

Syllabus

MCA 1st Year IInd Semester

**MCA (MASTER OF COMPUTER APPLICATION)
FIRST YEAR SYLLABUS
SEMESTER-II**

KCA201: THEORY OF AUTOMATA & FORMAL LANGUAGES		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to		
CO 1	Define various types of automata for different classes of formal languages and explain their working.	K ₁ , K ₂
CO 2	State and prove key properties of formal languages and automata.	K ₁ , K ₃
CO 3	Construct appropriate formal notations (such as grammars, acceptors, transducers and regular expressions) for given formal languages.	K ₃ , K ₄
CO 4	Convert among equivalent notations for formal languages.	K ₃
CO 5	Explain the significance of the Universal Turing machine, Church-Turing thesis and concept of Undecidability.	K ₂
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Basic Concepts and Automata Theory: Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, 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, Myhill-Nerode Theorem, Simulation of DFA and NFA.	08
II	Regular Expressions and Languages: Regular Expressions, Transition Graph, Kleene's Theorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem, Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, Decidability- Decision properties, Finite Automata and Regular Languages, Regular Languages and Computers, Simulation of Transition Graph and Regular language.	08
III	Regular and Non-Regular Grammars: Context Free Grammar (CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form (CNF), Greibach Normal Form (GNF), Chomsky Hierarchy, Programming problems based on the properties of CFGs.	08
IV	Push Down Automata and Properties of Context Free Languages: Nondeterministic Pushdown Automata (NPDA)- Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown Automata (DPDA) and Deterministic Context free Languages (DCFL),	08

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	Pushdown Automata for Context Free Languages, Context Free grammars 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.	
V	Turing Machines and Recursive Function Theory : 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, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Halting Problem, Post Correspondence Problem, Introduction to Recursive Function Theory.	08
Suggested Readings: <ol style="list-style-type: none">1. J.E. Hopcraft, R. Motwani, and Ullman, "Introduction to Automata theory, Languages and Computation", Pearson EducationAsia,2nd Edition.2. J. Martin, "Introduction to languages and the theory of computation", McGraw Hill, 3rd Edition.3. C. Papadimitrou and C. L. Lewis, "Elements and Theory of Computation", PHI.4. K.L.P. Mishra and N. Chandrasekaran , "Theory of Computer Science Automata Languages and Computation" , PHI.5. Y.N. Singh, "Mathematical Foundation of Computer Science", New Age International.		

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KCA202 : OBJECT ORIENTED PROGRAMMING		
Course Outcome (CO)	Bloom's Knowledge Level (KL)	
At the end of course , the student will be able to		
CO 1	List the significance and key features of object oriented programming and modeling using UML	K ₄
CO 2	Construct basic structural, behavioral and architectural models using object oriented software engineering approach.	K ₆
CO 3	Integrate object oriented modeling techniques for analysis and design of a system.	K ₄ , K ₅
CO 4	Use the basic features of data abstraction and encapsulation in C++ programs.	K ₄
CO 5	Use the advanced features such as Inheritance, polymorphism and virtual function in C++ programs.	K ₃ , K ₄
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction: Object Oriented Programming: objects, classes, Abstraction, Encapsulation, Inheritance, Polymorphism, OOP in Java, Characteristics of Java, The Java Environment, Java Source File Structure, and Compilation. Fundamental Programming Structures in Java: Defining classes in Java, constructors, methods, access specifiers, static members, Comments, Data Types, Variables, Operators, Control Flow, Arrays.	08
II	Inheritance, Interfaces, and Packages: Inheritance: Super classes, sub classes, Protected members, constructors in sub classes, Object class, abstract classes and methods. Interfaces: defining an interface, implementing interface, differences between classes and interfaces and extending interfaces, Object cloning, inner classes. Packages: Defining Package, CLASSPATH Setting for Packages, Making JAR Files for Library Packages, Import and Static Import Naming Convention For Packages, Networking java.net package.	08
III	Exception Handling, I/O: Exceptions: exception hierarchy, throwing and catching exceptions, built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics: Byte streams and Character streams, Reading and Writing, Console Reading and Writing Files.	08
IV	Multithreading and Generic Programming: Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming: Generic classes, generic methods, Bounded Types: Restrictions and Limitations.	08
V	Event Driven Programming: Graphics programming: Frame, Components, working with 2D shapes, Using colors, fonts, and images. Basics of event handling: event handlers, adapter classes, actions, mouse events, AWT event hierarchy. Introduction to Swing: layout management, Swing Components: Text Fields, Text Areas, Buttons, Check Boxes, Radio Buttons, Lists, choices, Scrollbars, Windows Menus and Dialog Boxes.	08
Suggested Readings:		
<ol style="list-style-type: none"> 1. Herbert Schildt, "Java The complete referencel", McGraw Hill Education, 8th Edition, 2011. 2. Cay S. Horstmann, Gary Cornell, "Core Java Volume –I Fundamentals", Prentice Hall, 9th Edition, 2013. 3. Steven Holzner, "Java Black Book", Dreamtech. 4. Balagurusamy E, "Programming in Java", McGraw Hill 5. Naughton, Schildt, "The Complete reference java2", McGraw Hill 6. Khalid Mughal, "A Programmer's Guide to Java SE 8 Oracle Certified Associate (OCA)", Addison-Wesley. 		

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KCA203 : OPERATING SYSTEMS		
Course Outcome (CO)	Bloom's Knowledge Level (KL)	
At the end of course , the student will be able to		
CO 1	Explain main components, services, types and structure of Operating Systems.	K ₂
CO 2	Apply the various algorithms and techniques to handle the various concurrency control issues.	K ₃
CO 3	Compare and apply various CPU scheduling algorithms for process execution.	K ₂
CO 4	Identify occurrence of deadlock and describe ways to handle it.	K ₃
CO 5	Explain and apply various memory, I/O and disk management techniques.	K ₅
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Introduction: Operating System Structure- Layered structure, System Components, Operating system functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multi process Systems, Multithreaded Systems, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	08
II	Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation, Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem, Inter Process Communication models and Schemes, Process generation.	08
III	CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	08
IV	Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.	08
V	I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	08
Suggested Readings:		
<ol style="list-style-type: none"> 1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley Publication. 2. Sibsankar Halder and Alex A Arvind, "Operating Systems", Pearson Education. 3. Harvey M Dietel, "An Introduction to Operating System", Pearson Education. 4. William Stallings, "Operating Systems: Internals and Design Principles", 6th Edition, Pearson Education. 5. Harris, Schaum's Outline Of Operating Systems, McGraw Hill 		
KCA204 : DATABASE MANAGEMENT SYSTEMS		

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Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to		
CO 1	Describe the features of a database system and its application and compare various types of data models.	K ₂
CO 2	Construct an ER Model for a given problem and transform it into a relation database schema.	K ₅ , K ₆
CO 3	Formulate solution to a query problem using SQL Commands, relational algebra, tuple calculus and domain calculus.	K ₅ , K ₆
CO 4	Explain the need of normalization and normalize a given relation to the desired normal form.	K ₂ , K ₃
CO 5	Explain different approaches of transaction processing and concurrency control.	K ₂
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Introduction: Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, 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, Relationship of Higher Degree.	08
II	Relational data Model and Language: Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction to SQL: Characteristics of SQL, Advantage of SQL. SQL Data Type and Literals. Types of SQL Commands. SQL Operators and their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	08
III	Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design	08
IV	Transaction Processing Concept: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System	08
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, Case Study of Oracle.	08
Suggested Readings:		
<ol style="list-style-type: none"> 1. Korth, Silbertz, Sudarshan, " Database Concepts", McGraw Hill. 2. Date C J, "An Introduction to Database Systems", Addison Wesley. 3. Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley. 4. O'Neil, "Databases", Elsevier Pub. 5. Ramakrishnan, "Database Management Systems", McGraw Hill. 6. Leon & Leon, "Database Management Systems", Vikas Publishing House. 7. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications. 8. Majumdar & Bhattacharya, "Database Management System", McGraw Hill. 		

KCA205: DATA STRUCTURES & ANALYSIS OF ALGORITHMS		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to		
CO 1	Explain the concept of data structure, abstract data types, algorithms, analysis of algorithms and basic data organization schemes such as arrays and linked lists.	K ₂
CO 2	Describe the applications of stacks and queues and implement various operations on them using arrays and linked lists.	K ₃
CO 3	Describe the properties of graphs and trees and implement various operations such as searching and traversal on them.	K ₃
CO 4	Compare incremental and divide-and-conquer approaches of designing algorithms for problems such as sorting and searching.	K ₄
CO 5	Apply and analyze various design approaches such as Divide-and-Conquer, greedy and dynamic for problem solving .	K ₄
DETAILED SYLLABUS		4-0-0
Unit	Topic	Proposed Lecture
I	<p>Introduction to data structure: Data, Entity, Information, Difference between Data and Information, Data type , Build in data type, Abstract data type, Definition of data structures, Types of Data Structures: Linear and Non-Linear Data Structure, Introduction to Algorithms: Definition of Algorithms, Difference between algorithm and programs, properties of algorithm, Algorithm Design Techniques, Performance Analysis of Algorithms, Complexity of various code structures, Order of Growth, Asymptotic Notations.</p> <p>Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D Array Application of arrays, Sparse Matrices and their representations.</p> <p>Linked lists: Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction & Multiplications of Single variable.</p>	08
II	<p>Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers.</p> <p>Queues: Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.</p> <p>Searching: Concept of Searching, Sequential search, Index Sequential Search, Binary Search. Concept of Hashing & Collision resolution Techniques used in Hashing.</p>	08

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III	Sorting: Insertion Sort, Selection Sort, Bubble Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time: Counting Sort and Bucket Sort. Graphs: Terminology used with Graph, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, Connected Component.	08
IV	Trees: Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer (Linked List) Representation, Binary Search Tree, Complete Binary Tree, A Extended Binary Trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Constructing Binary Tree from given Tree Traversal, Operation of Insertion, Deletion, Searching & Modification of data in Binary Search Tree. Threaded Binary trees, Huffman coding using Binary Tree, AVL Tree and B Tree.	08
V	Divide and Conquer with Examples Such as Merge Sort, Quick Sort, Matrix Multiplication: Strassen's Algorithm Dynamic Programming: Dijkstra Algorithm, Bellman Ford Algorithm, All-pair Shortest Path: Warshal Algorithm, Longest Common Sub-sequence Greedy Programming: Prims and Kruskal algorithm.	08
Suggested Readings: <ol style="list-style-type: none">1. Cormen T. H., Leiserson C. E., Rivest R. L., and Stein C., "Introduction to Algorithms", PHI.2. Horowitz Ellis, Sahni Sartaj and Rajasekharan S., "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.3. Dave P. H., H.B.Dave, "Design and Analysis of Algorithms", 2nd Edition, Pearson Education.4. Lipschutz S., "Theory and Problems of Data Structures", Schaum's Series.5. Goyal K. K., Sharma Sandeep & Gupta Atul, "Data Structures and Analysis of Algorithms", HP Hamilton.6. Lipschutz, Data Structures With C - SIE - SOS, McGraw Hill7. Samanta D., "Classic Data Structures", 2nd Edition Prentice Hall India.8. Goodrich M. T. and Tomassia R., "Algorithm Design: Foundations, Analysis and Internet examples", John Wiley and sons.9. Sridhar S., "Design and Analysis of Algorithms", Oxford Univ. Press.10. Aho, Ullman and Hopcroft, "Design and Analysis of algorithms", Pearson Education.11. R. Neapolitan and K. Naimipour, "Foundations of Algorithms", 4th edition, Jones an Bartlett Student edition.12. Reema Thareja, Data Structures using C, Oxford Univ. Press		

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KCAA01: CYBER SECURITY		
Course Outcome (CO)	Bloom's Knowledge Level (KL)	
At the end of course , the student will be able to		
CO 1	Identify and analyze nature & inherent difficulties in the security of the Information System.	K ₃
CO 2	Analyze various threats and attacks, corresponding counter measures and various vulnerability assessment and security techniques in an organization.	K ₃
CO 3	Applications of cyber based policies and use of IPR and patent law for software-based design. Define E-commerce types and threats to E-commerce.	K ₁ ,K ₂
CO 4	Explain concepts and theories of networking and apply them to various situations, classifying networks, analyzing performance.	K ₂
DETAILED SYLLABUS		2-0-0
Unit	Topic	Proposed Lecture
I	Introduction- Introduction to Information Systems, Types of Information Systems, Development of Information Systems, Introduction to Information Security and CIA triad, Need for Information Security, Threats to Information Systems, Information Assurance and Security Risk Analysis, Cyber Security.	08
II	Application Security- (Database, E-mail and Internet), Data Security Considerations-(Backups, Archival Storage and Disposal of Data), Security Technology-(Firewall , VPNs, Intrusion Detection System), Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack.	08
III	Introduction to E-Commerce , Threats to E-Commerce, Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, Cryptography Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets - Access Control, CCTV, Backup Security Measures.	08
IV	Security Policies- Why policies should be developed, Policy Review Process, Publication and Notification Requirement of policies, Types of policies – WWW policies, Email Security policies, Corporate Policies, Sample Security Policies. Case Study – Corporate Security	08
V	Information Security Standards- ISO, IT Act, Copyright Act, IPR. Cyber Crimes , Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law, Copy Right Law , Semiconductor Law and Patent Law , Software Piracy and Software License.	08

KCA251:OBJECT ORIENTED PROGRAMMING LAB		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to		
CO1	Use the Concept of Data Abstraction and Encapsulation in C++ programs.	K ₃
CO2	Design and Develop C++ program using the concept such as polymorphism, virtual function, exception handling and template.	K ₃
CO3	Apply object oriented techniques to analyze, design and develop a complete solution for a given problem.	K ₃
<ol style="list-style-type: none">1. Use Java compiler and eclipse platform to write and execute java program.2. Creating simple java programs,3. Understand OOP concepts and basics of Java programming.4. Create Java programs using inheritance and polymorphism.5. Implement error-handling techniques using exception handling and multithreading.6. Understand the use of java packages.7. File handling and establishment of database connection.8. Develop a calculator application in java.9. Develop a Client Server Application.10. Develop GUI applications using Swing components.		

KCA252: DATABASE MANAGEMENT SYSTEMS LAB		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to		
CO1	Use the Concept of Data Abstraction and Encapsulation in C++ programs.	K ₆
CO2	Write SQL commands to query a database.	K ₃
CO3	Write PL/SQL programs for implementing stored procedures, stored functions, cursors, trigger and packages.	K ₆
<ol style="list-style-type: none">1. Installing oracle/ MYSQL.2. Creating Entity-Relationship Diagram using case tools.3. Writing SQL statements Using ORACLE /MYSQL:<ol style="list-style-type: none">a. Writing basic SQL SELECT statements.b. Restricting and sorting data.c. Displaying data from multiple tables.d. Aggregating data using group function.e. Manipulating data.f. Creating and managing tables.4. Normalization.5. Creating cursor.6. Creating procedure and functions.7. Creating packages and triggers.8. Design and implementation of payroll processing system.9. Design and implementation of Library Information System.10. Design and implementation of Student Information System.11. Automatic Backup of Files and Recovery of Files.		

KCA253:DATA STRUCTURES & ANALYSIS OF ALGORITHMS LAB		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to		
CO1	Write and execute programs to implement various searching and sorting algorithms.	K ₃
CO2	Write and execute programs to implement various operations on two-dimensional arrays.	K ₃
CO3	Implement various operations of Stacks and Queues using both arrays and linked lists data structures.	K ₃
CO4	Implement graph algorithm to solve the problem of minimum spanning tree	K ₃
<p>Program in C or C++ for following:</p> <ol style="list-style-type: none">1. To implement addition and multiplication of two 2D arrays.2. To transpose a 2D array.3. To implement stack using array4. To implement queue using array.5. To implement circular queue using array.6. To implement stack using linked list.7. To implement queue using linked list.8. To implement BFS using linked list.9. To implement DFS using linked list.10. To implement Linear Search.11. To implement Binary Search.12. To implement Bubble Sorting.13. To implement Selection Sorting.14. To implement Insertion Sorting.15. To implement Merge Sorting.16. To implement Heap Sorting.17. To implement Matrix Multiplication by strassen's algorithm18. Find Minimum Spanning Tree using Kruskal's Algorithm		