



आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश  
**IFTM University, Moradabad, Uttar Pradesh**  
**NAAC ACCREDITED**

**IFTM University**  
**N.H.-24, Lodhipur Rajput, Delhi Road, Moradabad, Uttar Pradesh-244001**  
**[www.iftmuniversity.ac.in](http://www.iftmuniversity.ac.in)**

**Study & Evaluation Scheme of**  
**Master of Computer Applications**  
**[Session: 2019-20]**

<b>Programme:</b>	<b>Master of Computer Applications</b>
<b>Course Level:</b>	<b>PG Degree</b>
<b>Duration:</b>	<b>Three years (six semesters) Full Time</b>
<b>Medium of Instruction:</b>	<b>English</b>
<b>Minimum Required Attendance:</b>	<b>75%</b>
<b>Maximum Credits:</b>	<b>150</b>

**Programme Outcomes (POs):**

The programme emphasizes the application of software technology to solve mathematical, computing, communications/networking and commercial problems. Students completing this programme will be able to:

- Develop an ability to apply knowledge in the computing discipline.
- Develop ability to design and conduct experiments, as well as interpret data
- Develop ability to demonstrate team work with the ability of leadership, analytical reasoning for solving time critical problems and strong human values for responsible professional.
- Develop ability to use research, experiment, contemporary issues to solve industrial problems.
- Develop class environment congenial and competitive for generation of ideas, innovation and sharing.

### MCA I-Year Semester-I

S. No	Subject Code	Subject Name	Periods/Week			Evaluation Scheme						Credit
			L	T	P	Sessional				ESE	Total	
						TA	AT	CT	Total			
1.	MCA-111	Computer Fundamentals and Programming in C	3	1	0	5	5	10+10	30	70	100	4
2.	MCA-112	Computer Organization and Architecture	3	1	0	5	5	10+10	30	70	100	4
3.	MCA-113	Accounting and Financial Management	3	1	0	5	5	10+10	30	70	100	4
4.	MCA-114	Discrete Mathematics	3	1	0	5	5	10+10	30	70	100	4
5.	PSD-101	Professional Skill Development-I	3	1	0	5	5	10+10	30	70	100	4
	Practicals /Seminar/Projects											
6.	MCA-11P	Programming Lab Based on MCA-111	0	0	3	10	10	30	50	50	100	2
7.	MCA-12P	Computer Organization Lab Based on MCA-112	0	0	3	10	10	30	50	50	100	2
8.	MCA-11G	G.P	--	--	--	--	--	--	100	---	100	1
		Total	15	5	6	--	--	---	350	450	800	25

### MCA I-Year Semester-II

S. No	Subject Code	Subject Name	Periods/Week			Evaluation Scheme						Credit
			L	T	P	Sessional				ESE	Total	
						TA	AT	CT	Total			
1.	MCA-211	Data and File Structure using C / C++	3	1	0	5	5	10+10	30	70	100	4
2.	MCA-212	Computer Based Numerical and Statistical Techniques	3	1	0	5	5	10+10	30	70	100	4
3.	MCA-213	Object Oriented System using C++	3	1	0	5	5	10+10	30	70	100	4
4.	MCA-214	Operating System	3	1	0	5	5	10+10	30	70	100	4
5.	MCA-215	System Analysis and Design	3	1	0	5	5	10+10	30	70	100	4
	Practicals /Seminar/Projects											
6.	MCA-21P	Data Structure Lab Based on MCA-211	0	0	3	10	10	30	50	50	100	2
7.	MCA-22P	Object Oriented Lab Based on MCA-213	0	0	3	10	10	30	50	50	100	2
8.	MCA-22G	G.P	--	--	--	--	--	--	100	---	100	1
		Total	15	5	6	--	--	---	350	450	800	25

### MCA II-Year Semester-III

S. No	Subject Code	Subject Name	Periods/Week			Evaluation Scheme						Credit
			L	T	P	Sessional				ESE	Total	
						TA	AT	CT	Total			
1.	MCA-311	Database Management System	3	1	0	5	5	10+10	30	70	100	4
2.	MCA-312	Computer Networks	3	1	0	5	5	10+10	30	70	100	4
3.	MCA-313	Design and Analysis of Algorithms	3	1	0	5	5	10+10	30	70	100	4
4.	MCA-314	E-Commerce	3	1	0	5	5	10+10	30	70	100	4
5.	MCA-315	Internet and Java Programming	3	1	0	5	5	10+10	30	70	100	4
	Practicals /Seminar/Projects											
6.	MCA-31P	Database Lab Based on MCA-311	0	0	3	10	10	30	50	50	100	2
7.	MCA-32P	Java Programming Lab Based on MCA-315	0	0	3	10	10	30	50	50	100	2
8.	MCA-33G	G.P	--	--	--	--	--	--	100	---	100	1
		Total	15	5	6	--	--	---	350	450	800	25

### MCA II-Year Semester-IV

S. No	Subject Code	Subject Name	Periods/Week			Evaluation Scheme						Credit
			L	T	P	Sessional				ESE	Total	
						TA	AT	CT	Total			
1.	MCA-411	Computer Graphics and Animation	3	1	0	5	5	10+10	30	70	100	4
2.	MCA-412	Dot Net Framework with C#	3	1	0	5	5	10+10	30	70	100	4
3.	MCA-413	Software Engineering	3	1	0	5	5	10+10	30	70	100	4
4.	MCA-414	Theory of Computation	3	1	0	5	5	10+10	30	70	100	4
5.	Elective-I	(any one of the following) MCA-415/416/417/418/419/420/421/422/423/424	3	1	0	5	5	10+10	30	70	100	4
	Practicals /Seminar/Projects											
6.	MCA-41P	Computer Graphics Lab Based on MCA-411	0	0	3	10	10	30	50	50	100	2
7.	MCA-42P	Dot Net Lab Based on MCA-412	0	0	3	10	10	30	50	50	100	2
8.	MCA-44G	G.P	--	--	--	--	--	--	100	---	100	1
		Total	15	5	6	--	--	---	350	450	800	25

### MCA III-Year Semester-V

S. No	Subject Code	Subject Name	Periods/Week			Evaluation Scheme						Credit
			L	T	P	Sessional				ESE	Total	
						TA	AT	CT	Total			
1.	MCA-511	Web Technology	3	1	0	5	5	10+10	30	70	100	4
2.	MCA-512	Python Programming Language	3	1	0	5	5	10+10	30	70	100	4
3.	MCA-513	Multimedia System & Applications	3	1	0	5	5	10+10	30	70	100	4
4.	Elective-II	(any one of the following) MCA-514/515/516/517/518/519/520/521/522/523	3	1	0	5	5	10+10	30	70	100	4
	Practicals /Seminar/Projects											
5.	MCA-51P	Web Technology Lab Based on MCA-511	0	0	3	10	10	30	50	50	100	2
6.	MCA-52P	Python Programming Lab Based on MCA-512	0	0	3	10	10	30	50	50	100	2
7.	MCA-53P	Project Work	0	0	4	10	10	30	50	50	100	4
8.	MCA-55G	G.P	--	--	--	--	--	--	100	---	100	1
		Total	12	4	10	--	--	---	370	430	800	25

### MCA III-Year Semester-VI

S. No	Subject Code	Subject Name	Periods/Week			Evaluation Scheme						Credit
			L	T	P	Sessional				ESE	Total	
						TA	AT	CT	Total			
	Practicals /Seminar/Projects											
2.	MCA-61P	Industrial Training / Project Work / Dissertation	0	0	20	---	---	---	200	350	550	20
3.	MCA-62P	Colloquium	0	0	6	---	---	---	100	150	250	5
4.		Total	---	---	26	---	---	---	300	500	800	25

## **List of Electives**

<b>Sr. No.</b>	<b>Code</b>	<b>Elective- I (any one of the following)</b>
1.	MCA-415	Client Server Computing
2.	MCA-416	Data Warehousing and Mining
3.	MCA-417	Advanced Computer Architecture
4.	MCA-418	Software Project Management
5.	MCA-419	Cryptography and Network Security
6.	MCA-420	Natural Language Processing
7.	MCA-421	Information and Cyber Security
8.	MCA-422	Digital Image Processing
9.	MCA-423	Management Information System
10.	MCA-424	Distributed System
<b>Sr. No.</b>	<b>Code</b>	<b>Elective- II (any one of the following)</b>
1.	MCA-514	Compiler Design
2.	MCA-515	Soft Computing
3.	MCA-516	Mobile Computing
4.	MCA-517	Cloud Computing
5.	MCA-518	Enterprise Resource Planning
6.	MCA-519	Advance Database Management System
7.	MCA-520	Pattern Recognition
8.	MCA-521	Simulation and Modeling
9.	MCA-522	Artificial Intelligence
10.	MCA-523	Research Methodology

**There must be at least 15 students for any elective paper**



**IFTM University, Moradabad**  
**Master in Computer Applications (M.C.A.) Programme**  
**MCA I Year (I Semester)**

**MCA-111: COMPUTER FUNDAMENTALS AND PROGRAMMING IN C**

**Objective:** The objective of this course is to familiarize the student with computer fundamentals and programming concepts with particular attention to Engineering examples. This course will focus on fundamental parts of programming language that will help to understand other programming language in upcoming semesters.

**UNIT I**

**(8 Sessions)**

Introduction to Computers, Fundamental units of Computer system- I/O devices, Primary and Secondary memories and their characteristics, Central Processing Unit. Introduction to Operating System, Programming Environment, Introduction to the Digital Computer; Concept of an algorithm. Algorithms to programs: specification, top-down development and stepwise refinement. Use of high level programming language for the systematic development of programs., Trace an algorithm to depict the logic, Number Systems and conversion methods

**UNIT II**

**(8 Sessions)**

Standard I/O in “C”, Fundamental Data Types and Storage Classes: Character types, Integer, short, long, unsigned, single and double-precision floating point, storage classes, automatic, register, static and external, Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion, Logical operators, Operator precedence and associativity

**UNIT III**

**(8 Sessions)**

Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, Program Loops and Iteration: Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue, Modular Programming: Passing arguments by value, scope rules and global variables, separate compilation, and linkage, building your own modules.

**UNIT IV**

**(8 Sessions)**

Arrays: Array notation and representation, manipulating array elements, using multidimensional arrays, Structures: Purpose and usage of structures, declaring structures, assigning of structures, Pointers to Objects: Pointer and address arithmetic, pointer operations and declarations, using pointers as function arguments, defining and using stacks and linked lists.

**UNIT V**

**(8 Sessions)**

Sequential search, Sorting arrays, Strings, Text files, The Standard C Preprocessor: Defining and calling macros, utilizing conditional compilation, passing values to the compiler, The Standard C Library: Input/Output : fopen, fread, etc, string handling functions, Math functions : log, sin, alike Other Standard C functions.

**Course Outcome:** On completion of the course students will be able to

- Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming
- Write, compile and debug programs in C language and use different data types for writing the programs.
- Design programs connecting decision structures, loops , functions and pointers.
- Use different data structures and create / manipulate basic data files and developing applications for real world problems.

**Suggested Readings:**

1. *Problem Solving and Program Design in C*, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
2. *Computer Science- A Structured Programming Approach Using C*, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition [India Edition], 2007.
3. *Computer Fundamental and Concepts* by V. Raja Raman.
4. *Let Us C* by Yaswant P. Kanetkar

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**MCA I Year (I Semester)**

**Website Sources:**

- <https://www.tutorialspoint.com/cprogramming/index.htm>
- <https://www.javatpoint.com/c-programming-language-tutorial>
- <https://www.programiz.com/c-programming>
- <https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with-examples/>

## **MCA-112: COMPUTER ORGANIZATION AND ARCHITECTURE**

**Objective:** The objective of this course is to familiarize the student with basics involved in data representation and digital logic circuits used in the computer system. This includes the general concepts in digital logic design, including logic elements, and their use in combinational and sequential logic circuit design.

### **UNIT I**

**(8 Sessions)**

Introduction of Digital Electronics: Introduction of Logic Gates, Number System. Simplifications of Boolean equations using K-maps, Circuit Designing techniques (SOP, POS), Flip Flops, Adder & Subtractor, Multiplexer, Decoder, Counter, Number representation; Fixed and Floating point number representation, IEEE standard for Floating point numbers,

### **UNIT II**

**(8 Sessions)**

Register Transfer: Register Transfer Language, Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Microoperation, Addition and Subtraction of signed numbers, Multiplication: Signed operand multiplication, Booths algorithm.

Pipeline And Vector Processing Flynn's taxonomy, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction, Pipeline, RISC Pipeline, Vector Processing, Array Processors

### **UNIT III**

**(8 Sessions)**

Hardwired & Micro Programmed (Control Unit): Fundamental Concepts (Register Transfers, Performing of arithmetic or logical operations, Fetching a word from memory, storing a word in memory), Execution of a complete instruction, Multiple-Bus organization, Hardwired Control, Micro programmed control (Microinstruction, Microprogram sequencing, Wide-Branch addressing, Microinstruction with Next-address field, Prefetching Microinstruction).

### **UNIT IV**

**(8 Sessions)**

General register organization, Stack organization, Addressing mode, Instruction format, Data transfer & manipulations, Program Control, RISC & CISC. Input-Output Organization: I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory access, Input-Output processor.

### **UNIT V**

**(8 Sessions)**

Memory Organization: Memory Hierarchy, Main Memory (RAM and ROM Chips), Auxiliary memory, Associative Memory, Cache memory, miss rate and miss penalty, Virtual Memory, Memory management hardware.

**Course Outcome:** On completion of the course students will be able to

- Identify, understand and apply different number systems and codes.
- Understand the digital representation of data in a computer system.
- Understand the general concepts in digital logic design, including logic elements,
- Use in combinational and sequential logic circuit design.

### **Suggested Readings:**

1. Computer Architecture (PHI) 1998 : M.M. Mano
2. Digital Electronics (TMH) 1998 : Malvino and Leach
3. Computer Organization and Architecture : William Stallings
4. Leventhal, L.A, "Introduction to Microprocessors", Prentice Hall of India
5. Mathur, A.P., "Introduction to Microprocessors" , Tata McGraw Hill
6. Rao,P.V.S., "Prospective in Computer Architechture" , Prentice Hall of India.

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**MCA I Year (I Semester)**

**Website Sources:**

- <https://www.javatpoint.com/computer-organization-and-architecture-tutorial>
- <https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/>
- <https://www.studytonight.com/computer-architecture/>
- <https://www.gatevidyalay.com/tag/computer-organization-and-architecture-tutorial/>

## **MCA-113: ACCOUNTING AND FINANCIAL MANAGEMENT**

**Objective:** The objective of this course is to familiarize the student with basics of accounting and financial management. Student will learn about the accounting standards , balance sheet , cash flow statement and trail balance with profit and loss ratio.

### **UNIT I (10 Sessions)**

Overview: Accounting concepts, conventions and principles; Accounting Equation, International Accounting principles and standards; Matching of Indian Accounting Standards with International Accounting Standards.

### **UNIT II (10 Sessions)**

Mechanics of Accounting: Double entry system of accounting, journalizing of transactions; preparation of final accounts, Profit & Loss Account, Profit & Loss Appropriation account and Balance Sheet.

### **UNIT III (10 Sessions)**

Analysis of financial statement: Ratio Analysis- Meaning, Need, Importance and its types; Common Size Statement; Comparative Balance Sheet.

### **UNIT IV (10 Sessions)**

Funds Flow Statement: Meaning, Concept of Gross and Net Working Capital, Preparation of Schedule of Changes in Working Capital, Preparation of Funds Flow Statement and its analysis; Cash Flow Statement: Preparation of Cash Flow Statement and its analysis.

**Course Outcome:** After studying the unit the students will be able to:

- Understand the meaning of Accounting.
- Explain the Accounting Principles and Concepts.
- Know the Process of Accounting.
- Understand and explain the process of Accounting.

### **Suggested Readings:**

1. *Narayanswami - Financial Accounting: A Managerial Perspective (PHI)*
2. *Mukherjee - Financial Accounting for Management (TMH)*
3. *Ramchandran&Kakani - Financial Accounting for Management (TMH)*
4. *Ghosh T P - Accounting and Finance for Managers (Taxman)*
5. *Maheshwari S.N &Maheshwari S K – An Introduction to Accountancy (Vikas Publications)*
6. *Ashish K. Bhattacharya- Essentials of Financial Accounting (PHI, New Delhi)*
7. *Ghosh T.P- Financial Accounting for Managers (Taxman)*
8. *Maheshwari S.N &Maheshwari S K – A text book of Accounting for Management (Vikas Publications)*
9. *Gupta Ambrish - Financial Accounting for Management (Pearson Education)*
10. *Chowdhary Anil - Fundamentals of Accounting and Financial Analysis (Pearson Education)*

### **Website Sources:**

- <https://www.accountingcoach.com/>
- <https://managementhelp.org/businessfinance/index.htm>
- <https://www.lynda.com/Accounting-training-tutorials/30-0.html>
- <http://www.fao.org/3/aq077e/aq077e00.pdf>

## MCA-114: DISCRETE MATHEMATICS

**Objective:** The main aims of this course are to prepare the students to develop and understand the mathematical foundations and create mathematical arguments require in learning many mathematics and computer sciences courses. To motivate students how to solve practical problems using discrete mathematics. Also, in this course basic concepts of Graph theory such as Trees, Regular Graph, Eulerian Graphs, Vertex colourings and learn about the basic knowledge of Algebraic structures, Combinatorics, Boolean Algebra, prepositions.

### UNIT I

(10 Sessions)

**Prerequisite-** Set theory

**Algebraic structures:** Binary operations, Algebraic structures, Semi-groups, Groups, Abelian group, Finite and Infinite groups, Factor group, Permutations, Order of an element of a group, Isomorphism of groups, Subgroup, Cosets, Cayley,s theorem, Normal subgroups, Homomorphisms of groups, Automorphisms of a group, Rings and Fields (only definition and examples)

### UNIT II

(12 Sessions)

**Functions:** Introduction, Functions, Identity function, One to one, Onto and Invertible functions, Composition of functions, Mathematical functions, Exponential and Logarithmic functions, Recursively defined function.

**Relations:** Introduction, Ordered pair, Cartesian product, Relations, Domain and Range, Pictorial representation of relations, Inverse relation, Identity relation, Universal relation, Composition of relations, Types of relations, Equivalence relations and Partial order relations.

### UNIT III

(10 Sessions)

**Propositional Logic:** Proposition, First order logic, Basic logical operations, Truth table, Tautologies, Contradictions, Algebra of propositions, Logical implications, Logical equivalence, Predicates, Universal and Existential quantifiers.

**Combinatorics:** Basic counting technique, Pigeon –hole principle, Recurrence relation, Generating function and counting principle.

### UNIT IV

(8 Sessions)

**Boolean Algebra:** Introduction, Basic Definitions, Duality, Basic theorems, Boolean algebras. Sum of product and Product of sums form in Boolean algebra, Minimal Boolean expressions, Logic gates, Truth tables, Boolean functions and Karnaugh Maps.

### UNIT V

(10 Sessions)

**Graphs:** Simple graph , Multi graph, Graph terminology, Representation of graphs, Bipartite, Regular, Planar and Connected graph, Graph coloring, Chromatic number, Isomorphism and Homomorphism of graphs, Incidence matrix, Adjacency matrix, Circuit matrix and Path matrix.

**Trees:** Definition, Rooted tree, Properties of trees, Binary trees, Binary search trees, Pathlength.

### Course Outcomes:

The student is able to

- Write an argument using logical notation and determine if the argument is or is not valid.
- Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.
- Understand the basic principles of sets and operations in sets.
- Apply counting principles to determine probabilities.
- Demonstrate an understanding of relations and functions and be able to determine their properties.
- Demonstrate different traversal methods for trees and graphs.

### Suggested Readings:

1. C.L.Liu, “Elements of Discrete Mathematics” Mc Graw Hill Book Co., 1985.
2. N.Deo, “Graph Theory with application to Engineering and Computer Science”, PHI.1993.
3. Kolman, Busby and Ross, “Discrete Mathematical structure,” PHI.
4. Olympia Nicodemi, “Discrete Mathematics” CBS Publication, Delhi.

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**MCA I Year (I Semester)**

5. S.K.Sarkar, “ Discrete Mathematics” S. Chand Publication, New Delhi .

**Website Sources:**

- [www.pdfdrive.com](http://www.pdfdrive.com)
- [www.dmi.gov.in](http://www.dmi.gov.in)
- [www.yourarticlelibrary.com](http://www.yourarticlelibrary.com)
- [onlinecourses.nptel.ac.in](http://onlinecourses.nptel.ac.in)
- [en.wikipedia.org](http://en.wikipedia.org)

## PSD-101: PROFESSIONAL SKILL DEVELOPMENT-I

**Objective:** The objective of this course is to familiarize the student with basics of language that is being use in software organization using various modern techniques. Student will learn letter writing, keynotes development and speech writing with resume building.

### UNIT I (8 Sessions)

#### Basic Applied Grammar and Usage

The Sentences: Parts – Subject and Predicate; Kinds of Sentences and their Transformation. Parts of Speech. Noun: Kinds; Gender; Case; Number; Usage. Pronouns: Definition; Kinds; Usage. Adjectives: Kinds, Degrees of Comparison, Transformation of Degrees. Determiners: Kinds: many, many a, a great many; less and fewer; each and every; elder, eldest and older, oldest; much, many; little, a little, the little. Articles: Kinds, Articles and Number system, Articles and Gender system, Omission of Articles, Repetition of Articles. Verbs: Kinds; Auxiliaries: Principal Auxiliaries; Modal Auxiliaries; Semi-Modals; Usage

### UNIT II (8 Sessions)

#### Basic Applied Grammar Continued

Non-Finite Verbs: Kinds; Infinitives; Gerund; Participle. Adverbs: Kinds and Usage. Prepositions: Kinds and Usage. Conjunctions: Kinds; Usage. Interjections: Definition; Usage.

### UNIT III (8 Sessions)

Clauses and Phrases, Tenses, Active and Passive Voice, Direct and Indirect Speech

### UNIT IV (8 Sessions)

Précis Writing: Techniques of Précis Writing; examples. Paragraph Writing: Structure of Paragraph, Construction of Paragraphs; Techniques of Paragraph Writing: Unity, Coherence, Emphasis. Reading Comprehension. Listening Comprehension.

### UNIT V (8 Sessions)

Writing of Resume, Bio-Data. Writing of Letters and Applications: Formats; Elements; Kinds: Leave Applications, Job Applications, Order Letters, Letters of Claims and Complaints, Letters of Adjustment.

**Course Outcome:** After studying the unit the students will be able to:

- Understand the concept, nature, characteristics of growth and development
- Update their knowledge about the personality development.
- Understand the concept and process of Listening Comprehension.
- Understand the concept and importance of Resume, Letters,Bio-Data & Complaints.

#### Suggested Readings:

- (1) *Remedial English Language* by Malti Agarwal, Krishna Publications, Meerut.
- (2) *Professional Communication* by Malti Agarwal, Krishna Publications, Meerut.
- (3) *High School English Grammar & Composition* by Wren & Martin, S. Chand & Company LTD., New Delhi.

#### Website Sources:

- [https://www.tutorialspoint.com/soft\\_skill\\_tutorials.htm](https://www.tutorialspoint.com/soft_skill_tutorials.htm)
- <https://www.maxknowledge.com/tutorials.php>

**IFTM University, Moradabad**  
**Master in Computer Applications (M.C.A.) Programme**  
**MCA I Year (I Semester)**  
**MCA-11P: Programming Lab Based on MCA-111**

**Course Objective:**

To produce programmers equipped with an understanding of

- fundamental computational concepts underlying most programming languages
- a range of problem solving techniques using computers
- the role of programming within the overall software development process
- attitudes and working practices appropriate for a professional programmer
- the solution of small problems using a programming language
- the clear expression of solutions at different levels of abstraction
- Independent and self-motivated study in Computing Science.

**Program List**

- WAP to print a single statement.
- WAP to print more than one statement.
- WAP to calculate the arithmetic multiplication
- WAP which demonstrate the use of if\_else statement
- WAP to select the largest of three values which is entered through the keyboard
- WAP to determine whether a number is 'odd' or 'even' and print the message for odd or even.
- WAP to get Sum of two integer type value by call by value method of function call.
- WAP to swap the values by using call by value method of function call.
- WAP to get the address of all type of variable & gets the value by pointer type.
- WAP to swap two values by using the call by reference method.
- WAP to scan the element in a array and print them.
- WAP to scan & print the element in a 2-Dim. array representation
- WAP to sort the element in array by using the bubble sort.
- WAP to calculate the transpose of a matrix
- WAP to input a string & print the string.
- WAP to input a string & print the string by using the gets() & puts() functions..
- WAP to count the vowels in a string.
- WAP To Define Structure Student Of N Students Which Have Following Fields:  
Sno, Name, Fees, Accept All The Values From The Keyboard & Display The Value Of N Students.
- WAP To Expose The Use Of Union.
- WAP To Open A File Abc.Txt, Give Input To This File & Close The File.

**Course Outcomes:**

- Understands the concept of Computer's Input/output devices, the concept of dynamic memory, data types, loops, functions, array, pointers, string, structures and files.
- Design program logic on real-world problems.
- Analyze problems, errors
- Applying programming concepts to compile and debug c programs to find solutions.
- Understand the concept of data types, loops, functions, array, pointers, string, structures and files.

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**MCA I Year (I Semester)**

**MCA-12P: Computer Organization Lab Based on MCA-112**

**Course Objective:**

The objectives are to study

- To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To prepare students to perform the analysis and design of various digital electronic circuits.

**Program List**

1. Realization of basic gates using Universal logic gates.
2. Code conversion circuits- BCD to Excess-3 and vice-versa.
3. Four-bit parity generator and comparator circuits.
4. Construction of simple Decoder and Multiplexer circuits using logic gates.
5. Design of combinational circuit for BCD to decimal conversion to drive 7-segment display using multiplexer.
6. Construction of simple arithmetic circuits-Adder, Subtractor.
7. Realization of RS-JK and D flip-flops using Universal logic gates.
8. Realization of Universal Register using JK flip-flops and logic gates.
9. Realization of Universal Register using multiplexer and flip-flops.
10. Realization of Asynchronous Up/Down counter.
11. Realization of Synchronous Up/Down counter.
12. Realization of Ring counter and Johnson's counter.
13. Construction of adder circuit using Shift Register and full Adder.
14. Code conversion circuits – Binary to Gray & Vice-Versa. (Innovative)
15. Design of Sequential Counter with irregular sequences. (Innovative)

**Course Outcomes:**

After studying this course the students would gain enough knowledge

- Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
- To understand and examine the structure of various number systems and its application in digital design.
- The ability to understand, analyze and design various combinational and sequential circuits.

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**Semester-II**

**MCA-211: DATA AND FILE STRUCTURE USING C/C++**

**Objective:** The objective of this course is to provide an overview of programming languages and problem solving techniques with Impart knowledge about data structures including linked lists, stacks & queues, and binary tree. Students will also learn about sorting and searching algorithm.

**UNIT I**

**(8 Sessions)**

**Introduction to Data Structures**

Definition of data structure, abstract data type, static and dynamic implementations. Complexity Analysis: time and space complexity of algorithms, asymptotic analysis of algorithm, importance of efficient algorithm, arrays, address calculation in a single and multi dimensional array, sparse matrices., recursion technique- overview including tail recursion.

**UNIT II**

**(8 Sessions)**

**Stacks, Queues and Lists**

Definition, Array based implementation of stack, Linked List based implementation of stack, Infix, postfix, prefix representation of expression, applications of stack Evaluation, Definition: Queue & List: Array based implementation of Queue / List, Linked List implementation of Queue / List, Circular implementation of Queue and Singly linked List, Straight / circular implementation of doubly linked Queue / List, Priority queue .

**UNIT III**

**(8 Sessions)**

**Trees & Graphs**

Definition of tree, properties of binary tree, binary tree traversal - preorder, post order, inorder traversal, binary search tree, threaded trees, balanced trees: AVL- tree ,B-tree .Graph: Matrix and other representations of graphs, undirected and directed graphs, connected components of graphs, spanning trees, Graph Traversal- Breadth First Search, Depth First Search. Applications of Graphs: Topological Sorting, Shortest-Path Algorithms, Minimum spanning tree- Prim's Algorithm and Kruskal's Algorithm,

**UNIT IV**

**(8 Sessions)**

**Sorting Algorithms Introduction:** Sorting by exchange, insertions, bubble sort, selection sort, Insertion sort, shell sort, merge sort, quick sort, Heap sort, Radix sort, Efficiency of above algorithms, External Sorting.

**UNIT V**

**(8 Sessions)**

**Running time & Searching Algorithms:** Time Complexity: Best Case, Worst Case, Average Case, non –recursive and recursive algorithm of straight sequential search, binary Search. File Structures: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files.

**Course Outcome:** After studying the unit the students will be able to:

- Design correct programs to solve problems.
- Choose efficient data structures and apply them to solve problems.
- Analyze the efficiency of programs based on time complexity.
- Prove the correctness of a program using loop invariants, pre-conditions and post-conditions in programs.

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**Suggested Readings:**

1. *Data Structures using C* by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub, 6<sup>th</sup> Edition.
2. *How to Program C++* by Paul Deitel, Harvey Deitel, Prentice Hall; 8<sup>th</sup> edition.
3. *Theory & Problems of Data Structures* by Jr. Symour Lipschetz, Schaum's outline by TMH 2006, Special Indian Edition.
4. *Data Structures and Algorithms* by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.
5. *Fundamentals of Data structures* by Ellis Horowitz & Sartaj Sahni, Pub, 1983, AW, 1<sup>st</sup> Edition.
6. *Data Structures and Program Design in C* By Robert Kruse, PHI, 2<sup>nd</sup> Edition.

**Website Sources:**

- <https://www.includehelp.com/data-structure-tutorial/>
- <https://www.programiz.com/dsa>
- <http://www.cplusplus.com/doc/tutorial/structures/>
- <https://www.cprogramming.com/algorithms-and-data-structures.html>

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**MCA-212: COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES**

**Objective:** The main aims of this course are to provide an introduction to a broad range of numerical methods and statistics for solving mathematical problems that arise in Science and Engineering. The goal is to provide a basic understanding of the derivation, analysis, and use of these numerical methods, along with a rudimentary understanding of finite precision arithmetic and the conditioning and stability of the various problems and methods. This will help you choose, develop and apply the appropriate numerical and statistical techniques for your problem, interpret the results, and assess accuracy.

**UNIT I** **(12 Sessions)**

Interpolation with Equal Intervals: Introduction, Forward differences, Backward differences, Differences tables, Shift operator, Newton's forward and Newton's Backward interpolation formulae.

Central Differences Interpolation Formulae: Introduction, Gauss's forward and Gauss's backward interpolation formulae and Stirling's formula.

Interpolation with Unequal Intervals: Introduction, Divided differences, Divided difference table, Newton's divided difference formula, Lagrange's interpolation formula and Lagrange's inverse interpolation formula.

**UNIT II** **(10 Sessions)**

Numerical Differentiation: Introduction, Derivatives of Newton's forward and Newton's backward interpolation formulae, Derivatives of Stirling's formula, Derivatives of Newton's divided difference formula.

Numerical Integrations: Introduction, General quadrature formula, Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule and Boole's rule.

Numerical Solution of Ordinary Differential Equations: Introduction, Picard's method, Taylor's series method, Euler's method, Runge-Kutta's fourth order methods.

**UNIT III** **(10 Sessions)**

Solution of Simultaneous Algebraic Equations: Introduction, Gauss's elimination method and with pivoting, Gauss-Jordan Method, Jacobi's iteration method and Gauss-Seidal iteration method and Ill-Conditioned system of linear equations.

Solution of Algebraic and Transcendental Equations: Introduction, Bisection method, Regula-falsi method, Newton-Raphson method and its rate of convergence and Iteration method.

**UNIT IV** **(10 Sessions)**

Curve Fitting: Introduction, Principle of least squares, Fitting a straight line, Fitting of second degree parabolic curve, Exponential curve.

Regression Analysis: Regression, Linear regression, Lines of regression  $y$  on  $x$  and  $x$  on  $y$ , Regression coefficients, Properties of regression coefficients, Angle between two lines of regression.

**UNIT V** **(8 Sessions)**

Test of Significance: Hypothesis, Statistical hypothesis, Null hypothesis, Alternative hypothesis, level of significance.

Student's ' $t$ ' Test:  $t$ -test, Applications of  $t$ -test, Test the significance of sample mean, Testing the significance of the difference between the sample means and Paired  $t$ -test for difference of means, Assumptions for  $t$ -test.

F-Test:  $F$ -test for equality of population variances, Assumptions for  $F$ -test.

Chi-Square Test: Chi-square variate, Applications of chi-square test, Chi-square test for population variance, Chi-square test of Goodness of fit, Chi-square test for independence of attributes.

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**Course Outcomes:**

The student is able to

- Apply numerical methods to find our solution of algebraic equations using different methods under different conditions, and numerical solution of system of algebraic equations
- Apply various interpolation methods and finite difference concepts
- Work out numerical differentiation and integration whenever and wherever routine methods are not applicable

**Suggested Readings:**

1. V. Rajaraman: “Computer Oriented Numerical Methods”, PHI.
2. Gupta & Malik : “Numerical Analysis”, Krishna Prakashan Media (P) Ltd, Meerut.
3. B. S. Grewal: “Numerical methods in Engineering and Science”, Khanna Publishers, Delhi.
4. Pradip Niyogi : “Numerical Analysis and Algorithms”, TMH.
5. S. C. Gupta & V. K. Kapoor: “Fundamentals of Mathematical Statistics”, Sultan chand & Sons, Delhi.

**Website Sources:**

- [www.pdfdrive.com](http://www.pdfdrive.com)
- [www.dmi.gov.in](http://www.dmi.gov.in)
- [www.yourarticlelibrary.com](http://www.yourarticlelibrary.com)
- [onlinecourses.nptel.ac.in](http://onlinecourses.nptel.ac.in)
- [en.wikipedia.org](http://en.wikipedia.org)

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**MCA-213: OBJECT ORIENTED SYSTEMS USING C++**

**Objective:** The objective of this course is to provide the in-depth coverage of object-oriented programming principles and techniques using C++. Topics include classes, overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, file processing, templates, exceptions, container classes, and low level language features with UML functionality.

**UNIT I**

**(8 Sessions)**

Object Modeling: Objects and classes, links and association, generalization and specialization, aggregation, abstract class, Meta data, candidate keys, constraints.

Dynamic Modeling: Events and states, operations, nested state diagrams and concurrency, advanced dynamic modeling concepts, a sample dynamic model.

**UNIT II**

**(8 Sessions)**

Functional Modeling: Data flow diagram, specifying operations, constraints, a sample functional model. OMT (object modeling techniques) methodologies, examples and case studies to demonstrate methodologies, comparisons of methodologies, SA/SD.

**UNIT III**

**(8 Sessions)**

Object Oriented Programming paradigm and its general Concepts; Benefits of OOP, Object-oriented Languages. Object oriented Programming using C++: Classes and Objects, Constructors and Destructors, Operator Overloading: Unary and Binary.

**UNIT IV**

**(8 Sessions)**

Functions: User Defined Functions, library functions, Friend Functions, Inline Functions, Structures and Unions in C++, Pointer: Pointer with structure, Pointer with functions. Inheritance and its types, Virtual Functions, Type Conversions, Polymorphism: Run time and Compile time.

**UNIT V**

**(8 Sessions)**

Exception Handling: System Defined Exceptions and User Defined Exceptions , I/O Stream in C++, File Handling, Templates: Class template , Function Template , Overloading of Function Template,, Standard Template Library.

**Course Outcome:** After studying the unit the students will be able to:

- Develop a greater understanding of the issues involved in programming language design and implementation.
- Develop an in-depth understanding of functional, logic, and object oriented programming paradigms
- Implement several programs in C++ language based on OOPs Concepts.
- Understand design/implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing

**Suggested Readings:**

1. H. Schildt, C++: The Complete Reference, Osborne/McGraw-Hill, 4/e.
2. Rumbagh et. al., Object Oriented Modelling, PHI.
3. E. Balagurusamy, "Object Oriented Programming with C++", TMH
4. B. Stroustrup, The C++ Programming Language, Addison-Wesley.
5. R.S. Pressman, Software Engineering: A Practitioner's Approach, Mc Graw Hill.]

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**Website Sources:**

- [https://www.w3schools.com/cpp/cpp\\_oop.asp](https://www.w3schools.com/cpp/cpp_oop.asp)
- <https://www.softwaretestinghelp.com/cpp-tutorials/>
- <https://www.studytonight.com/cpp/cpp-and-oops-concepts.php>

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**MCA-214: OPERATING SYSTEM**

**Objective:** The objective of this course is to provide overall functionality of Operating System such as Process Management, Memory Management, File Management and Security Issue. This course will also provide sufficient understanding of operating system design with the impact of operating system on application systems design and performance.

**UNIT I**

**(8 Sessions)**

Introduction: Definition and types of operating systems, Batch Systems, multi programming, time-sharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls Virtual machines.

**UNIT II**

**(8 Sessions)**

Process Management: Process concept, Process scheduling, Cooperating processes, Threads, Inter-process communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and Algorithm evaluation.

**UNIT III**

**(8 Sessions)**

Process Synchronization: The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.

**UNIT IV**

**(8 Sessions)**

Storage management: Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging in MULTICS and Intel 386, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation, File systems, Secondary Storage Structure, File concept, access methods, Directory implementation, Efficiency and performance, Recovery, Disk structure, disk scheduling methods, Disk management, Swap-Space management, Disk reliability.

**UNIT V**

**(8 Sessions)**

Security & Case Study: Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, The Security problem, Authentication, One Time passwords, Program threats, System threats, Threat Monitoring, Encryption.

**Course Outcome:** After studying the unit the students will be able to:

- Exhibit familiarity with the fundamental concepts of operating systems.
- Apply a mature understanding of operating system design and how it impacts applications systems design and performance.
- Exhibit competence in recognizing operating systems features and issues.

**Suggested Readings:**

1. Abraham Siberschatz and Peter Baer Galvin, “Operating System Concepts”, Fifth Edition, Addison-Wesley.
2. Milan Milankovic, “Operating Systems, Concepts and Design”, McGraw-Hill.
3. Harvey M Deital, "Operating Systems", Addison Wesley.
4. Richard Peterson, “Linux: The Complete Reference”, Osborne McGraw-Hill.

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**Website Sources:**

- <https://www.guru99.com/operating-system-tutorial.html>
- <https://www.w3schools.in/operating-system-tutorial/intro/>
- <https://www.tutorialandexample.com/operating-system-tutorial/>

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**MCA-215: SYSTEM ANALYSIS AND DESIGN**

**Objective:** The objective of this course is to understand concepts of Analysis and Designing Information Systems. Students will understand writing system proposals, system development scheduling, and cost-benefits analysis etc. also dealing with quality assurance.

**UNIT I** **(8 Sessions)**

**INTRODUCTION TO SAD**

Introduction, Definition of a System, Characteristics of a system, Elements of Systems Analysis, Development of a Successful System, Role of Systems Analyst, various functional areas, Systems Development Life Cycle, Phases of SDLC, Concepts and Process of Documentation, Types of Documentation, Different Standards & qualities for Documentation.

**UNIT II** **(8 Sessions)**

**PLANNING AND DESIGNING SYSTEMS**

Introduction, Fact Finding Techniques Issues involved in Feasibility Study, Cost Benefit Analysis, Gathering Requirements of System, Design Principles, Structure Charts, Modularity, Logical and Physical Design, Process Modeling, Data Modeling, Process Specification Tools, Data Dictionary

**UNIT III** **(8 Sessions)**

**MORE DESIGN ISSUES AND CASE TOOLS**

Forms, Reports, Process of Designing Forms and Reports, Design Specifications, Types of Information, General Formatting Guidelines, Guidelines for Displaying Contents, Criteria for Form & Report Design,

**UNIT IV** **(8 Sessions)**

**DATABASE DESIGN**

Introduction to Database design, Design of Database fields, Design of Physical Records, Design of Physical Files, Design of Database, Use of CASE Tools by Organizations, Components of CASE, Visual and Emerging CASE Tools.

**UNIT V** **(8 Sessions)**

**IMPLEMENTATION AND SECURITY OF SYSTEMS & MIS**

Implementation of Systems, Maintenance of Systems, Definition of Audit, Audit of Transactions on Computer, Computer Assisted Audit Techniques, Concurrent Audit Techniques, Computer System and Security issues, Threat to computer system and control measures, Disaster recovery and contingency planning, Role of MIS in an Organization, Different kinds of Information Systems.

**Course Outcome:** After studying the unit the students will be able to:

- Understand and create interest in User Experience Design
- Analyze the framework and methodological approach for user experience design.
- Apply prototyping and problems solving techniques
- Design real life application with end-to-end understanding

**Suggested Readings:**

1. *Systems Analysis and Design* by James A. Senn
2. *Systems Analysis and Design* by Elias M. Awa

**Website Sources:**

- <https://www.w3computing.com/systemsanalysis/>
- [https://www.tutorialspoint.com/system\\_analysis\\_and\\_design/index.htm](https://www.tutorialspoint.com/system_analysis_and_design/index.htm)
- [https://www.academia.edu/33486396/System\\_analysis\\_and\\_design\\_tutorial](https://www.academia.edu/33486396/System_analysis_and_design_tutorial)

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**MCA I Year (II Semester)**

**MCA-21 P: DATA STRUCTURE LAB BASED ON MCA-211**

**Course Objective:**

To produce programmers equipped with an understanding of

- fundamental computational concepts of data structure
- a range of problem solving techniques using data structure
- the role of programming within the program development process
- attitudes and working practices for appropriate data structure

**Program List**

- To find both the largest and smallest number in a list of integers
- To determine if the given string is a palindrome or not.
- Write a program for finding the roots of a quadratic equation using function.
- Write a program for printing a string input by a user in reverse order.
- Write a program for implementing Stack operations PUSH and POP using array.
- Write a program for implementing Stack operations PUSH and POP using linked list.
- Write a program for implementing Queue operations using Array.
- Write a program for showing Queue operations using linked list.
- Write a program to implement a singly linked list.
- Write a program to implement doubly linked list.
- Write a program for concatenate two linked lists.
- Write a program for printing pre-order traversal of Binary Tree.
- Write a program for printing post-order traversal of Binary Tree.
- Write a program for Linear Search.
- Write a program for Binary Search.
- Write a program for implementing Bubble Sort.
- Write a program for implementing Heap sort.

**Course Outcomes:**

- Understands the concept of Computer's Input/output devices, the concept of dynamic memory, data structure, Searching and Sorting.
- Design program logic on real-world problems.
- Analyze problems, errors
- Applying programming concepts to compile and debug c programs to find solutions.

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**MCA-22 P: OBJECT ORIENTED LAB BASED ON MCA-213**

**Course Objective:**

Objective: The objective of course is to develop programming skills of students, using object oriented programming concepts, learn the concept of class and object using C++ and develop classes for simple applications.

**Program List**

- WAP to print a single statement.
- WAP to print more than one statement.
- WAP to calculate the arithmetic multiplication
- WAP which demonstrate the use of if\_else statement.
- WAP which demonstrate the use of while loop.
- WAP which demonstrate the use of do\_ while loop.
- WAP which demonstrate the use of for loop.
- WAP to get the area of square, circle & rectangle according the choice of user by using a case.
- WAP to demonstrate the break statement.
- WAP to demonstrate the continue.
- WAP to get Sum of two integer type value by call by value method of function call.
- WAP to swap the values by using call by value method of function call.
- WAP to get the address of all type of variable & gets the value by pointer type.
- WAP to swap two values by using the call by reference method.
- WAP to find the factorial of a number using recursion.
- WAP to demonstrate the inline function.
- WAP to expose the use of simple class with an object.
- WAP to expose the use of simple one class with two object.
- WAP to expose the use of simple friend class.
- WAP to expose the use of constructor.
- WAP to expose the use of single inheritance
- WAP to expose the use virtual function.
- WAP to expose the use static data member
- WAP to expose the use of function overloading
- WAP to expose the use of operator overloading

**Course Outcomes:**

- After completion of this course, student will be able to
- Identify importance of object oriented programming and difference between structured→ oriented and object oriented programming features.
- Able to make use of objects and classes for developing programs.
- Able to use various object oriented concepts to solve different problems.

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**MCA -II Year (III Semester)**

**MCA-311: Database Management System**

**Objectives:**

Students will try to learn:

- To describe a sound introduction to the discipline of database management systems.
- To give a good formal foundation on the relational model of data and usage of Relational Algebra.
- To introduce the concepts of basic SQL as a universal Database language.
- To enhance knowledge to advanced SQL topics like embedded SQL, procedures connectivity through JDBC.
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

**UNIT- I**

Introduction: An overview of database management system, Database System Vs File System, Database system concepts and architecture, Data definitions language, DML, Overall Database Structure. Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys.

**(8 Sessions)**

**UNIT - II**

Relational data Model, integrity constraints, entity integrity, referential integrity, Keys constraints. Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Sequences, Synonyms, Indexes, Unions, Intersection, Minus, Cursors in SQL. PL/SQL, Triggers and cursors, Procedures and Packages.

**(8 Sessions)**

**UNIT- 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. Transaction Processing Concepts: Transaction system, Testing of Serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling. Performance Tuning, Database Security Management.

**(8 Sessions)**

**UNIT- IV**

Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Recovery with concurrent transaction. Transaction Processing in Distributed system, data fragmentation. Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distrusted database. Backup and Recovery Solutions including RMAN, Database Migration.

**(8 Sessions)**

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**Course Outcomes:**

Students will able to:

1. Explain the features of database management systems and Relational database.
2. Design conceptual models of a database using ER modeling for real life applications and also construct queries in Relational Algebra.
3. Create and populate a RDBMS for a real life application, with constraints and keys, using SQL.
4. Retrieve any type of information from a data base by formulating complex queries in SQL.
5. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database. 6 Build indexing mechanisms for efficient retrieval of information from a database.

**Suggested Reading:**

1. Date C J, "An Introduction To Database System", Addison Wesley
2. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill
3. Elmasri, Navathe, "Fundamentals Of Database Systems", Addison Wesley
4. Paul Beynon Davies, "Database Systems", Palgrave Macmillan
5. Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication

**Website Sources:**

- <https://www.tutorialspoint.com/dbms/index.htm>
- <https://www.geeksforgeeks.org/dbms/>
- <http://www.jbiet.edu.in/coursefiles/cse/HO/cse2/DBMSI-III.pdf>
- <https://www.guru99.com/dbms-tutorial.html>

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**MCA -II Year (III Semester)**

**MCA-312:Computer Networks**

**Objectives:**

Students will try to learn:

- Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- Acquire knowledge of Application layer and Presentation layer paradigms and protocols.
- Study Session layer design issues, Transport layer services, and protocols.
- Gain core knowledge of Network layer routing protocols and IP addressing.
- Study data link layer concepts, design issues, and protocols.
- Read the fundamentals and basics of Physical layer, and will apply them in real time applications.

**UNIT-I**

Introduction : Uses of networks (goals and applications), OSI reference model, and its Evolution, TCP/IP model, Example Network- Novell Netware, ARPANET, NSFNET, The Internet, Different type of networks, LAN, MAN, WAN Topologies used in the Networks, Physical Layer- transmission, switching methods, Integrated services digital networks.

**(8 Sessions)**

**UNIT-II**

Medium access sub layer: Channel allocations, LAN protocols, ALOHA Protocols- Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, Ethernet, FDDI, Data Link Layer- basic design issues, error correction & detection algorithms, elementary data link layer protocols, sliding window protocols, error handling, HDLC, SDLC.

**(8 Sessions)**

**UNIT-III**

Network Layer: Network layer design issue, shortest path routing, Flooding, Flow-based routing Broadcast routing, Congestion control and prevention policies; Internetworking connectionless internetworking, tunneling Internet work, Routing, Fragmentation, Firewall, IP address, Internet Controls Protocols.

**(8 Sessions)**

**UNIT-IV**

Transport Layer: Design issues, connection management, Internet Transport Protocol (UDP), Ethernet transport Protocol.

**(8 Sessions)**

**UNIT-V**

Application Layer: Domain Name System, SNMP, E mail, FTP, HTTP, Introduction to Cryptography and Network Security (DES, RSA algorithms), Communication Security (IPSec, Firewalls), Authentication protocols such as authentication based on shared key (Diffie Helleman Key exchanger), Introduction to multimedia and compression Techniques.

**(8 Sessions)**

**Course Outcomes:**

Students will able to:

1. Describe the functions of each layer in OSI and TCP/IP model.
2. Explain the functions of Application layer and Presentation layer paradigms and Protocols.

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3. Describe the Session layer design issues and Transport layer services.
4. Classify the routing protocols and analyze how to assign the IP addresses for the given network.
5. Describe the functions of data link layer and explain the protocols.
6. Explain the types of transmission media with real time applications

**Suggested Reading:**

- 1 Tanenbaum, A. S, Computer Networks. Prentice Hall of India, 3<sup>rd</sup> Edition.
- 2 Ross, Kurose, Computer Networking, Pearson Education, 3<sup>rd</sup> Edition..
- 3 Prakash C. Gupta, Data Communications, Prentice Hall of India, New Delhi, 1996.
- 4 Leon W. Couch-II, Modern Communication Systems, Prentice Hall of India, New Delhi, 1998.
- 5 Stallings William, Data and Computer Communications. Prentice Hall of India, 5<sup>th</sup> Edition
- 6 Forouzon, A. Behrouz, Data communications & Networking, McGraw Hill, 4th Edition

**Website Sources:**

- <https://www.geeksforgeeks.org/computer-network-tutorials/>
- <https://www.geeksforgeeks.org/computer-network-tutorials/>
- <https://www.gatevidyalay.com/computer-networks/>

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**MCA-313: Design and Analysis of Algorithms**

**Objectives:**

Students will try to learn:

- To learn mathematical background for analysis of algorithm
- To learn various advanced data structures.
- To understand the concept of designing an algorithm.
- To learn dynamic programming and greedy method.
- To understand the concept of pattern matching
- To learn advanced tree and graph applications.

**UNIT-I**

Introduction: Algorithms, Analysis of Algorithms, Design of Algorithms, Complexity of Algorithms, Asymptotic Notations, Growth of function, Recurrences and their solution methods. Sorting in polynomial Time: Insertion sort, Merge sort, Heap sort, and Quick sort ,Sorting in Linear Time: Counting sort, Radix Sort.

**(8 Sessions)**

**UNIT-II**

Advanced Data Structure: Red Black Trees, Binomial Heap, B-Tree, Fibonacci Heap, and Data Structure for Disjoint Sets.

**(8 Sessions)**

**UNIT-III**

Advanced Design and Analysis Techniques: Dynamic programming, Greedy Algorithm, Backtracking, Amortized Analysis.

**(8 Sessions)**

**UNIT-IV**

Graph Algorithms: Elementary Graph Algorithms, Breadth First Search, Depth First Search, Minimum Spanning Tree, Kruskal's Algorithms, Prim's Algorithms, Single Source Shortest Path, All pair Shortest Path, Maximum flow .

**(8 Sessions)**

**UNIT-V**

String and pattern Matching Algorithms, Text Compression, NP-Hard and NP-Completeness, Number Theory and Cryptography: Fundamental Algorithms involving Numbers, Cryptographic Compressions, Information Security Algorithms .

**(8 Sessions)**

**Course Outcomes:**

Students will able to:

1. Students will be able to choose appropriate advanced data structure for given problem.
2. Students will be able to calculate complexity.
3. Students will be able to select appropriate design techniques to solve real world problems.
4. Students will able to apply the dynamic programming technique to solve the problems.
5. Students will be able to apply the greedy programming technique to solve the problems.
6. Students will be able to select a proper pattern matching algorithm for given problem

**Suggested Reading:**

- 1 Fundamentals of Computer Algorithms by Horowitz and Sahani, Galgotia
- 2 Introduction to Algorithms by Thomas H Cormen Leiserson et al, PHI

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- 3 Computer Algorithms : Introduction to Design and Analysis by Sara Baase and Allen Van Gelder, Pearson Education
- 4 Algorithm Design by Jon Kleinberg and Eva Tardos, Pearson Education
- 5 Fundamental of Algorithms by Brassard Bratley, PHI
- 6 Algorithms Design by M T Goodrich et al, John Wiley
- 7 The Design and analysis of Algorithms by A V Aho et al, Pearson Education.

**Website Sources:**

- [https://www.vssut.ac.in/lecture\\_notes/lecture1428551222.pdf](https://www.vssut.ac.in/lecture_notes/lecture1428551222.pdf)
- <https://www.ics.uci.edu/~goodrich/teach/cs161/notes/>
- [https://www.tutorialspoint.com/design\\_and\\_analysis\\_of\\_algorithms/index.htm](https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm)

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**MCA-314: E-Commerce**

**Objectives:**

Students will try to learn:

- Understand concept of Ecommerce and its types.
- Be familiarized with technologies for Ecommerce.
- Understand different types of Online Payment systems.
- Understand Selling and marketing on web.
- Be familiarized with concept of Ebusiness and Ebusiness Models.
- Understand various E-business Strategies.

**UNIT 1**

**Introduction:** Electronic Commerce - Technology and Prospects, Definition of E- Commerce, Economic potential of electronic commerce, forces behind E-Commerce, Advantages and Disadvantages, Architectural framework, Impact of E-commerce on business.

**Network Infrastructure for E- Commerce:** Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication.

**(8 Sessions)**

**UNIT II**

**Mobile Commerce:** Introduction, Wireless Application Protocol, WAP technology, Mobile Information device, Mobile Computing Applications.

**(8 Sessions)**

**UNIT III**

**Web Security:** Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls. IT Act 2000, Cyber crimes and cyber laws

**(8 Sessions)**

**UNIT IV**

**Encryption:** Encryption techniques, Symmetric Encryption- Keys and data encryption standard, Triple encryption, Asymmetric encryption- Secret key encryption, public and private pair key encryption, Digital Signatures, Virtual Private Network.

**(8 Sessions)**

**UNIT V**

**Electronic Payments:** Overview, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking, EDI, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.

**(8 Sessions)**

**Course Outcomes:**

Students will able to:

1. Define and differentiate various types of Ecommerce.
2. Describe Hardware and Software Technologies for Ecommerce.
3. Explain payment systems for E - commerce.
4. Describe the process of Selling and Marketing on web.
5. Define and Describe E-business and its Models.
6. Discuss various Ebusiness Strategies.

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**Suggested Reading:**

1. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.
2. Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH
3. P. Loshin, John Vacca, "Electronic commerce", Firewall Media, New Delhi

**Website Sources:**

- <https://www.ncertbooks.guru/e-commerce-full-notes/>
- <http://notes4learners.blogspot.com/p/ecommerce-unit-1.html>
- <https://www.studocu.com/in/document/university-of-rajasthan/e-commerce/lecture-notes/e-commerce-notes-pdf-lecture-notes-university-level/1911743/view>
- [https://www.iare.ac.in/sites/default/files/lecture\\_notes/IARE\\_E-Commerce\\_Lecture\\_Notes.pdf](https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_E-Commerce_Lecture_Notes.pdf)

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**MCA-315: Internet and Java Programming**

**Objectives:**

Students will try to learn:

- To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions.
- To understand the importance of Classes & objects along with constructors, Arrays and Vectors.
- Discuss the principles of inheritance, interface and packages and demonstrate through problem analysis assignments how they relate to the design of methods, abstract classes and interfaces and packages.
- To understand importance of Multi-threading & different exception handling mechanisms.
- To learn experience of designing, implementing, testing, and debugging graphical user interfaces in Java using applet and AWT that respond to different user events.
- To understand Java Swings for designing GUI applications based on MVC architecture.

**UNIT-I**

Internet: Internet, Connecting to Internet: Telephone, Cable, Satellite connection, Choosing an ISP, Introduction to Internet services, E-Mail concepts, Sending and Receiving secure E-Mail, Voice and Video Conferencing.

**(8 Sessions)**

**UNIT- II**

Core Java: Introduction, Operator, Data type, Variable, Arrays, Control Statements, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Networking, Event handling, Introduction to AWT, AWT controls, Layout managers, Menus, Images, Graphics.

**(8 Sessions)**

**UNIT-III**

Java Swing: Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner frame.

JDBC: The connectivity Model, JDBC/ODBC Bridge, java.sql package, connectivity to remote database, navigating through multiple rows retrieved from a database.

**(8 Sessions)**

**UNIT-IV**

Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB), Introduction to RMI (Remote Method Invocation): A simple client-server application using RMI.

**(8 Sessions)**

**UNIT-V**

Java Servlets: Servlet basics, Servlet API basic, Life cycle of a Servlet, Running Servlet, Debugging Servlets, Thread-safe Servlets, HTTP Redirects, Cookies, Introduction to Java Server pages (JSP).

**(8 Sessions)**

**Course Outcomes:**

Students will able to:

1. Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.

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2. Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem
3. Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
4. Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
5. Identify and describe common abstract user interface components to design GUI in Java using Applet & AWT along with response to events
6. Identify, Design & develop complex Graphical user interfaces using principal Java Swing classes based on MVC architecture

**Suggested Reading:**

1. Margaret Levine Young, "The Complete Reference Internet", TMH
2. Naughton, Schildt, "The Complete Reference JAVA2", TMH
3. Balagurusamy E, "Programming in JAVA", TMH
4. Dustin R. Callway, "Inside Servlets", Addison Wesley
5. Mark Wutica, "Java Enterprise Edition", QUE
6. Steven Holzner, "Java2 Black book", dreamtech

**Website Sources:**

- <https://www.iitk.ac.in/esc101/share/downloads/javanotes5.pdf>
- <https://www.ncertbooks.guru/java-programming-notes/>
- <http://www.ddegjust.ac.in/studymaterial/msc-cs/ms-18.pdf>
- <https://www.w3schools.com/java/default.asp>

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**MCA-31P: Database Lab Based on MCA-311**

**Course Objective:**

- To explain basic database concepts, applications, data models, schemas and instances.
- To demonstrate the use of constraints and relational algebra operations.
- Describe the basics of SQL and construct queries using SQL.
- To emphasize the importance of normalization in databases.
- To facilitate students in Database design
- To familiarize issues of concurrency control and transaction management.

**List of Programs:**

1. Draw E-R diagram and convert entities and relationships to relation table for a given scenario.
  - a. Two assignments shall be carried out i.e. consider two different scenarios (eg. bank, college)
2. Write relational algebra queries for a given set of relations.
3. Perform the following:
  - a. Viewing all databases, Creating a Database, Viewing all Tables in a Database, Creating Tables (With and Without Constraints), Inserting/Updating/Deleting Records in a Table, Saving (Commit) and Undoing (rollback)
4. Perform the following:
  - a. Altering a Table, Dropping/Truncating/Renaming Tables, Backing up / Restoring a Database.
5. For a given set of relation schemes, create tables and perform the following  
Simple Queries, Simple Queries with Aggregate functions, Queries with Aggregate functions (group by and having clause), Queries involving- Date Functions, String Functions , Math Functions  
Join Queries- Inner Join, Outer Join  
Subqueries- With IN clause, With EXISTS clause
6. For a given set of relation tables perform the following
  - a. Creating Views (with and without check option), Dropping views, Selecting from a view
7. Write a PL/SQL program using FOR loop to insert ten rows into a database table.
8. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID) write a cursor to select the five highest paid employees from the table.
9. Illustrate how you can embed PL/SQL in a high-level host language such as C/Java  
And demonstrates how a banking debit transaction might be done.
10. Given an integer i, write a PL/SQL procedure to insert the tuple (i, 'xxx') into a given relation

**COURSE OUTCOMES:**

At the end of the course the students are able to:

1. Apply the basic concepts of Database Systems and Applications.
2. Use the basics of SQL and construct queries using SQL in database creation and interaction.
3. Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system.
4. Analyze and Select storage and recovery techniques of database system

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**MCA-32P: Java Programming Lab Based on MCA-315**

**Course Objective:**

Covers software design, implementation, and testing using Java. Introduces object-oriented design techniques and problem solving. Emphasizes development of secure, well-designed software projects that solve practical real-world problems.

**List of Programs:**

1. Write a program to display any message:
2. Write a Java program to display default value of all primitive data types of Java.
3. Write a program check two strings are equal or not
4. Write a program to arrange the numbers in ascending order.
5. Write a program for the following
  - Example for call by value.
  - Example for call by reference
6. Write a program for calculating Matrix Operations.
7. Write a program to give the example for 'super' keyword.
8. Write a program to give the example for method overriding concepts.
9. Write a program to give a simple example for abstract class.
10. Write a program to create a class named shape. In this class we have three sub classes circle, triangle and square each class has two member function named draw () and erase (). Create these using polymorphism concepts.
11. Write a program to give example for multiple inheritance in Java.
12. Write a program to create interface named test. In this interface the member function is square. Implement this interface in arithmetic class. Create one new class called ToTestInt in this class use the object of arithmetic class.
13. Write a program for example of try and catch block. In this check whether the given array size is negative or not.
14. Write a program to get the reference to the current thread by calling currentThread() method.
15. Write a Applet program that automatically display the text with Font Style, Font type .
16. Write a program to create a dialogbox and menu.
17. Write a program to create a grid layout control.
18. Write a program to create a border layout control.
19. Write a program to create a padding layout control.
20. Write a program for example of multiple catch statements occurring in a program.
21. Write a program to illustrate sub class exception precedence over base class.
22. Write a program to illustrate usage of try/catch with finally clause.
23. Write a program to describe usage of throws clause.
24. Write a program for creation of user defined exception.
25. Basic File handling program in java with reader/writer .
26. Write a program that read from a file and write to file.
27. Write RMI based client-server programs.
28. Write programs of database connectivity using JDBC-ODBC drivers.
29. Write a program to calculate the roots of Quadratic equations.

**Course Outcomes:**

On completion of the course the student should be able to:

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- Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.
- Read and make elementary modifications to Java programs that solve real-world problems.
- Validate input in a Java program.
- Identify and fix defects and common security issues in code.
- Document a Java program using Javadoc.
- Use a version control system to track source code in a project.

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**MCA-411: Computer Graphics and Animation**

**Objectives:**

Students will try to learn:

- To introduce the use of the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.
- To learn the basic principles of 3- dimensional computer graphics.
- Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
- Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.
- To be able to discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications.
- To comprehend and analyze the fundamentals of animation, virtual reality, underlying technologies, principles, and

**UNIT I**

Graphics Primitives: Display Devices: Refresh Cathode Ray Tube, Raster Scan Display, Plasma display, Liquid Crystal display, Plotters, Printers. Input Devices: Keyboard, Trackball, Joystick, Mouse, Light Pen, Tablet, and Digitizing Camera. Input Techniques: Positioning techniques, Positioning Constraints, Scales & Guidelines, Rubber-Band techniques, Dragging, Pointing and Selection: the use of selection points, defining a boundary rectangle, multiple selections, Menu selection.

**(8 Sessions)**

**UNIT II**

Mathematics for Computer Graphics: Point representation, Vector representation, Matrices and operations related to matrices, Scalar product of two vectors, Vector product of two vectors. Line Drawing Algorithms: DDA algorithms, Bresenham's Line algorithm. Segment & Display files.

**(8 Sessions)**

**UNIT III**

Graphics Operations: Introduction to Clipping, Point Clipping, Line Clipping, parametric line clipping algorithm (Cyrus Beck), Polygon Clipping. Filling: Inside Tests, Flood fill algorithm, Boundary-Fill Algorithm and scan-line polygon fill algorithm.

Curves and Surfaces: Parametric representation of curves, Spline & Bezier Representations: Interpolation Method, Bezier curves and surfaces.

**(8 Sessions)**

**UNIT IV**

Transformation: Basic Transformations, 2D Transformation, Composite Transformations, Reflection, Shearing, Transformation between coordinate systems, Basics of 3D transformations.

**(8 Sessions)**

**UNIT V**

3 D Graphics: 3D Display Methods, Projection, Parallel Projection, Perspective Projection. Animation : Introduction to Animation, Principles of Animation, Types of Animation, Animation and Flash Overview, Using Layer and Creating Animation.

**(8 Sessions)**

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**Course Outcomes::**

Students will able to:

1. To list the basic concepts used in computer graphics.
2. To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
3. To describe the importance of viewing and projections.
4. To define the fundamentals of animation, virtual reality and its related technologies.
5. To understand a typical graphics pipeline
6. To design an application with the principles of virtual reality

**Suggested Reading:**

1. Donald Hearn and M. Pauline Baker, "Computer Graphics", PHI
2. Steven Harrington, "Computer Graphics: A Programming Approach", TMH
3. Prajapati A. K, "Computer Graphics", PPM Ed 2
4. Foley James D, "Computer Graphics", AW Ed 2
5. Newman and Sproul, "Principle of Interactive Computer Graphics", McGraw Hill
6. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill
7. Rogers and Adams, "Mathematical Elements of Computer Graphics", McGraw Hill

**Website Sources:**

- 1. <https://www.javatpoint.com/computer-graphics-animation>
- 2. [https://www.tutorialspoint.com/computer\\_graphics/computer\\_animation.htm](https://www.tutorialspoint.com/computer_graphics/computer_animation.htm)
- 3. <https://www.geeksforgeeks.org/computer-animation/>
- 4. <http://cs.wellesley.edu/~cs110/lectures/M01-color/graphics.pdf>

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**MCA-412: Dot Net Framework with C#**

**Objectives:**

This Lab course will help students to achieve the following objectives:

- Introduce to .Net IDE Component Framework.
- Programming concepts in .Net Framework.
- Creating website using ASP.Net Controls.
- To gain programming knowledge in .Net Framework.

**UNIT-1**

The .Net framework: Introduction, The Origin of .Net Technology, components of the .Net architecture, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Time Compilation, Framework Base Classes.

**(8 Sessions)**

**UNIT-II**

C -Sharp Language (C#): Introduction, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Object and Classes, Inheritance and Polymorphism, Operator Overloading, Interfaces, Delegates and Events. Type conversion.

**(8 Sessions)**

**UNIT-III**

C# Using Libraries: Namespace- System, Input-Output, Multi-Threading, Networking and sockets, Managing Console I/O Operations, Windows Forms, Error Handling.

**(8 Sessions)**

**UNIT-IV**

Advanced Features Using C#: Web Services, Window Services, Asp.net Web Form Controls, ADO.Net. Distributed Application in C#, Unsafe Mode, Graphical Device interface with C#.

**(8 Sessions)**

**UNIT-V**

.Net Assemblies and Attribute: .Net Assemblies features and structure, private and share assemblies, Built-In attribute and custom attribute. Introduction about generic.

**(8 Sessions)**

**Course Outcomes::**

Students will able to:

1. Create user interactive web pages using ASP.Net.
2. Create simple data binding applications using ADO.Net connectivity.
3. Performing Database operations for Windows Form and web applications.

**Suggested Reading:**

1. Wiley,” Beginning Visual C# 2008”, Wrox
2. Fergal Grimes,” Microsoft .Net for Programmers”. (SPI)
3. Balagurusamy,” Programming with C#”, (TMH)
4. Mark Michaelis, “Essential C# 3.0: For .NET Framework 3.5, 2/e, Pearson Education
5. Shibi Parikkar, “C# with .Net Frame Work” , Firewall Media.

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**Website Sources:**

- 1. <https://docs.microsoft.com/en-us/dotnet/csharp/getting-started/introduction-to-the-csharp-language-and-the-net-framework>.
- 2. <https://www.geeksforgeeks.org/c-sharp-net-framework-basic-architecture-component-stack/>

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**MCA-413:Software Engineering**

**Objectives:**

Students will try to learn:

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To Explain methods of capturing, specifying, visualizing and analyzing software requirements.
- To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces.
- To know basics of testing and understanding concept of software quality assurance and software configuration management process.
- To understand need of project management and project management life cycle.
- To understand project scheduling concept and risk management associated to various type of projects.

**UNIT-I**

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

**(8 Sessions)**

**UNIT-II**

Requirement engineering, requirement elicitation techniques like FAST, QFD & Use case approach, requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS. Size Estimation like lines of Code & Function Count, Cost Estimation Models, Static single & Multivariable Models, COCOMO.

**(8 Sessions)**

**UNIT-III**

Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Cohesion & Coupling, Classification of Cohesiveness & Coupling, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design, User Interface Design.

**(8 Sessions)**

**UNIT-IV**

Software Testing: Testing process, Design of test cases, functional testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing, Path Testing, Data flow and mutation testing, UNIT Testing, Integration and System Testing, Debugging, Alpha & Beta Testing, Regression Testing, Testing Tools & Standards.

**(8 Sessions)**

**UNIT-V**

Software Reliability: Importance, Hardware Reliability & Software Reliability, Failure and Faults, Reliability Models, Basic Model, Logarithmic Poisson Model, Calendar time Component. Software Quality Assurance (SQA): Verification and Validation, ISO 9000 Models, SEI-CMM Model.

**(8 Sessions)**

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**Course Outcomes::**

Students will able to:

1. Define various software application domains and remember different process model used in software development.
2. Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques.
3. Convert the requirements model into the design model and demonstrate use of software and userinterface design principles.
4. Distinguish among SCM and SQA and can classify different testing strategies and tactics and compare them.
5. Justify role of SDLC in Software Project Development and they can evaluate importance of Software Engineering in PLC. type of Projects. They can also organize different activities of project as per Risk impact factor.
6. Generate project schedule and can construct, design and develop network diagram for different

**Suggested Reading:**

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley
5. Carlo Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.

**Website Sources:**

- 1. [https://www.tutorialspoint.com/software\\_engineering/index.htm](https://www.tutorialspoint.com/software_engineering/index.htm).
- 2. <https://www.javatpoint.com/software-engineering-tutorial>.
- 3. <https://www.geeksforgeeks.org/software-engineering/>

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**MCA-414:Theory of Computation**

**Objectives:**

- To give an overview of the theoretical foundations of computer science from the perspective of formal languages
- To illustrate finite state machines to solve problems in computing
- To explain the hierarchy of problems arising in the computer sciences.
- To familiarize Regular grammars, context free grammar.

**UNIT – I**

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Myhill-Nerode Theorem

**(8 Sessions)**

**UNIT – II**

Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleene's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

**(8 Sessions)**

**UNIT – III**

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness, Pumping lemma for CFLs,

**(8 Sessions)**

**UNIT – IV**

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

**(8 Sessions)**

**UNIT – V**

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem.

**(8 Sessions)**

**Course Outcomes::**

After learning the course the students should be able to

1. Understand the basic concepts and application of Theory of Computation.
2. Apply this basic knowledge of Theory of Computation in the computer field to solve computational problems and in the field of compiler also.

**Suggested Reading:**

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education

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2. K.L.P. Mishra and N.Chandrasekaran, “Theory of Computer Science : Automata, Languages and Computation”, PHI
3. Martin J. C., “Introduction to Languages and Theory of Computations”, TMH
4. Papadimitrou, C. and Lewis, C.L., “Elements of the Theory of Computation”, PHI

**Website Sources:**

- 1.<https://www.geeksforgeeks.org/introduction-of-theory-of-computation/>
- 2. <https://www.javatpoint.com/automata-tutorial>.
- 3. <https://nptel.ac.in/courses/106/104/106104028/>

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**MCA-415: Client Server Computing**

**Objectives:**

- This Subject deals with the C/S Computing, GUI.
- To apply the techniques and features of a client/server development language to construct a moderately complex client/server application.
- To learn the advantages of client-server systems over monolithic systems.

**UNIT I**

Client/Server Computing: DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client server development tools, advantages of client server computing.

**(8 Sessions)**

**UNIT II**

Components of Client/Server application: The client: services, request for services, RPC, windows services, fax, print services, remote boot services, other remote services, Utility Services & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), Common Object Request Broker Architecture (CORBA). The server: Detailed server functionality, the network operating system, available platforms, the network operating system, available platform, the server operating system.

**(8 Sessions)**

**UNIT III**

Client/Server Network: connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system development: Software, Client–Server System Hardware: Network Acquisition, PC-level processing UNIT, Macintosh, notebooks, pen, UNIX workstation, x-terminals, server hardware.

**(8 Sessions)**

**UNIT IV**

Data Storage: magnetic disk, magnetic tape, CD-ROM, WORM, Optical disk, mirrored disk, fault tolerance, RAID, RAID-Disk network interface cards. Network protection devices, Power Protection Devices, UPS, Surge protectors. Client Server Systems Development: Services and Support, system administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Network management, Help Desk, Remote Systems Management Security, LAN and Network Management issues.

**(8 Sessions)**

**UNIT V**

Client/Server System Development: Training, Training advantages of GUI Application, System Administrator is training, Database Administrator training, End-user training. The future of client server Computing Enabling Technologies, The transformational system.

**(8 Sessions)**

**Course Outcomes::**

1. Comprehend the basic concepts of the client-server model.
2. Understand how Client-Server systems work.
3. Differentiate between two-tier and three-tier architectures.
4. Improve the performance and reliability of Client Server based systems.

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5. Identify security and ethical issues in Client Server Computing.

***Suggested Reading:***

1. Patrick Smith & Steave Guengerich, "Client / Server Computing", PHI
2. Dawna Travis Dewire, "Client/Server Computing", TMH
3. Majumdar & Bhattacharya, "Database management System", TMH
4. Korth, Silberchatz, Sudarshan, "Database Concepts", McGraw Hill
5. Elmasri, Navathe, S.B, "Fundamentals of Data Base System", Addison Wesley

**Website Sources:**

- <https://www.tutorialspoint.com/Client-Server-Computing>
- <https://pdfs.semanticscholar.org/fe8c/ca2f103875e09a3f7ca72e1542c4022f0729.pdf>
- <https://lecturenotes.in/subject/1293/client-server-computing>
- [https://www.technicalsymposium.com/CLIENT\\_SERVER\\_COMPUTING.html](https://www.technicalsymposium.com/CLIENT_SERVER_COMPUTING.html)

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**MCA-416: Data Warehousing and Mining**

**Objectives:**

Students will try to learn:

- To introduce the concept of data Mining as an important tool for enterprise data management and as a cutting edge technology for building competitive advantage.
- To enable students to effectively identify sources of data and process it for data mining
- To make students well versed in all data mining algorithms, methods of evaluation.
- To impart knowledge of tools used for data mining
- To provide knowledge on how to gather and analyze large sets of data to gain useful business understanding.
- To impart skills that can enable students to approach business problems analytically by identifying opportunities to derive business value from data.

**UNIT- I**

Data Warehousing: Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture.

**(8 Sessions)**

**UNIT- II**

Data Warehouse Process and Technology: Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design, Data Extraction, Cleanup & Transformation Tools, Warehouse Metadata.

**(8 Sessions)**

**UNIT- III**

Data Mining: Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction, Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree.

**(8 Sessions)**

**UNIT- IV**

Classification Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering Methods. Grid Based Methods, Model Based Method, Association rules: Introduction, Large Item sets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.

**(8 Sessions)**

**UNIT- V**

Data Visualization and Overall Perspective: Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining.

**(8 Sessions)**

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**Course Outcomes:**

Students will able to:

1. Demonstrate an understanding of the importance of data mining and the principles of business Intelligence
2. Organize and prepare the data needed for data mining using pre preprocessing techniques
3. Perform exploratory analysis of the data to be used for mining.
4. Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on large data sets.
5. Define and apply metrics to measure the performance of various data mining algorithms.
6. Apply BI to solve practical problems: Analyze the problem domain, use the data collected in Enterprise apply the appropriate data mining technique, interpret and visualize the results and provide decision support.

**Suggested Reading:**

1. M.H.Dunham, "Data Mining: Introductory and Advanced Topics" Pearson Education
2. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier
3. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World : A
4. Mallach, "Data Warehousing System", McGraw –Hill
5. Elmasri, Navathe, "Fundamentals Of Database Systems", Addison Wesley

**Website Sources:**

- [http://www.crectirupati.com/sites/default/files/lecture\\_notes/mca%20dmdw.pdf](http://www.crectirupati.com/sites/default/files/lecture_notes/mca%20dmdw.pdf)
- <https://www.dei.unipd.it/~capri/SI/MATERIALE/DWDM0405.pdf>
- [https://www.cs.uct.ac.za/mit\\_notes/database/pdfs/chp19.pdf](https://www.cs.uct.ac.za/mit_notes/database/pdfs/chp19.pdf)

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**MCA-417: Advanced Computer Architecture**

**Objectives:**

- To make students know about the Parallelism concepts in Programming To give the students an elaborate idea about the different memory systems and buses.
- To introduce the advanced processor architectures to the students.
- To make the students know about the importance of multiprocessor and multicomputer.
- To study about data flow computer architectures.

**UNIT - I**

Introduction to Parallel Computing, Parallel Computer Model, Program and Network Properties, Parallel Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws: Multiprocessor System and Interconnection Networks; IEEE POSIX Threads: Creating and Exiting Threads, Simultaneous Execution of Threads, Thread Synchronization using Semaphore and Mutex, Cancelling the Threads.

**(8 Sessions)**

**UNIT – II**

Pipelining And Memory Hierarchy:- Basic and Intermediate Concepts, Instruction Set Principle; ILP: Basics, Exploiting ILP, Limits on ILP; Linear and Nonlinear Pipeline Processors; Super Scalar and Super Pipeline Design; Memory Hierarchy Design: Advanced Optimization of Cache Performance, Memory Technology and Optimization, Cache Coherence and Synchronization Mechanisms.

**(8 Sessions)**

**UNIT – III**

Thread And Process Level Parallel Architecture: Introduction to MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures, Shared Memory MIMD Architecture, Clustering, Instruction Level Data Parallel Architecture, SIMD Architecture, Fine Grained and Coarse Grained SIMD Architecture, Associative and Neural Architecture, Data Parallel Pipelined and Systolic Architectures, Vector Architectures.

**(8 Sessions)**

**UNIT – IV**

Parallel Algorithms: PRAM Algorithms: Parallel Reduction, Prefix Sums, Preorder Tree Traversal, Merging two Sorted lists; Matrix Multiplication: Row Column Oriented Algorithms, Block Oriented Algorithms; Parallel Quicksort, Hyper Quicksort; Solving Linear Systems: Gaussian Elimination, Jacobi Algorithm; Parallel Algorithm Design Strategies.

**(8 Sessions)**

**UNIT – V**

Developing Parallel Computing Applications: OpenMP Implementation in 'C': Execution Model, Memory Model; Directives: Conditional Compilation, Internal Control Variables, Parallel Construct, Work Sharing Constructs, Combined Parallel Work-Sharing Constructs, Master and Synchronization Constructs; Run-Time Library Routines: Execution Environment Routines, Lock Routines, Timing Routines; Simple Examples in 'C'. Basics of MPI.

**(8 Sessions)**

**Course Outcomes:**

1. Demonstrate concepts of parallelism in hardware/software.
- 2 : Discuss memory organization and mapping techniques.
- 3 : Describe architectural features of advanced processors.
- 4 : Interpret performance of different pipelined processors.
- 5: Explain data flow in arithmetic algorithms

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6 : Development of software to solve computationally intensive problems.

**Suggested Reading:**

1. Kai Hwang, "Advance Computer Architecture", TMH
2. Matthew, "Beginning Linux Programming", SPD/WROX
3. Hennessy and Patterson, "Computer Architecture: A Quantitative Approach", Elsevier
4. Dezso and Sima, "Advanced Computer Architecture", Pearson
5. Quinn, "Parallel Computing: Theory & Practice", TMH
6. Quinn, "Parallel Programming in C with MPI and Open MP", TMH

**Website Sources:**

- <https://www.smartworld.com/notes/advanced-computer-architecture-engg-notes-pdf-aca/>
- <https://www.docsity.com/en/study-notes/computer-science/advanced-computer-architecture/>
- <http://www.alphace.ac.in/downloads/notes/cse/10CS74.pdf>

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**MCA-418: Software Project Management**

**Objectives:**

Students will try to learn:

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To explain methods of capturing, specifying, visualizing and analyzing software requirements.
- To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces.
- To know basics of testing and understanding concept of software quality assurance and software configuration management process.
- To understand need of project management and project management life cycle.
- To understand project scheduling concept and risk management associated to various type of projects.

**UNIT- I**

**PROJECT EVALUATION AND PROJECT PLANNING:** Project Management concepts, Importance of Software Project Management, Categorization of Software Projects, Process Framework, Project Planning Software Life Cycle Models, Artifacts of the Project Management Process.

**(8 Sessions)**

**UNIT- II**

**PROJECT LIFE CYCLE AND EFFORT ESTIMATION :** Software process and Process Models Choice of Process models, Rapid Application development, Agile methods, Extreme Programming, SCRUM, Managing interactive processes, Basics of Software estimation, Effort and Cost estimation techniques, COSMIC Full function points, COCOMO II A Parametric Productivity Model – Staffing Pattern.

**(8 Sessions)**

**UNIT- III**

**ACTIVITY PLANNING AND RISK MANAGEMENT :** Objectives of Activity planning, Project schedules, Activities, Sequencing and scheduling, Network Planning models, Forward Pass & Backward Pass techniques, Critical path (CRM) method, Risk identification, Assessment Monitoring, PERT technique, Monte Carlo simulation, Resource Allocation, Creation of critical patterns, Cost schedules.

**(8 Sessions)**

**UNIT- IV**

**PROJECT MANAGEMENT AND CONTROL:** Framework for Management and control, Collection of data Project termination, Visualizing progress, Cost monitoring, Earned Value Analysis- Project tracking, Change control, Software Configuration Management, Managing contracts, Contract Management.

**(8 Sessions)**

**UNIT- V**

**STAFFING IN SOFTWARE PROJECTS:** Managing people, Organizational behavior, Best methods of staff selection, Motivation, The Oldham-Hackman job characteristic model, Ethical and Programmed concerns, Working in teams, Decision making, Team structures, Virtual teams, Communications genres, Communication plans.

**(8 Sessions)**

**Course Outcomes:**

Students will able to:

1. Define various software application domains and remember different process model used in software development.
2. Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques.

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3. Convert the requirements model into the design model and demonstrate use of software and user interface design principles.
4. Distinguish among SCM and SQA and can classify different testing strategies and tactics and compare them.
5. Justify role of SDLC in Software Project Development and they can evaluate importance of Software Engineering in PLC.
6. Generate project schedule and can construct, design and develop network diagram for different type of Projects. They can also organize different activities of project as per Risk impact factor.

**Suggested Reading:**

1. Software Project Management by M. Cotterell
2. Information Technology Project Management : A Concise Study, S. A. Kelkar, PHI
3. Software Project Management: A Concise Study, S. A. Kelkar, PHI
4. Software Project Management by Walker Royce, Pearson.

**Website Sources:**

- [https://mrcet.com/downloads/digital\\_notes/CSE/IV%20Year/SOFTWARE%20PROJECT%20MANAGEMENT.pdf](https://mrcet.com/downloads/digital_notes/CSE/IV%20Year/SOFTWARE%20PROJECT%20MANAGEMENT.pdf)
- [https://www.tutorialspoint.com/software\\_engineering/software\\_project\\_management.htm](https://www.tutorialspoint.com/software_engineering/software_project_management.htm)
- <https://www.srividyaengg.ac.in/coursematerial/CSE/104831.pdf>

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**MCA-419: Cryptography and Network Security**

**Objectives:**

- The concepts of classical encryption techniques and concepts of finite fields and number theory.
- And explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms.
- And explore the design issues and working principles of various authentication protocols, PKI standards.
- And explore various secure communication standards including Kerberos, IPsec, and SSL/TLS and email.
- The ability to use existing cryptographic utilities to build programs for secure communications.
- The concepts of cryptographic utilities and authentication mechanisms to design secure applications

**UNIT-I**

Introduction: to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation.

**(8 Sessions)**

**UNIT-II**

Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffie-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.

**(8 Sessions)**

**UNIT-III**

Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.

**(8 Sessions)**

**UNIT-IV**

Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.

**(8 Sessions)**

**UNIT-V**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

**(8 Sessions)**

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**Course Outcomes::**

Students will able to:

1. Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory.
2. Understand, compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
3. Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes
4. Apply different digital signature algorithms to achieve authentication and create secure applications
5. Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP.
6. Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications.

**Suggested Reading:**

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security, Wiley
4. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
5. V.K. Jain, Cryptography and Network Security, Khanna Publishing House
6. Bernard Menezes," Network Security and Cryptography", Cengage Learning. 6. AtulKahate, "Cryptography and Network Security", Tata McGraw Hill

**Website Sources:**

- [http://vssut.ac.in/lecture\\_notes/lecture1428550736.pdf](http://vssut.ac.in/lecture_notes/lecture1428550736.pdf)
- <http://www.sasurieengg.com/e-course-material/It-MCA/III-IT/3.IT2352Cryptography%20and%20Network%20Security.pdf>
- <https://www.uptunotes.com/aktu-notescryptographic-network-security-nit701-notes/>
- <http://www.cse.iitd.ac.in/~shweta/notes/Lec1.pdf>

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**MCA-420: Natural Language Processing**

**Objectives:**

- This course introduces the fundamental concepts and techniques of natural language processing (NLP).
- Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- 3.The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.

**UNIT-I**

Introduction to Natural Language Understanding, Language as a knowledge base process, Processing Indian Languages, Basic linguistics.

**(8 Sessions)**

**UNIT-II**

Morphology - Types and Parsing, N-gram Model, Maximum Likelihood Estimation, Smoothing techniques on N-gram Model, Words and Word Classes, POS Tagging.  
Grammar and Parsing - Top Down Parsing, Bottom-up Parsing, Dependency Grammar, Parsing Indian Languages.

**(8 Sessions)**

**UNIT-III**

Meaning Representation, First Order Predicate Calculus, Elements of FOPC, Semantics and FOPC, Syntax Driven Semantic Analysis, Principle of Compositionally, Semantic Augmentation of CFG Rules, Robust Semantic Analysis,

**(8 Sessions)**

**UNIT-IV**

Introduction to Semantic Grammar, Structure of Words, Thematic Roles, Word Sense Disambiguation - Selectional Restrictions, Machine Learning Approaches, Dictionary Based Approaches.

**(8 Sessions)**

**UNIT-V**

Context and World Knowledge, Knowledge Representation and Reasoning, Discourse and World Knowledge, Cohesion, Reference Resolution, Various Resolution Algorithms, Discourse Coherence, Coherence Relations, Language Learning.

**(8 Sessions)**

**Course Outcomes:**

Students will able to:

1. Understand approaches to syntax and semantics in NLP.
2. Understand approaches to discourse, generation, dialogue and summarization within NLP.
3. Understand current methods for statistical approaches to machine translation.
4. Understand machine learning techniques used in NLP, including hidden Markov models and probabilistic context-free grammars, clustering and unsupervised methods, log-linear and discriminative models, and the EM algorithm as applied within NLP

**Suggested Reading:**

1. James Allen, Natural Language Understanding, 2<sup>nd</sup> Edition, Pearson Education India, 1995.
2. Akshar Bharti, VineetChaitanya and Rajeev Sangal, Natural Language Processing: APaninian Perspective, Prentice Hall of India, 1995.
3. Christopher D. Manning and HinrichSchütze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

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4. Lucja M Iwanska and Stuart C Shapiro, Natural Language Processing and Knowledge Representation, Universities Press India, 2001.
5. Daniel Jurafsky and James H Martin, Speech and Language Processing, Pearson Education India, 2000.

**Website Sources:**

- <https://www.cl.cam.ac.uk/teaching/2002/NatLangProc/nlp1-4.pdf>
- [https://www.tutorialspoint.com/artificial\\_intelligence/artificial\\_intelligence\\_natural\\_language\\_processing.htm](https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_natural_language_processing.htm)
- <https://www.cse.iitb.ac.in/~cs626-460-2012/>
- <https://github.com/jacobeisenstein/gt-nlp-class/blob/master/notes/eisenstein-nlp-notes.pdf>

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**MCA-421:Information and Cyber Security**

**Objectives:**

Objective of this course is to:

- Provide information to the students regarding emerging web application vulnerabilities.
- Deliver the information regarding tools which are utilized for the exploitation of the cyber security vulnerabilities.
- Secure both clean and corrupted systems, protecting personal data, securing simple computer networks, and safe Internet usage.
- Understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.
- Determine computer technologies, digital evidence collection, and evidentiary reporting in forensic acquisition.

**UNIT I**

Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

**(8 Sessions)**

**UNIT II**

Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to ECommerce- Electronic Payment System, e-Cash, Credit/Debit Cards. Digital Signature, public Key Cryptography.

**(10 Sessions)**

**UNIT III**

Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, CCTV and intrusion Detection Systems, Backup Security Measures.

**(6 Sessions)**

**UNIT IV**

Security Policies, Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate policies-Sample Security Policies, Publishing and Notification.

**(8 Sessions)**

**UNIT V**

Requirement of the Policies. Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.

**(8 Sessions)**

**Course Outcomes::**

Students will able to:

1. Describe and analyze the hardware, software, components of a network and the interrelations.
2. Explain networking protocols and their hierarchical relationship hardware and software. Compare protocol models and select appropriate protocols for a particular design.
3. Manage multiple operating systems, systems software, network services and security.
4. Evaluate and compare systems software and emerging technologies.

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5. Develop solutions for networking and security problems, balancing business concerns, technical issues and security.
6. Explain concepts and theories of networking and apply them to various situations, classifying networks, analyzing performance and implementing new technologies.

**Suggested Reading:-**

1. Charles P. P fleeger, Shari Lawerance Pfleeger, “Analysing Computer Security”, Pearson Education India.
2. V.K. Pachghare, “Cryptography and information Security”, PHI Learning Private Limited, Delhi India.
3. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla , “Introduction to Information Security and Cyber Law” Willey Dreamtech Press.
4. Schou, Shoemaker, “Information Assurance for the Enterprise”, Tata McGraw Hill.
5. CHANDER, HARISH, “Cyber Laws And It Protection”, PHI Learning Private Limited, Delhi, India.

**Website Sources:**

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- <http://www.uou.ac.in/sites/default/files/slm/Introduction-cyber-security.pdf>
- <https://www.geeksforgeeks.org/what-is-information-security/>
- <https://sites.google.com/view/yubgadyivw/lecture-notes-on-cyber-security-pdf>

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**MCA-422: Digital Image Processing**

**Objectives:**

- Describe and explain basic principles of digital image processing.
- Design and implement algorithms that perform basic image processing (e.g. noise removal and image enhancement).
- Design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).
- Assess the performance of image processing algorithms and systems.

**UNIT-I** Introduction to Digital Image Processing, Applications, Components of Image, Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization. Image Enhancement in Frequency Domain Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain.

**(8 Sessions)**

**UNIT-II** Image Enhancement in Spatial Domain Introduction, Basic Gray Level Functions, Piecewise-Linear Transformation Functions, Contrast Stretching, Histogram Specification, Local Enhancement, Enhancement using Arithmetic/Logic Operations–Image Subtraction, Image Averaging, Basics of Spatial Filtering.

**(8 Sessions)**

**UNIT-III** Image Restoration, Noise Models, Restoration in the presence of Noise only-Spatial Filtering, Mean Filters, Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters, Median Filter, Max and Min filters, Periodic Noise Reduction by Frequency Domain Filtering, Bandpass Filters, Minimum Mean-square Error Restoration.

**(8 Sessions)**

**UNIT-IV** Introduction to Image Compression, Image compression model, Error-free compression, Lossy compression, Lossless predictive coding, Lossy predictive coding, transform coding, wavelet coding.

**(8 Sessions)**

**UNIT-V** Introduction to Image Segmentation, Detection of discontinuities, Edge linking and boundary detection, thresholding, region based segmentation.

**(8 Sessions)**

**Course Outcomes::**

Students will able to:

1. Analyze general terminology of digital image processing.
2. Examine various types of images, intensity transformations and spatial filtering.
3. Develop Fourier transform for image processing in frequency domain.
4. Evaluate the methodologies for image segmentation, restoration etc.
5. Implement image process and analysis algorithms.
6. Apply image processing algorithms in practical applications.

**Suggested Reading:**

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by PrenticeHall, Upper Saddle River, NJ.

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4. Digital Image Processing, by W.K. Prett, Addison Wesley.

**Website Sources:**

- [http://www.vssut.ac.in/lecture\\_notes/lecture1423722885.pdf](http://www.vssut.ac.in/lecture_notes/lecture1423722885.pdf)
- [https://www.iare.ac.in/sites/default/files/lecture\\_notes/DIP-LECTURE\\_NOTES.pdf](https://www.iare.ac.in/sites/default/files/lecture_notes/DIP-LECTURE_NOTES.pdf)
- <https://www.cs.nmt.edu/~ip/lectures.html>
- [https://mrcet.com/downloads/digital\\_notes/ECE/IV%20Year/6.Digital%20Image%20Processing.pdf](https://mrcet.com/downloads/digital_notes/ECE/IV%20Year/6.Digital%20Image%20Processing.pdf)

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**MCA-423: Management Information System**

**Objectives:**

- To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.
- To introduce the fundamental principles of computer-based information systems analysis and design and develop an understanding of the principles and techniques used.
- To enable students understand the various knowledge representation methods and different expert system structures as strategic weapons to counter the threats to business and make business more competitive.
- To enable the students to use information to assess the impact of the Internet and Internet technology on electronic commerce and electronic business and understand the specific threats and vulnerabilities of computer systems.
- To provide the theoretical models used in database management systems to answer business questions.

**UNIT I**

Foundation of Information Systems: Introduction to information system in business, fundamentals of information systems, Solving business problems with information systems, Types of information systems, Effectiveness and efficiency criteria in information system.

**(8 Sessions)**

**UNIT II**

An overview of Management Information Systems: Definition of a management information system, MIS versus Data processing, MIS & Decision Support Systems, MIS & Information Resources Management, Concept of an MIS, Structure of MIS, End user computing.

**(8 Sessions)**

**UNIT III**

Concepts of planning & control: Concept of organizational planning, The Planning Process, Computational support for planning, Characteristics of control process, The nature of control in an organization.

**(8 Sessions)**

**UNIT IV**

Business applications of information technology: Internet & electronic commerce, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information System for Managerial Decision Support, Information System for Strategic Advantage.

**(8 Sessions)**

**UNIT V**

Managing Information Technology: Enterprise & global management, Security & Ethical challenges, Planning & Implementing changes. Advanced Concepts in Information Systems: Enterprise Resource Planning, Supply Chain Management, Customer Relationship Management, and Procurement Management.

**(8 Sessions)**

**Course Outcomes::**

Students will able to:

1. Relate the basic concepts and technologies used in the field of management information systems;
2. Compare the processes of developing and implementing information systems.
3. Outline the role of the ethical, social, and security issues of information systems.

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4. Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.
5. Apply the understanding of how various information systems like DBMS work together to accomplish the information objectives of an organization.

**Suggested Reading:**

1. O Brian, "Introduction to Information System", MCGRAW HILL.
2. Murdick, "Information System for Modern Management", PHI.
3. Jawadekar, "Management Information System", TMH.
4. Jain Sarika, "Information System", PPM
5. Davis, "Information System", Palgrave Macmillan

**Website Sources:**

- <https://www.sigc.edu/departement/mba/studymet/ManagmentInformationSystem.pdf>
- [https://www.tutorialspoint.com/management\\_information\\_system/management\\_information\\_system.htm](https://www.tutorialspoint.com/management_information_system/management_information_system.htm)
- <http://www.mbaexamnotes.com/management-information-system-notes.html>

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**MCA-424 : Distributed System**

**Objective:**

- To expose students to both the abstraction and details of file systems.
- To provide students with contemporary knowledge in parallel and distributed computing.
- To focus on performance and flexibility issues related to systems design decisions.
- Introduce a variety of methodologies and approaches for reasoning about concurrent and distributed programs

**UNIT-I**

Introduction to Distributed Systems, Design Goals, Types of Distributed systems, system architectures and fundamental models, middleware, Threads, virtualization, client-Server Model, Code migration, Communication fundamentals. **(8 Sessions)**

**UNIT-II**

Remote Procedure Call, message oriented communication, and stream oriented communication, multicast communication. Synchronization: clock synchronization, logical clocks, mutual exclusion algorithms: centralized, decentralized, distributed and token ring algorithms, election algorithms.

**(8 Sessions)**

**UNIT-III**

Replication management: need for replication, consistency models: data centric and client centric consistency models, replica management, consistency protocols: continuous, primary-based, replicated-write and cache-coherence protocols.

**(8 Sessions)**

**UNIT-IV**

Fault tolerance: basic concepts and failure models, process resilience, reliable client-server and group communication, distributed commit recovery mechanisms.

**(8 Sessions)**

**UNIT-V**

Security in distributed systems, secure channels, authentication, integrity and confidentiality, access control, security management. Naming: Flat naming approaches, structured naming, name space and resolution, attribute- based naming, directory services, LDAP, decentralized implementations.

**(8 Sessions)**

**Course Outcomes::**

Students will able to:

After successful completion of this course, student will be able to:

1. Understand the concepts and issues related to distributed systems.
2. Design and develop the programs for distributed environment.
3. Manage performance, reliability and other issues while designing in distributed environment.

**Suggested Reading:**

1. Distributed Systems, Principles and Paradigms, 2nd edition by Andrew S. Tanenbaum and Maarten Van Steen, Pearson Education, (ISBN-13: 978-0132392273)
2. Distributed System: Concepts and Design, 5th edition by Coulouris, Dollimore, Kindberg, Pearson Ed, (ISBN-13: 978- 0132143011).
3. Distributed Algorithms: Principles, Algorithms, and Systems by A. D. Kshemkalyani and M. Singhal, (ISBN-13: 978- 0521189842)

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**Website Sources:**

- [https://mrcet.com/downloads/digital\\_notes/CSE/III%20Year/Distributed%20systems.pdf](https://mrcet.com/downloads/digital_notes/CSE/III%20Year/Distributed%20systems.pdf)
- <https://www.cs.yale.edu/homes/aspnes/classes/465/notes.pdf>

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**MCA-41P: Computer Graphics Lab Based on MCA-411**

**Course Objective:**

- Understand the need of developing graphics application
- 2. Learn algorithmic development of graphics primitives like: line, circle, polygon etc.
- Learn the representation and transformation of graphical images and pictures.

**List of Programs:**

1. Write a program to draw points on a plane in OpenGL
2. Write a program to draw a line on plane in OpenGL.
3. Write a program to draw circle on plane in OpenGL.
4. Write a program draw a white rectangle on a black background in OpenGL.
5. Write a program to draw a square when we click on the mouse button in openGL
6. Write a program to draw a color cube and spin it using open GL transformation matrices in OpenGL.
7. Write a program to create a house like figure and rotate it about a given fixed point using OpenGL functions in OpenGL.
8. Write a program to implement the Cohen-Sutherland line clipping algorithm. Make provision to specify the input line, window for clipping and viewport for displaying the clipped image in OpenGL
9. Write a program to fill any given polygon using scan line area filling algorithm in OpenGL

**Course Outcomes:**

At the end of this course student will:

- Draw Geometric primitives using OpenGL
- Execute scan line polygon filling using OpenGL
- Implement basic transformations on objects using OpenGL
- Implement clipping algorithm on lines using OpenGL

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**MCA-42P: Dot.Net Lab Based on MCA-412**

**Course Objective:** Students will gain the ability to implement the algorithms in C#.net, VB.net and ASP.net. The basics of the asp.net programming with the introduction of .NET framework and .NET class framework with some programming variables, data types, object-oriented terminology, creating objects and classes, overloading methods, constructors, shared methods and more.

**List of Programs:**

1. Write a program to display the following feedback form.
2. Write a program containing the following controls:
3. Write a program that displays a button in green color and it should change into yellow when the mouse moves over it.
4. Write a program to display “Welcome To Radiant” in the form when the “click” button is clicked. The form title must be ASP.NET.
5. Write a program to get a user input such as the boiling point of water and test it to the appropriate value using CompareValidator.
6. Write a program that uses a textbox for a user input name and validate it for RequiredField Validation.
7. Write a program that gets user input such as the user name, mode of payment, appropriate credit card. After the user enters the appropriate values the Validation button validates the values entered.
8. Write a program to connect to the master database in SQL Server, in the Page\_Load event. When the connection is established, the message “Connection has been established” should be displayed in a label in the form.
9. Create a RadioButtonList that displays the names of some flowers in two columns. Bind a label to the RadioButtonList so that when the user selects an option from the list and clicks on a button, the label displays the flower selected by the user.
- 10.10.

**Course Outcomes:**

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

- Create Simple application using web controls
- Work with States of ASP.NET Pages & Adrotator Control
- Use of calendar control, Treeview control & Validation controls
- Query textbox and Displaying records & Display records by using database
- Datalist link control & Databinding using dropdownlist control
- Inserting record into a database & Deleting record into a database
- Databinding using datalist control & Datalist control templates
- Databinding using datagrid & Datagrid control template
- Datagrid hyperlink & Datagrid button column
- Datalist event & Datagrid paging
- Creating own table format using datagrid

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**MCA-511: Web Technology**

**Objective:** The objective of this course is to provide the basic web technology concepts that are required for developing web applications. The key technology components are descriptive languages, server side program elements and client side program elements. In addition the course gives specific contents that are beneficial for developing web-based solutions, like relational data-base communication basics and information security principles and approaches.

**UNIT I** **(8 Sessions)**

Introduction: Introduction to Internet, www, Internet browsers, what is web, Introduction to Client Server Concepts, History of the web, Growth of the web, protocols governing the web, web development strategies, Web applications, web project, web team.

**UNIT II** **(8 Sessions)**

Web Page Designing: HTML: list, table, images, frames, forms, Cascading Style Sheet (CSS); XML: Introduction to XML, DTD, XML schemes, presenting and using XML

**UNIT III** **(8 Sessions)**

Scripting: Introduction to Java script, variables, control structures, looping structures, documents, forms, statements, functions, objects, event and event handling, Arrays; Introduction to VB Script, Fundamental of AJAX.

**UNIT IV** **(8 Sessions)**

Server Site Programming: Introduction to java server pages (JSP), JSP application design, tomcat server, JSP Life Cycle, JSP Implicit objects, JSP Scripting Elements, Declaring variables, and methods, debugging, sharing data between JSP pages, Session, Database with JSP, Introduction to active server pages (ASP), ASP.NET.

**UNIT V** **(8 Sessions)**

PHP (Hypertext Preprocessor): Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form mail, file upload, session, error, exception, filter, PHP-ODBC.

**Course Outcome:** On completion of the course students will be able to

- Understand the basics of computer networks and HTTP protocol
- Understand and know how to use descriptive languages like HTML and XML
- Understand to use web programming languages (like PHP and JavaScript) and be capable of construction less demanding web application on their own.

**Suggested Readings:**

1. Xavier, C, “ Web Technology and Design” , New Age International
2. Ivan Bayross, ” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication.
3. Ramesh Bangia, “Internet and Web Design” , New Age International
4. Bhav, “Programming with Java”, Pearson Education
5. Ullman, “PHP for the Web: Visual QuickStart Guide”, Pearson Education
6. Deitel, “Java for programmers”, Pearson Education
7. Ravi Kalakota, Andrew Winston, “Frontiers of Electronic Commerce”, Addison Wesley.
8. Bajaj and Nag, “E-Commerce the cutting edge of Business”, TMH
9. P. Loshin, John Vacca, “Electronic commerce”, Firewall Media, New Delhi

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**Website Sources:**

- <https://www.tutorialspoint.com>
- <https://www.javatpoint.com>
- [onlinecourses.nptel.ac.in](https://onlinecourses.nptel.ac.in)
- <https://www.programiz.com>

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**MCA-512: Python Programming Language**

**Objective:** The objective of this course is to introduce Python programming language through its core language basics and program design techniques suitable for modern applications. And also to understand the wide range of programming facilities available in Python covering graphics, GUI, data visualization and Databases.

**UNIT I** **(8 Sessions)**

**Python Programming:** Overview of Python Programming Language, History of Python, Installation Python, writing and executing the first python program, Internal working of Python, Python character set, Token, Data type, Variables, Assignments, Formatting Number of Strings, Operators and Expression, **Decision statements:** Boolean type, Boolean Operators, Using Number and String with Boolean Operators, Boolean Expression and Relational Operators.

**UNIT II** **(8 Sessions)**

**Decision Making Statements:** Introduction, if Statements, if-else statements, nested if statements, multi-way if-elif-else statements, Conditional expression. **Loop Control Statements:** Introduction, The while Loop, for loop, nested loop, break statement, continues statement. **Function:** Introduction, Syntax and Basic of a function, use of a function, Parameter and Arguments in a function, Local and Global scope of a variable, Recursive function, Lambda function, range() function.

**UNIT III** **(8 Sessions)**

**Strings:** Fundamental of strings, the str class, The inbuilt python function for strings, the index[] operator, Immutable strings, String Operators, String Operations. **List and Processing:** Introduction, Creating, Accessing, list slicing, inbuilt function for list, List Operators, List Methods, List and String, Parsing List to a function. **Searching and Sorting:** Searching Techniques, Linear search, Binary search, Fundamental of Sorting, Bubble sorting, selection Sort, Insertion Sort, Quick Sort, Merge Sort.

**UNIT IV** **(8 Sessions)**

**Object-Oriented Programming:** Introduction, Defining Class, Self-parameter and Adding Methods to a Class, Display Class Attributes and Method, Accessibility, Passing an Object as Parameter to a Method, Method Overloading, Operator Overloading, Inheritance, Object Class. Tuples, Sets, and Dictionary in Python.

**UNIT V** **(8 Sessions)**

**File Handling:** Introduction, Need of file Handling, text Input and Output, Binary Files, Accessing and Manipulating Files and Directories on a disk. **Graphics Programming:** Drawing and moving with Turtle Graphics, Drawing Basic Shape Using Iteration. Fundamentals of Errors and Exceptions, Database with Python, Applications of Python.

**Course Outcome:** On completion of the course students will be able to

- Design real life situational problems and think creatively about solutions of them.
- Apply a solution clearly and accurately in a program using Python.
- Apply the best features of Python to program real life problems

**Suggested Readings:**

1. Programming and Problem Solving with PYTHON, by Ashok Namdev Kamthane and Amit Ashok Kamthane, Mc Graw Hill Education.
2. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.

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3. Learning with Python: How to Think Like a Computer Scientist Paperback – Allen Downey, Jeffrey Elkner, 2015.
4. Core Python Programming, Second Edition, by Wesley J. Chun, Prentice Hall.

**Website Sources:**

- <https://www.tutorialspoint.com>
- <https://www.javatpoint.com>
- [onlinecourses.nptel.ac.in](https://onlinecourses.nptel.ac.in)
- <https://www.programiz.com>

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**MCA-513: Multimedia System & Applications**

**Objective:** The objective of this course is to provide the basic concept of multimedia with appreciate multimedia as a new chapter in information technology and to identify and describe various components of multimedia like, sound, animation and graphics.

**UNIT I** **(8 Sessions)**

Introduction to Multimedia, Multimedia Information, Multimedia in business and work. Communication and Entertainment products Stages of Multimedia Projects, Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools.

**UNIT II** **(8 Sessions)**

Multimedia Building Blocks and Compression: Text, Sound MIDI, Digital Audio, Data Compression: Huffman Coding, Huffman Algorithms, Adaptive Coding, Arithmetic. Dictionary based Compression, Sliding Window Compression, and Compression ratio, lossless & lossy compression.

**UNIT III** **(8 Sessions)**

Speech Compression: Speech Compression & Synthesis Digital Audio concepts, Sampling Variables, Lossless compression of sound, lossy compression & silence compression.

**UNIT IV** **(8 Sessions)**

Images: Multiple monitors, bitmaps, Vector drawing, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding, Multimedia Database.

**UNIT V** **(8 Sessions)**

Video: Video representation, Colors, Video Compression, MPEG standards, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, recent development in Multimedia.

**Course Outcome:** On completion of the course students will be able to

- Understand various hardware requirement for multimedia
- Understand how images and sound works in multimedia.
- Will be able to know complete overview of Multimedia

**Suggested Readings:**

1. Tay Vaughan, "Multimedia, Making IT Work", McGraw Hill.
2. Buford, "Multimedia Systems", Addison Wesley.
3. Mark Nelson, "Data Compression Hand Book", BPB.
4. Sleinreitz, "Multimedia System", Addison Wesley.

**Website Sources:**

- <https://www.tutorialspoint.com>
- <https://www.javatpoint.com>
- [onlinecourses.nptel.ac.in](https://onlinecourses.nptel.ac.in)
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**MCA-514: Compiler Design**

**Objective:** The objective of this course is to introduce the major concept areas of language translation and compiler design. To enrich the knowledge in various phases of compiler and its use, code optimization techniques, machine code generation, and use of symbol table and extend the knowledge of parser by parsing LL parser and LR parser.

**UNIT I** **(8 Sessions)**

Introduction to Compiling: Compilers, Analysis of the source program, phases of compiler. Lexical Analysis: The role of Lexical Analyzer, input buffering, specification and recognition of tokens, Finite Automate, NFA and DFA construction, NFA to DFA conversion, Optimization of DFA Type Checking: Type systems, specification of simple type checkers, equivalence of type expressions, type conversions.

**UNIT II** **(8 Sessions)**

Run-Time Environments: Source language issues, storage organizations and allocation strategies, parameter passing, symbol table, an introduction to dynamic storage allocation. based pattern matcher.

**UNIT III** **(8 Sessions)**

Syntax Analysis: The role of parser, Context free grammar, writing grammar, top-down and bottom-up parsing, operator precedence parsing, LR parsers. Syntax Directed Translations: Definitions, construction of syntax trees, bottom up evaluation of S-attributed definitions, L-attributed definitions, Bottom-up evaluation of inherited attributes.

**UNIT IV** **(8 Sessions)**

Intermediate Code Generation: Intermediate languages, declarations, assignment statements, Boolean statements, back-patching and procedure calls. Code Generation: Issues in the design of code generator, target machines, run-time storage management, basic blocks and flow graphs, next use information, Dag representation of basic blocks, peephole optimization.

**UNIT V** **(8 Sessions)**

Code Optimization: Definitions and necessity, principal source of optimization, optimization of basic blocks, loops in flow graph, introduction to global data flow analysis and code improving transformations.

**Course Outcome:** On completion of the course students will be able to

- Construct parse tree, given a BNF grammar and a string over the appropriate alphabet.
- Compute the FIRST set for a BNF grammar.
- Fix simple violations of constraints that preclude single symbol-lookahead, top-down, lookahead parsing
- Design and implement a single-symbol-lookahead, top-down, lookahead parser from a BNF grammar
- Enhance the parser to perform semantic tests as it parses an input

**Suggested Readings:**

1. A.V.Aho, Ravi Sethi and J.D.Ullman, Compilers: Principles, Techniques and Tools, Addison Wesley.
2. D. M. Dhamdhare, Compiler Construction-Principles And Practices, Mcmillian
3. Trembley J.P. And Sorenson, The Theory And Practice Of Compiler Writing, Tata McGraw Hill, McGraw-Hill.
4. Waite W.N. And Goos G, Compiler Construction, Springer Verlag.
5. SudhaSadasivam, Compiler Design, Scitech Publications Pvt Ltd.

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- <https://www.javatpoint.com>
- [onlinecourses.nptel.ac.in](https://onlinecourses.nptel.ac.in)
- <https://www.programiz.com>

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**MCA-515: Soft Computing**

**Objective:** The objective of this course is to provide the basic with the need for soft computing and its associated tools and to understand about the concepts relating to fuzzy sets and logic and their applications in various domains with the need for Genetic Algorithms and their utility in solving the problems having huge state space.

**UNIT I** **(8 Sessions)**

What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.

**Neural Network:** What is Neural Network, Learning rules and various activation functions, Single layer Perceptrons , BackPropagation networks, Backpropagation Learning, Variation of Standard Back propagation Neural Network.

**UNIT II** **(8 Sessions)**

Fundamental of Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.

**UNIT III** **(8 Sessions)**

Introduction to Genetic Algorithm, History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA..

**UNIT IV** **(8 Sessions)**

Introduction to Hybrid Systems, Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.

**UNIT V** **(8 Sessions)**

GA based Backpropagation Networks: GA based Weight Determination, K - factor determination in Columns. Fuzzy Backpropagation Networks: LR type Fuzzy numbers, Fuzzy Neuron, Learning in Fuzzy BP, Application of Fuzzy BP Networks.

**Course Outcome:** On completion of the course students will be able to

- Understand and apply basic concepts related to fuzzy sets and logic.
- Understand and apply basic concepts related to neural networks.
- Understand and apply basic concepts related to Genetic Algorithms.
- Understand concepts related to Genetic Algorithms, Neural Networks and Fuzzy Logic to practical problems.

**Suggested Readings:**

1. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.
2. Genetic Algorithms: Search and Optimization, E. Goldberg.
3. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee, PHI.
4. Build\_Neural\_Network\_With\_MS\_Excel\_sample by Joe choong.

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**Website Sources:**

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- <https://www.programiz.com>

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**MCA-516: Mobile Computing**

**Objective:** The objective of this course is to identify the basic problems, strengths and current trends of mobile computing with the explanation of current wireless networking mechanisms to create novel mechanisms and systems for supporting mobile computing.

**UNIT I** **(8 Sessions)**

Issues in Mobile Computing, Wireless Telephony, Digital Cellular Standards, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

**UNIT II** **(8 Sessions)**

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

**UNIT III** **(8 Sessions)**

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

**UNIT IV** **(8 Sessions)**

Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

**UNIT V** **(8 Sessions)**

What is Ad-hoc Network? , Problems with Message Routing in Wireless Ad-hoc Mobile Networks, Routing scheme based on signal strength, Dynamic State Routing (DSR), Route Maintenance and Routing error, Fisheye Routing (FSR), Ad-hoc on Demand Distance Vector (AODV).

**Course Outcome:** On completion of the course students will be able to

- Describe wireless and mobile communications systems and be able to choose an appropriate mobile system from a set of requirements.
- Be able to work around the strengths and weaknesses of mobile computing.
- Understanding the Interface of a mobile computing system to hardware and networks.
- Design applications on a mobile computing system interacting with servers and database systems.

**Suggested Readings:**

1. Shambhu Upadhyaya, Abhijeet Chaudhary, Kevin Kwiat, Mark Weises, “Mobile Computing”, Kluwer Academic Publishers
2. UWE Hansmann, Lothar Merk, Martin-S-Nickious, Thomas Stohe, “Principles of Mobile Computing”, Springer International Edition

**Website Sources:**

- <https://www.tutorialspoint.com>
- <https://www.javatpoint.com>
- [onlinecourses.nptel.ac.in](https://onlinecourses.nptel.ac.in)
- <https://www.programiz.com>

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**MCA-517: Cloud Computing**

**Objective:** The objective of this course is to provide the basic to understand the concept of cloud and utility computing, various issues in cloud computing, with the lead players in cloud and the emergence of cloud as the next generation computing paradigm.

**UNIT I** **(8 Sessions)**

Introduction: Cloud-definition, benefits, usage scenarios, History of Cloud Computing - Cloud Architecture - Types of Clouds - Business models around Clouds – Major Players in Cloud Computing-issues in Clouds - Eucalyptus - Nimbus - Open Nebula, Cloud Sim.

**UNIT II** **(8 Sessions)**

Cloud Services: Types of Cloud services: Software as a Service-Platform as a Service –Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services. Service providers- Google, Amazon, Microsoft Azure, IBM, Sales force.

**UNIT III** **(8 Sessions)**

Collaborating Using Cloud Services: Email Communication over the Cloud - CRM management - Project Management-Event Management - Task Management – Calendar - Schedules - Word Processing – Presentation – Spreadsheet - Databases – Desktop - Social Networks and Groupware.

**UNIT IV** **(8 Sessions)**

Virtualization for Cloud: Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization –System Vm, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - supervisors – Xen, KVM, VMware, Virtual Box, Hyper-V.

**UNIT V** **(8 Sessions)**

Security, Standards and Applications: Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud.

**Course Outcome:** On completion of the course students will be able to

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- Identify the architecture, infrastructure and delivery models of cloud computing
- Explain the core issues of cloud computing such as security, privacy and interoperability.
- To be able to set up a private cloud.

**Suggested Readings:**

1. David E.Y. Sarna Implementing and Developing Cloud Application, CRC press 2011.
2. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.
3. Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing : A Practical Approach, Tata McGraw-Hill 2010.
4. Haley Beard, Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.
5. G.J.Popek, R.P. Goldberg, Formal requirements for virtualizable third generation Architectures, Communications of the ACM, No.7 Vol.17, July 1974

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6. John Rittinghouse & James Ransome, Cloud Computing, Implementation, Management and Strategy, CRC Press, 2010.
7. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Que Publishing, August 2008.
8. James E Smith, Ravi Nair, Virtual Machines, Morgan Kaufmann Publishers, 2006.

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- <https://www.programiz.com>

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**MCA-518: Enterprise Resource Planning**

**Objective:** The objective of this course is to familiarize the student with ERP process and ERP implementation process using information technology.

**UNIT I** (8 Sessions)

ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, The Evolution of ERP, the Structure of ERP

**UNIT II** (8 Sessions)

Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing(OLAP), Product Life Cycle Management(PLM),LAP, Supply chain Management.

**UNIT III** (8 Sessions)

ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, The Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

**UNIT IV** (8 Sessions)

ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees,

**UNIT V** (8 Sessions)

ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study

**Course Outcome:** On completion of the course students will be able to

- Understand basics of ERP applications by using features of ERP tools.
- Understand the Importance of ERP in future.
- Understand the Implementation process of ERP Implementation.
- Know important software that can be learn.

**Suggested Readings:**

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill
2. Rahul V. Altekhar “Enterprisewide Resource Planning”, Tata McGraw Hill,
3. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning – Concepts and Practice”, PHI
4. Joseph A Brady, Ellen F Monk, Bret Wagner, “Concepts in Enterprise Resource Planning”, Thompson Course Technology
5. Mary Summer, “Enterprise Resource Planning”- Pearson Education

**Website Sources:**

- <https://www.tutorialspoint.com>
- <https://www.javatpoint.com>
- [onlinecourses.nptel.ac.in](https://onlinecourses.nptel.ac.in)
- <https://www.programiz.com>

**IFTM University, Moradabad**  
**Master in Computer Applications (M.C.A.) Programme**  
**MCA III Year (V Semester)**

**MCA-519: Advanced Database Management System**

**Objective:** The objective of this course is to provide the basic concept of large database repositories, Data warehouse and data mining. Student will be able to differentiate between data warehouse and any other database system and can to retrieve or mine the data for various purposes (like prediction, analysis etc.) from large data repositories.

**UNIT I** **(8 Sessions)**

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.

**UNIT II** **(8 Sessions)**

Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializability by Locks, Locking system with multiple lock modes, architecture for Locking scheduler

**UNIT III** **(8 Sessions)**

Distributed Transactions Management, Data Distribution, fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol

**UNIT IV** **(8 Sessions)**

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Inconsistent Messages.

**UNIT V** **(8 Sessions)**

Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques.

**Course Outcome:** On completion of the course students will be able

- To understand Enhanced Entity Relationship Model, Object Model
- To understand about Object Oriented database with their advantages and storage and access methods.
- To understand Distributed database concepts, Architectures for distributed databases,
- To understand Databases on Web and Semi Structured Data: 6. To understand Enhanced Data Models for Advanced Applications.

**Suggested Readings:**

1. R. Ramakrishnan, J. Gehrke, Database Management Systems, McGraw Hill.
2. A. Silberschatz, H. Korth, S. Sudarshan, Database system concepts, 5/e, McGraw Hill.
3. KJ Rini Chakrabarti, Shilbhadra Dasgupta, Advanced Database Management System, Wiley.
4. Elmasri, Navathe, "Fundamentals Of Database Systems", Addison Wesley.

**Website Sources:**

- <https://www.tutorialspoint.com>
- <https://www.javatpoint.com>
- [onlinecourses.nptel.ac.in](https://onlinecourses.nptel.ac.in)
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**IFTM University, Moradabad**  
**Master in Computer Applications (M.C.A.) Programme**  
**MCA III Year (V Semester)**

**MCA-520: Pattern Recognition**

**Objective:** The objective of this course is to provide the basics of pattern recognition to gain knowledge about various theories and classifiers. It is important to understand about PCA and Expectation-maximization that can be used in clustering.

**UNIT I** **(8 Sessions)**

Introduction to pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities.

**UNIT II** **(8 Sessions)**

Fundamental of Statistical Pattern Recognition, Bayesian Decision Theory, Classifiers, Normal density and discriminate functions,

**UNIT III** **(8 Sessions)**

Parameter estimation methods, Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods, Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM).

**UNIT IV** **(8 Sessions)**

Nonparametric Techniques, Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

**UNIT V** **(8 Sessions)**

Unsupervised Learning & Clustering, Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering-K means, agglomerative hierarchical clustering, Cluster validation.

**Course Outcome:** On completion of the course students will be able to

- Understand fundamental concept, statistical approach to pattern recognition.
- how to design optimal classifier and focus on related techniques of parameter estimation.
- Know about non parametric procedures used with arbitrary distribution, various procedures for determining discriminant function.
- To learn unsupervised procedure that used unlabelled sample.

**Suggested Readings:**

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.

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- <https://www.javatpoint.com>
- [onlinecourses.nptel.ac.in](https://onlinecourses.nptel.ac.in)
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**IFTM University, Moradabad**  
**Master in Computer Applications (M.C.A.) Programme**  
**MCA III Year (V Semester)**

**MCA-521: Simulation & Modeling**

**Objective:** The objective of this course is to gain the knowledge about system and its behavior so that a person can transform the physical behavior of a system into a mathematical model that can in turn transform into a efficient algorithm for simulation purpose.

**UNIT I** **(8 Sessions)**

Definition of system, system concepts, types of system. Continuous & discrete system, with example Modeling process. Verification & validation.

**UNIT II** **(8 Sessions)**

Simulation: Introduction, classification of simulation models. Advantages & disadvantages of simulation. Discrete system simulation: Monte Carlo method, random no generation, [Models :- compartmental model, linear and nonlinear model, stochastic model]

**UNIT III** **(8 Sessions)**

Introduction to queuing theory: Queuing model with poison input Exponential service & arbitrary service times Simulation of queuing system, simulation of single server queue; Simulation of two server queue, model as two server, [M/M/1 queue, Application of queuing theory in computer system like operating system, computer network.

**UNIT IV** **(8 Sessions)**

Introduction to inventory theory: More complex inventory model, finite & infinite delivery rate model with and without back ordering.

**UNIT V** **(8 Sessions)**

Introduction of Simulation of system dynamics model, Evaluation of simulation, length of simulation runs. Introduction Variance reduction techniques. Project management: Simulation of Pert /CPM technique .Models as component of information system *Modeling for decision support Virtual reality: ultimate interactive model*. Simulation languages :- Simula. Dyanamo, Stella.

**Course Outcome:** On completion of the course students will be able to

- Know the importance of ethics and methods of developing technologies
- Concepts of System Softwares and their applications

**Suggested Readings:**

1. Payne, J.A. *Introduction to Simulation*, Tata McGraw-Hill.
2. Law, A.M., Kelton W.D., *Simulation Modelling and Analysis*, Tata McGraw-Hill
3. Gorden, G., *System Simulation*, Prentice Hall of India.
4. DeoNarsingh, *System Simulation*, Tata Mcgraw-Hill

**Website Sources:**

- <https://www.tutorialspoint.com>
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**IFTM University, Moradabad**  
**Master in Computer Applications (M.C.A.) Programme**  
**MCA III Year (V Semester)**

**MCA-522: Artificial Intelligence**

**Objective:** The objective of this course is to provide the achievements of AI and the theory underlying those achievements and to review "conventional" searching methods including breadth-first, depth-first, best first search any many more heuristic techniques. Heuristic functions and their effect on performance of search algorithms.

**UNIT I** **(8 Sessions)**

Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

**UNIT II** **(8 Sessions)**

Introduction to Search: Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

**UNIT III** **(8 Sessions)**

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

**UNIT IV** **(8 Sessions)**

Machine Learning: Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data – EM algorithm, Reinforcement learning,

**UNIT V** **(8 Sessions)**

Pattern Recognition: Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

**Course Outcome:** On completion of the course students will be able to

- Understand the importance, the basic concepts and the Applications of AI.
- Apply various search techniques used for Intelligent systems
- Efficiently represent the various knowledge representation schemes used for intelligent systems.
- Apply some statistical like Bayes Theorem and Soft computing techniques

**Suggested Readings:**

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill
3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India.

**Website Sources:**

- <https://www.tutorialspoint.com>
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**IFTM University, Moradabad**  
**Master in Computer Applications (M.C.A.) Programme**  
**MCA III Year (V Semester)**

**MCA-523: Research Methodology**

**Objective:** The objective of this course is to provide the basic how to discover answers to questions through the application of scientific procedures. The main aim of this paper is to find out the truth which is hidden and which has not been discovered as yet which can help in research.

**UNIT I** **(8 Sessions)**

**Introduction to Research Methodology**

Motivation and objectives – Research methods vs Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Defining Research problem and basics of principles of experimental design.

**UNIT II** **(8 Sessions)**

Defining and formulating the research problem -Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem Guidelines for reading Research papers, The student will be given sample papers and guided how to read researchpapers.

**UNIT III** **(8 Sessions)**

**Guidelines on writing literature review**

Primary and secondary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review.

**Methods of data collection:** Collection of primary data, Observation method, Interview method, Collection of data through questionnaire and schedules, Collection of secondary data, Selection of appropriate method for data collection.

**UNIT IV** **(8 Sessions)**

**Statistic in Research methodology, Hypothesis testing, Report and Thesis writing**

Structure and components of scientific reports -Types of report – Technical reports and thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports – Illustrations and tables - Bibliography, referencing and footnotes.

**Presentation Skills:** Oral presentation – Planning – Preparation – Practice – Making presentation – Use of visual aids - Importance of effective communication –.

**UNIT V** **(8 Sessions)**

**Application of results and ethics**

Environmental impacts - Ethical issues -ethical committees - Commercialisation – Copy right – royalty - Intellectual property rights and patent law – Trade Related aspects of Intellectual Property Rights – Reproduction of published material – Plagiarism – Citation and acknowledgement - Reproducibility and accountability.

**Course Outcome:** On completion of the course students will be able

- To gain familiarity with a phenomenon or to achieve new insights into it
- To portray accurately the characteristics of a particular individual, situation or a group
- To determine the frequency with which something occurs or with which it is associated with something else

**Suggested Readings:**

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002 An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International.

**IFTM University, Moradabad**  
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**MCA III Year (V Semester)**

3. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes
4. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.
5. Wadehra, B.L. 2000. Law relating to patents, trademarks, copyright designs and geographical indications. Universal Law Publishing.

**Website Sources:**

- <https://www.tutorialspoint.com>
- <https://www.javatpoint.com>
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**IFTM University, Moradabad**  
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**MCA III Year (V Semester)**

**MCA-51 P: Web Technology Lab Based on MCA-511**

**Course Objectives:**

This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the 'language of the Web' – HTML, the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web, and a general grounding introduction to more advanced topics such as programming and scripting. This will also expose students to the basic tools and applications used in Web publishing.

**List of Programs:**

1. Create a form by using various attributes of the input tags.
2. Create a web page multiple types of style sheet used in a single page.
3. Write a CGI sample program to send output back to the user.
4. Write a Java Script program by using variables.
5. Write a java script program to multiply two numbers and display the result in separate text box.
6. Write a java script program on Form Validations.
7. Write a AJAX program checking the presence of XMLHttpRequest object.
8. Write a program to create sales report for our books by using AJAX
9. Design a dynamic web page with validation using JavaScript.
10. Design an HTML having a text box and four buttons viz Factorial, Fibonacci, Prime.
11. Write a java program to connect to a database server using JDBC and insert 10 students information of user choice in to student table.
12. Write a java program to display all records in the student table.
13. Write JavaScript programs on Event Handling.
14. Use frames to Include Images and Videos.
15. Add a Cascading Style sheet for designing the web page.

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**MCA III Year (V Semester)**

**MCA-52 P: Python Programming Lab Based on MCA-512**

**Objective:**

Learn Syntax and Semantics and create Functions in Python.

Handle Strings and Files in Python.

Understand Lists, Dictionaries and Regular expressions in Python.

Implement Object Oriented Programming concepts in Python

Build Web Services and introduction to Network and Database Programming in Python.

**Program List**

- 1) Write a Python program to find GCD of two numbers.
- 2) Write a Python Program to find the square root of a number by Newton's Method
- 3) Write a Python program to find the exponentiation of a number.
- 4) Write a Python Program to find the maximum from a list of numbers.
- 5) write a Python Program to perform Linear Search
- 6) write a Python Program to perform Binary Search
- 7) Write a Python Program to perform selection sort.
- 8) Write a Python Program to perform insertion sort.
- 9) Write a Python Program to perform Merge sort.
- 10) Write a Python program to find first n prime numbers.
- 11) Write a Python program to multiply matrices.

**Course Outcomes:**

Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.

Demonstrate proficiency in handling Strings and File Systems.

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**MCA III Year (V Semester)**

**MCA-53 P: Project Work**

**Course Objective:**

The MCA students are encouraged to involve themselves completely on the project work in their final semester. It is advised to students to develop their project for solving problems of software industry or any research organization. Doing this will give more exposure to handle real life problems of project development.

The courses studied by you during your MCA programme provide you the basic background to work on diverse application domains. The theoretical background of various courses provides you the necessary foundation, principles, and practices to develop effective ways to solve computing problems. The hands on experience gained from the practical courses provide you the knowledge to work with various operating systems, programming languages, and software tools.

Students should take this project work very seriously. MCA project should be taken as an opportunity to develop software, which gives exposure to SDLC. Topics selected, should be complex and large enough to justify as a BCA project. The project should be genuine and original in nature and should not be copied from anywhere else. If found copied, the project report will be forwarded to the Exam Discipline Committee of the University as an Unfair means case for necessary action. Students should strictly follow and adhere to the BCA project guidelines.

**List of Projects:**

1. university management system project in php
2. college management system project in asp.net
3. online examination system in php
4. student information system project in j2ee
5. online job portal project in php
6. airline reservation system project in asp net
7. online doctor appointment system project
8. vehicle management system project in j2ee
9. online examination system project in php
10. hospital management system project in php
11. online recruitment system project in java with source code
12. mobile shopping project
13. blood bank management system project
14. social networking scripts
15. online voting system project
16. college admission system project
17. institute management system project
18. attendance management system project

**MCA-61P: Industrial Training / Project Work**

**Objective:**

- To prepare students to excel in computer applications to succeed in industry/ technical profession.
- To provide students with solid foundation in mathematical and computing fundamentals and techniques required to solve related problems and also to pursue higher studies and research.
- To train students with good computing breadth so as to comprehend, analyze, design and create computing solutions for the real life problems.
- To provide the change management in Distance mode through inquiry based curriculum updating and with use of innovative E-Learning teaching aids.

Each student should carry out their Project Work using the software development tools/languages/technologies during the concerned semester. The Project Work will be assessed by the internal and external examiners.

**Learning outcomes:**

On completion of the course students should be able to

- Graduates will have an ability to identify, formulate and implement computing solutions.
- Graduates will have an ability to design and conduct experiments, analyze and interpret data.
- Graduates will be able to design a system, component or process as per needs and specification.
- Graduates will have the skill to work on multidisciplinary tasks and will be aware of the new and emerging disciplines.
- Graduates will demonstrate skills to use modern tools, software and equipments to analyze problems.

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**MCA-62P: Colloquium**

Each student would select a topic based on current developments and technologies to deliver a seminar. The student will study and analyze the chosen topic independently and prepare a seminar report. Finally, each student will prepare a power-point presentation based on the contents of the seminar report and deliver the seminar in the presence of other students and faculty member. The evaluation would be done by internal / external examiner. Director/Head is required to submit a copy of the seminar reports of all the students to the Examination Section of the University for External Assessment.