IIMT University Meerut

Evaluation Scheme and Syllabus For
M.C.A. (Master of Computer Application)
On
Choice Based Credit System
Semester I and II

(Effective from the Session: 2020-21)

MCA (MASTER OF COMPUTER APPLICATION)
MCA FIRST YEAR, 2020-21

SEMESTER-I

S.No.	Subject Code	Subject Name	Course Type	L	T	P	Internal	External	Total	Credit
1.	MCA-111	Fundamental of Computers & Emerging Technologies	Core Theory	3	1	0	30	70	100	4
2.	MCA-112	Problem Solving using C	Core Theory	3	1	0	30	70	100	4
3.	MCA-113	Principles of Management & Communication	DSE	4	0	0	30	70	100	4
4.	MCA-114	Discrete Mathematics	DSE	4	0	0	30	70	100	4
5.	MCA-115	Computer Organization & Architecture	Core Theory	3	1	0	30	70	100	4
6.	MCA-116P	Problem Solving using C **Lab**	Core Practical	0	0	4	20	30	50	2
7.	MCA-117P	Computer Organization & Architecture **Lab**	Core Practical	0	0	4	20	30	50	2
8.	MCA-P1	Mini Project lab	Skill Enhancement Course	0	0	4	20	30	50	2
9.	ECC-111	Industrial Visits/Seminar or Presentation Based on the Report of Visits	Skill Enhancement Course	0	0	0	0	0	25	0
10	ECC-112	University Social Responsibility	Skill Enhancement Course	0	0	0	0	0	25	0
11		Sports	Audit Course	0	0	0	50	0	50	0
		Total		17	3	12	210	440	**650**	**26**

SEMESTER-II

S.No.	Subject Code	Subject Name	Course Type	Periods			Internal	External	Total	Credit
				L	T	P				
1.	MCA-121	Theory of Automata & Formal Languages	DSE	4	0	0	30	70	100	4
2.	MCA-122	Object Oriented Programming	Core Theory	3	1	0	30	70	100	4
3.	MCA-123	Operating Systems	Core Theory	3	1	0	30	70	100	4
4.	MCA-124	Database Management Systems	Core Theory	3	1	0	30	70	100	4
5.	MCA-125	Data Structures & Analysis of Algorithms	DSE	4	0	0	30	70	100	4
7.	MCA-126P	Object Oriented Programming Lab	Core Practical	0	0	4	20	30	50	2
9.	MCA-127P	DBMS LAB	Core Practical	0	0	4	20	30	50	2
	MCA-P2	Mini Project Lab	Skill Enhancement Course	0	0	4	20	30	50	2
	ECC-121	Industrial Visits/Seminar or Presentation Based on the Report of Visits	Skill Enhancement Course	0	0	0	0	0	25	0
	ECC-122	University Social Responsibility	Skill Enhancement Course	0	0	0	0	0	25	0
		Sports	Audit Course	0	0	0	50	0	50	0
		Total		17	3	12	210	440	**650**	**26**

Syllabus

MCA 1st Year
Ist Semester

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

MCA-111: FUNDAMENTAL OF COMPUTERS & EMERGING TECHNOLOGIES

Course Outcome (CO)		
At the end of course , the student will be able to		
CO 1	Demonstratetheknowledgeofthebasicstructure,components, featuresand generations of computers.	
CO 2	Describe the concept of computer languages, language translators and construct algorithms to solve problems using programming concepts.	
CO 3	Compare and contrast features, functioning & types of operating system and computer networks.	
CO 4	Demonstrate architecture, functioning & services of the Internet and basics of multimedia.	
CO 5	Illustrate the emerging trends and technologies in the field of Information Technology.	
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Computer:** Definition, Computer Hardware & Computer Software **Components:** Hardware – Introduction, Input devices, Output devices, Central ProcessingUnit,Memory-PrimaryandSecondary.Software-Introduction,Types – System and Application. **Computer Languages:** Introduction, Concept of Compiler, Interpreter & Assembler **Problem solving concept:** Algorithms – Introduction, Definition, Characteristics, Limitations, Conditions in pseudo-code, Loops in pseudo code.	08
II	**Operating system:** Definition, Functions, Types, Classification, Elements of command based and GUI based operating system. **Computer Network:** Overview, Types (LAN, WAN and MAN), Data communication, topologies.	08
III	**Internet :** Overview, Architecture, Functioning, Basic services like WWW, FTP, Telnet, Gopher etc., Search engines, E-mail, Web Browsers. **Internet of Things (IoT):** Definition, Sensors, their types and features, Smart Cities, Industrial Internet of Things.	08
IV	**Block chain:** Introduction, overview, features, limitations and application areas fundamentals of Block Chain. **Crypto currencies:** Introduction , Applications and use cases **Cloud Computing:** It nature and benefits, AWS, Google, Microsoft & IBM Services	08
V	**Emerging Technologies:** Introduction, overview, features, limitations and application areas of Augmented Reality , Virtual Reality, Grid computing,Green computing, Big data analytics, Quantum Computing and BrainComputer Interface	08

Suggested Readings:
1. Rajaraman V., "Fundamentals of Computers", Prentice-Hall ofIndia.
2. Norton P., "Introduction to Computers", McGraw HillEducation.
3. Goel A., "Computer Fundamentals",Pearson.
4. BalagurusamyE.," FundamentalsofComputers",McGrawHill
5. TharejaR., "FundamentalsofComputers",OxfordUniversityPress.
6. BindraJ.,"TheTechWhisperer-onDigitalTransformationandtheTechnologiesthatEnableit",Penguin

MCA-112 :PROBLEM SOLVING USING C		
Course Outcome (CO)		
At the end of course , the student will be able to		
CO 1	Describe the functional components and fundamental concepts of a digital computer system including number systems.	
CO 2	Construct flowchart and write algorithms for solving basic problems.	
CO 3	Write 'C' programs that incorporate use of variables, operators and expressions along with data types.	
CO 4	Write simple programs using the basic elements like control statements, functions, arrays and strings.	
CO 5	Write advanced programs using the concepts of pointers, structures, unions and enumerated data types.	
CO 6	Apply pre-processor directives and basic file handling and graphics operations in advanced programming.	
DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	**Basics of programming:** Approaches to problem solving, Use of high level programming language for systematic development of programs, Concept of algorithm andflowchart, Concept and role of structured programming. **Basics of C**: 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 and expressions.	**08**
II	**Conditional Program Execution:** if, if-else, and nested if-else statements, Switch statements, Restrictions on switch values, Use of break and default with switch, Comparison of switch andif-else. **Loops and Iteration:** for, while and do-while loops, Multiple loop variables, Nested loops, Assignment operators, break and continue statement. **Functions:** Introduction, Types, Declaration of a Function, Function calls, Defining functions, Function Prototypes, Passing arguments to a function Return values and their types, Writing multifunctionprogram, Calling function by value, Recursive functions.	**08**
III	**Arrays:** 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. **Pointers:** Introduction, Characteristics, * and & operators, Pointer type declaration andassignment, Pointer arithmetic, Call by reference, Passing pointers tofunctions, arrayof pointers, Pointers to functions, Pointer to pointer, Array ofpointers. **Strings:** Introduction, Initializing strings, Accessing string elements, Array of strings, Passing strings to functions, String functions.	**08**

IV	**Structure:** Introduction, Initializing, defining and declaring structure, Accessing members, Operations on individual members, Operations on structures, Structure within structure, Array of structure, Pointers to structure. **Union:** Introduction, Declaring union, Usage of unions, Operations on union. Enumerated data types **Storage classes**: Introduction, Types- automatic, register, static and external.	**08**
V	**Dynamic Memory Allocation**: Introduction, Library functions – malloc, calloc, realloc andfree. **File Handling:** Basics, File types, File operations, File pointer, File opening modes, File handling functions, File handling through command line argument, Record I/O in files. **Graphics:** Introduction, Constant, Data types and global variables used in graphics, Library functions used indrawing, Drawing andfilling images, GUI interaction within the program.	**08**

Suggested Readings:

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

MCA-113 : Principles of Management & Communication		
Course Outcome (CO)		
At the end of course , the student will be able to		
CO 1	Describe primary features, processes and principles of management.	
CO 2	Explain functions of management in terms of planning, decision making and organizing.	
CO 3	Illustrate key factors of leadership skill in directing and controlling business resources and processes.	
CO 4	Exhibit adequate verbal and non-verbal communication skills	
CO 5	Demonstrate effective discussion, presentation and writing skills.	
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Management**: Need, Scope, Meaning and Definition. The process of Management, Development of Management thought F.W. Taylor and Henry Fayol, Horothorne Studies, Qualities of an Efficient Management.	**08**
II	**Planning & Organising:** Need, Scope and Importance of Planning, Steps in planning, Decision making model. Organising need and Importance, Organisational Design, Organisational structure, centralisation and Decentralisation, Deligation.	**08**
III	**Directing & Controlling:** Motivation—Meaning, Importance, need.Theories of Motivation,Leadership—meaning,needandimportance,leadershipstyle,Qualitiesof effective leader, principles of directing, Basic control process, Different control Techniques.	**08**
IV	**IntroductiontoCommunication:**WhatisCommunication,Levelsofcommunication, Barriers to communication, Process of Communication, Non-verbal Communication, TheflowofCommunication:Downward,Upward,LateralorHorizontal(Peergroup) Communication, Technology Enabled communication, Impact of Technology, Selection of appropriate communication Technology, Importance ofTechnical communication.	**08**
V	**Business letters :** Sales & Credit letters; Claim and Adjustment Letters; Job application andResumes. **Reports:** Types; Structure, Style & Writing of Reports. **Technical Proposal:** Parts; Types; Writing of Proposal; Significance. NuancesofDelivery;BodyLanguage;DimensionsofSpeech:Syllable;Accent;Pitch; Rhythm; Intonation; Paralinguistic features ofvoice; Communication skills, Presentation strategies, Group Discussion; Interview skills; Workshop; Conference; Seminars.	**08**

Suggested Readings:

1. P.C.Tripathi,P.N.Reddy,"PrinciplesofManagement",McGrawHillEducation6ᵗʰEdition.
2. C.B.Gupta,"ManagementPrinciplesandPractice",SultanChand&Sons3ʳᵈedition.
3. T.N.Chhabra, "Business Communication", Sun IndiaPublication.
4. V.N.AroraandLaxmiChandra,"ImproveYourWriting",OxfordUniv.Press,2001,NewDelhi.
5. Madhu Rani and SeemaVerma, "Technical Communication: A Practical Approach", Acme Learning, NewDelhi-2011.
6. MeenakshiRaman&SangeetaSharma,"TechnicalCommunication-PrinciplesandPractices",Oxford Univ. Press, 2007, NewDelhi.
7. KoontzHarold&WeihrichHeinz,"EssentialsofManagement",McGrawHill5ᵗʰEdition2008.
8. RobbinsandCoulter,"Management",PrenticeHallof India,9ᵗʰedition.
9. James A. F., Stoner, "Management", Pearson EducationDelhi.
10. P.D.Chaturvedi, "Business Communication", PearsonEducation.

MCA-114 : Discrete Mathematics		
Course Outcome (CO)		
At the end of course , the student will be able to		
CO 1	Use mathematical and logical notation to define and formally reason about basic discrete structures such as Sets, Relations and Functions	
CO 2	Apply mathematical arguments using logical connectives and quantifiers to check the validity of an argument through truth tables and propositional and predicate logic	
CO 3	Identify and prove properties of Algebraic Structures like Groups, Rings and Fields	
CO 4	Formulate and solve recurrences and recursive functions	
CO 5	Apply the concept of combinatorics to solve basic problems in discrete mathematics	
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**SetTheory:**Introduction,SizeofsetsandCardinals,Venndiagrams,Combinationof sets, Multisets, Ordered pairs and SetIdentities. **Relation:**Definition,Operationsonrelations,Compositerelations,Propertiesof relations,Equalityofrelations,Partialorderrelation. **Functions:** Definition, Classification of functions, Operations on functions, Recursively defined functions.	**08**
II	**Posets,HasseDiagramandLattices:**Introduction,Partialorderedsets,Combination ofPartialorderedsets,Hassediagram,Introductionoflattices,Propertiesoflattices– Bounded, Complemented, Modular and Completelattice. **Boolean Algebra:** Introduction, Axioms and Theorems of Boolean algebra, Boolean functions. Simplification of Boolean functions, Karnaugh maps, Logic gates.	**08**
III	**Propositional:** Propositions, Truth tables, Tautology, Contradiction, Algebra of Propositions, Theory of Inference and Natural Detection. **Predicate Logic:** Theory of Predicates, First order predicate, Predicate formulas, Quantifiers, Inference theory of predicate logic.	**08**
IV	**Algebraic Structures:**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. **Rings and Fields:** Definition and elementary properties of Rings and Fields.	**08**
V	**Natural Numbers:** Introduction, Piano's axioms, Mathematical Induction, Strong Induction and Induction with Nonzero Base cases. **Recurrence Relation & Generating functions:** Introduction and properties of Generating Functions. Simple Recurrence relation with constant coefficients and Linear recurrence relation without constant coefficients. Methods of solving recurrences. **Combinatorics:** Introduction, Counting techniques and Pigeonhole principle, Polya's Counting theorem.	**08**
Suggested Readings: 1. KennethH.Rosen,"DiscreteMathematicsandItsApplications",McGrawHill,2006. 2. B.Kolman,R.CBusbyandS.CRoss,"DiscreteMathematicsStructures",PrenticeHall,2004. 3. R.PGirimaldi,"DiscreteandCombinatorialMathematics",AddisonWesley,2004. 4. Y.N.Singh,"DiscreteMathematicalStructures",Wiley-India,Firstedition,2010. 5. SwapankumarSarkar,"ATextbookofDiscreteMathematics",S.Chand&CompanyPVT.LTD.V. 6. Krishnamurthy,"CombinatoricsTheory&Application",East-WestPressPvt.Ltd.,NewDelhi. 7. Liptschutz, Seymour, "Discrete Mathematics", McGrawHill. 8. J.P.Trembely&R.Manohar,"DiscreteMathematicalStructurewithapplicationtoComputerScience", McGrawHill.		

MCA-115 : COMPUTER ORGANIZATION & ARCHITECTURE

Course Outcome (CO)	
At the end of course , the student will be able to	
CO 1	Describe functional units of digital system and explain how arithmetic and logical operations are performed by computers
CO 2	Describe the operations of control unit and write sequence of instructions for carrying out simple operation using various addressing modes.
CO 3	Design various types of memory and its organization.
CO 4	Describe the various modes in which IO devices communicate with CPU and memory.
CO 5	List the criteria for classification of parallel computer and describe various architectural schemes.

DETAILED SYLLABUS		3-1-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. **Processor organization:** general registers organization, stack organization and addressing modes.	**08**
II	**Arithmetic and logic unit:** Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers.	**08**
III	**Control Unit:** Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro-program sequencing, concept of horizontal and vertical microprogramming.	**08**
IV	**Memory:** Basic concept and hierarchy, semiconductor RAM memories, 2D & 21/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.	**08**
V	**Input / Output:** Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	**08**

Suggested Readings:

1. John P.Hayes,"Computer Architecture and Organization",McGraw Hill.
2. William Stallings, "Computer Organization and Architecture -Designing for Performance", Pearson Education.
3. M. Morris Mano, "Computer System Architecture",PHI.
4. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", McGraw -Hill.
5. Behrooz Parahami, "Computer Architecture", Oxford University Press.
6. David A. Patterson and John L. Hennessy, "Computer Architecture-A Quantitative Approach", Elsevier Pub.
7. Tannenbaum, "Structured Computer Organization",PHI.

MCA-116P: PROBLEM SOLVING USING C LAB

Course Outcome (CO)	)

At the end of course , the student will be able to

CO1	Write, compile, debug and execute programs in a C programming environment.	
CO2	Write programs that incorporate use of variables, operators and expressions along with data types.	
CO3	Write programs for solving problems involving use of decision control structures and loops.	
CO4	Write programs that involve the use of arrays, structures and user definedfunctions.	
CO5	Write programs using graphics and file handling operations.	

1. Program to implement conditional statements in Clanguage.
2. Program to implement switch-case statement in Clanguage
3. Program to implement looping constructs inClanguage.
4. Program to perform basic input-output operations in Clanguage.
5. Program to implement user defined functions in Clanguage.
6. Program to implement recursive functions in Clanguage.
7. Program to implement one-dimensional arrays in C language.
8. Program to implement two-dimensional arrays in C language.
9. Program to perform various operations on two-dimensional arrays in Clanguage.
10. Program to implement multi-dimensional arrays in Clanguage.
11. Program to implement string manipulation functions in Clanguage.
12. Program to implement structure in Clanguage.
13. Program to implement union in Clanguage.
14. Program to perform file handling operations in Clanguage.
15. Program to perform graphical operations in Clanguage.

Note: The Instructor may add/delete/modifyexperiments, wherever he/she feels in a justified manner.

MCA-117P: COMPUTER ORGANIZATION & ARCHITECTURE LAB

	Course Outcome (CO)	
	At the end of course , the student will be able to	
CO1	Design and verify combinational circuits (adder, code converter, decoder, multiplexer) using basicgates.	
CO2	Design and verify various flip-flops.	
CO3	Design I/O system and ALU.	
CO4	Demonstrate combinational circuit using simulator	

1. Implementing HALF ADDER, FULL ADDER using basic logicgates.
2. Implementing Binary -to -Gray, Gray -to -Binary codeconversions.
3. Implementing 3-8 line DECODER. Implementing 4x1 and 8x1MULTIPLEXERS.
4. Verify the excitation tables of variousFLIP-FLOPS.
5. Design of an 8-bit Input/ Output system with four 8-bit InternalRegisters.
6. Design of an 8-bit ARITHMETIC LOGICUNIT.
7. Design the data path of a computer from itsregister transfer language description.
8. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer languagedescription.
9. Implement a simple instruction set computer with a control unit and adata path.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

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

MCA-121: THEORY OF AUTOMATA & FORMAL LANGUAGES		
Course Outcome (CO)		
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.	
CO 2	State and prove key properties of formal languages and automata.	
CO 3	Construct appropriate formal notations (such as grammars, acceptors, transducers and regular expressions) for given formal languages.	
CO 4	Convert among equivalent notations for formal languages.	
CO 5	Explain the significance of the Universal Turing machine, Church-Turing thesis and concept of Undecidability.	
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	**RegularExpressionsandLanguages:**RegularExpressions,Transition Graph,Kleen'sTheorem, 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**

		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:
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.

MCA-122 : OBJECT ORIENTED PROGRAMMING	
Course Outcome (CO)	
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
CO 2	Construct basic structural, behavioral and architectural models using object oriented software engineering approach.
CO 3	Integrate object oriented modeling techniques for analysis and design of a system.
CO 4	Use the basic features of data abstraction and encapsulation in C++ programs.
CO 5	Use the advanced features such as Inheritance, polymorphism and virtual function in C++ programs.

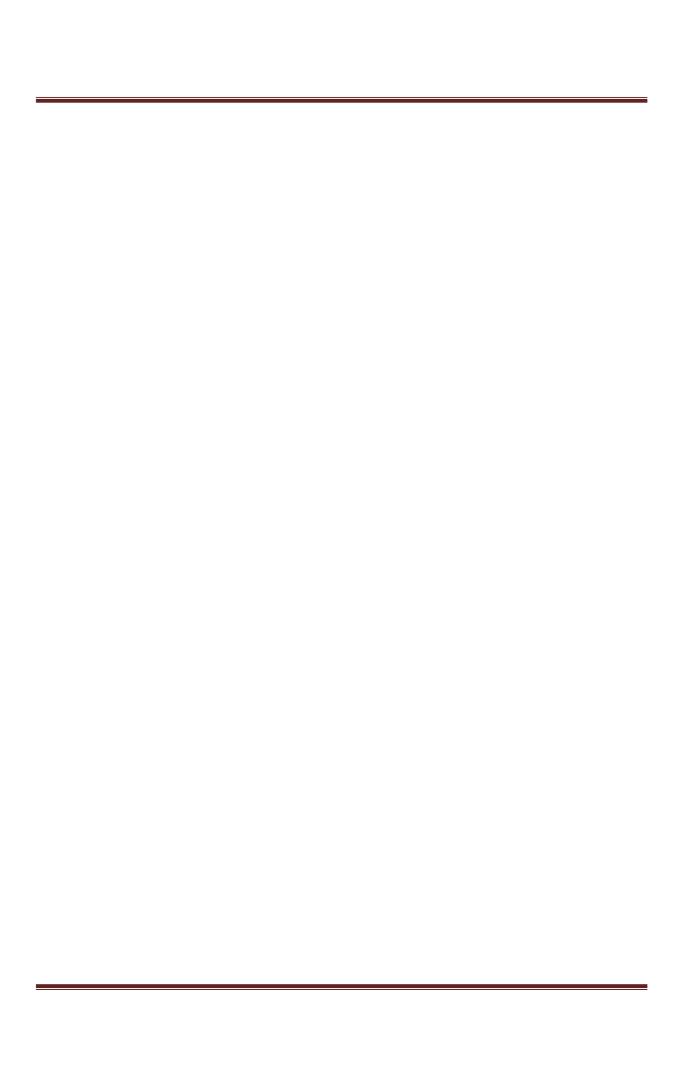| DETAILED SYLLABUS		3-1-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Object Oriented Programming: objects, classes, Abstraction, Encapsulation, Inheritance, Polymorphism, OOP in Java, Characteristics of Java, The Java Environment, Java Source File Structure, and Compilation. Fundamental Programming Structures in Java: Defining classes in Java, constructors, methods, access specifies, 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:
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.

MCA-123 : OPERATING SYSTEMS		
Course Outcome (CO)		
At the end of course , the student will be able to		
CO 1	Explain main components, services, types and structure of Operating Systems.	
CO 2	Apply the various algorithms and techniques to handle the various concurrency control issues.	
CO 3	Compare and apply various CPU scheduling algorithms for process execution.	
CO 4	Identify occurrence of deadlock and describe ways to handle it.	
CO 5	Explain and apply various memory, I/O and disk management techniques.	
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:
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

MCA-124 : DATABASE MANAGEMENT SYSTEMS

Course Outcome (CO)		
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.	
CO 2	Construct an ER Model for a given problem and transform it into a relation database schema.	
CO 3	Formulate solution to a query problem using SQL Commands, relational algebra, tuple calculus and domain calculus.	
CO 4	Explain the need of normalization and normalize a given relation to the desired normal form.	
CO 5	Explain different approaches of transaction processing and concurrency control.	
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:
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.

MCA-125: DATA STRUCTURES & ANALYSIS OF ALGORITHMS

Course Outcome (CO)	
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.	
CO 2	Describe the applications of stacks and queues and implement various operations on them using arrays and linked lists.	
CO 3	Describe the properties of graphs and trees and implement various operations such as searching and traversal on them.	
CO 4	Compare incremental and divide-and-conquer approaches of designing algorithms for problems such as sorting and searching.	
CO 5	Apply and analyze various design approaches such as Divide-and-Conquer, greedy and dynamic for problem solving .	

DETAILED SYLLABUS		4-0-0
Unit	**Topic**	**Proposed Lecture**
I	**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.	**08**
II	**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.	**08**

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: Dijikstra Algorithm, Bellman Ford Algorithm, All-pair Shortest Path: Warshal Algorithm, Longest Common Sub-sequence Greedy Programming: Prims and Kruskal algorithm.	08

Suggested Readings:

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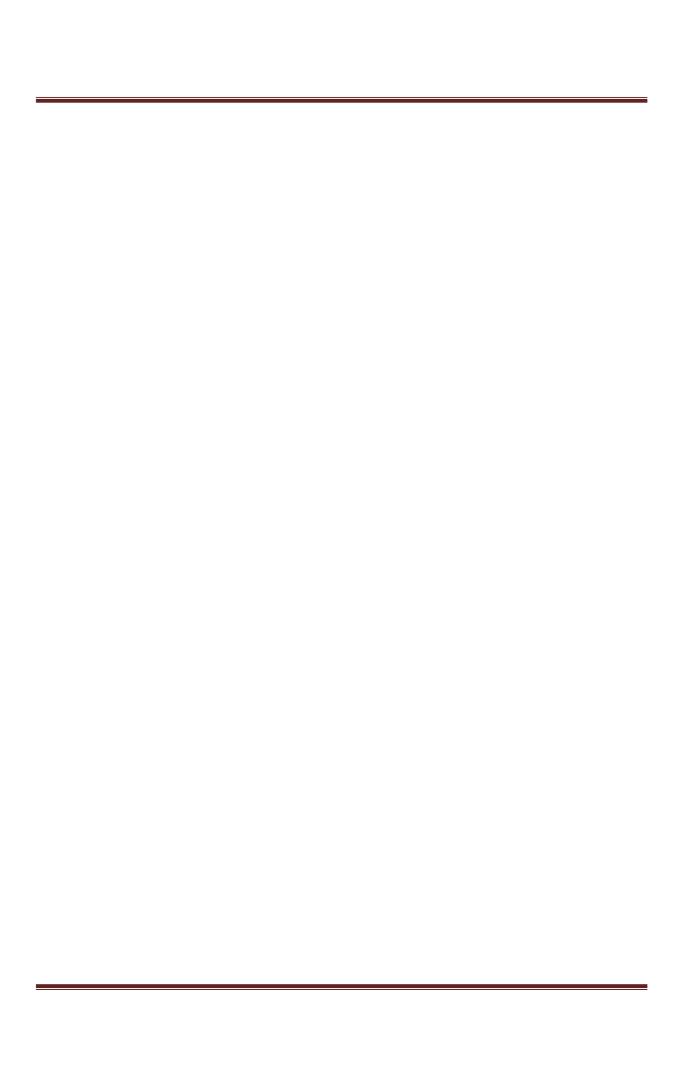12. Reema Thareja, Data Structures using C, Oxford Univ. Press

MCA-126P:OBJECT ORIENTED PROGRAMMING LAB	
Course Outcome (CO)	
At the end of course , the student will be able to	
CO1	Use the Concept of Data Abstraction and Encapsulation in C++ programs.	
CO2	Design and Develop C++ program using the concept such as polymorphism, virtual function, exception handling and template.	
CO3	Apply object oriented techniques to analyze, design and develop a complete solution for a given problem.	

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.

MCA-127P:DATA STRUCTURES & ANALYSIS OF ALGORITHMS LAB	
Course Outcome (CO)	
At the end of course , the student will be able to	
CO1	Write and execute programs to implement various searching and sorting algorithms.	
CO2	Write and execute programs to implement various operations on two-dimensional arrays.	
CO3	Implement various operations of Stacks and Queues using both arrays and linked lists data structures.	
CO4	Implement graph algorithm to solve the problem of minimum spanning tree	

Program in C or C++ for following:
1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array
4. 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. 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 algorithm
18. Find Minimum Spanning Tree using Kruskal's Algorithm

MCA(AI&ML)
SEMESTER-I

S.No.	Subject Code	Subject Name	Course Type	Periods			Internal	External	Total	Credit
				L	T	P				
1.	MCA-111	Fundamental of Computers & Emerging Technologies	DSE	3	1	0	30	70	100	4
2.	MCA-112	Problem Solving using C	Core Theory	3	1	0	30	70	100	4
3.	MCA-118	Python Programming	Core Theory	4	0	0	30	70	100	4
4.	MCA-119	Probability & Statistics	DSE	4	0	0	30	70	100	4
5.	MCA-115	Computer Organization & Architecture	Core Theory	3	1	0	30	70	100	4
6.	MCA-116P	Problem Solving using C **Lab**	Core Practical	0	0	4	20	30	50	2
7.	MCA-117P	Computer Organization & Architecture **Lab**	Core Practical	0	0	4	20	30	50	2
8.	MCA-P1	Mini Project lab	Skill Enhancement Course	0	0	4	20	30	50	2
9.	ECC-111	Industrial Visits/Seminar or Presentation Based on the Report of Visits	Skill Enhancement Course	0	0	0	0	0	25	0
10	ECC-112	University Social Responsibility	Skill Enhancement Course	0	0	0	0	0	25	0
11		Sports	Audit Course	0	0	0	50	0	50	0
		Total		17	3	12	210	440	**650**	**26**

MCA(AI&ML)

SEMESTER-II

S.No.	Subject Code	Subject Name	Course Type	Periods			Internal	External	Total	Credit
				L	T	P				
1.	MCA-128	Advanced Microsoft Excel with Tableau	DSE	4	0	0	30	70	100	4
2.	MCA-122	Object Oriented Programming	Core Theory	3	1	0	30	70	100	4
3.	MCA-129	LINUX ADMINISTRATION WITH SCRIPTING	Core Theory	3	1	0	30	70	100	4
4.	MCA-124	Database Management Systems	Core Theory	3	1	0	30	70	100	4
5.	MCA-125	Data Structures & Analysis of Algorithms	DSE	4	0	0	30	70	100	4
7.	MCA-126P	Object Oriented Programming Lab	Core Practical	0	0	4	20	30	50	2
9.	MCA-127P	DBMS LAB	Core Practical	0	0	4	20	30	50	2
	MCA-P2	Mini Project Lab	Skill Enhancement Course	0	0	4	20	30	50	2
	ECC-121	Industrial Visits/Seminar or Presentation Based on the Report of Visits	Skill Enhancement Course	0	0	0	0	0	25	0
	ECC-122	University Social Responsibility	Skill Enhancement Course	0	0	0	0	0	25	0
		Sports	Audit Course	0	0	0	50	0	50	0
		Total		17	3	12	210	440	**650**	**26**

Python Programming			
Course Code-MCA-118	Theory Course	**L-T-P-C**	**4-0-0-4**
Course Contents			
UNIT-I	Getting Help, How To execute Python program, Writing your first program, Python coding Introduction, Python keywords and Identifiers, Python statements, Comments in python, Getting user input, Variables, Data types, Numbers, Strings, Lists, tuples & Dictionary.		
UNIT-II	Control flow and syntax, The if statement, Python operators, The while Loop, Break and continue, The for Loop, Pass statement, Introduction of function, Calling a Function, Function arguments, Built in function, Scope of variables, Decorators, Passing function to a function, Lambda expression.		
UNIT-III	Modules and Packages, Importing Modules, Standard Modules- sys, Standard Modules-OS, The dir Function, Packages, Exception Handling, errors, Run Time Errors, handling IO Exception, Try….except statement, Raise, Assert.		
UNIT-IV	Introduction to File Handling in Python, Files and Directories, Writing data to a file, Reading data from a file, Additional file methods, Working with files, Working with Directories, The pickle Module, Classes & Objects, Introduction of classes and objects, Creating Classes, Instance method, Special class method, Inheritance, Method overriding, Data hiding.		
UNIT-V	Scientific Computing with NumPy, N-Dimensional Array Object, Array Slicing Method, Array reshaping methods, Numerical routines in Numpy, Introduction to Matplotlib, Python 2D plotting, Plotting with default settings, Customizing matplotlib Graphic with colors and line width, Generate plots, histograms, power spectra, Generate bar charts, scatterplots, introduction To Pandas, Pandas data structures and data analysis		
Text Books	**1.** Pooja Sharma, *"Programming in Python",* BPB Publications. **2.** Mark Summerfield, *"Programming in Python 3: A Complete Introduction to the Python Language",* Pearson Education.		
Referential Books	1. Mark Lutz, *"Programming Python"*, O'Reilly Media. 2. Wesley J. Chun, *"Core Python Programming"*, Prentice Hall. 3. Alex Martelli, *"Python in a Nutshell"*, O'Reilly Media.		

Probability & Statistics

Course Code-MCA-119	Theory Course	L-T-P-C	4-0-0-4

Course Contents	
UNIT-I	**Basics of Data Science:-** Defining Objective of study, Population(universe), collection of data-census, method of sampling, Tools of collecting data-questionnaire, telephonic conversation, emails, sms, online surveys, Classification of Data-based on various parameters Age, income, gender, education etc, Tabulation of Data-Forming the tables for further Analysis. **Central Tendency:-** Basics of Normal Curve, Average and their needs-Mean(AM, GM, HM), Median, Mode, Why always AM is used as Average generally, Locational Averages-Quartiles, Deciles, Percentiles. **Dispersion of Data:-** Mean Deviation, Standard Deviation(rms value), Different Coefficient of Dispersion-Quartile deviation, Range, Standard Deviation, Combined Mean Combined Standard Deviation, Coefficient of variation & its Applications, Understanding Six-sigma Scale.
UNIT-II	**To discuss parameters of Normal tendency of Data: ->Skewness& Kurtosis:-** Defining the Moments and Moment Generating Functions, Moments about Actual Mean or Arbitrary Origin, defining **SKEWNESS** as Horizontal distortion of Data-Karl. Pearson's coefficient of Skewness, Bowlay's coefficient of Skewness, Skewness by methods of Moments, Defining **KURTOSIS** as Vertical distortion of Data-Playkurtic, Mesokurtic, Leptokurtic curves, Understanding the Normal Curve through Skewness & Kurtosis.
UNIT-III	**Theory of Probability-1:-**. Basics of Probability-Simple events, Sure events, impossible events, Compound Events, Equally likely events, Exhaustive Events, Understanding the Sample Space, empirical definition of probability, Defining the logical connectives OR, IF THEN & AND in probability, Understanding OR-Addition Theorem of Probability-Mutually & Non-Mutually Exclusive events. **Theory of Probability-2:-**. Conditional probability Theorem: Defining IF THEN, Understanding the compound events-Independent events, dependent(Non-Independent)Events, Multiplications Theorem of Probability, Understanding the Priori and Posterior events, Understanding the total Probability The theorem, Baye's Theorem and its applications, Bernauliian or Binomial approach of Probability. **Theory of Probability-2:-**. Defining Probability as Function of Random variable, Understanding the Discrete and continuous Random Variable, Probability Distribution Functions for discrete Random variable, Probability Distribution Functions for Discrete Random variable & its mean and Variance, Probability Density Functions for Continuous Random variable & its mean and Variance.

UNIT-IV	**Discrete Theoretical Distributions:-** Binomial Theoretical Distributions and its Parameters, Poissson Theoretical Distributions and its Parameters, Applications of theoretical distribution to create expected frequencies. **Continuous Theoretical Distributions:-** Defining Normal (or Gaussian) Distribution-Understanding its characteristics mean & variance, Defining The standard normal Distribution-Understanding Area under Normal Curve, Understanding The Normalization of Data. **Correlation & Regression:-** Simple Correlation-Karl Pearson coefficient of Correlation, Spearmen's rank Correlation, Multiple & Partial Correlation, Regression Analysis- Least square Method, Fitting of Line, Fitting of Quadratic, Fitting of Exponential Regression Analysis, Logistic Regression- Sigmoid curves Analysis.
UNIT-V	**Test of significance of samples:-** Elementary theory of Testing of Hypothesis-two types of errors, Small and Large Samples, various Test- Standard normal test, t-Test, F-test, Fishers z-Test, Chi-Square Test-For Test of goodness of fit of an Experiment, Test of independence of Attributes, Introduction of ANOVA. **Introduction of Linear Algebra(in Brief):-** Vectors & Scalars- Products, cosine law, Orthogonal vectors, linear combination, linear independence of vectors, Matrices-addition, Product, transpose, determinant, Identify matrix, Invertible matrix, Inverse, rank of Matrix, Trace, Spur, Popular Types of Matrices-Symmetric, Diagonal, Orthogonal, Orthonormal, Eigen values & Eigen Vectors. **Introduction of Topology(In Brief):-** Introduction of Metric spaces (Metric distances)-Various types of Metric.
Text Books	"An Introduction to Probability Theory and Its Applications": By William Feller "Fifty Challenging Problems in Probability with Solutions": By Frederick Mosteller
Referential Books	"Probability Statistics and Queueing Theory" by P Kandasamy

Advanced Microsoft Excel with Tableau			
Course Code-MCA-128	Theory Course	**L-T-P-C**	**4-0-0-4**
Course Contents			
UNIT-I	**More Functions and Formulas:-** Formulas with multiple operators, Inserting and Editing a Function, Auto calculate and Manual Calculation, Defining Names, Using and Managing Defined Names, Displaying and Tracing Formulas, Understanding Formulas Errors, Using Logical Function (IF), Using Financial Functions (PMT), Using Database Functions (DSUM), Using Lookup Functions (VLOOKUP), User Defined and Compatibility Functions, Financial Functions, Date & Time Functions, Math & Trig Functions, Statistical Functions, Lookup & Reference Functions, Database Functions, Text Functions, text Functions, Logical Functions, Information Functions, Engineering and Cube Functions.		
UNIT-II	**Working with Data Ranges:-** Sorting by One Column, Sorting by Colors or Icons, Sorting by Multiple Columns, Sorting by a Custom List, Filtering Data, Creating a Custom AutoFilter, Using an Advanced Filter. **Working with Pivot Tables:-** Creating a PivotTable, Specifying PivotTable data, Changing a PivotTable's Calculation, Filtering and Sorting a PivotTable, Working with PivotTable Layout, Grouping PivotTable Items, Updating a PivotTable, Formatting a PivotTable, Creating a PivotTable, Creating a PivotChart, Using Slicers, Sharing Slicers Between PivotTables.		
UNIT-III	**Analyzing and Organizing Data:-** Creating Scenarios, Creating a Scenario Report, Working with Data Tables, Using Goal Seek, Using Solver, Using Text to Columns, Grouping and Outlining Data, Using Subtotals, Consolidating Data by Position or Category, Consolidating Data Using Formulas. **Working with the Web and External Data:-** Inserting a Hyperlink, Importing data from an Access database or Text File, Importing data from the Web and other Sources, Working with Existing Data Connections.		
UNIT-IV	**Customizing Excel:-** Customizing the ribbon, Customizing the Quick Access toolbar, Using and Customizing AutoCorrect, Changing Excel's Default Options, Creating a Custom AutoFill List, Creating a Custom Number Format. **Working on Live Data and Dashboards:-** Creating dashboards on company specific data, Working on live data, Dashboards with the help of Developer Ribbon, Working with critical & Complex formulas.		
UNIT-V	**Tableau:-** Understand how Tableau Desktop fits within the Tableau family of products, Combine data sources for use by Tableau, Connect to a variety of sources including flat files and databases, Understand data types and roles, Use key operations in Tableau-filtering, sorting, grouping and creating sets, Work with extracts (file formats used by Tableau), Build and format data visualizations, Work with maps and location-based data, Create interactive dashboards by using parameters, calculations and actions, Working with bins, groups and parameters, Working with folders, Creating story.		
Text Books	"Microsoft Excel 2019 Data Analysis and Business Modeling" by *Wayne Winston* "Microsoft Excel Data Analysis and Business Modeling "by *Wayne Winston*		

LINUX ADMINISTRATION WITH SCRIPTING			
Course Code-MCA-129	Theory Course	**L-T-P-C**	**4-0-0-4**
Course Contents			
UNIT-I	Linux History, overview, Principles, Getting started with GNOME and edit text files with gedit, Manage files graphically and access remote system with Nautilus, Getting help in graphical environment, Installation overview, directory structure, Installation Graphical, Configuring Local Services, date and time, Configuration of printer , Basic commands vi editor, manage users and groups.		
UNIT-II	Partiton, Swap Creation Ivm, quota management and permanent mouting, Raid, Luks, Basic job control or cron use of helping command scp or ssh, filter command, Understand runlevels.		
UNIT-III	Package installation with rpm, package installation with yum, Use hardlinks, softlinks, archives, Regular Expressions, Pipelines, and I/O Redirection, nfs, cifs and autofs, Ldap, Controlling Access to files, Analyzing and Storing Logs, Managing Processes, Tuning and Maintaining the Kernel, System Recovery Techniques, Enchance User Security, Apache Server.		
UNIT-IV	File Security with Gnupg, Route Network Traffic Secure Network Traffic, NTP Server Configuration, Web Server Additional Configuration, Basic SMTP Configuration, Caching-Only DNS Server, FTP, Squid, samba, dhcp, nis, pam, iptables, TCP Wrappers, Bash Scripting and tools, basic Shell Scripting, Graphical tools of Scripting(Zenity and dialogs).		
Text Books	"Linux For Beginners" by Jason Cannon "The Linux Command Line : A Complete Introduction" by William Shotts		
Referential Books	"Linux Network Administration Guide" by Tony Bautts		