Integral University, Lucknow
Department of Computer Application
STUDY & EVALUATION SCHEME
Choice Based Credit System

Master of Computer Application (MCA)
w.e.f. Session 2020-21

Year Ist, Semester IInd

S. No.	Course Category	Subject Code	Name of the Subject	Periods				Evaluation Scheme				Subject Total
								Sessional (CA)			End Sem. Exam	
				L	T	P	C	UE	TA	Total	ESE	
1.	Core	CA460	Data Structure and Analysis of Algorithms	3	1	0	4	40	20	60	40	100
2.	Core	CA461	Computer Networks	3	1	0	4	40	20	60	40	100
3.	Core	CA462	Distributed System	3	1	0	4	40	20	60	40	100
4.	Core	CA463	Database Management System	3	1	0	4	40	20	60	40	100
5.	Core	CA464	Object Oriented Programming using JAVA	3	1	0	4	40	20	60	40	100
6.	Elective –I			3	1	0	4	40	20	60	40	100
7.	Core	CA471	Data Structure and Algorithms Lab	0	0	3	1	40	20	60	40	100
8.	Core	CA472	DBMS Lab	0	0	3	1	40	20	60	40	100
9.	Core	CA473	JAVA Lab	0	0	2	1	40	20	60	40	100
Total				**18**	**6**	**8**	**27**					**900**

L - Lecture **T** – Tutorial **P** – Practical **C** – Credit **UE**– Unit Exams **TA** – Teacher Assessment
Sessional Total (CA) = Class Test + Teacher Assessment

Subject Total = Sessional Total (CA) + End Semester Examination (ESE)

Elective – I
CA465 Data Warehousing and Data Mining
CA466 Data Science
CA467 ERP Systems
CA468 Storage Technology and Management
CA469 Automata Theory
CA470 Android Programming

CA460 DATA STRUCTURE AND ANALYSIS OF ALGORITHMS
w.e.f. Session 2020-21

PREREQUISITE: NONE **COREQUISITE: CA471** **L T P**
3 1 0

UNIT-I

Introduction: Basic Terminology, Elementary Data Organization and Data Structure Operations.

Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, Address Calculation, Application of Arrays, Character String in C and Character String Operation.

Algorithm Analysis: Asymptotic Notation, Growth of Functions. Recurrences: Master's Theorem. [8]

UNIT-II

Linked List: Introduction, Representation and Implementation of Linked Lists, Types of Linked List, Operations of Linked List and application of Linked List.

Searching and Hashing: Sequential Search, Binary Search, Comparison, Analysis and Hashing. [8]

UNIT-III

Queues: Array, Linked Representation and Implementation of Queues, Operations on Queues, Types of Queues.

Stacks: Array, Linked Representation and Implementation of Stack. Operations on Stacks: PUSH and POP. Application of Stack: Conversion of Infix to prefix and Postfix Expressions, Evaluation of Postfix Expression using Stack and Tower of Hanoi Problem. [8]

UNIT-IV

Trees: Basic Terminology, Types of Tree, Array and Linked Representation of Binary Tree, Operation on Binary Tree, Tree Traversing Techniques, Application of Trees.

Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST.

Height Balancing Trees: AVL Tree, B-Tree

Elementary Graph Algorithms: Terminology and Representations, Graphs and Multi-Graphs, Directed Graphs. Traversal of Graphs: Breadth First Search, Depth First Search.

Minimum Spanning Trees: Kruskal and Prim's Algorithms. [8]

UNIT-V

Design Techniques: Divide and Conquer, Strassen's Matrix Multiplication.

Sorting: Insertion Sort, Quick Sort, Merge Sort, Heap Sort.

The Greedy Method: General Method, Knapsack Problem, Huffman Algorithm. Single Source Shortest Paths: Dijkstra's Algorithm, Bellman-Ford Algorithm.

Dynamic Programming: General Method. All Pair Shortest Paths: Floyd-Warshall Algorithm, Introduction to Backtracking. [8]

REFRENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", The MIT Press Cambridge, Massachusetts London, England McGraw-Hill Book Company, 1990, North America.
2. A. M. Tenenbaum, "Data Structures using C & C++", PHI Pvt. Ltd., 1989, India, New Delhi.

3. Horwitz and Sahani, “Fundamental of Computer Algorithm”, Galgotia Publication Pvt. Ltd., 1978, India, New Delhi.
4. Seymour Lipschutz, “Data Structures with C (Schaum's Outline Series)", Mcgraw-hill Publishing Company Limited, 2006, India, New Delhi.
5. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publication Pvt. Ltd., 2006, India, New Delhi.

CA461 COMPUTER NETWORKS
w.e.f. Session 2020-21

PREREQUISITE: NONE **COREQUISITE: NONE** **L T P**
3 1 0

UNIT-I
Introductory Concepts: Goals and Applications of Networks, Network Structure and Architecture, OSI Reference Model, Network Topology. Physical Layer: Transmission, Switching Methods, Multiplexing. Introduction to Digital Communication: Line Coding Techniques [8]

UNIT-II
Medium Access Sub Layer: Channel Allocations, LAN Protocols, ALOHA Protocols, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision Free Protocols, IEEE Standards (802.34, 802.4, 802.5, and 802.6) and FDDI.
Data Link Layer: Elementary Data Link Control Protocols, Sliding Window Protocols, Error Handling (Error-Correction and Detection) and HDLC. [10]

UNIT-III
Network Layer: Point to Point Networks, Routing Algorithms, Congestion Control Algorithms and Leaky Bucket Algorithm.
Internetworking: Overview, TCP/IP Model. Network Layer: IP Protocol, IP Addresses, IPv4 and IPv6. [8]

UNIT-IV
Transport Layer: Duties of Transport Layer, Connection Management, TCP Window Management, User Datagram Protocol, Transmission Control Protocol.
Session Layer: Session and Transport Interaction, Synchronization Points, Session Protocol Data Unit.
Presentation Unit: Translation, Encryption/ Decryption, Authentication, Data Compression. [8]

UNIT-V
Application Layer: Network Security, DES, RSA Algorithms. Domain Name System, Simple Network Management Protocol, Electronic Mail, File Transfer Protocol, Hyper Text Transfer Protocol, Cryptography and Compression Techniques. [6]

REFERENCES:

1. A. S. Tanenbaum, David J. Wetherall, “Computer Networks”, 3rd Edition PHI, 2011, India, New Delhi.
2. Behrouz Forouzan, “Data Communication and Networking”, TMH, 2012 India, New Delhi.
3. W. Stallings, “Data and Computer Communication”, Macmillan Press, 2014 India, New Delhi.
4. Dr. Douglas Comer, “Computer Networks and Internet”, PHI, 2014, India, New Delhi.
5. Douglas Comer, David L. Stevens, “Internetworking with TCP/IP”, PHI, 2006, USA, Washington.

CA462 DISTRIBUTED SYSTEM
w.e.f. Session 2020-21

PREREQUISITE: NONE **COREQUISITE: NONE** **L T P**
3 1 0

UNIT-I
Introduction to Distributed Systems: System Architecture, Issues in Distributed System, Global Knowledge, Naming, Scalability, Compatibility, Process Synchronization, Security, Theoretical Foundation for Distributed Systems.
Limitation of Distributed Systems: Absence of Global Clock and Shared Memory, Lamport's Logical Clock, Vector Clocks, Causal Ordering of Messages, Global State, Termination Detection. [8]

UNIT-II
Distributed Mutual Exclusion: Introduction, Classification of Mutual Exclusion Algorithms, Requirement of Mutual Exclusion Algorithms, Non Token Based and Token Based Algorithms, Comparative Performance Analysis.
Distributed Deadlock Detection: System Model, Resource Vs Communication Deadlock. Deadlock Handling Strategies: Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Resolution, Centralized and Distributed Deadlock Detection Algorithms. [8]

UNIT-III
Agreement Protocols: Introduction, System Model.
Classification of Agreement Problem: Byzantine Agreement Problem, Consensus Problem, Interactive Consistency Problem, Solution to Byzantine Agreement Problem, Application of Agreement Problem.
Distributed File Systems: Introduction, Architecture. Building Mechanism: Mounting Caching, Hints, Bulk Data Transfer and Encryption. Design Issues: Naming and Name Resolution, Caches on Disk or Main Memory, Writing Policy. [8]

UNIT-IV
Distributed Shared Memory: Introduction, Architecture and Motivation, Algorithm for Implementing DSM, Memory Coherence, Coherence Protocols.
Distributed Scheduling: Issues in Load Distribution, Component of Load Distribution Algorithms, Load Distribution Algorithms, Performance Comparison, Task Migration. Introduction to Fault Tolerance, Data Security, Encryption, Multiprocessor Operating Systems. [8]

UNIT-V
Distributed Algorithms: Introduction to Communication Protocols, Balanced Sliding Window Protocol, Routing Algorithms, Destination Based Routing, APSP Problem, Deadlock Free Packet Switching, Introduction to Wave and Traversal Algorithms, Election Algorithms. [8]

REFERENCES:

1. Singhal, Shivratri, "Advanced Concept of Operating Systems", TMH, 2017, India, New Delhi.
2. Colourisis, Dollimore, Kindberg, Blair, "Distributed Systems", Pearson, 2011, India, New Delhi.

CA463 DATABASE MANAGEMENT SYSTEM
w.e.f. Session 2020-21

PREREQUISITE: NONE **COREQUISITE: CA472** **L T P**
3 1 0

UNIT-I

Introduction: An Overview of Database Management System, Database System Vs. File System, Database System Concepts and Architecture, Data Models, Schema and Instances, Data Independence, Database Language and Interfaces, Data Definitions Language and Data Manipulation Language, Overall Database Structure.

Data Modeling Using The Entity-Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model. [8]

UNIT-II

Relational Data Model and Language: Relational Data Model Concepts, Integrity Constraints: Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra and Relational Calculus, Tuple and Domain Calculus.

Introduction To SQL: Characteristics of SQL, Advantages of SQL, SQL Data Types and Literals, Types of SQL Commands, SQL Operators and their Procedure, Tables, Views, Indexes, Queries and Sub Queries, Aggregate Functions, Insert, Update and Delete Operations, Joins, Union, Intersection, Minus, Cursors, Triggers and Procedures in SQL, PL/SQL. [8]

UNIT-III

Database Design and Normalization: Functional Dependencies, Normal Forms: First, Second, Third Normal Forms, BCNF, Fourth Normal Form, Fifth Normal Form, Inclusion Dependencies, Lossless Join Decompositions, Normalization using FD, MVD and JDs, Alternative Approaches to Database Design. [8]

UNIT-IV

Transaction Processing Concepts: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict and View Seralizable Schedule, Recoverability, Recovery from Transaction Failures, Log-Based Recovery, Checkpoints and Deadlock Handling. [8]

UNIT-V

Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi-Version Schemes, Recovery with Concurrent Transaction, Basic Architecture and Case Study of Oracle.

Object-Oriented Database: Introduction, Object-Oriented Database Concepts, Application of OODBMS, Comparison with RDBMS. [8]

REFERENCES:

1. C. J. Date, A. Kannan and S. Swamynathan, "An Introduction to Database Systems", Pearson Education, 8th edition, 2009, USA, Washington.
2. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, "Database System Concepts", McGraw-Hill Education, 7th edition, 2020, USA, New York.
3. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson Education, 7th edition, 2016, USA, New York.

CA464 OBJECT ORIENTED PROGRAMMING USING JAVA
w.e.f. Session 2020-21

PREREQUISITE: NONE **COREQUISITE: CA473** **L T P**
3 1 0

UNIT-I

Introduction to Object Oriented System: Object Oriented Concepts, Modelling as a Design Technique, Modelling Concepts, The Three Models, Object Model, Dynamic Model and Functional Model.

Core Java: Introduction, Operators, Data Type, Variable, Arrays, Control Statements, Methods and Classes, Inheritance. [8]

UNIT-II

Core Java: Package and Interface, Exception Handling, Multithread Programming and String Handling.

Java Applets: Java Applet, Introduction to AWT, AWT Controls, Layout Managers, Menus, Images, Graphics, Event Handling, Networking. [8]

UNIT-III

Java Swings: Creating a Swing Applet and Applications, Programming using Panes, Scroll Panes, Layered Panes, Tabbed Panes, Split Panes, Swing Controls Labels, Text Fields, Buttons, Toggle Buttons, Checkboxes, Radio Buttons, View Ports, Scroll Bars, Lists, Combo Box, Progress Bar, Menus and Toolbars, Layouts, Dialog Boxes, Inner Frame. [8]

UNIT-IV

JDBC: The Connectivity Model, JDBC Drivers, Java SQL Package, Connectivity to Remote Database, Navigation in Database.

RMI: Introduction to RMI(Remote Method Invocation), A simple Client-Server Application using RMI.

[8]

UNIT-V

EJB: Introduction to Enterprise Java Beans (EJB), Session Beans, Entity Beans and Message Beans.

Java Servlets: Servlet Basics, Servlet API Basic, Life Cycle of a Servlet, Running a Servlet, Cookies, Introduction to Java Server Pages (JSP). [8]

REFERENCES:

1. Margaret Levine Young, “The Complete Reference Internet”, TMH, 2002, India, New Delhi.
2. Naughton, Schildt, “The Complete Reference JAVA2”, TMH, 2018, India, New Delhi.
3. Balagurusamy E, “Programming in JAVA”, TMH, 2019, India, New Delhi.
4. Dustin R. Callway, “Inside Servlets”, Addison Wesley, 2001, USA, Boston.

CA465 DATA WAREHOUSING AND DATA MINING
w.e.f. Session 2020-21

PREREQUISITE: NONE **COREQUISITE: NONE** **L T P**
3 1 0

UNIT-I
DSS Uses, Definition, Operational Database, Introduction to Data Warehousing, Data Mart, Concept of Data Warehousing, Multi Dimensional Database Structures, Client/Server Computing Model and Data Warehousing, Parallel Processors and Cluster Systems, Distributed DBMS Implementations. [8]

UNIT-II
Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, DBMS Schemas for Decision Support, Data Extraction, Cleanup and Transformation Tools, Metadata. [8]

UNIT-III
Reporting and Query Tools, Applications, Online Analytical Processing (OLAP), Patterns and Models, Statistics, Artificial Intelligence. [8]

UNIT-IV
Data Mining, Introduction to Data Mining, Techniques of Data Mining, Decision Trees, Neural Networks, Nearest Neighbor and Clustering, Genetic Algorithms, Rule Introduction, Selecting and using the Right Technique. [8]

UNIT-V
Multimedia Databases, Mining Multimedia Data, Data Mining and the World Wide Web, Web Data Mining, Mining and Meta Data, Data Visualization and Overall Perspective, Data Visualization, Applications of Data Mining [8]

REFERENCES:

1. Berson, “Data Warehousing, Data-Mining and OLAP”, TMH, 2004, India, New Delhi.
2. Mallach, “Decision Support and Data Warehousing System”, TMH, 2002, India, New Delhi.
3. Bhavani Thura-Is-Ingham, “Data-Mining Technologies, Techniques Tools and Trends”, CRC Press, 2014, USA, Florida.
4. Navathe, “Fundamental of Database System”, Pearson, 2016, India, New Delhi.
5. Margaret H. Dunham, “Data-Mining. Introductory and Advanced Topics”, Pearson, 2011, India, New Delhi.
6. Pieter Adriaans, Dolf Zantinge, “Data-Mining”, Pearson, 1998, USA, Washington.

CA466 DATA SCIENCE
w.e.f. Session 2020-21

PREREQUISITE: NONE	**COREQUISITE: NONE**	**L T P**
		3 1 0

UNIT-I

Introduction to Data Science: Basic terminology, Data Science Venn Diagram, Benefits and uses of Data Science, Data Science case studies.

Data Science Road Map: Data types: Structured, Unstructured, Natural language, Machine-Generated, Graph-Based, Audio, video, and images, Streaming. Levels of Data: Nominal level, Ordinal level, Interval level, Ratio level. [8]

UNIT-II

The Data Science Process: Overview and steps of the Data Science Process: Setting the Research goal, Retrieving Data, Data Preparation, Data Exploration, Data Modeling or Model Building, Presentation and Automation. Case Study: Global Innovation Network and Analysis (GINA).

Handling Large Data: Problems in Handling Large Data, General Techniques for Handling Large volumes of Data, General programming tips for dealing with Large Data Sets. [8]

UNIT-III

Machine Learning: Machine Learning, Applications and Use of Machine Learning in Data Science, Modeling Process used in Machine Learning, Types of Machine Learning, Case study.

Programming Languages for Data Science: Python, R programming, MATLAB, Octave, SAS, Scala.

Basic Mathematics Used in Data Science: Basic Symbols/Terminology, Logarithms/Exponents, Set Theory, Calculus, Matrix (linear) Algebra. [8]

UNIT-IV

Basic Data Analytic Methods: Exploratory Data Analysis: Visualization before Analysis, Dirty Data, Visualizing a Single Variable, Examining Multiple Variables, Data Exploration vs. Presentation.

Statistical Methods for Evaluation: Hypothesis Testing, Difference of Means, Type I and Type II Errors, ANOVA.

Advanced Analytical Methods: Regression Analysis, Linear Regression, Logistic Regression, Reasons to choose and cautions, Additional Regression Models. [8]

UNIT-V

Text Mining and Text Analytics: Importance of Text Mining, Text Mining in the real world, Applications of Text Mining. Text Mining Techniques: Bag of Words, Stemming and Lemmatization, Decision Tree Classifier, Case study: Classifying Reddit posts.

Advanced Analytical Methods for Text Analysis: Text Analysis Steps, A Text Analysis example, Collecting Raw Text. Representing Text, Term Frequency— (TFIDF), Categorizing Documents by Topics, Determining Sentiments. [8]

REFERENCES:

1. Davy Cielen, “Introducing Data Science”, Manning Publications Co., 2016, USA, New York.
2. Sinan Ozdemir, “Principles of Data Science”, Packt Publishing Ltd., 2016, U.K, Birmingham.

3. David Dietrich, “Data Science and Big Data Analytics”, John Wiley & Sons, Inc., 2015, U.S.A, New Jersey.
4. T. H. Davenport, “Data Scientist: The Sexiest Job of the 21st Century,” Harvard Business Review, October 2012, USA, Harvard.
5. The R Project for Statistical Computing, “R Licenses.” [Online]. Available: http://www.rproject.org/Licenses/.

CA467 ERP SYSTEMS
w.e.f. Session 2020-21

PREREQUISITE: NONE **COREQUISITE: NONE** **L T P**
3 1 0

UNIT-I
Enterprise Wide Information System, Custom Built and Packaged Approaches, Needs and Evolution of ERP Systems, Common Myths and Evolving Realities, ERP and Related Technologies, Business Process Reengineering and Information Technology, Supply Chain Management, Relevance to Data Warehousing, Data Mining and OLAP, ERP Drivers, Decision Support System. [8]

UNIT-II
ERP Domain, ERP Benefits Classification, Present Global and Indian Market Scenario, Milestones and Pitfalls, Forecast, Market Players and Profiles, Evaluation Criterion for ERP Product. ERP Life Cycle: Adoption Decision, Acquisition, Implementation, Use and Maintenance, Evolution and Retirement Phases, ERP Modules. [8]

UNIT-III
Framework for Evaluating ERP Acquisition, Analytical Hierarchy Processes (AHP), Applications of AHP in Evaluating ERP, Selection of Weights, Role of Consultants, Vendors and Users in ERP Implementation, Implementation Vendors Evaluation Criterion, ERP Implementation Approaches and Methodology, ERP Implementation Strategies, ERP Customization, ERP-A Manufacturing Perspective. [8]

UNIT-IV
Critical Success and Failure Factors for Implementation, Model for Improving ERP Effectiveness, ROI of ERP Implementation, Hidden Costs, ERP Success Inhibitors and Accelerators, Management Concern for ERP Success, Strategic Grid, Useful Guidelines for ERP Implementations. [8]

UNIT-V
Technologies in ERP Systems and Extended ERP, Case Studies of Development and Analysis of ERP Systems, Implementation through Soft System Approaches or Qualitative Analysis Tools, Learning and Emerging Issues, ERP and E-Commerce. [8]

REFERENCES:

1. Alexis Leon, "Enterprise Resource Planning", 1999, India, New Delhi.
2. Brady, Joseph A. Monk, Ellen F. Wagner, Bret J., "Enterprise Resource Planning", Course Technology, Thomson Learning, 2008**,** USA, Mishawaka.

CA468 STORAGE TECHNOLOGY AND MANAGEMENT
w.e.f. Session 2020-21

PREREQUISITE: NONE **COREQUISITE: NONE** **L T P**
3 1 0

UNIT-I
Introduction to Storage Technology: Data Proliferation, Varying value of Data with time and usage, Sources of Data and States of Data Creation, Data Center need and its requirements, Evolution of Storage, Overview of basic Storage Management skills and activities, The five pillars of Technology, Overview of Storage Infrastructure Components, Information Lifecycle Management Concept, Data Categorization within an Enterprise. [8]

UNIT-II
Storage Systems Architecture: Intelligent Disk Subsystems Overview, Contrast of Integrated vs. Modular Arrays, Component Architecture of Intelligent Disk Subsystems, Disk Physical Structure Components, Properties, Performance and Specifications, Logical partitioning of Disks, RAID and Parity Algorithms, Hot Sparing, Physical vs. Logical Disk Organization, Protection and Back End Management, Array Caching Properties and Algorithms, Front End Connectivity and Queuing properties, Front End to Host Storage Provisioning, Mapping and Operation, Interaction of File Systems with Storage, Storage System Connectivity Protocols. [8]

UNIT-III
DAS(Direct Attached Storage): Elements, Connectivity and Management.
NAS(Network Attached Storage): Elements, NFS, CiFS, FTP, Filers and Appliances, Configuration and Management.
SAN(Storage Area Network): Elements, FCP, ISCSI, FCIP, SAN Configuration and Management.
CAS(Content Addressable Storage): Elements, Connectivity and Management Storage Interfaces: SCSI, SATA, IDE, Storage Virtualization at various layers, HA Solutions, Advantages and uses. [8]

UNIT-IV
Introduction to Information Availability: Business Continuity and Disaster Recovery Basics, Local Business Continuity Techniques, Remote Business Continuity Techniques, Disaster Recovery Principles and Techniques. [8]

UNIT-V
Managing and Monitoring: Management Philosophies (Holistic vs. System and Component), Industry Management Standards (SNMP, SMI-S, CIM), Standard Framework Applications, Key Management Metrics (Thresholds, Availability, Capacity, Security, Performance), Metric Analysis Methodologies and Trend Analysis, Reactive and Pro-active Management Best Practices, Provisioning and Configuration Change Planning, Problem Reporting, Prioritization and Handling Techniques, Management Tools Overview. [8]

REFERENCES:

1. Barry Mellish, Jure Arzensek, Christian Demmer, Noam Rosen, “Fiber Array Storage Technology A FAST Introduction”, IBM Corp., Redbooks, 2001, New Jersey, USA.
2. Greg Schulz, “Resilient Storage Networks: Designing Flexible Scalable Data Infrastructure”, Elsevier Digital Press, 2004, Massachusetts, USA.

CA469 AUTOMATA THEORY
w.e.f. Session 2020-21

PREREQUISITE: NONE **COREQUISITE: NONE** **L T P**
3 1 0

UNIT-I

Introduction of Automata: Definition, Description of a Finite Automata, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA) and Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ε-Transition, Equivalence of NFA's with and without ε-Transition.

Finite Automata with Output: Moore Machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata. [8]

UNIT-II

Regular Expressions and Languages: Regular Expressions, Transition graph, Kleen's theorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic method Using Arden's theorem, Construction of Finite Automata Equivalent a Regular Expression, Equivalence of two Regular Expression, Pumping Lemma, Application of Pumping Lemma, Regular Sets and Regular grammar. [8]

UNIT-III

Context Free Grammar (CFG): Definition, Derivations, Languages, Derivative Trees and Ambiguity, Construction of Reduced Grammars, Elimination of Null Production, Elimination of Unit Production, Conversion of FA into CFG and Regular Grammar into FA, Normal Forms-Chomsky Normal Form(CNF), Greibach Normal Form (GNF), Chomsky hierarchy. [8]

UNIT-IV

Push Down Automata (PDA): Definition, Acceptance by PDA, Push Down automata for context Languages, Context Free Grammars (CFG) for Pushdown Automata, Two Stack Pushdown Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL, Programming Problems based on the properties of CFLs. [8]

UNIT-V

Turing Machines and Recursive Function: Basic Turing Machine Model, Representation of Turing Machines, Language acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing Machine, Recursively Enumerable Language, Post's Correspondence Problem, Introduction to Recursive Function Theory. [8]

References:

1. J. E. Hopcraft, R. Motwani, and Ullman, "Introduction to Automata theory, Languages and Computation", 2nd edition, Pearson Education Asia, 2001, India, New Delhi.
2. J. C. Martin, "Introduction to Languages and the Theory of Computation", 3rd edition, TMH, 2013, India, New Delhi.

3. K.L.P. Mishra and N. Chandrasekaran, “Theory of Computer Science Automata, Languages and Computation”, 3rd edition, PHI Learning Private Limited, 2012, India, New Delhi.
4. Y. N. Singh, “Mathematical Foundation of Computer Science”, New Age International Private Limited, 2005, India, New Delhi.

CA470 ANDROID PROGRAMMING
w.e.f. Session 2020-21

PREREQUISITE: NONE **COREQUISITE: NONE** **L T P**
3 1 0

UNIT-I
Basic of Android Programming: Introduction to Android OS, Flavors of Android Operating Systems, Setting up the Android Application Development Environment, Creating, Testing and Debugging Applications, Android Stack, Android Applications Structure, Challenges of developing for Android. Activity Life Cycle: Activity Lifecycle Callback Methods, Activity Instance State, Understanding Implicit and Explicit Intents. [8]

UNIT-II
User Interface in Android: Adaptive and Responsive User Interfaces. User Input Controls: Getting user input, Changing Keyboards, Buttons, Dialogs and Pickers, Spinners, Checkboxes, and Radio Buttons, Gestures, Speech Recognition, Sensors. Menus: Options Menu, Contextual Menus, and Popup Menu, Adding Menu Items, Handling on Clicks from Menus. Screen Navigation: Different ways a user can navigate through an app, Action Bar, Settings Menu, Navigation Drawer, Directed Workflow, Recycler View, Drawables. Themes and Styles: Best practices for Themes and Styles, Performance benefits for Themes. Fragments: Fragment Life Cycle, Introduction to Material Design, Testing the user interface. [8]

UNIT-III
Background Tasks: AsyncTask, AsyncTaskLoader: Introduction to AsyncTaskLoader, LoadInBackground(), AsyncTaskLoader callbacks, Benefits of Loaders, Connecting App to Internet. Broadcast Receivers: Broadcast Receiver and Broadcast Intent, Broadcast Receiver Security and Lifecycle. Services: Difference between Activity and Service, Start and 10 Stop Services, Lifecycle Methods, Foreground Services, Intent Service Class, App priority (critical, high, low). Notifications: Notification Design Guidelines, Alarm Managers. [8]

UNIT-IV
Sensor, Location and Maps: Sensor Basic, Motion and Position Sensors, Location Services, Google Maps API, Google Places API.
Working with Data in Android: Shared Preferences, App Setting, SQLite primer, Store Data using SQLite database, Content Providers, Content Resolver, Loader [8]

UNIT-V
Performance Improvement of App: Performance Parameters, Profiling Tools, Rendering and Layout, Garbage Collection and Memory Leaks, Best Practices.
Publishing Your App: Preparing for Publishing, Signing and Preparing the Graphics, Publishing to the Android Market. [8]

REFERENCES:

1. J.F. DiMarzio, “Android: A Programmer’s Guide”, TMH; 1st edition, 2008, India, New Delhi.
2. Zigurd Mednieks, “Programming Android”, O′Reilly, 2013, USA, Sebastopol.
3. Ian G. Clifton, “Android User Interface Design: Turning Ideas and Sketches into Beautifully Designed Apps”, Pearson, 2013, USA, Washington.
4. Reto Meier, “Professional Android 4 Application Development”, Wiley, 2012, India, New Delhi.

CA471 DATA STRUCTURE AND ALGORITHMS LAB
w.e.f. Session 2020-2021

PREREQUISITE: NONE **COREQUISITE: CA460** **L T P**
0 0 3

1. Implementing Concept of Sorting Using C Programming Language
   i. Program to demonstrate the working of Bubble sort, Insertion sort, Selection sort.
   ii. Program to demonstrate the working of Merge sort.
   iii. Program to demonstrate the working of Quick sort.
   iv. Program to demonstrate the working of Heap sort.

2. Implementing Concept of Searching Using C Programming Language
   i. Program to demonstrate the working of Linear Search.
   ii. Program to demonstrate the working of Binary Search.

3. Implementing Concept of Linear Data Structure C Using Programming Language
   i. Program to demonstrate array implementation of Stack, Queue, Circular Queue, and Linked List.
   ii. Program to demonstrate Implementation of Stack, Queue, Circular Queue, and Linked List using Dynamic Memory Allocation.

4. Implementing Concept of Non Linear Data Structure Using C Programming Language
   i. Program to demonstrate the working of Binary tree.
   ii. Program to demonstrate the working of Tree Traversals (Preorder, Inorder, Postorder).
   iii. Program to demonstrate the working of Graph Traversal (BFS, DFS).
   iv. Program to demonstrate the working of Minimum Cost Spanning Tree (Prims or Kruskal's) algorithm.

CA472 DBMS LAB
w.e.f. Session 2020-21

PREREQUISITE: NONE	**COREQUISITE: CA463**	**L T P**
		0 0 3

Programs to be implemented in SQL using Oracle:-

1. Overview of RDBMS, Create Table, Drop Table, Delete Table, Alter and Truncate Table commands.
2. Insertion, Deletion, Updation and Retrieval of data, Operators, Expressions, Where Clause, AND and OR Clauses.
3. Like Clause, Order By, Group By, Having Clause, Distinct Keyword, Functions(Aggregate and Scalar).
4. Constraints, Joins, Union Clause, NULL Values, Alias Syntax.
5. PL/SQL - Introduction of PL/SQL, Advantages of PL/SQL, PL/SQL character set and Data Types, Executing PL/SQL.
6. Control structure Conditions and Loops.
7. Procedures and Functions- Definition, Creating, Parameters.
8. Concept of Cursors and Triggers.
9. Concept of Indexing and Views.
10. Concept of Rollback and Commit, Grant and Revoke Permission.

CA473 JAVA LAB
w.e.f. Session 2020-21

PREREQUISITE: NONE	**COREQUISITE: CA464**	**L T P**
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1. Program illustrating overloading methods and various forms of Inheritance.
2. Program to create Packages and Interface in Java.
3. Program to create multiple Threads in Java.
4. Program to handle exceptions in Java.
5. Understand and handle Mouse Events, Keyboard Events using Layout Manager using AWT and Java Swings.
6. Adding Text Area, Canvas, Scroll Bars, Frames and Menus using AWT and Java Swings.
7. Writing Java Applets.
8. Client Server interaction with stream socket connections (Use Net Package).
9. Client Server application using RMI.
10. Writing Java Servlets.
11. Program using JDBC.
12. Develop a Mini Project using advance concepts of Java.