CSA103: DATABASE MANAGEMENT SYSTEMS

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Introduction to Databases: Characteristics of the Database Approach, Advantages of using the DBMS Approach, A Brief History of Database Applications, Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System environment, Centralized and Client-Server Architecture for DBMSs. Conceptual Data Modeling: High-Level Conceptual Data Models for Database Design, A Sample Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues, Relationship Types of Degree Higher Than Two. Relational Database Design Using ER-toRelational Mapping. Relational Model: The Relational Model Concepts, Relational Model Constraints and Relational Database Schemas. Basic SQL: SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic retrieval Queries in SQL ,INSERT, DELETE AND UPDATE Statements in SQL More SQL: More complex SQL retrieval queries Advanced Queries, Specifying constraints as Assertions and Actions as Triggers, Views in SQL Relational Algebra: Unary Relational Operations: Select and Project, Relational Algebra Operations from SetTheory, Binary Relational Operations: Join and Division, Examples of Queries in Relational Algebra. Keys, General definitions of Second and Third Normal Forms , Boyce-Codd Normal Form, Multi valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal FormTransaction Processing: Introduction, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability & Serializability, Transaction Support in SQL. Introduction to Concurrency Control: Two-Phase Locking Techniques for concurrency control: Types of Locks and System Lock Tables, Guaranteeing Serializability by Two-Phase Locking. Introduction to Recovery Protocols: Recovery Concepts, No- UNDO/REDO Recovery Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging.

Textbooks:

Fundamentals of Database Systems, Ramez Elmasri,ShamkantB. Navathe, Seventh edition, Pearson.

Reference Books:

Data base System Concepts, Abraham Silberschatz, Henry F Korth, S. Sudarshan, FifthEdition, McGraw Hill.

22CSA104: OPERATING SYSTEMS

L-T-P-S: 4-0-0-0

Credits:4

Prerequisites: Nil

Syllabus:

Overview: Introduction: What Operating Systems Do, Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating-System Operations. Operating System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls. Process Management: Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication. Threads: Overview, Multi-core Programming, Multithreading Models. Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms (First-Come, First-Served Scheduling, Shortest-Job-First Scheduling, Priority Scheduling, Round-Robin Scheduling.) Process Synchronization: Background, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors. Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. Memory Management: Main Memory: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Basic Page Replacement, FIFO Page Replacement, Optimal Page Replacement, LRU Page Replacement, LRU-Approximation Page Replacement, Allocation of Frames, Thrashing. Storage Management: File-System Interface: File Concept, Access Methods, Directory and Disk Structure. File-System Implementation: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods. Mass-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, FCFS Scheduling, SSTF Scheduling, SCAN Scheduling, C-SCAN Scheduling, LOOK Scheduling, Selection of a Disk-Scheduling Algorithm.

Text book:

Operating System Concepts, Abraham Silberchatz, Peter Baer Galvin, Greg Gagne, Ninth Edition, 2016, Wiley India.

Reference Books:

Operating Systems - Internal and Design Principles, William Stallings, Ninth Edition, 2018, Pearson.
Operating Systems - Harvey M.Deitel, Paul J Deitel and David R.Choffnes , Third Edition, 2019, Pearson.
Operating Systems - A Concept based Approach- D.M. Dhamdhare, Second Edition, 2010, McGraw Hill.

22CSA105 - OBJECT ORIENTED PROGRAMMING

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Introduction. Object Oriented Programming Class Fundamentals, Object & Object reference, Object Life time & Garbage Collection, Creating and Operating Objects , Constructor & initialization code block, Access Control, Modifiers, methods Nested , Inner Class & Anonymous Classes , Abstract Class & Interfaces Defining Methods, Argument Passing Mechanism , Method Overloading, Recursion, Dealing with Static Members, Finalize() Method, Native Method. Use of “this “reference, Use of Modifiers with Classes & Methods, Design of Accessors and Mutator Methods Cloning Objects, shallow and deep cloning, Generic Class Types. Extending Classes and Inheritance Use and Benefits of Inheritance in OOP, Types of Inheritance in Java, Inheriting Data members and Methods, Role of Constructors in inheritance, Overriding Super Class Methods ,Use of “super” , Polymorphism in inheritance ,Type Compatibility and Conversion Implementing interfaces. Package Organizing Classes and Interfaces in Packages , Package as Access Protection , Defining Package ,CLASSPATH Setting for Packages , Making JAR Files for Library Packages Import and Static Import Naming Convention For Packages. Exception Handling: Exceptions & Errors ,Types of Exception ,Control Flow In Exceptions, JVM reaction to Exceptions ,Use of try, catch, finally, throw, throws in Exception Handling ,In-built and User Defined Exceptions, Checked and Un-Checked Exceptions. Array & String : Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array, Operation on String, Mutable & Immutable String, Using Collection Bases Loop for String, Tokenizing a String, Creating Strings using StringBuffer . Thread : Understanding Threads , Needs of Multi-Threaded Programming ,Thread Life-Cycle, Thread Priorities ,Synchronizing Threads, Inter Communication of Threads ,Critical Factor in Thread –DeadLock,) The Collection Framework : Collections of Objects , Collection Types, Sets , Sequence, Map, Understanding Hashing, Use of ArrayList & Vector. Event Handling Event-Driven Programming in Java, Event- Handling Process, Event- Handling Mechanism, The Delegation Model of Event Handling, Event Classes, Event Sources, Event Listeners, Adapter Classes as Helper Classes in Event Handling. Database Programming using JDBC Introduction to JDBC,JDBC Drivers & Architecture, CRUD operation Using JDBC, Connecting to non-conventional Databases. Java Server Technologies Servlet Web Application Basics, Architecture and challenges of Web Application, Introduction to servlet, Servlet life cycle, Developing and Deploying Servlets, Exploring Deployment , Descriptor (web.xml), Handling Request and Response.

Textbooks:

“Java: Object-Oriented Programming in Java" by Kamthane

“Java Programming: From the Beginning" by K. N. King

Beginning Java 8 Fundamentals: Language Syntax, Arrays, Data Types, Objects, and Regular Expressions, by Kishori Sharan:

22CSA106: DATA STRUCTURES

L-T-P-S: 4-0-0-0

Credits:4

Prerequisites : Nil

Syllabus:

Introduction: Algorithm Specification, Time complexity & space complexity and their notations. Recursion: What is Recursion, Why Recursion, Format of a Recursive function, Recursion and memory, Recursion Vs. Iteration, Examples Sorting and Searching: Searching- Linear and Binary search algorithms, Sorting- Bubble, Insertion, Selection, Merge, Quick sort algorithms. Linked lists: Single linked list, double linked list, circular linked list, and operations on linked lists. Stacks: Definition, operations: array implementation, linked list implementation and applications. Queues: Definition, operations: array implementation, linked list implementation and applications, Circular Queue. Trees: Introduction- Terminology, representation of trees, binary trees abstract data type, Properties of binary trees, binary tree representation, binary tree traversals In order, preorder, post order, Binary search trees Definition, searching BST, insert into BST, delete from a BST, Height of a BST. AVL Trees – Priority Queue (Heaps) – Binary Heap ,B-Tree – B+ Tree Graphs: The Graph ADT Introduction, definition, graph representation, elementary graph operations BFS, DFS, Minimum Spanning Tree – only: Prim's and Kruskal's MST. Topological Sort – Dijkstra's algorithm, Hashing – Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

Text Books :

Data Structures and Algorithm Analysis in C, Mark Allen Weiss, Second Edition, 2002, Pearson.

Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Third Edition, 2010, PHI.

Data Structures and Algorithms Made Easy by Narasimha Karumanchi, 2020, CareerMonk Publications.

Reference Books:

Fundamental of Data Structures in C, Horowitz, Sahani, Anderson-Freed, Second Edition, 2008, Universities Press.

Classic Data Structures, Debasis Samantha, Second Edition, 2009, PHI.

22CSA107: DESIGN AND ANALYSIS OF ALGORITHMS

L-T-P-S: 4-0-0-0

Credits:4

Prerequisites: Nil

Syllabus:

Introduction: Notion of Algorithm, Fundamentals of Algorithmic Problem Solving. Fundamentals of the Analysis of Algorithm Efficiency: Analysis framework and Asymptotic Notations and Basic Efficiency Classes, Amortized Analysis. Randomized Algorithms. Sets & Disjoint set union: introduction, union and find operations. Basic Traversal & Search Techniques: Techniques for Graphs, connected components and Spanning Trees, Bi-connected components and DFS. Introduction to Brute Force Technique, Exhaustive Search, Divide and Conquer: Introduction, General Method, Defective chessboard, Merge sort, Quick sort, Binary Search, Finding Maximum and Minimum, Strassen's Matrix Multiplication. The Greedy Method: The general Method, container loading, Huffman Trees and codes, Minimum Coin Change problem, Knapsack problem, Job sequencing with deadlines, Minimum Cost Spanning Trees, Single Source Shortest paths. Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, single source shortest paths: general weights, optimal Binary search trees, 0/1 knapsack, reliability Design, The traveling salesperson problem, matrix chain multiplication. Back Tracking: Introduction, n-Queens problem, Sum of subsets, Graph coloring problem, Hamiltonian cycle. Branch and Bound: Introduction, Assignment problem, FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack problem, Traveling salesperson problem. Introduction to Complexity classes: NP-Hard and NP-Complete problems: Basic concepts, Cook's Theorem. String Matching: Introduction, String Matching-Meaning and Application, Native String Matching Algorithm, Rabin-Karp Algorithm, Knuth-Morris-Pratt Automata, Tries, Suffix Tree.

Textbooks:

Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.

Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press.

Reference Books:

Horowitz E. Sahani S: "Fundamentals of Computer Algorithms", 2nd Edition, Galgotia Publications, 2008.
S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

22CSA108: IOT DEVELOPMENT AND CONNECTIVITY

L-T-P-S: 4-0-0-0

Credits:4

Prerequisites –Nil

Syllabus:

Definition and Characteristics of Internet of Things (IoT) - Challenges and Issues - Physical Design of IoT - Logical Design of IoT - IoT Functional Blocks. Control Units – Communication modules – Bluetooth – Zigbee – WiFi – GPS - IoT Protocols (IPv6, 6LoWPAN, RPL, CoAP) – MQTT - Wired Communication - Power Sources. Four pillars of IoT paradigm: RFID, Wireless Sensor Networks, Supervisory Control and Data Acquisition (SCADA) - M2M - IoT Enabling Technologies: BigData Analytics, Cloud Computing, Embedded Systems. Working principles of sensors – IoT deployment for Raspberry Pi /Arduino/Equivalent platform – Reading from Sensors, Communication: Connecting microcontroller with mobile devices - Communication through Bluetooth - WiFi and USB - Contiki OS - Cooja Simulator. Scalability: Network Configuration Protocol, Open vSwitch Database Management Protocol - Routing and Protocols: Collection Tree, LOADng. Scope of Web of Things (WoT) – IoT Data Management: Set up cloud environment, Cloud access from sensors, Data Analytics Platforms for IOT- Resource Identification: Richardson Maturity Model - REST API. Business models for IoT - Green energy buildings and infrastructure - Smart farming - Smart retailing and Smart fleet management

Text Books

Adrian McEwen, Hakim Cassimally - Designing the Internet of Thing Wiley Publications, 2012.
David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, ||IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, 1stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)

Reference Books

ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014
Srinivasa K G, Internet of Things, CENGAGE Learning India, 2017.

22CSA109- SOFT COMPUTING TECHNIQUES AND APPLICATIONS

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Introduction to Neuro-Fuzzy and soft computing: computing constituents and conventions, characteristics. Fuzzy set theory: basic definitions and terminology, set-theoretic operations, Mf formulation and parameterization. Fuzzy rules and reasoning: extension principles and fuzzy relations, fuzzy if-then rules, fuzzy reasoning. Fuzzy inference systems: mamdani fuzzy models, sugeno fuzzy models, Tsukamoto fuzzy models, other considerations. Regression and optimization: least-squares methods for system identification. Introduction, basics of matrix manipulation and calculus, least-square estimator, geometric interpretation of LSE, recursive least squares estimator, recursive LSE for time varying systems, statistical properties and maximum likelihood estimator, LSE for nonlinear models. Derivative-based optimization: introduction, descent methods, the method of steepest descent, newtons methods, step-size determination, conjugate gradient methods, analysis of quadratic case, non linear least square problems, incorporation of stochastic mechanisms. Derivative-free optimization: introduction, genetic algorithms, simulated annealing, random search, downhill simple search. Neural Networks: Adaptive networks, supervised learning neural networks, unsupervised learning and other neural networks. neuro-fuzzy modeling: ANFIS, Coactive Neuro-Fuzzy Modeling: Towards Generalized ANFIS. Advanced Neuro-Fuzzy modeling: classification and regression trees, data clustering algorithms, rule based structure identification. Neuro Fuzzy control: ANFIS: introduction, architecture, hybrid learning algorithm, learning methods that cross fertilize ANFIS and RBFN, ANFIS as a universal approximation. Simulation examples: example 1. Modeling a two-input sinc function, Example 2. Modeling a three input non-linear function, example 3. On-line identification in control systems, example 4. Predicting chaotic time series. coactive neuro-fuzzy modeling: Towards Generalized ANFIS: introduction, framework, neuron functions for adaptive networks, neuro-fuzzy spectrum, analysis of adaptive learning capability. NEURO-FUZZY CONTROL-I Introduction, framework, control systems and neuro-fuzzy control, expert control, inverse learning, specialized learning, back-propagation through time and real-time recurrent learning. NEURO-FUZZY CONTROL-II : Introduction, Reinforcement learning control, Gradient-free optimization, Gain Scheduling, Feedback Linearization and Sliding Control. GENETIC ALGORITHMS: A Genetic Introduction to Genetic Algorithms: What are Genetic Algorithms, Robustness of Traditional Optimization and search methods, goals of Optimization, How genetic algorithms different from traditional methods, A Simple Genetic Algorithm, Genetic Algorithms at work. Genetic Algorithms Revisited: Mathematical Foundations Computer implementation of a genetic algorithm. Advanced Operations and Techniques in Genetic Search: Introduction to Genetics based Machine Learning, Applications of Genetics based Machine Learning.

Textbooks:

1. Neuro-Fuzzy And Soft Computing BY “J-S.R.Jang, Ct. Sun, E.Mizutani” Prentice-Hall Of India Private Limited Publications.
2. Genetic Algorithms BY “David E. Goldberg” Pearson Education.

REFERENCES:

1. Neural Networks and Learning Machines By “Simon Haykin” 3rd Edition, Phi Publication.
2. Fuzzy Sets and Fuzzy Logic By “George J. Klir|Bo|Yuan” In Phi Publications.

22CSA110: ADVANCES IN COMPUTING

L-T-P-S: 4-0-0-0

Credits: 4

Prerequisites –Nil

Syllabus:

Introduction to Advances in Computing - Overview of modern computing paradigms - Historical developments and key breakthroughs - Current trends and challenges in computing High-Performance Computing Parallel computing architectures: Distributed systems and clusters, GPU computing and acceleration - Performance optimization techniques Quantum Computing: Basics of quantum mechanics, Quantum algorithms and programming, Quantum cryptography and secure communication, Quantum computing applications Cloud Computing and Big Data: Cloud service models (SaaS, PaaS, IaaS), MapReduce and Hadoop, Data storage and processing in the cloud, Big data analytics and real-world applications, Cyber-Physical Systems: Embedded systems and sensor networks, Cybersecurity for IoT, Smart cities and applications. Soft Computing and Artificial Intelligence: Introduction of Soft Computing, Soft Computing vs. Hard Computing, Various Types of Soft Computing Techniques, Applications of Soft Computing, AI Search Algorithm, Predicate Calculus, Rules of Inference, Semantic Networks, Frames, Objects, Hybrid Models.

Text Books:

1. "Quantum Computing: A Gentle Introduction" by Eleanor G. Rieffel and Wolfgang H. Polak: The MIT Press, 1st Edition (2011)
2. Soft Computing: Techniques and Applications by Debasis Ghosh and Ashish Ghosh
3. "Introduction to Parallel Computing" by Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar.

Reference Books:

1. "Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers" by Barry Wilkinson and Michael Allen
2. "Quantum Computation and Quantum Information" by Michael A. Nielsen and Isaac L. Chuang, Cambridge University Press, Edition: 10th Edition (2020)

22CSA111 MOBILE COMPUTING USING CLOUD

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS. Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations. Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment. Introduction To Cloud Computing: Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning. Cloud Enabling Technologies Service Oriented Architecture: REST and Systems of Systems – Web Services – Publish, Subscribe Model – Basics of Virtualization – Types of Virtualizations – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices – Virtualization Support and Disaster Recovery. Cloud Architecture, Services and Storage: Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3. Cloud Technologies And Advancements Hadoop: MapReduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine — Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.

Text books:

J. Schiller, Mobile Communications, Addison Wesley.

A. Mehrotra, GSM System Engineering.

M. V. D. Heijden, M. Taylor, Understanding WAP, Artech House.

4.Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.

Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017.

Reference books:

Ian Foster, et al., “The Open Grid Services Architecture”, Version 1.5 (GFD.80). Open Grid Forum, 2006.

Rajkumar Buyya. High Performance Cluster Computing: Architectures and Systems. PrenticeHall India, 1999.

22CSA112 DATA WAREHOUSING AND DATA MINING

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Data Warehousing and Online Analytical Processing: Data Warehouse: Basic Concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation. Introduction: Fundamentals of data mining: Kinds of data, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Discretization. Mining Frequent Patterns, Associations, and Correlations: Basic Concepts, Frequent Item Set Mining Methods. Classification: Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule Based Classification. Cluster Analysis: Basic Concepts and Methods, Cluster Analysis, Partitioning Methods: k-means and k-medoids, Hierarchical Method: Agglomerative Hierarchical clustering (BIRCH), Density-Based Methods: DBSCAN, Grid-based Methods. Outlier Detection: Outliers and Outlier Analysis, Outlier Detection Methods. Data Mining Trends: Mining Complex Data Types, Other Methodologies of Data Mining.

Text Books:

Data Mining – Concepts and Techniques – 3/e, Jiawei Han , Micheline Kamber & Jian Pei- Elsevier.

Reference Books:

Introduction to Data Mining with Case Studies – 2nd Edition, G.K.Gupta, PHI

Introduction to Data Mining: Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Pearson.

Data Mining Techniques – ARUN K PUJARI, University Press.

Data Warehousing in the Real World, SAM ANAHORY & DENNIS MURRAY, Pearson Edn. Asia.

22CSA113 PRINCIPLES OF SOFTWARE RELIABILITY

L-T-P-S: 4-0-0-0

Credits:4

Prerequisites –Nil

Syllabus:

Basic Ideas of Software Reliability, Hardware reliability vs. Software reliability, Reliability metrics, Failure and Faults – Prevention, Removal, Tolerance, Forecast, Dependability Concept – Failure Behaviour, Characteristics, Maintenance Policy, Reliability and Availability Modeling, Reliability Evaluation Testing methods, Limits, Starvation, Coverage, Filtering, Microscopic Model of Software Risk. Computation of software reliability, Functional and Operational Profile, Operational Profiles – Difficulties, Customer Type, User Type, System Mode, Test Selection - Selecting Operations, Regression Test. Classes of software reliability Models, Time Dependent Software Reliability Models: Time between failure reliability Models, Fault Counting Reliability Models. Time Independent Software Reliability Models: Fault injection model of Software Reliability, Input Domain Reliability Model, Orthogonal defect classification, Software availability Models. Software Reliability Modeling: A general procedure for reliability modelling Short and Long Term Prediction, Model Accuracy, Analysing Predictive Accuracy – Outcomes, PLR, U and Y Plot, Errors and Inaccuracy, Recalibration – Detecting Bias, Different Techniques, Power of Recalibration, Limitations in Present Techniques, Improvements.

Text Books:

System Software Reliability - Hoang Pham, Springer, 2006.

An Introduction to Reliability and Maintainability Engineering- Charles E. Ebeling, Tata McGraw-Hill Edition, 2000.

Reference Books:

Software Reliability Engineering, Michael R. Lyu, McGraw-Hill Inc.,US; Har/Cdr edition

Software Reliability Engineering: More Reliable Software, Faster and Cheaper, John D. Musa, McGraw Hill Education (India) Private Limited, 2004 edition.

22CSA201: HADOOP AND BIGDATA

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Understanding Big Data: Definition of Big Data, Types of Big Data, How Big Data is Generated, Different source of Big Data Generation, Rate at which Big Data is being generated, Different V's, How a single person is contributing towards Big Data, Significance for Big Data, Reason for Big Data, Understanding RDBMS and why it is failing to store Big Data, Future of Big Data, Maintenance/storage of Big data, Big Data use cases for major IT Industries Introduction to Hadoop: What is Hadoop, Apache Community, History of Hadoop, How is Hadoop Important, Apache Hadoop Ecosystem, Hadoop Architecture, Difference between Hadoop 1.x, 2.x and 3. x Architecture, Master-Slave Architecture, Advantages of Hadoop. HDFS and its features, Map Reduce and its features, Map Reduce V1 vs. Map Reduce V2, Hadoop YARN-job scheduling in YARN, storage options in HADOOP – File Formats & Compression Formats, Encryption, and User Authentication. Introduction to Spark: What is Spark, history of Spark, Theoretical concepts in Spark – Resilient distributed datasets, Directed acyclic graphs, Spark Context, Spark Data Frames, Actions and Transformations, Spark deployment options, Spark APIs. Core Components in Spark – Spark Core, Spark SQL, Spark Streaming, GraphX, MLib. The Architecture of Spark. Big Data Analytics with Hadoop plus Spark: Limitations of Hadoop, overcoming limitations of Hadoop, Spark solutions, spark practical on big data analytics, Hadoop Practical on Big data analytics, Hadoop vs. Spark, Why Hadoop plus Spark – Hadoop features, Spark features. Installing Hadoop plus Spark Clusters.

Text Books :1. Hadoop: The Definitive Guide, By: Tom White, O'Reilly 2.Practical Big Data Analytics:: hands-on techniques to implement enterprise analytics and machine learning using Hadoop By Nataraj Dasgupta, Packt Publishing Ltd

Text Books:

Big Data: Principles and Practices by Anand Rai and Mukesh Khaira, CRC Press.
Hadoop: The Definitive Guide by Tom White, O'Reilly Media.

Reference Books:

Data Science for Business by Foster Provost and Tom Fawcett, O'Reilly Media.
Mining Massive Datasets by Jure Leskovec, Anand Rajaraman, and Jeffrey Ullman, Cambridge University Press.

22CSA202:APPLIED ARTIFICIAL INTELLIGENCE

L-T-P-S: 4-0-0-0

Credits:4

Prerequisites –Nil

Syllabus :

Overview and Historical Perspective, Turing test, Physical Symbol Systems and the scope of Symbolic AI, Agents. State Space Search: Depth First Search, Breadth First Search, DFID. Heuristic Search: Best First Search, Hill Climbing, Beam Search, Tabu Search. Randomized Search: Simulated Annealing, Genetic Algorithms, Ant Colony optimization. Finding Optimal Paths: Branch and Bound, A*, IDA*, Divide and Conquer approaches, Beam Stack Search. Problem Decomposition: Goal Trees, AO*, Rule Based Systems, Rete Net. Game Playing: Planning and Constraint Satisfaction: Domains, Forward and Backward Search, Goal Stack Planning, Plan Space Planning, Graph plan, Constraint Propagation. Logic and Inferences: Propositional Logic, First Order Logic, Soundness and Completeness, Forward and backward chaining. Knowledge and reasoning: knowledge based agents, Logic, propositional logics and horn clauses, first order logic, Inference in first order logic, Propositional versus first order inference, unification and lifting, forward & backward chaining, resolution. Handling Uncertainty: Quantifying uncertainty, basic probability notation, Baye's theorem, Probabilistic reasoning, representation of conditional distributions, probabilistic reasoning overtime, hidden markov model, Kalman filters Knowledge and reasoning: knowledge-based agents, Logic, propositional logics and horn clauses, first order logic, Inference in first order logic, Propositional versus first order inference, unification and lifting, forward & backward chaining, resolution. Heuristic Search Techniques: Greedy BFS, A*, memory bounded, heuristic functions. Local & Adversarial search: Optimization problems, hill climbing search, simulated annealing, local beam search, genetic algorithms. Online search agents and unknown environments. Optimal decisions in games, alpha-beta pruning, cutting of search, forward pruning, stochastic games, partially observable games. Handling Uncertainty: Quantifying uncertainty, basic probability notation, Baye's theorem, Probabilistic reasoning, representation of conditional distributions, probabilistic reasoning overtime, hidden markov model, Kalman filters, well defined problems and solutions with examples. Applications of AI:- ANN, Fuzzy Systems, NLP, Introduction to Expert systems. Uninformed search strategies-BFS, DFS, Iterative deepening, bidirectional search.

Text Books :

Deepak Khemani. A First Course in Artificial Intelligence, McGraw (India), 2013. Hill Education
Artificial Intelligence a Modern Approach by Peter Norvig and Andrew Rusell, Third Edition, Prentice Hall.

Reference Books :

Stefan Edelkamp and Stefan Schroedl. Heuristic Search: Theory and Applications, Morgan Kaufmann, 2011.

22CSA203: DATA ANALYTICS

L-T-P-S: 4-0-0-0

Credits:4

Prerequisites :Nil

Syllabus:

Programming Essentials in Python Cisco Networking Academy netacad.com Python Essentials , Introduction to Python and computer programming • , Data types, variables, basic input-output operations, basic operators • , Boolean values, conditional execution, loops, lists and list processing, logical and bitwise operations • , Functions, tuples, dictionaries, and data processing • Mögliche Zertifizierung: PCEP Python, packages, string and list methods, and exceptions • , The object-oriented approach: classes, methods, objects, and the standard objective features; exception handling, and working with files • Mögliche Zertifizierung: PCAStatistical Thinking in the Age of Big Data. Exploratory Data Analysis, The Data Science Process, Machine Learning Algorithms, Linear Regression, k-Nearest Neighbors (k-NN), k-means, Logistic Regression, Python Language Basics, IPython, and Jupyter Notebooks: The Python Interpreter, IPython Basics, Python Language Basics, Built-in Data Structures, Functions, and Files, NumPy Basics: Arrays and Vectorized Computation, Introduction to pandas Data Structures, Essential Functionality, Summarizing and Computing Descriptive Statistics Data Loading, Storage, and File Formats: Reading and Writing Data in Text Format, Binary Data Formats, Interacting with Web APIs, Interacting with Databases Data Cleaning and Preparation: Handling Missing Data, Data Transformation, String Manipulation, Data Wrangling: Join, Combine, and Reshape, Hierarchical Indexing, Combining and Merging Datasets, Reshaping and Pivoting, Plotting and Visualization: A Brief matplotlib API Primer, Plotting with pandas and seaborn Other Python Visualization Tools. Data Aggregation and Group Operations: GroupBy Mechanics, Data Aggregation, Apply: General split-apply-combine, Pivot Tables and Cross-Tabulation, Time Series: Date and Time Data Types and Tools, Time Series Basics, Date Ranges, Frequencies, and Shifting, Time Zone Handling, Periods and Period Arithmetic, Resampling and Frequency Conversion, Moving Window Functions.

Text Books:

Doing Data Science: Straight Talk From The Frontline, 1st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013.

McKinney, W. (2012). Python for data analysis: Data wrangling with Pandas, NumPy, and IPython. ” O'Reilly Media, Inc.”.

Reference Books:

Anderson Sweeney Williams (2011). Statistics for Business and Economics. “Cengage Learning”.

22CSA204: APPLIED MACHINE LEARNING

L-T-P-S: 4-0-0-0

Credits:4

Prerequisites : Nil

Syllabus:

Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning
Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias. Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning. Artificial Neural Networks-1–Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm. Artificial Neural Networks-2-Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks. reinforcement Learning – Introduction, the learning task, Q-learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming. Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms. Bayesian learning –Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm. Computational learning theory –Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning. Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms. Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

Textbooks:

Machine Learning – Tom M. Mitchell, - MGH

Reference Books:

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

22CSA205 PROBLEM SOLVING USING PYTHON PROGRAMMING

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Introduction to Computers, Characteristics of Computers, Uses of Computers, Types and Generations of Computers, Units of a computer, CPU, ALU, Memory Hierarchy, Registers, I/O devices, Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation, Algorithms, Flowchart, Flowchart using Raptor Tool, Pseudocode, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming, Structure of a Python Program, Elements of Python, Python Interpreter, Using Python as calculator, Python shell, Indentation, Atoms, Identifiers and keywords, Literals, Strings, Types of Operators, Input and Output Statements, Conditional Statements Control statements: while and for statements, nested loops, Difference between break, continue and pass, Lists, Tuples, Dictionary, Date and time Defining Function, User-Defined Functions, Passing Arguments and Lambda Functions, Creating class and objects, Constructors, Getter and setter methods, static methods, Inheritance, Exception Handling, Modules, import statement, Packages, File handling, Event Driven Programming, GUI Programming, Database Programming, Data Analytics with Python Client server programming with Python, Internet Data Handling and web Programming, The Process of Computational Problem Solving, Python, Programming Language, Python Data Types: Expressions, Variables and Assignments, Strings, List, Objects and Classes, Python Standard Library, Imperative Programming: Python programs, Execution Control, Structures, User-Defined Functions, Python Variables and Assignments, Parameter Passing. Strings, Formatted Output, Files, Errors and Exception Handling, Execution and Control Structures: if Statement, for Loop, Two Dimensional Lists, while Loop, More Loop Patterns, Additional, Iteration Control Statements, Containers and Randomness: Dictionaries, Other Built-in Container Types, Character Encoding and Strings, Module random, Set Data Type. Numerical Computing in Python: NumPy, Vectorized Algorithms, Graphical User Interfaces: Basics of tkinter GUI Development, Event- Based tkinter Widgets, Designing GUIs, OOP for GUI, The Web and Search: The World Wide Web, Python WWW API, String Pattern Matching, Database Programming in Python

Textbooks:

Ljubomir Perkovic, "Introduction to Computing Using Python: An Application Development Focus", Wiley, 2012.

R. Nageswara Rao Core Python Programming Paperback, 2018

Yashavant Kanetkar Let Us Python, 2019

Reference Books:

S.Kuppuswamy, S.Malliga, C.S.Kanimozhi Selvi, K.Kousalya. Problem Solving and Programming. 2019, Tata McGraw Hill.

22CSA206: SECURING WEB SYSTEMS AND NETWORKS

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Web Basics: HTML, CSS, JS, URLs, DOM, Frames, HTTP, Navigation, X-Domain communication, web security, Security elements, Implementation of safety assessment, understanding the dangers of an insecure communication channel, Network Attacks & HTTPS, HTTPS deployment, HTTPS impact on your application, Insights into the latest evolutions for HTTPS deployments, Limitations of HTTPS, Cookie Flaws and Server Misconfiguration. Security of Browser same origin policy, sandbox browser, malicious URL intercept, Rapid development of browser security, cross-site scripting attack, Advanced XSS attack, XSS defence, Cross-Site Request Forgery, Advanced CSRF defence, Clickjacking, HTML5 Securities, other security problems. Injection Attacks, SQL injection attacks, Database attacking techniques properly defending against SQL injection and other injection, File Upload Vulnerability, designing secure file upload features, Authentication and session management, Attacks on User Interfaces, Access control, Encryption algorithms and random numbers, Web framework security, Application-layer Denial-of-Service Attacks, PHP security, TCP Reset Attack. Security of Internet Business, Business logic security, How the account is stolen, Internet garbage phishing, User privacy protection ,Security development lifecycle, Security operations, Process of vulnerability patch, security monitoring, Practical ways to secure the authentication process, prevent authorization bypasses and harden session management mechanisms (10) security planning, business continuity planning, Handling incidents Risk Analysis, Dealing with disaster: privacy on the web, Privacy impacts of emerging technologies, Handling incidents, Risk Analysis, Dealing with disaster: privacy on the web, Privacy impacts of emerging technologies, Browser Design & Flaws.

Text Books:

Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Applications (1 ed.), O'Reilly Media, 2020. ISBN 978- 1492053118.

Reference Books:

Malcolm McDonald, Web Security for Developers (1 ed.), No Starch Press, 2020. ISBN 9781593279957.

22CSA207: Distributed Databases

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Introduction: Distributed Data Processing, Distributed Database System, Promises of DDBSs, Complicating Factors, Problem Areas Distributed DBMS Architecture DBMS Standardization, Architectural Models for Distributed DBMSs, Distributed DBMS Architecture, Global Directory Issues. Distributed Database Design: Alternative Design Strategies, Distribution Design Issues, Fragmentation, Allocation. Semantic Data Control: View Management, Data Security, Semantic Integrity Control. Overview of Query Processing: Query Processing Problem, Objectives of Query Processing, Complexity of Relational Algebra Operations, Characterization of Query Processing, Layers of Query Processing Query Decomposition and Data Localization: Query Decomposition, Localization of Distributed Data Optimization of Distributed Queries Query Optimization, Centralized Query Optimization, Join Ordering in Fragment Queries, Distributed Query Optimization Algorithms.

Textbooks:

Principles of Distributed Database Systems, Second Edition, M.Tamer Ozsü, Patrick Valduriez, Pearson Education, 1999.

Reference Books:

Distributed Database Management Systems: A Practical Approach] Saeed K. Rahimi ,Frank S. Haug , Wiely,2010.

22CSA208: THE JOY OF COMPUTING USING R PROGRAMMING

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Introduction, Reserved Words, Variables & Constants, Operators, Operator Precedence, Decision: if...else, if else () Function. for loop, while Loop, break & next, repeat Loop. Functions, Function Return Value, Environment & Scope, Recursive Function, R Infix Operator, switch, Vectors, Matrix, List, Data Frame, Factor. Descriptive statistics in R: Introduction, Data, Minimum and maximum, Range, Mean, Median, Mode, First and third quartile, other quartiles, Interquartile range, Standard deviation, and variance. Histogram, Bar plot, Coefficient of variation, Boxplot, Contingency table – Mosaic Plot. Probability Distributions – Binomial, Bernoulli, Geometric, Poisson, Exponential, Normal, Uniform distributions. Correlation & Regression - Introduction, Correlation & Regression plot - Scatterplot, Line plot, Classification using logistic regression. Hypothesis testing – Introduction, Hypothesis tests - Proportions, Diff between props, Mean, Diff between means, Diff between pairs, Goodness of fit test- Chi- square test.

Text Books:

Vincent Zoonekynd, Statistics With R Salvatore S. Mangiafico, Summary and Analysis of Extension Program Evaluation in R.

Hadley Wikham & Garrett Grolemond, R for Data Science, O'Reilly Publications

Reference Books:

Garrett Grolemond, Hands-On Programming with R, O'Reilly publications.

Nina Zumel, Jahn Mount, Practical Data Science with R, dreamtech press Winston Chang, R Graphics Cookbook, O'Reilly Publications.

22CSA209 – APPLIED DEEP LEARNING

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Feed forward networks and training, Machine learning vs and Deep learning, Activation functions, initialization, regularization, batch normalization, model selection, ensemble techniques, Convolutional neural networks, Fundamentals, architectures, pooling, visualization Deep learning for spatial localization, Transposed convolution, efficient pooling, object detection, semantic segmentation. Recurrent neural networks Recurrent neural networks (RNN), long-short term memory (LSTM), language models, machine translation, image captioning, video processing, visual question answering, video processing, and learning from descriptions Deep generative models, Boltzmann Machine and Auto-encoders, variational auto-encoders, generative adversarial networks, autoregressive models, generative image models. Deep reinforcement learning, Temporal difference learning, Policy gradient methods, Q-learning, Deep Q-Learning.

Textbook:

1. Goodfellow, Y. Bengio, A. Courville, Deep Learning, MIT Press, 2016. <http://www.deeplearningbook.org>.

Reference Book:

1) François Chollet , Deep learning with Python, 2017 Manning publications

22CSA210: CLOUD INFRASTRUCTURE WITH SERVICES

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Introduction to cloud computing: Definition, roots of clouds, characteristics, Cloud Architecture-public, private, hybrid, community, Advantages & Disadvantages of cloud computing. Virtualization: benefits&drawbacks of virtualization, Virtualization types-operating system virtualization, platform virtualization, storage virtualization, network virtualization, application virtualization, virtualization technologies. Cloud Computing Architecture: Cloud computing stack: Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services; Service Models (XaaS): Infrastructure as a Service (IaaS), Platform as a Service(PaaS), Software as a Service(SaaS); Deployment Models: Public cloud, Private cloud, Hybrid cloud, Community cloud. Accessing the cloud: Hardware and infrastructure requirements; Access Mechanisms: web Applications, web APIs. web Browsers. Cloud Storage and cloud Standards: Overview; Storage as a Service; Cloud Storage issues; Challenges; Standards. Security Issues: Securing the Cloud. Securing Data, Establishing identity and presence. Developing Applications: Major Players in Cloud Business; Overview of Service Oriented Architecture; Tools for developing cloud services and applications.

Text books:

Arshadeep Bagha,vijay Madiseti, Cloud computing-A Hands-on Approach, University press ,2014
Books l. Arrthony T. Velte, Toby J. Velte, and Robert Elsenpeter, Cloud Computing: A Practical Approach, McGraw Hill, 2010.

Reference Books:

Rajkumar Buyya, JamesBroberg. Andrzej Goscinski (Editors), Cloud Computing: Principles and Paradigms, Wiley,2011.
Cloud Computing Bible, Barrie Sosinsky, Wiley-india, 2010.

22CSA211 SERVICE MANAGEMENT IN CLOUD COMPUTING

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Introduction to Cloud Computing and Service Management, Overview of Cloud Computing: Concepts, characteristics, and deployment models. Introduction to Service Management in Cloud Computing. Cloud Service Models Understanding and comparing IaaS, PaaS, SaaS, and FaaS. Service Catalog Management: Service definition, publication, and updates. Service Management in Cloud Computing: Service Level Agreements (SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously, Managing Data, Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud, Large Scale Data Processing. IT Service Management (ITSM) in the Cloud: ITIL (Information Technology Infrastructure Library) in the Cloud. Best practices for IT Service Management in a Cloud environment. Cloud Service Provisioning and Orchestration: Automated provisioning and deprovisioning of cloud resources. Service Orchestration and workflow automation. Cloud Service Security and Compliance: Security challenges and solutions in the cloud. Compliance and regulatory considerations for cloud services. Emerging Trends in Cloud Service Management: Cloud-native technologies and methodologies. Edge computing and its impact on service management.

Text Books:

"Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl, et al.

"Managing Cloud Services" by Markus Linder.

Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012

"ITIL Foundation: ITIL 4 Edition" by AXELOS Global Best Practice.

Reference Books:

"Cloud Computing: Automating the Virtualized Data Center" by Venkata Josyula and Malcom Orr.

"Cloud Security and Governance: Who's on Your Cloud?" by Raj Samani and Jim Reavis.

"Cloud Native Transformation: Practical Patterns for Innovation" by Pini Reznik and Jamie Dobson.

22CSA212- DATA MANAGEMENT IN CLOUD COMPUTING

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Overview of cloud computing models (IaaS, PaaS, SaaS) Cloud service providers and offerings Advantages and challenges of cloud computing Types of cloud storage (object, block, file) Cloud storage providers (e.g., AWS S3, Azure Blob Storage) Data consistency and durability in cloud storage, Data retrieval mechanisms (e.g., RESTful APIs) Query languages and tools (e.g., SQL, NoSQL), Indexing and searching in cloud databases . Data Security and Privacy in the Cloud-Cloud security models and responsibilities, Encryption and key management, Compliance and data privacy regulations, Scalability and Performance Optimization, Horizontal and vertical scaling Load balancing and auto-scaling Caching and optimization techniques, Data Backup and Disaster Recovery Backup strategies and best practices, High availability and fault tolerance, Disaster recovery planning in the cloud. Data Analytics and Machine Learning Big data frameworks (e.g., Hadoop, Spark) Cloud-based analytics and machine learning platforms, Data preprocessing and modelling, Serverless Computing and Data Processing Serverless architecture (e.g., AWS Lambda, Azure Functions) Event-driven data processing Stream processing and real-time analytics. Cloud Data Governance and Compliance -Data governance frameworks, Regulatory compliance, Data lifecycle management

Textbooks:

"Cloud Computing: Principles and Paradigms" by Rajkumar Buyya, James Broberg, and Andrzej M. Goscinski.

Reference Books:

"Amazon Web Services in Action" by Andreas Wittig and Michael Wittig.

"Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems" by Martin Kleppmann.

22CSA213- SECURING CLOUD COMPUTING ENVIRONMENTS

L-T-P-S: 4-0-0-0

Credits:4

Prerequisite: Nil

Syllabus:

Introduction to Cloud Security: Overview of cloud computing models (IaaS, PaaS, SaaS), Cloud security responsibilities (shared responsibility model), Key security challenges in the cloud. Cloud Security Models: Public, private, hybrid, and multicloud models, Security considerations for different deployment models, Identity and Access Management (IAM) in the cloud. Threats and Vulnerabilities- Common cloud security threats (e.g., data breaches, DDoS), Vulnerability assessment and risk analysis, Security auditing and compliance Data Security in the Cloud: Encryption and key management, Data masking and tokenization, Data loss prevention (DLP) strategies. Network and Application Security- Virtual private clouds (VPCs) and network security groups, Web application firewall (WAF) and API security, Security in serverless computing. Identity and Access Management: Role-based access control (RBAC), Multi-factor authentication (MFA), Single sign-on (SSO) and identity federation. Cloud Security Monitoring and Incident Response- Security information and event management (SIEM), Cloud-specific monitoring tools, Incident response planning and execution. Compliance and Legal Considerations: Cloud compliance frameworks (e.g., GDPR, HIPAA) International data transfer regulations, Legal aspects of cloud contracts and service-level agreements (SLAs), Cloud Security Best Practices- Security by design principles, DevSecOps and continuous security, Third-party risk assessment and vendor security.

Textbooks:

"The Art of Scalability: Scalable Web Architecture, Processes, and Organizations for the Modern Enterprise" by Martin L. Abbott and Michael T. Fisher.

"Data Governance: How to Design, Deploy, and Sustain an Effective Data Governance Program" by John Ladley

Reference Books:

"Mastering Cloud Computing: Foundations and Applications Programming" by Rajkumar Buyya, Christian Vecchiola, and S. Thamarai Selvi.

"Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance" by Tim Mather, Subra Kumaraswamy, and Shahed Latif.