Kashi Institute of Technology, Varanasi

(An Autonomous Institute of Dr. A.P.J.Abdul Kalam Technical University, Lucknow)

Evaluation Scheme & Syllabus

For

MCA First Year

(Effective from Session: 2024-25)

MS 23KM, Varanasi – Prayagraj (Allahabad) Highway, Mirzamurad, Varanasi

Uttar Pradesh - 221307

MCA First Year, Semester-I

S.N.	Course Category	Course Code	Course Title	Evaluation Scheme							
				Type	Periods			FA	SA	Total	Credit
					L	T	P				
1		MCA101	Computer Organization & Architecture	T	3	1	0	70	30	100	4
2		MCA102	Programming Principle & Problem Solving using C	T	3	1	0	70	30	100	4
3		MCA103	Principles of Management & Professional Communication	T	3	0	0	70	30	100	3
4		MCA104	Discrete Mathematics	T	3	0	0	70	30	100	3
5		MCA105	Python Programming	T	3	1	0	70	30	100	4
6		MCA151	Problem Solving using C **Lab**	P	0	0	4	70	30	100	2
7		MCA152	Computer Organization & Architecture **Lab**	P	0	0	3	70	30	100	2
8		MCA153	Python Programming **Lab**	P	0	0	4	70	30	100	2
9	CCA	CCA151	CO-CURRICULAR ACTIVITIES	-	-	-	-	-	-	100	0.5
10	MC	MCGP101	GENERAL PROFICIENCY	-	-	-	-	-	-	100	0.5
Total				**-**	**15**	**3**	**11**	**560**	**240**	**1000**	**25**

MCA First Year, Semester-II

SN	Course Category	Course Code	Course Title	Evaluation Scheme							
				Type	Period			FA	SA	Total	Credit
					L	T	P				
1		MCA201	Theory of Automata & Formal Languages	T	3	0	0	70	30	100	3
2		MCA202	Object-Oriented Programming using Java	T	3	1	0	70	30	100	4
3		MCA203	Operating Systems	T	3	0	0	70	30	100	3
4		MCA204	Database Management Systems	T	3	1	0	70	30	100	4
5		MCA205	Data Structures using C	T	3	1	0	70	30	100	4
6		MCA251	Object Oriented Programming **Lab**	P	0	0	3	70	30	100	2
7		MCA252	DBMS **Lab**	P	0	0	3	70	30	100	2
8		MCA253	Data Structures using C **Lab**	P	0	0	4	-	-	100	2
9	CCA	CCA251	CO-CURRICULAR ACTIVITIES	-	-	-	-	-	-	100	0.5
10	MC	MCGP201	GENERAL PROFICIENCY	-	-	-	-	-	-	100	0.5
Total				**-**	**15**	**3**	**10**	**560**	**240**	**1000**	**25**

FA: Formative Assessment, **SA**: Summative Assessment, **L**: Lecture, **T**- Tutorial, **P:** Practical

Abbreviation Used:

CCA: Co-Curricular Activities
MC: Mandatory Courses

DETAILED SYLLABUS
MCA 1St Year

1st Semester

(Effective from Session: 2024-25)

Department : **Computer Application**			Programme : **M.C.A.**			
Semester : **I**			Course Category Code :			
Course Code	Course		Period / Week			Credit
			L	T	P	C
MCA 101	**Computer Organization & Architecture**		**3**	**1**	**-**	**4**
Prerequisite	***At the end of this course, the students will be able to:***					**Bloom's Level**
Course Outcome	**CO1**	*Describe functional units of digital system and explain how arithmetic and logical operations are performed by computers*				K2, K3
	CO2	*Describe the operations of control unit and write sequence of instructions for carrying out simple operation using various addressing modes*				K2, K4
	CO3	*Design various types of memory and its organization*				K3
	CO4	*Describe the various modes in which IO devices communicate with CPU and memory*				K2, K3
	CO5	*List the criteria for classification of parallel computer and describe various architectural schemes.*				K1, K2
UNIT – I	**Introduction and Processor organization**					**Contact Hours : 8**
Basic Gates, Flip-Flops: SR,JK,D & T, Digital computer Block diagram, functional units and their interconnections, buses, types of buses and bus arbitration. Register, bus and memory transfer. General registers organization, stack organization and addressing modes.						**CO1**
UNIT – II	**Number representation**					**Contact Hours : 8**
Fixed point Integer representation, Fixed point arithmetic operations in 2'scomplement form: Addition, Subtraction, Booths multiplication algorithm, array multiplier, and Division techniques. Floating point number representation, IEEE standard for floating point representation, Floating point arithmetic operation.						**CO2**
UNIT – III	**Central Processing unit & Control Unit**					**Contact Hours : 8**
Register Transfer language, Arithmetic, logic and shift micro operations, arithmetic and logic unit, Processor organization: Single Accumulator, Instruction types, Instruction formats, and instruction cycle. Hardwired and micro programmed control, concept of horizontal and vertical microprogramming.						**CO3**
UNIT – IV	**Memory**					**Contact Hours : 8**
Basic concept and hierarchy, semiconductor RAM memories, ROM memories, Cache memory, address mapping techniques and replacement, Auxiliary memories,2D & 2 1/2D memory organization, magnetic tape and optical disks Virtual memory: concept implementation.						**CO4**
UNIT – V	**Input / Output**					**Contact Hours : 8**
Peripheral devices, I/O interface, I/O ports, Interrupts, types of interrupts, Modes of Data Transfer, Programmed I/O, interrupt initiated I/O and Direct Memory Access. Pipelining: Basic concepts of pipelining, throughput and speedup.						**CO5**
Lecture Hours : 30		**Tutorial Hours : 10**				**Total : 40**
Reference Books						

1. *John P. Hayes, "Computer Architecture and Organization", McGraw Hill.*
2. *William Stallings, "Computer Organization and Architecture-Designing for Performance", Pearson Education.*
3. *Carl Hamacher, ZvonkoVranesic, SafwatZaky, "Computer Organization", McGraw-Hill.*
4. *BehroozParahami, "Computer Architecture", Oxford University Press.*
5. *David A. Patterson and John L. Hennessy, "Computer Architecture-A Quantitative Approach", Elsevier Pub.*
6. *Tannenbaum, "Structured Computer Organization", PHI.*

Text Book :

1. *M. Morris Mano, "Computer System Architecture", PHI.*

Video Content:

1. *https://youtu.be/8msCz6Nb6nk?list=PL-JvKqQx2Atfuxo1LR0m9RQramPymoBsj*
2. *https://youtu.be/_Wbo0FgjVWo?list=PL-JvKqQx2Atfuxo1LR0m9RQramPymoBsj*
3. *https://youtu.be/oADINwRQbAQ?list=PL-JvKqQx2Atfuxo1LR0m9RQramPymoBsj*
4. *https://youtu.be/7eyihPQpxRo?list=PL-JvKqQx2Atfuxo1LR0m9RQramPymoBsj*
5. *https://youtu.be/Drx1jThP83M?list=PL-JvKqQx2Atfuxo1LR0m9RQramPymoBsj*

Department : **Computer Application**			Programme : **M.C.A.**			
Semester : **I**			Course Category Code :			
Course Code	Course		Period / Week			Credit
			L	T	P	C
MCA102	**PROGRAMMING PRINCIPLE & PROBLEM SOLVING USING C**		**3**	**1**	**-**	**4**
Prerequisite	***At the end of this course, the students will be able to:***					**Bloom's Level**
Course Outcome	**CO1**	*Describe the functional components and fundamental concepts of a digital computer system including number systems.*				K_1, K_2
	CO2	*Construct flowchart and write algorithms for solving basic problems.*				K_2, K_3
	CO3	*Write 'C' programs that incorporate use of variables, operators and expressions along with data types.*				K_2, K_3
	CO4	*Write simple programs using the basic elements like control statements, functions, arrays and strings.*				K_2, K_3
	CO5	*Write advanced programs using the concepts of pointers, structures, unions and enumerated data types.* *Apply pre-processor directives and basic file handling and graphics operations in advanced programming.*				K_2, K_3
UNIT – I	**Basics of programming & C**					**Contact Hours : 8**
Approaches to problem solving, Use of high level programming language for systematic development of programs, Concept of algorithm and flowchart, Concept and role of structured programming. History of C, Salient features of C, Structure of C Program, Compiling C Program, Link and Run C Program, Character set, Tokens, Keywords, Identifiers, Constants, Variables, Instructions, Data types, Standard Input/output, Operators, Precedence and Associativity						**CO1**
UNIT – II	**Conditional Program Execution , Loops and Iteration , Functions**					**Contact Hours : 8**
if, if-else, and nested if-else statements, Switch statements, Restrictions on switch values, Use of break and default with switch, Comparison of switch and if-else. for, while and do-while loops, Multiple loop variables, Nested loops, Assignment operators, break and continue statement. Introduction, Types, Declaration of a Function, Function calls, Defining functions, Function Prototypes, Passing arguments to a function Return values and their types, Writing multi-function program, Recursion. Calling function by value, Recursive functions.						**CO2**
UNIT – III	**Arrays , Pointers & Strings**					**Contact Hours : 8**
Array notation and representation, Declaring one-dimensional array, Initializing arrays, Accessing array elements, Manipulating array elements, Arrays of unknown or varying size, Two-dimensional arrays, Multidimensional arrays. Introduction, Characteristics, * and & operators, Pointer type declaration and assignment, Pointer arithmetic, Call by reference, Passing pointers to functions, array of pointers, Pointers to functions, Pointer to pointer, Array of pointers. Introduction ,Initializing strings, Accessing string ,Array of strings, Passing strings to functions, standard library function: strlen(), strcpy(), strcat(), strcmp();Implementation without using standard library function						**CO3**
UNIT – IV	**Structure , Union & Storage classes**					**Contact Hours : 8**
Introduction, Initializing, defining and declaring structure, Accessing members, Operations on individual members, Operations on structures, Structure within structure, Array of structure, Pointers to structure. Introduction, Declaring union, Usage of unions, Operations on union. Differentiate between Union and structure, Enumerated data types						**CO4**

Introduction, Types- automatic, register, static and external.		
UNIT – V	**Dynamic Memory Allocation , Introduction C Preprocessor Bitwise Operators & File Handling**	**Contact Hours : 8**
Introduction, Library functions – malloc, calloc, realloc and free. Definition of Preprocessor; Macro substitution directives; File inclusion directives; Conditional compilation Bitwise operators; Shift operators; Masks; Bit field. Basics, File types, File operations, File pointer, File opening modes, File handling functions, File handling through command line argument, Record I/O in files.		**CO5**
Lecture Hours : 30	**Tutorial Hours : 10**	**Total : 40**

Reference Books

1. *Hanly J. R. and Koffman E. B.,"Problem Solving and Program Design in C", Pearson Education.*
2. *Schildt H., "C- The Complete Reference", McGraw-Hill.*
3. *Goyal K. K. and Pandey H.M., Trouble Free C", University Science Press*
4. *Gottfried B., "Schaum's Outlines- Programming in C", McGraw-Hill Publications.*
5. *Kochan S.G., "Programming in C", Addison-Wesley.*
6. *Dey P. and Ghosh M., "Computer Fundamentals and Programming in C", Oxford University Press.*
7. *Goyal K. K., Sharma M. K. and Thapliyal M. P. "Concept of Computer and C Programming", University Science Press.*

Text Book :

1. *Kanetkar Y., "Let Us C", BPB Publications.*

Video Content:

1. https://youtu.be/KJgsSFOSQv0
2. https://youtu.be/EZ3IZg3Jeys
3. https://youtu.be/gOdEfBqOfpo
4. https://youtu.be/K4MA1Hkwj0s
5. https://youtu.be/fYTduOpML5s
6. https://youtu.be/jjNs_x7rlQk
7. https://youtu.be/eNH5KqzOM7c
8. https://youtu.be/69OzAUm_Mp0
9. https://youtu.be/P9IAfh89EK8
10. https://youtu.be/MyxVAq9MifI
11. https://youtu.be/aJzJh0lAano

Department : **Computer Application**			Programme : **M.C.A.**			
Semester : **I**			Course Category Code :			
Course Code	Course		Period / Week			Credit
			L	T	P	C
MCA103	**Principles of Management & Professional Communication**		**3**	**1**	**-**	**4**
Prerequisite	***At the end of this course, the students will be able to:***					**Bloom's Level**
Course Outcome	**CO1**	*Describe primary features, processes and principles of management.*				K_1, K_2
	CO2	*Explain functions of management in terms of planning, decision making and organizing.*				K_3, K_4
	CO3	*Illustrate key factors of leadership skill in directing and controlling business resources and processes.*				K_5, K_6
	CO4	*Exhibit adequate verbal and non-verbal communication skills*				K_1, K_3
	CO5	*Demonstrate effective discussion, presentation and writing skills.*				K_3, K_5
UNIT – I	**Foundations of Management: Concepts, History, and Best Practices**					**Contact Hours : 6**
Understanding Management: Its Need, Scope, Meaning, and Definition, The Management Process: Key Steps and Activities, Historical Perspectives: Contributions of F.W. Taylor and Henry Fayol,: Key Findings and Their Impact, Qualities of Effective Management: Traits of Successful Managers.						**CO1**
UNIT – II	**Planning & Organizing**					**Contact Hours : 6**
Need, Scope and Importance of Planning, Steps in planning, Decision making model. Organizing need and Importance, Organizational Design, Organizational structure, centralization and Decentralization, Delegation.						**CO2**
UNIT – III	**Directing and Controlling**					**Contact Hours : 6**
Motivation: Definition and Significance, Necessity of Motivation, Motivation Theories, Leadership: Definition and Role, Importance of Leadership, Leadership Styles, Attributes of a Successful Leader, Directing: Fundamental Principles, Controlling: Essential Control Process, Control Methods.						**CO3**
UNIT – IV	**Fundamentals of Communication**					**Contact Hours : 6**
Definition of Communication, Levels of Communication, Barriers to Communication, Communication Process, Non-verbal Communication, Communication Flow, Technology-Enabled Communication, Selecting Communication Technology, Technical Communication.						**CO4**
UNIT – V	**Business Correspondence**					**Contact Hours : 6**
Business letters: Sales & Credit letters; Claim and Adjustment Letters; Job application and Resumes. Reports: Types; Structure, Style & Writing of Reports. Technical Proposal: Parts; Types; Writing of Proposal; Significance. Nuances of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Communication skills, Presentation strategies, Group Discussion; Interview skills; Workshop; Conference; Seminars.						**CO5**
Lecture Hours : 20		**Tutorial Hours : 10**				**Total : 30**

Reference Books

1. *C. B. Gupta, "Management Principles and Practice", Sultan Chand & Sons 3rd edition.*
2. *T.N.Chhabra, "Business Communication", Sun India Publication.*
3. *V.N.Arora and Laxmi Chandra, "Improve Your Writing", Oxford Univ. Press, 2001, New Delhi.*
4. *Madhu Rani and SeemaVerma, "Technical Communication: A Practical Approach", Acme Learning, New Delhi-2011.*
5. *Meenakshi Raman &Sangeeta Sharma, "Technical Communication- Principles and Practices", Oxford Univ. Press, 2007, New Delhi.*
6. *Koontz Harold &Weihrich Heinz, "Essentials of Management", McGraw Hill 5thEdition 2008.*
7. *Robbins and Coulter, "Management", Prentice Hall of India, 9th edition.*
8. *James A. F., Stoner, "Management", Pearson Education Delhi.*
9. *P.D.Chaturvedi, "Business Communication", Pearson Education.*

Text Book :

1. *P.C. Tripathi, P.N. Reddy, "Principles of Management", McGraw Hill Education 6th Edition.*

Video Content:

1. *https://youtu.be/mKJDPkd6Z0o?si=P0hoc187cV5UprYV*

Department : **Computer Application**			Programme : **M.C.A.**			
Semester : **I**			Course Category Code :			
Course Code	Course		Period / Week			Credit
			L	T	P	C
MCA104	**Discrete Mathematics**		**3**	**0**	**-**	**3**
Prerequisite	***At the end of this course, the students will be able to:***					**Bloom's Level**
Course Outcome	**CO1**	*Use mathematical and logical notation to define and formally reason about basic discrete structures such as Sets, Relations and Functions*				K1, K2
	CO2	*Apply mathematical arguments using logical connectives and quantifiers to check the validity of an argument through truth tables and propositional and predicate logic*				K2, K3
	CO3	*Identify and prove properties of Algebraic Structures like Groups, Rings and Fields*				K3,K4
	CO4	*Formulate and solve recurrences and recursive functions*				K3, K4
	CO5	*Apply the concept of combinatorics to solve basic problems in discrete mathematics*				K1, K3
UNIT – I	**Set Theory , Relation & Functions**					**Contact Hours : 8**
Introduction, Size of sets and Cardinals, Venn diagrams, Combination of sets, Multi-sets, Ordered pairs and Set Identities. Definition, Operations on relations, Composite relations, Properties ofrelations, Equality of relations, Partial order relation. Definition, Classification of functions, Operations on functions,Recursively defined functions.						**CO1**
UNIT – II	**Posets, Hasse Diagram and Lattices , Boolean Algebra**					**Contact Hours : 8**
Introduction, Partial ordered sets, Combination of Partial ordered sets, Hasse diagram, Introduction of lattices, Properties of lattices – Bounded, Complemented, Modular and Complete lattice. Introduction, Axioms and Theorems of Boolean algebra, Boolean Functions . Simplification of Boolean functions, Karnaugh maps, Logic gates.						**CO2**
UNIT – III	**Propositional & Predicate Logic**					**Contact Hours : 8**
Propositions, Truth tables, Tautology, Contradiction, Algebra ofPropositions, Theory of Inference and Natural Detection. Theory of Predicates, First order predicate, Predicate formulas,Quantifiers, Inference theory of predicate logic.						**CO3**
UNIT – IV	**Algebraic Structures & Rings and Fields**					**Contact Hours : 8**
Introduction to algebraic Structures and properties. Types of algebraic structures: Semi group, Monoid, Group, Abelian group and Properties of group. Subgroup, Cyclic group, Cosets, Permutation groups, Homomorphism and Isomorphism of groups. Definition and elementary properties of Rings and Fields.						**CO4**
UNIT – V	**Natural Numbers , Recurrence Relation & Generating functions and Combinatorics**					**Contact Hours : 8**
Introduction, Piano's axioms, Mathematical Induction, Strong Induction and Induction with Nonzero Base cases. Introduction and properties of Generating Functions. Simple Recurrence relation with						**CO5**

constant coefficients and Linear recurrence relation without constant coefficients. Methods of solving recurrences. Introduction, Counting techniques and Pigeonhole principle, Polya's Counting theorem.		
Lecture Hours : 30	**Tutorial Hours : 10**	**Total : 40**

Reference Books

1. *Kenneth H. Rosen, "Discrete Mathematics and Its Applications", McGraw Hill, 2006.*
2. *B. Kolman, R.C Busby and S.C Ross, "Discrete Mathematics Structures", Prentice Hall ,2004.*
3. *R.P Girimaldi, "Discrete and Combinatorial Mathematics", Addison Wesley, 2004.*
4. *Y.N. Singh, "Discrete Mathematical Structures", Wiley- India, First edition, 2010.*
5. *Swapankumar Sarkar, "A Textbook of Discrete Mathematics", S. Chand & Company PVT. LTD.V.*
6. *Krishnamurthy, "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi.*
7. *Liptschutz, Seymour, "Discrete Mathematics", McGraw Hill.*

Text Book :

1. *J.P. Trembely&R.Manohar, "Discrete Mathematical Structure with application to Computer Science", McGraw Hill.*

Video Content:

1. *https://www.youtube.com/watch?v=xlUFkMKSB3Y&list=PL0862D1A947252D20&index=1*
2. *https://www.youtube.com/watch?v=DmCltf8ypks&list=PL0862D1A947252D20&index=3*
3. *https://www.youtube.com/watch?v=ruwZxR2YRpE&list=PL0862D1A947252D20&index=6*
4. *https://www.youtube.com/watch?v=kZ6UqFm8lnw&list=PL0862D1A947252D20&index=5*
5. *https://www.youtube.com/watch?v=9AUCdsmBGmA&list=PL0862D1A947252D20&index=*10

Department : **Computer Application**			Programme : **M.C.A.**			
Semester : **I**			Course Category Code :			
Course Code	Course		Period / Week			Credit
			L	T	P	C
MCA105	**PYTHON PROGRAMMING**		**3**	**1**	**-**	**4**
Prerequisite	***At the end of this course, the students will be able to:***					**Bloom's Level**
Course Outcome	**CO1**	*Introduce the core concepts of Python Programming*				K1, K2
	CO2	*Introduce the functions concept of Python Programming*				K2, K3
	CO3	*Introduce the data structure concept of Python Programming*				K4
	CO4	*Introduce the string and matrix concept*				K2
	CO5	*Introduce the basic insight of programming using Python libraries and how to use functionality of various Python libraries for various tasks*				K1, K2
UNIT – I	**Introduction**					**Contact Hours : 8**
Introduction: A Brief History of Python, Applications areas of python, The Programming Cycle for Python, Python IDE. Elements of Python: keywords and identifiers, variables, data types and type conversion, Indexing and Slicing, operators in python, Operator precedence and associativity, expressions in python. Conditional Statements: if statement, if-else statement, Nested-if statement and el-if statements. Loops: Purpose and working of loops, while loop, for loop, else with loop statement, Nested Loops, break, continue and pass statement						**CO1**
UNIT – II	**Functions in python**					**Contact Hours : 8**
Introduction to Functions, Built-in Functions, Standard Functions: Mathematical Functions, time Functions, Random Numbers, System-specific Functions, The *eval* and *exec* Functions, Writing Functions, Function Basics Parameter Passing Documenting Functions, User defined Functions Vs. Standard Functions, Global Variables, Default Parameters, Introduction to Recursion, Functions as Data, Anonymous Functions, Function Decorators, Generators						**CO2**
UNIT – III	**Arrays using array module and numpy() in python, Lists, Tuples , Dictionaries & Sets in Python**					**Contact Hours : 8**
Introduction to Array, Array using array module, Introduction to *numpy* module, Creating and importing Array, Types of Array, Indexing and slicing on Array, Mathematical operations on Array, Comparing Arrays, Aliasing Arrays, Attributes of an Array, Array methods, Basic operations on Multi-dimensional Array, Matrices in numpy, Random Numbers, Introduction to Lists, Use of List, Building Lists, List Membership, List Assignment and Equivalence, List Bounds, Slicing, List Element Removal, Lists and Functions, List Methods, Lists Vs. Generators,Tuples, Basic operations on Tuple, Nested Tuple, Dictionaries, Dictionary Methods, Counting with Dictionaries, Grouping with Dictionaries, Sets, Set Quantification with all and any, Enumerating the Elements of a Data Structure						**CO3**
UNIT – IV	**Strings in Python & Matrix in Python**					**Contact Hours : 8**
Introduction to Programming with Python Creating Strings, Indexing and Slicing in Strings, Concatenation of Strings, membership in Strings, Comparing Strings, Replacing a String, Splitting and Joining Strings, Changing case in Strings, String Testing methods, Formatting Strings, Sorting Strings, Substring, Inserting Substring into String Importing Matrix, basic operations on Matrix: finding maximum and minimum elements, Sum and average of elements, Products of elements, Sorting the Matrix, Transpose of a Matrix, Matrix operations, Diagonal elements of a Matrix						**CO4**

UNIT – V	**Introduction to Object Oriented programming with Python: Exceptions, Files in Python, Overview of Objects and Modules used with Python**	**Contact Hours : 8**
Introduction of OOPS, Classes and Objects: Creating Class, Constructor, Types of variable, types of Methods, Inner Classes, Encapsulation, Abstraction, Inheritance, Types of Inheritance, super(),Polymorphism, Duck typing philosophy of Python, Overloading, Method Overriding, Abstract Method, Abstract Class, Interface in Python Errors in Python, Exception and Exception handling, Types of Exceptions, *Except* block, *assert* statement, User-Defined Exceptions Files, Types of Files, Opening and Closing Files, Working with Text Files, Working with Binary *Files*, with statement, Pickle in Python, seek() and tell() methods *Objects:* Introduction to Objects, Introduction to Turtle Graphics Objects, Graphics with tkinter Objects, Date and time Objects, *import* statement, Introduction to *Pandas* and *Matplotlib* modules		**CO5**
Lecture Hours : 30	**Tutorial Hours : 10**	**Total : 40**

Reference Books

1. Rao N.R., "Core Python Programming", Dreamtech Publication India
2. Sarker M.O.F., "Python Network Programming Cookbook", Packt Publication
3. Halterman R.,"Fundamentals of Python Programming", Southern Adventist University
4. Guttag J.V., "Introduction to Computation and Programming Using Python", Prentice Hall India
5. Chun W., "Core Python Programming", Prentice Hall India

Text Book :

1. Python Programming using Problem solving approach by ReemaThareja OXFORD Higher education

Video Content:

1. *Python Tutorial for Beginners | Learn Python in 1.5 Hours (youtube.com)*
2. *https://www.youtube.com/watch?v=oSPMmeaiQ68*
3. *https://www.youtube.com/watch?v=QswQA1lRIQY*
4. *https://www.youtube.com/watch?v=6a39OjkCN5I*
5. *https://www.youtube.com/watch?v=8JfDAm9y_7s*
6. *https://www.youtube.com/watch?v=QGLNQwfTO2w*
7. *https://www.youtube.com/watch?v=Blzp9iuhZqo*
8. *https://www.youtube.com/watch?v=NMTEjQ8-AJM*
9. *https://www.youtube.com/watch?v=qiSCMNBIP2g*
10. *https://www.youtube.com/watch?v=aequTxAvQq4*
11. *https://www.youtube.com/watch?v=pxKu2pQ7ILo*
12. *https://www.youtube.com/watch?v=BnXwUGLRu70*
13. *https://www.youtube.com/watch?v=yZTBMMdPOww*

Department : **Computer Application**			Programme: **M.C.A.**			
Semester : **I**			Course Category Code :			
Course Code	Course		Period/Week			Credit
			L	T	P	C
MCA151	**PROBLEM SOLVING USING C LAB**		**-**	**-**	**4**	**2**
Prerequisite	***At the end of this course, the students will be able to:***					
Course Outcome	**CO1**	*Write, compile, debug and execute programs in a C programmingenvironment.*				
	CO2	*Write programs that incorporate use of variables, operators andexpressions along with data types.*				
	CO3	*Write programs for solving problems involving use of decision controlstructures and loops.*				
	CO4	*Write programs that involve the use of arrays, structures and userdefined functions.*				
	CO5	*Write programs using graphics and file handling operations.*				

List of Practicals

1. Study of Compilation and execution of simple C programs 2. Basic C Programs, Arithmetic Operations, Area and Circumference of a circ. Swapping with and without Temporary Variables	**CO1**
3. Program to implement conditional statements in C language. a. To check the number as Odd or Even. b. Greatest of Three Numbers. c. Counting Vowels. d. Grading based on Student's Mark.	**CO2**
4. Program to implement switch-case statement in C language 5. Program to implement looping constructs in C language. a. Computing Factorial of a number b. Fibonacci Series generation c. Prime Number Checking d. Computing Sum of Digit	**CO3**
6. Program to perform basic input-output operations in C language. 7. Program to implement user defined functions in C language. a. Computing nCr b. Call by Value and Call by Reference 8. Program to implement recursive functions in C language. a. Factorial using Recursion 9. Program to implement one-dimensional arrays in C language. b. Sum of 'n' numbers c. Sorting an Array 10. Program to implement two-dimensional arrays in C language. 11. Program to perform various operations on two-dimensional arrays in C language. a. Matrix Addition, Subtraction, Multiplication and Transpose 12. Program to implement multi-dimensional arrays in C language.	**CO4**

13. Programs using Pointers a. Point r and Array b. Pointers as argument and return value c. Pointer and Structure	
14. Program to implement string manipulation functions in C language. a. Palindrome Checking b. Searching and Sorting Names 15. Program to implement structure in C language. a. Student Information System b. Employee Pay Slip Generation c. Electricity Bill Generation 16. Program to implement union in C language. 17. Program to perform file handling operations in C language. a. Counting No. of Lines, Characters and Black Spaces b. Content copy from one file to another 18. Reading and Writing Data in File 19. Program to perform conditional compilation in C language. 20. Program to perform bitwise operation in C language.	**CO5**

Department : **Computer Application**			Programme: **M.C.A.**			
Semester : **I**			Course Category Code :			
Course Code	Course		Period/Week			Credit
			L	T	P	C
MCA 152	**COMPUTER ORGANIZATION & ARCHITECTURE LAB**		**-**	**-**	**3**	**2**
Prerequisite	***At the end of this course, the students will be able to:***					
Course Outcome	**CO1**	*Design and verify Basic Gates.*				
	CO2	*Design and verify various Flip-Flops.*				
	CO3	*Design and verify combinational circuits (Full adder, half adder, Decoder, multiplexer).*				
	CO4	*Design I/O system and ALU.*				

List of Practicals

1. Implementing basic logic gates.	**CO1**
2. Implementing of Flip-Flops: SR, JK, D, T.	**CO2**
3. Implementing Half Adder, Full Adder using basic logic gates. 4. Implementing 3-8 line DECODER Implementing 4x1 and 8x1 MULTIPLEXERS.	**CO3**
5. Design of an 8-bit ARITHMETIC LOGIC UNIT. 6. Implementing of Binary Adder. 7. Implementing of Binary Subtractor.	**CO4**

Department : **Computer Application**			Programme: **M.C.A.**			
Semester : **I**			Course Category Code :			
Course Code	Course		Period/Week			Credit
			L	T	P	C
MCA153	**PYTHON PROGRAMMING LAB**		**-**	**-**	**4**	**2**
Prerequisite	***At the end of this course, the students will be able to:***					
Course Outcome	**CO1**	*Develop algorithmic solutions to simple computational problems*				
	CO2	*Develop and execute simple Python programs.*				
	CO3	*Implement programs in Python using conditionals and loops for solving problems.*				
	CO4	*Deploy functions to decompose a Python program.*				
	CO5	*Process compound data using Python data structures.*				

List of Practicals

1. Python Program to read and print values of variables of different data types.	**CO1**
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).	**CO2**
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern) 4. Implementing real-time/technical applications using Lists, Tuples. 5. Implementing programs using Sets, Dictionaries.	**CO3**
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape) 7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters) 8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)	**CO4**
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word) 10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)	**CO5**

DETAILED SYLLABUS
MCA 1St Year

2nd Semester

(Effective from Session: 2024-25)

Department : **Computer Application**			Programme : **M.C.A.**			
Semester : **II**			Course Category Code :			
Course Code	Course		Period / Week			Credit
			L	T	P	C
MCA201	**THEORY OF AUTOMATA & FORMAL LANGUAGES**		**3**	**0**	**-**	**3**
Prerequisite	***At the end of this course, the students will be able to:***					**Bloom's Level**
Course Outcome	**CO1**	*Define various types of automata for different classes of formal languages and explain their working.*				K_1, K_2
	CO2	*State and prove key properties of formal languages and automata.*				K_1, K_3
	CO3	*Construct appropriate formal notations (such as grammars, acceptors, transducers and regular expressions) for given formal languages.*				K_3, K_4
	CO4	*Convert among equivalent notations for formal languages.*				K_3
	CO5	*Explain the significance of the Universal Turing machine, Church-Turing thesis and concept of Undecidability.*				K_2
UNIT – I	**Basic Concepts and Automata Theory**					**Contact Hours : 6**
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.						**CO1**
UNIT – II	**Regular Expressions and Languages**					**Contact Hours : 6**
Regular Expressions, Transition Graph, Kleen'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.						**CO2**
UNIT – III	**Regular and Non-Regular Grammars**					**Contact Hours : 6**
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						**CO3**
UNIT – IV	**Push Down Automata and Properties of Context Free Languages**					**Contact Hours : 6**
Nondeterministic Pushdown Automata (NPDA)- Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown Automata(DPDA) and Deterministic Context free Languages(DCFL), 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.						**CO4**
UNIT – V	**Turing Machines and Recursive Function Theory**					**Contact Hours : 6**
Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing						**CO5**

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.		
Lecture Hours : 20	**Tutorial Hours : 10**	**Total : 30**

Reference Books

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 AutomataLanguages and Computation" , PHI.*
5. *Y.N. Singh, "Mathematical Foundation of Computer Science", New Age International..*

Text Book :

1. *K.L.P. Mishra and N. Chandrasekaran ,"Theory of Computer Science AutomataLanguages and Computation" , PHI.*

2.

Video Content:

12. *https://www.youtube.com/watch?v=MPzydKmFrIM&list=PLDt-fuLi9lO8bmknIGMcXjxMB0urudE4Y&index=2*
13. *https://www.youtube.com/watch?v=7n3mTRdXtTk&list=PLDt-fuLi9lO8bmknIGMcXjxMB0urudE4Y&index=2*
14. *https://www.youtube.com/watch?v=5TyjnRe8_x8&list=PLDt-fuLi9lO8bmknIGMcXjxMB0urudE4Y&index=4*
15. *https://www.youtube.com/watch?v=X3t_cvaI0us&list=PLDt-fuLi9lO8bmknIGMcXjxMB0urudE4Y&index=5*
16. *https://www.youtube.com/watch?v=ZUm76sQlKF4&list=PLDt-fuLi9lO8bmknIGMcXjxMB0urudE4Y&index=6*
17. *https://www.youtube.com/watch?v=9kuynHcM3UA&list=PLmXKhU9FNesSdCsn6YQqu9DmXRMsYdZ2T*

Department : **Computer Application**			Programme : **M.C.A.**			
Semester : **II**			Course Category Code :			
Course Code	Course		Period / Week			Credit
			L	T	P	C
MCA202	**Object-Oriented Programming using Java**		**3**	**1**	**-**	**4**
Prerequisite	***At the end of this course, the students will be able to:***					**Bloom's Level**
Course Outcome	**CO1**	*List the significance and key features of object oriented programming and modeling using UML*				K_1, K_2
	CO2	*Construct basic structural, behavioral and architectural models using object oriented software engineering approach.*				K_1, K_3
	CO3	*Integrate object oriented modeling techniques for analysis and design of a system.*				K_3, K_4
	CO4	*Use the basic features of data abstraction and encapsulation in C++ programs.*				K_3
	CO5	*Use the advanced features such as Inheritance, polymorphism and virtual function in C++ programs.*				K_2
UNIT – I	**Introduction**					**Contact Hours : 8**
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 specifies, static members, Comments, Data Types, Variables, Operators, Control Flow, Arrays..						**CO1**
UNIT – II	**Inheritance, Interfaces, and Packages**					**Contact Hours : 8**
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.						**CO2**
UNIT – III	**Exception Handling, I/O**					**Contact Hours : 8**
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						**CO3**
UNIT – IV	**Multithreading and Generic Programming**					**Contact Hours : 8**
Differences between multi-threadingand multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming: Genericclasses, generic methods, Bounded Types: Restrictions and Limitations						**CO4**
UNIT – V	**Event Driven Programming**					**Contact Hours : 8**
Graphics programming: Frame, Components, workingwith 2D shapes,Using colors, fonts, and images. Basics of event handling: event handlers, adapter classes, actions, mouse events, AWT event hierarchy. Introduction toSwing: layout management, Swing Components: Text Fields, Text Areas, Buttons, Check Boxes, Radio Buttons, Lists, choices, Scrollbars, Windows Menus and Dialog Boxes.						**CO5**
Lecture Hours : 30		**Tutorial Hours : 10**				**Total : 40**

Reference Books

1. *Herbert Schildt, "Java The complete reference‖", 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.*

Text Book :

1. *Herbert Schildt, "Java The complete reference‖", McGraw Hill Education, 8th Edition, 2011.*

Video Content:

1. *https://www.youtube.com/watch?v=GWVZtJNFyJQ*
2. *https://www.youtube.com/watch?v=H3mRIMd1by4&t=4s*
3. *https://www.youtube.com/watch?v=KSbRjtxnmjg&t=3s*
4. *https://www.youtube.com/watch?v=ygzzxMxpQ_8&t=4s*
5. *https://www.youtube.com/watch?v=KRe0jXTVLzo&t=5s*
6. *https://www.youtube.com/watch?v=00tmb4vdr80*

Department : **Computer Application**			Programme : **M.C.A.**			
Semester : **II**			Course Category Code :			
Course Code	Course		Period / Week			Credit
			L	T	P	C
MCA203	**OPERATING SYSTEMS**		**3**	**0**	**-**	**3**
Prerequisite	***At the end of this course, the students will be able to:***					**Bloom's Level**
Course Outcome	**CO1**	*Explain main components, services, types and structure of Operating Systems.*				K_1, K_2
	CO2	*Apply the various algorithms and techniques to handle the various concurrency control issues.*				K_2, K_3
	CO3	*Compare and apply various CPU scheduling algorithms for process execution.*				K_2, K_3
	CO4	*Identify occurrence of deadlock and describe ways to handle it.*				K_2, K_3
	CO5	*Explain and apply various memory, I/O and disk management techniques.*				K_2, K_3
UNIT – I	**Introduction**:					**Contact Hours : 6**
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						**CO1**
UNIT – II	**Concurrent Processes**					**Contact Hours : 6**
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.						**CO2**
UNIT – III	**CPU Scheduling**					**Contact Hours : 6**
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.						**CO3**
UNIT – IV	**Memory Management**					**Contact Hours : 6**
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.						**CO4**
UNIT – V	**I/O Management and Disk Scheduling**					**Contact Hours : 6**
I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: Fileconcept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.						**CO5**

Lecture Hours : 20	Tutorial Hours : 10	Total : 30

Reference Books

Suggested Readings:

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, "Ope Harris, Schaum's Outline Of Operating Systems, McGraw Hill rating Systems: Internals and Design Principles", 6th Edition, Pearson Education.*

Text Book :

1. *Silberschatz, Galvin and Gagne, "Operating Systems Concepts",Wiley Publication.*

Video Content:

1. *https://www.youtube.com/watch?v=xw_OuOhjauw&list=PLmXKhU9FNesSFvj6gASuWmQd23Ul5omtD*
2. *https://www.youtube.com/watch?v=vBURTt97EkA&list=PLBlnK6fEyqRiVhbXDGLXDk_OQAeuVcp2O*
3. *https://www.youtube.com/watch?v=aF2uRmibwco&list=PLrjkTql3jnm9U1tSPnPQWQGIGNkUwBFv-*
4. *https://www.youtube.com/watch?v=A4G0hOI6XyQ*
5. *https://www.youtube.com/watch?v=3obEP8eLsCw*

Department : **Computer Application**			Programme : **M.C.A.**			
Semester : **II**			Course Category Code :			
Course Code	Course		Period / Week			Credit
			L	T	P	C
MCA204	**DATABASE MANAGEMENT SYSTEMS**		**3**	**1**	**-**	**4**
Prerequisite	***At the end of this course, the students will be able to:***					**Bloom's Level**
Course Outcome	**CO1**	*Describe the features of a database system and its application and compare various types of data models.*				K_1, K_2
	CO2	*Construct an ER Model for a given problem and transform it into a relation database schema.*				K_2, K_3
	CO3	*Formulate solution to a query problem using SQL Commands, relational algebra, tuple calculus and domain calculus.*				K_2, K_3
	CO4	*Explain the need of normalization and normalize a given relation to the desired normal form.*				K_2, K_3
	CO5	*Explain different approaches of transaction processing and concurrency control.*				K_2, K_3
UNIT – I	**Introduction:**					**Contact Hours : 8**
Overview, Database System vs File System, Database System Conceptand Architecture, Data Model Schema and Instances, Data Independence and DatabaseLanguage 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						**CO1**
UNIT – II	**Relational data Model and Language**					**Contact Hours : 8**
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						**CO2**
UNIT – III	**Data Base Design & Normalization**					**Contact Hours : 8**
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						**CO3**
UNIT – IV	**Transaction Processing Concept**					**Contact Hours : 8**
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						**CO4**

UNIT – V	Concurrency Control Techniques:	Contact Hours : 8
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.		CO5
Lecture Hours : 30	Tutorial Hours : 10	Total : 40

Reference Books

Suggested Readings:

1. *Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill.*
2. *Date C J, "An Introduction to Database Systems", Addision Wesley.*
3. *Elmasri, Navathe, "Fundamentals of Database Systems", Addision 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.*

Text Book :

3. Kanetkar Y., "Let Us C", BPB Publications.

Video Content:

1. ***https://www.youtube.com/watch?v=ZaaSa1TtqXY&list=PLLOxZwkBK52B6FqMOu6FfU4_5Id2cBStN***
2. ***https://www.youtube.com/watch?v=wjfeGxqAQOY&list=PLrjkTql3jnm-CLxHftqLgkrZbM8fUt0vn***
3. ***https://www.youtube.com/watch?v=khKoJUpcXUE&list=PLG9aCp4uE-s0bu-I8fgDXXhVLO4qVROGv***
4. ***https://www.youtube.com/watch?v=FchQ6wZVqsA***
5. ***https://www.youtube.com/watch?v=fHAfc7Hjq28&list=PLWPirh4EWFpGrpcMfZ6UcdI786QdtSxV8***
6. ***https://www.youtube.com/watch?v=dl00fOOYLOM***

Department : **Computer Application**			Programme : **M.C.A.**			
Semester : **II**			Course Category Code :			
Course Code	Course		Period / Week			Credit
			L	T	P	C
MCA205	**Data Structures using C**		**3**	**1**	**-**	**4**
Prerequisite	***At the end of this course, the students will be able to:***					**Bloom's Level**
Course Outcome	**CO1**	*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_1, K_2
	CO2	*Describe the applications of stacks and queues and implement various operations on them using arrays and linked lists.*				K_1, K_3
	CO3	*Describe the properties of graphs and trees and implement various operations such as searching and traversal on them.*				K_3, K_4
	CO4	*Compare incremental and divide-and-conquer approaches of designing algorithms for problems such as sorting and searching.*				K_3
	CO5	*Apply and analyze various design approaches such as Divide-and-Conquer, greedy and dynamic for problem solving .*				K_2
UNIT – I	**Introduction to data structure, Arrays, Linked lists**					**Contact Hours : 8**
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. **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. **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.						**CO1**
UNIT – II	**Stacks, Queues, Searching**					**Contact Hours : 8**
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. **Queues:** Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue. **Searching:** Concept of Searching, Sequential search, Index Sequential Search, Binary Search. Concept of Hashing & Collision resolution Techniques used in Hashing.						**CO2**
UNIT – III	**Sorting, Graphs**					**Contact Hours : 8**

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.		**CO3**
UNIT – IV	**Trees**	**Contact Hours : 8**
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.		**CO4**
UNIT – V	**Divide and Conquer, Dynamic Programming**	**Contact Hours : 8**
Divide and Conquer with Examples Such as Merge Sort, Quick Sort, MatrixMultiplication: Strassen's Algorithm Dynamic Programming: Dijikstra Algorithm, Bellman Ford Algorithm, All-pair Shortest Path: Warshal Algorithm, Longest Common Sub-sequence Greedy Programming: Prims and Kruskal algorithm.		**CO5**
Lecture Hours : 30	**Tutorial Hours : 10**	**Total : 40**

Reference Books

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. *Lipschuts 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 Hill*
7. *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.*

Reema Thareja, Data Structures using C, Oxford Univ. Press

Text Book :

1. Cormen T. H., Leiserson C. E., Rivest R. L., and Stein C., "Introduction to Algorithms", PHI.

Video Content:

1. https://www.youtube.com/watch?v=MtVZAXepMPM
2. https://www.youtube.com/watch?v=Db9ZYbJONHc&list=PLVlQHNRLflP_OxF1QJoGBwH_TnZszHR_j
3. https://www.youtube.com/watch?v=0UZ_G2mcYVQ&list=PLf0LpPWikpPfA_vez2NndnYuQy6WkpTzc
4. https://www.youtube.com/watch?v=5_5oE5lgrhw&list=PLu0W_9lII9ahIappRPN0MCAgtOu3lQjQi
5. https://www.youtube.com/watch?v=7BbKVh8p5Cc&list=PLDDXuRcB-QG7qd6u2fu8NBIGq9BMtgXFz

Department : **Computer Application**			Programme: **M.C.A.**			
Semester : **II**			Course Category Code :			
Course Code	Course		Period/Week			Credit
			L	T	P	C
MCA251	**OBJECT ORIENTED PROGRAMMING LAB**		**-**	**-**	**3**	**2**
Prerequisite	***At the end of this course, the students will be able to:***					
Course Outcome	**CO1**	*Use the Concept of Data Abstraction and Encapsulation in java programs.*				
	CO2	*Design and Develop java program using the concept such aspolymorphism, virtual function, exception handling and template.*				
	CO3	*Apply object oriented techniques to analyze, design and develop acomplete solution for a given problem.*				

List of Practicals

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.	**CO1**
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.	**CO2**
8. Develop a calculator application in java. 9. Develop a Client Server Application. 10. Develop GUI applications using Swing components.	**CO3**

Department : **Computer Application**			Programme: **M.C.A.**			
Semester : **II**			Course Category Code : **MCA252**			
Course Code	Course		Period/Week			Credit
			L	T	P	C
MCA252	**DATABASE MANAGEMENT SYSTEMS LAB**		**-**	**-**	**2**	**1**
Prerequisite	***At the end of this course, the students will be able to:***					
Course Outcome	**CO1**	*Use the Concept of Data Abstraction and Encapsulation in C++programs.*				
	CO2	*Write SQL commands to query a database.*				
	CO3	*Write PL/SQL programs for implementing stored procedures, storedfunctions, cursors, trigger and packages.*				

List of Practicals

1. Installing oracle/ MYSQL. 2. Creating Entity-Relationship Diagram using case tools.	**CO1**
3. Writing SQL statements Using ORACLE /MYSQL: **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.	**CO2**
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.	**CO3**

Department : **Computer Application**			Programme: **M.C.A.**			
Semester : **II**			Course Category Code :			
Course Code	Course		Period/Week			Credit
			L	T	P	C
KCA253	**Data Structures using C Lab**		**-**	**-**	**4**	**2**
Prerequisite	***At the end of this course, the students will be able to:***					
Course Outcome	**CO1**	*Write and execute programs to implement various searching andsorting algorithms.*				
	CO2	*Write and execute programs to implement various operations ontwo-dimensional arrays.*				
	CO3	*Implement various operations of Stacks and Queues using botharrays and linked lists data structures.*				
	CO4	*Implement graph algorithm to solve the problem of minimumspanning tree*				

List of Practicals

Program in C or C++ for following: 1. To implement Linear Search. 2. To implement Binary Search. 3. To implement Bubble Sorting. 4. To implement Selection Sorting. 5. To implement Insertion Sorting. 6. To implement Merge Sorting. 7. To implement Heap Sorting.	**CO1**
8. To implement addition and multiplication of two 2D arrays. 9. To transpose a 2D array. 10. To implement stack using array 11. To implement queue using array. 12. To implement circular queue using array.	**CO2**
13. To implement stack using linked list. 14. To implement queue using linked list. 15. To implement BFS using linked list. 16. To implement DFS using linked list.	**CO3**
17. To implement Matrix Multiplication by strassen's algorithm 18. Find Minimum Spanning Tree using Kruskal's Algorithm	**CO4**