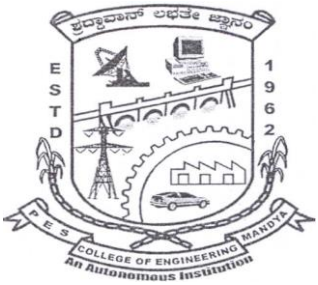
Scheme and Syllabus

Master of Computer Applications (MCA)
2018-2021



P.E.S. COLLEGE OF ENGINEERING

Mandya - 571401. Karnataka
(An Autonomous Institution Affiliated to VTU, Belagavi)
Grant-in-aid Institution
Accredited by NBA, New Delhi
Approved by AICTE, New Delhi.

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ABOUT THE DEPARTMENT

The department of MCA started in 1992 in PES College of Engineering Mandya, one among the earliest institutes in Karnataka to start MCA Programme. The intake of the department is 60 students. The department is run by highly qualified teaching staff. The department has three different laboratories to address the programmes of the revised syllabus. The department has received Rs. 25 lakhs funds from AICTE for modernization of labs. The Programme became autonomous in the year 2008 and is affiliated to Visvesvaraya Technological University and approved by AICTE. During last five years, the department has published number of papers in international conferences and journal. The department has been actively involved in conducting workshops, Technical Seminars from industry persons to provide a platform for sharing and spreading the latest developments in the field of Computer science and applications. The curriculum for the Master of Computer applications programme is designed to meet the need of IT industry. It includes the core computer science and computer application courses and in addition, the mathematics concepts required for modeling the domain of the software systems and solve them, and management principles. The core courses encompass the core concepts of computer science and the elective courses are designed to deliver the modern technologies and tools. The salient feature of the curriculum is, the laboratory component included as a part of most of the courses and adequate number of courses are having tutorial component. Some of the companies that offered placements to MCA students are Tech Mahindra, TCS, Mindtree, Headstrong, HP, Emphasis etc

VISION AND MISSION

Vision of PESCE

PESCE shall be a leading institution imparting quality engineering and management education developing creative and socially responsible professionals.

Mission of PESCE

- Provide state of the art infrastructure, motivate the faculty to be proficient in their field of specialization and adopt best teaching-learning practices.
- Impart engineering and managerial skills through competent and committed faculty using outcome based educational curriculum.
- Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs.
- Promote research, product development and industry-institution interaction.

Vision of the Department

A Department of high repute imparting quality education to develop competent computer application software professionals and technocrats to serve the society.

Mission of the Department

Committed to

- To provide state-of-the-art facilities with supportive environment for teaching and learning.
- To prepare the students with curricula of industry expectation.
- Train the students to be competent to solve the real world problems in the field of computer Applications and nurturing the students with ethical values for well being in the society.

ACADEMIC PROGRAM

PROGRAM EDUCATIONAL OBJECTIVES (PEO) :

PEO1. Deliver competence in a global environment as computer software professional with practice of software engineering principles.

PEO-2. Exhibit Technical and managerial skills to provide solutions for societal acceptable problems and manage projects.

PEO-3. Excel in profession with effective communication skills, ethical attitude, team work and ability to relate computer applications to broader societal context.

PROGRAMME OUTCOMES (PO)

PO-1. Apply knowledge of Computing fundamentals, mathematical principles and domain knowledge in the field of computer applications.

PO-2. Ability to analyze the literature of the domain, understands, identify and formulate problem definition and solve problems

PO-3. Design and develop solutions for small, medium and complex computing problems, and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public, cultural, societal, and economical considerations.

PO-4. Use research based knowledge and methods to analyze and design of unfamiliar problems to provide valid solutions and conclusions.

PO-5. Ability to use techniques, latest tools and skills necessary for development of Computer applications or real world problems.

PO-6. Work as professionals with ethical values, cyber regulations and moral behaviors.

PO-7. Engage in self learning the new technical concepts and domain for continual development as a computing professional to keep in pace with the changes in technologies.

PO-8. Apply the management principles for managing projects as a member in a team, leader in a team and as an individual for different domains considering financial factors.

.**PO-9.** Communicate effectively about system development activities in both verbal and written form with the stake holders of the system and with society.

PO-10. Assess the local and global impact of software solutions on societal context, individuals and organizations.

PO-11. Perform effectively as individual, in team and in diverse environment.

PO-12. Identify innovative ideas to succeed as an employee or entrepreneur using timely opportunity to create value and wealth for the betterment of the individual and society at large.

Credit Pattern

Core Courses **:** I Semester 16 Credits
II Semester 16.5 Credits
III Semester 12 Credits
IV Semester 06 Credits
V Semester 03 Credits

Total credits for core courses is 53.5 credits

Elective courses **:** III Semester 04 Credits
IV Semester 12 Credits
V Semester 12 Credits

Total credits for Elective courses is 28 credits

Soft skill **:** **04 Credits** (I to IV Semester)

Labs **:** I Semester 5 Credits
II Semester 4.5Credits
III Semester 3 Credits
IV Semester 2 Credits
V Semester 1 Credits

Total credits for Labs is 15.5 credits

Seminar **:** **2 Credits (**IV Semester)

Mini Project **:** **03 Credits** (V Semester)

Industrial Study Report/ NPTEL Certification **:** **01 Credit** (V Semester)

Project work **:** **25 Credits** (VI Semester)

A total of 132 credits for 3 years MCA Programme

A total of 88 credits for lateral entry MCA Programme

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MASTER OF COMPUTER APPLICATIONS (MCA)
SCHEME OF TEACHING AND EXAMINATION 2018-21

I SEMESTER

Sl. No	Course Code	Course Title	Hrs/Week	Credits	Examination		
					Marks		
			L : T : P : H		CIE	SEE	Total
1	P18MCA11	Problem Solving Using C	4 : 0 : 0 : 4	4	50	50	100
2	P18MCA12	Discrete Mathematical Structures	4 : 0 : 0 : 4	4	50	50	100
3	P18MCA13	Fundamentals of Computer Organization	4 : 0 : 0 : 4	4	50	50	100
4	P18MCA14	Introduction to UNIX	4 : 0 : 0 : 4	4	50	50	100
5	P18MCA15	Introduction to Web Technologies	0 : 3 : 3 : 6	3	50	50	100
6	P18MCA16	C Programming Lab	0 : 0 : 2 : 2	1	50	50	100
7	P18MCA17	UNIX Programming Lab	0 : 0 : 2 : 2	1	50	50	100
8	P18MHU101	Effective Communication Development (ECD)*	1 : 0 : 0 : 1	1	50	50	100
Total			**27**	**22**	**400**	**400**	**800**

L: Lecture, T: Tutorial, P: Practical, H: Total Hours; CIE: Continuous Internal Evaluation;
SEE: Semester End Examinations
* Taught by Humanities Science and Management Department

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II SEMESTER

Sl. No	Course Code	Course Title	Hrs/Week	Credits	Examination		
					Marks		
			L : T : P : H		CIE	SEE	Total
1	P18MCA21	Data Structures Using C	4 : 1 : 0 : 5	4.5	50	50	100
2	P18MCA22	Object Oriented Programming With C++	3 : 2 : 0 : 5	4	50	50	100
3	P18MCA23	Operating Systems	4 : 0 : 0 : 4	4	50	50	100
4	P18MCA24	Database Management Systems	4 : 0 : 0 : 4	4	50	50	100
5	P18MCA25	Data Structures Lab	0 : 0 : 3 : 3	1.5	50	50	100
6	P18MCA26	Object Oriented Programming With C++ Lab	0 : 0 : 3 : 3	1.5	50	50	100
7	P18MCA27	Database Management Systems Lab	0 : 0 : 3 : 3	1.5	50	50	100
8	P18MHU201	Professional Communication Development. (PCD)*	1 : 0 : 0 : 1	1	50	50	100
Total			**28**	**22**	**400**	**400**	**800**

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III SEMESTER

Sl. No	Course Code	Course Title	Hrs/Week	Credits	Examination		
					Marks		
			L : T : P : H		CIE	SEE	Total
1	P18MCA31	Programming with Java	2 : 2 : 0 : 4	3	50	50	100
2	P18MCA32	Software Engineering	4 : 0 : 0 : 4	3	50	50	100
3	P18MCA33	Python Programming	2 : 2 : 0 : 4	3	50	50	100
4	P18MCA34	Object-Oriented Modelling and Design Patterns	4 : 0 : 0 : 4	3	50	50	100
5	P18MCA35X	Elective - I	3 : 2 : 0 : 5	4	50	50	100
6	P18MCA36	Java Programming Lab	0 : 0 : 2 : 2	1	50	50	100
7	P18MCA37	Python Programming Lab	0 : 0 : 2 : 2	1	50	50	100
8	P18MCA38	Object-Oriented Modelling and Design Patterns Lab	0 : 0 : 2 : 2	1	50	50	100
9	P18MHU301	Aptitude and Reasoning Development-BEGINNER (ARDB)*	1 : 0 : 0 : 1	1	50	50	100
Total			**28**	**20**	**450**	**450**	**900**

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ELECTIVES

Sl. No.	Course code	Elective Group - I
1	P18MCA351	Computer Networks
2	P18MCA352	Accountancy and Financial Management
3	P18MCA353	Computer Graphics
4	P18MCA354	Graph Theory and Combinatorics

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IV SEMESTER

Sl. No.	Course Code	Course Title	Hrs/Week	Credits	Examination Marks		
			L : T : P : H		CIE	SEE	Total
1	P18MCA41	Design & Analysis of Algorithms	2 : 2 : 0 : 4	3	50	50	100
2	P18MCA42	Advanced Java Programming	4 : 0 : 0 : 4	3	50	50	100
3	P18MCA43X	Elective – II	3 : 2 : 0 : 5	4	50	50	100
4	P18MCA44X	Elective - III	4 : 0 : 0 : 4	4	50	50	100
5	P18MCA45X	Elective - IV	4 : 0 : 0 : 4	4	50	50	100
6	P18MCA46	Design & Analysis of Algorithms Lab	0 : 0 : 2 : 2	1	50	50	100
7	P18MCA47	Advanced Java Programming Lab	0 : 0 : 2 : 2	1	50	50	100
8	P18MCA48	Technical Seminar	0 : 0 : 0 : 4	2	50	--	50
9	P18MHU401	Aptitude and Reasoning Development ADVANCED (ARDA)*	2 : 0 : 0 : 2	1	50	50	100
Total			**31**	**23**	**450**	**400**	**850**

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ELECTIVES

Sl. No.	Course code	Elective Group - II	Sl. No.	Course code	Elective Group - III
1	P18MCA431	Data Warehousing & Data Mining	1	P18MCA441	Cryptography & Network Security
2	P18MCA432	Digital Image Processing	2	P18MCA442	Artificial Intelligence
3	P18MCA433	Principles of User Interface Design	3	P18MCA443	Distributed Computing
4	P18MCA434	Enterprise Resource Planning (ERP)	4	P18MCA444	Cloud Computing

Sl. No.	Course code	Elective Group - IV
1	P18MCA451	Research Methodology
2	P18MCA452	Business Communication
3	P18MCA453	Software Testing & Practices
4	P18MCA454	Basics of MIS & E-Commerce

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V SEMESTER

Sl. No	Course Code	Course Title	Hrs/Week	Credits	Examination		
					Marks		
			L : T : P: H		CIE	SEE	Total
1	P18MCA51	Programming using C# and .NET	4 : 0 : 0 : 4	3	50	50	100
2	P18MCA52X	Elective - V	4 : 0 : 0 : 4	4	50	50	100
3	P18MCA53X	Elective - VI	3 : 2 : 0 : 5	4	50	50	100
4	P18MCA54X	Elective - VII	3 : 2 : 0 : 5	4	50	50	100
5	P18MCA55	.NET Lab	0 : 0 : 2 : 2	1	50	50	100
6	P18MCA56	Mini Project	0 : 0 : 6 : 6	3	50	50	100
7	P18MCA57	Industrial Study Report	0 : 0 : 2 : 2	1	50	-	50
Total			**26**	**20**	**350**	**300**	**650**

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SEE: Semester End Examinations

ELECTIVES

Sl. No.	Course code	Elective Group – V	Sl. No.	Course code	Elective Group - VI
1	P18MCA521	System Simulation and Modeling	1	P18MCA531	Information Retrieval & Search Engines
2	P18MCA522	Soft Computing	2	P18MCA532	Business Intelligence - Data Warehousing and Analytics
3	P18MCA523	Big Data and Analytics	3	P18MCA533	IOT
4	P18MCA524	Service Oriented Architecture	4	P18MCA534	Machine Learning

Sl. No.	Course code	Elective Group – VII
1	P18MCA541	Advanced Web Programming
2	P18MCA542	Enterprise Application Programming
3	P18MCA543	Model View Control Programming
4	P18MCA544	Mobile Application Development

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MASTER OF COMPUTER APPLICATIONS (MCA)
SCHEME OF PROJECT WORK AND EXAMINATION 2018-21

VI SEMESTER

Sl. No	Course Code	Course Title	Hrs/Week	Credits	Examination		
					Marks		
			L : T : P: H		CIE	SEE	Total
1	P18MCA61	Project Phase-1	------	3	50	------	50
2	P18MCA62	Project Phase-2	------	3	50	------	50
3	P18MCA63	Project Dissertation Evaluation	------	9	-----	100	100
4	P18MCA64	Project Viva - Voce	------	10	-----	100	100
TOTAL			------	**25**	**100**	**200**	**300**

L: Lecture, T: Tutorial, P: Practical, C: Credits ; CIE: Continuous Internal Evaluation;
SEE: Semester End Examinations

Evaluation Scheme							
Scheme	**Weightage**	**Marks**	**Event Break UP**				
CIE	50%	50	**Test I**	**Test II**	**Quiz I**	**Quiz II**	**Assignment**
			35	35	5	5	10
SEE	50%	100	**Questions to Set : 10**		**Questions to Answer:5**		

Scheme of SEE Question Paper(100 Marks)		
Duration:3hrs	**Marks:100**	**Weightage:50%**

- Each of the two questions set shall be so comprehensive as to cover the entire contents of the unit.
- There will be direct choice between two questions within each unit.
- Total questions to be set are 10. All questions carry equal marks of 20.
- The number of subdivisions in each main question shall be limited to maximum of four only.

Number of question to be answered by students is 5.

Course Code : P18MCA11	Semester : I	L - T - P : 4 - 0 - 0
Course Title : Problem Solving Using C		
Credits : 4	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Design an algorithm and flowchart for the given problems
- Understand the fundamental concepts and constructs of C programming language
- Apply the concept of arrays, strings, structures, pointers in writing C programs.
- Recognize the use of different categories of functions in writing C programs.
- Illustrate the concepts of file management in C programming language.
- Compare structures and unions and different memory management techniques in C programming language

UNIT-I

12 Hours

Algorithms, Flowcharts and their need, Writing algorithms and drawing flowcharts for simple exercises like finding biggest of three numbers, to find roots of given quadratic equation, to find the biggest and smallest of given set of numbers, To generate N Fibonacci numbers and such other simple examples, Character set, C tokens, keywords & identifiers, structure of C program, Constants, variables, data types, declaration of variables, declaration of storage classes, assigning values to variables defining symbolic constants, declaring a variable as constant, declaring a variable as volatile, overflow and underflow of data, Arithmetic operators, relational operators, logical operators, assignment operator, increment and decrement operator, conditional operator, bitwise operators, comma operator, special operators, arithmetic expressions, evaluation of expressions, precedence of arithmetic operators, type conversions in expressions, operator precedence and associatively, mathematical functions.

UNIT-II

10 Hours

The *scanf() & printf()* functions for input and output operations, reading a character, writing a character, (the *getchar() & putchar()* functions) , the address operator(&), formatted input and output using format specifiers, Decision making with *if* statement, simple if statement, the *if..else* statement, nesting of *if..else* statements, the *else..if* ladder, the *switch* statement, the **?:** operator, the *goto* statement, the break statement, programming examples, The while statement, the do..while statement, the for statement, nested loops, jumps in loops, the continue statement, programming examples, The meaning of an array, one dimensional and two dimensional arrays, declaration and initialization of arrays, reading, writing and manipulation of above types of arrays, multidimensional arrays, dynamic arrays, programming examples.

UNIT-III

10 Hours

Declaring and initialing string variables, reading string from terminal, writing string to screen, arithmetic operations on characters, putting strings together, comparison of two strings, string handling functions, table of strings, programming examples, Need for user defined functions, a multi function program, elements of User defined functions, definition of functions, return values and their types, function calls, function declaration, category of functions, no arguments and no return values, arguments but no return values, arguments with return values, no arguments but returns a value, functions that return multiple values, nesting of functions, recursion, passing arrays to functions, passing string to functions, programming examples.

UNIT-IV

10 Hours

Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, operations on individual members, array of structures, structures within structures, structures and functions, Unions, size of structures, bit fields, programming examples, Understanding pointers, accessing the address space of a variable, declaring and initialization pointer variables, accessing a variable through its pointer, pointers and arrays, pointer and character strings, pointers and structures, programming examples.

UNIT-V

10 Hours

Defining and opening a file, closing a file, input/output operations on files, error handling during I/O operations, random access files, command line arguments, programming examples, Dynamic memory allocation, allocating a block of memory: malloc, allocating multiple blocks of memory: calloc, releasing the used space: free, altering the size of a block: realloc, programming examples, Preprocessor-Definition, macro substitution, files inclusion, compiler control directives, programming exercises.

Text Books:

1. Programming in ANSI C, Balagurusamy, 6th Edition onwards.
2. The C Programming Language, Brian W Kernighan, Dennis M Ritchie, PHI, 2nd Edition.

Reference Books:

1. Programming with C, Byron Gottfried & Jithendra Kumar Chhabra, Third Edition
2. Behrouz A. Forouzan and Richard F. Gilberg, Computer Science- A Structured Programming Approach using C.

Course outcomes

On completion of this course, the students should be able to:

CO1: Develop flowchart and algorithms and apply the fundamental concepts and Constructs of C to develop solutions for given programs

CO2: Identify the suitable decision-making statements and different looping statements and implement the problems with appropriate input and output functions and arrays

CO3: Analyze different categories of function and develop programs on strings.

CO4: Create programs on structure and pointers.

CO5: Explain different file management concepts and dynamic memory allocation.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	-	1	1	-	-	1	-
CO2	3	3	3	2	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-	-
CO5	3	3	2	2	-	-	-	-	1	-	-	-

3-Strong; 2-Medium; 1-Low

Course Code : P18MCA12	Semester : I	L - T - P : 4 - 0 - 0
Course Title : Discrete Mathematical Structures		
Credits : 4	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Analyze to solve problems using simple techniques of counting theory,and set theory
- Learn the fundamentals of logic and Identify the Use of quantifiers, the nature of proof like direct or indirect, proof by contradiction, check the validity of a given argument.
- Learn the basic concepts of Recurrence relations, Relations and Identify the different ways of representing relations in matrix and digraph form with properties.
- Apply the concepts of relations and functions to solve given problem.
- Learn the concepts graph theory and applications .

UNIT-I

10 Hours

Principles of Counting: The Rules of Sum and Product, Permutation, Combinations, combinations with repetition. Problems.
Sets and Subsets: Set Operations ,Membership table method and Venn diagram method and the Laws of Set Theory, Addition principle-Counting and Venn Diagrams, A First Word on Probability.

UNIT-II

12 Hours

Fundamentals of Logic: Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic theory, Logical Implication – Rules of Inference. Argument – Definition, validity and invalidity.
The Use of Quantifiers: Quantifiers, Definitions ,Argument representation using quantifiers, validity.
Proofs of Theorems- Direct and Indirect method - contradiction and contrapositive method.

UNIT-III

10 Hours

Relations and Functions: Properties of the Integers: Mathematical Induction, The Well Ordering Principle- Mathematical Induction (Alternative form)(problems)**,**Recursive Definitions
Cartesian Products and Relations, Functions – Plain and One-to-One, Onto Functions – Stirling Numbers of the Second Kind, Special Functions, The Pigeon-hole Principle, Function Composition and Inverse Functions**.**

UNIT-IV

10 Hours

Relations Revisited: Properties of Relations, Computer Recognition – Zero-One Matrices and its properties, Directed Graphs and properties. Composition of two relations.
Partial Orders – Partially ordered relations and Hasse Diagrams, Equivalence Relations and Partitions induced by Equivalence relations, Topological sorting algorithm , Total orders, Extremal elements, Lattices.

UNIT-V

10 Hours

An Introductions to Graph Theory: Definitions and examples Sub graphs, Complements, and Graph Isomorphism, Vertex Degree : Euler Trails and Circuits, Planar Graphs, Hamiltonian Paths and Cycles.

Graph coloring and Chromatic Numbers. Definitions, Properties and examples Rooted trees, Trees and sorting. Weighted Trees and Prefix codes. Spanning trees- minimal spanning tree by Prim's and Krushkal's Algorithm.

Text Book:

1. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education, 2004. Chapter 1.1, 1.2, 1.3, Chapter 3.1 to 3.4, Chapter 2, Chapter 4.1, 4.2, Chapter 5.1 to 5.6, Chapter 7.1 to 7.4,7.6, Chapter 11.1 to 12.4.

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, 7th Edition, McGraw Hill, 2007.
2. JayantGanguly, A Treatise on Discrete Mathematical Structures, Sanguine-Pearson, 2010.
3. Discrete Mathematical Structures –by Dr.D.S.Chandrashekaraih.

Course outcomes

On completion of this course, the students should be able to:

CO1: Explain the principles of counting and set theory.

CO2: Identify the quantifiers and their uses and **Utilize** fundamentals of logic theory.

CO3: Apply the mathematical induction principle and different methods to **solve** the given problem.

CO4: Solve the problems using the concepts of relations and functions and **Identify** the different ways of representing relations.

CO5: Analyze basic concepts of graph theory and solve the given problem.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA13	Semester : I	L - T - P : 4 - 0 - 0
Course Title : Fundamentals of Computer Organization		
Credits : 4	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Illustrate the number system conversion and construct a logic circuit.
- Outline of the basic operational concepts and bus structures.
- Understand the Machine Instructions and Input/Output Organization.
- Classify the different types of memories with their functionalities.
- Explain the different techniques in arithmetic operations.

UNIT I

Number Systems and Logic Gates **12 Hours**

Digital Computers and Digital Systems, Binary Numbers, Number Base Conversion, Octal and Hexadecimal Numbers, subtraction using r's and r-1 complements, Binary Code, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions ,Canonical and Standard Forms,Digital Logic Gates. The K-map Method, Two and Three–Variable Maps, Four – Variables Map, Product of Sums Simplification, Don't Care Conditions.

UNIT II

Combinational logic **10 Hours**

Introduction, Adders, Subtractors, Binary Parallel Adder, Decimal Adder.

Basic Structure of Computers

Computer Types, Functional Units, Basic Operational Concepts, Bus structure, Software, Performance, Multiprocessing and Multicomputers.

UNIT-III

Machine Instruction and Programs **10 Hours**

Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, basics of assembly language.

Input/Output Organization

Accessing I/O Devices, Interrupts, DMA, Buses.

UNIT-IV

The Memory System **10 Hours**

Some Basic Concepts, Semiconductor RAM Memories, Read – Only Memories, Speed, Size and Cost, Cache Memories, Virtual Memories, Memory Management Requirements, Secondary Storage.

UNIT-V

Arithmetic Unit **10 Hours**

Addition & subtraction of Signed Numbers, Design of Fast adders, Multiplication of Positive Numbers, Signed-Operand Multiplication, Fast Multiplication, Integer division Floating-Point Numbers & Operations.

Text Books:

1. M. Morris Mano, “Digital Logic and Computer Design”, Pearson, 2012.
2. Carl Hamacher, Zvonko Vranesic Safwat Zaky, ”Computer Organization”, 5th edition, Tata McGraw-Hill, 2011

Reference Books:

1. John P. Hayes, “Computer Architecture and Organization”, Tata McGraw - Hill, 3rd Edition, 2012.
2. Soumitrs Kumar Mandal, “Digital Electronics – Principles and Applications”, Tata McGraw - Hill, 2010.

Course Outcomes [CO]
On completion of this course, the students should be able to:

CO1: Design Digital logic circuit using Basic gates, universal gates and K-map and conversion of number system.
CO2: Illustrate the basic components of Computer**.**
CO3: Demonstrate the Machine instruction and Input/Output Organization.
CO4: Identify the different memory organization.
CO5: Apply the technique to perform the various arithmetic operations.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA14	Semester : I	L - T - P : 4 - 0 - 0
Course Title : Introduction to UNIX		
Credits : 4	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- State the major components and describe the architecture of UNIX operating system.
- Demonstrate the fundamentals of proper UNIX command syntax and issue in proper way.
- Discuss the UNIX file system concepts, organization and setting permission on files.
- State the responsibilities and duties of the UNIX system administrator.
- Demonstrate user and system process management.
- Use filters and regular expressions to effectively describe desired search pattern.
- Describe the shell script with conditional and looping statements.
- In team implement user interface programs for UNIX operating system

UNIT-I

Introduction of UNIX **10 Hours**

Introduction, UNIX Architecture, Features of UNIX.
General-Purpose Utilities: cal, date, who, printf, tty, stty, uname, passwd, echo, tput, bc, lock, script.
UNIX File System: The file, what's in a filename? The parent-child relationship, pwd, the Home directory, cd, mkdir, rmdir, absolute pathnames, Relative pathnames, The UNIX file system.
Handling Ordinary Files: cat, cp, rm, mv, wc, file.

UNIT-II

File Attributes **10 Hours**

ls, ls – l, the –d option, File ownership, File permissions, chmod, Directory Permissions, umask, File ownership, Changing file ownership, File system and Inodes, hard link, symbolic link, find.
Essential System Administration: root, Administrator's privileges, startup and shutdown, Managing disk space, cpio, tar.

UNIT-III

Shell Programming **12 Hours**

The Shell: Shell's interpretive cycle, Pattern matching, Escaping and Quoting, Redirection, Pipes, tee, Command substitution.
Shell variables Shell Programming: Shell Scripts, read, Using command line arguments, exit, The logical operators && and ||, if, test and [], case, expr, while, until, for, $@, The here document, set, shift, trap, debugging shell scripts with set -X, Sample validation and data entry scripts.
Customizing the Environment: Environment variables, The common environment variables, profile, aliases.

UNIT-IV

Simple Filters **10 Hours**

The sample database, pr, head, tail, cut, paste, sort, uniq, tr commands.
Filters using Regular expression : grep, Regular Expression, egrep, fgrep, sed instruction, Line addressing, Context addressing, Writing selected lines to a file, Text editing, Substitution.

UNIT-V

The Process and Awk-Advanced Filters **10 Hours**

Process basics, internal and external commands, ps, running jobs in background, nice, kill, at and batch, cron, time commands.

Awk-Advanced Filters: awk preliminaries, Splitting a line into fields, printf, Comparison operators, Number processing, Variables, The –f option, BEGIN and END, Positional parameters, getline, Built-in variables, Arrays, Functions, Control flow, Looping

Text Books:

1. UNIX concepts and Applications, Sumitabha Das, 4th Edition, Tata McGraw Hill, 2006. (Chapters: 2.1, 2.2, 3, 4, 5.1-5.4, 5.7, 5.8, 8, 10, 12, 13, 14, 15)
2. Your UNIX-The Ultimate Guide, Sumitabha Das, Tata McGraw Hill. (Chapter: 7, 10, 16)

Reference Books:

1. "Unix Shell Programming", Yashwant Kanetkar.
2. "Beginning Shell Scripting", Eric Foster -Johnson, John C Welch, Micah Anderson, Wrox publication.
3. "Introduction to UNIX" by M.G.Venkatesh Murthy.

Course Outcomes

After completion of this course the student will be able to

CO1: Identify UNIX utilities to create and manage simple file processing operations.

CO2: Organize file structure with appropriate security.

CO3: Develop shell scripts to perform simple and moderate tasks.

CO4: **Apply** filters and regular expressions to increase the information searching efficiency.

CO5: **Create** awk scripts and use simple tools for information processing.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	1	-	1	-	-	-	-	-
CO2	3	2	2	-	1	-	-	-	-	-	-	-
CO3	3	2	2	-	2	-	-	-	-	-	-	-
CO4	3	2	2	-	1	-	-	-	-	-	-	-
CO5	3	2	2	-	2	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA15	Semester : I	L - T - P : 0 - 3 - 3
Course Title : Introduction to Web Technologies		
Credits : 3	Contact Period : 32 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Implement XHTML script using fundamental tags.
- Develop style sheet using CSS for a given problem.
- Extend JavaScript to validate a form with event handler for a given problem.
- Construct own tags using XML and XSLT style sheet for a given problem .
- Demonstrate client/server application for a given problem using PHP and MYSQL.

Concepts to be discussed in Tutorials:
- Web Technology Environment.
- XHTML and CSS.
- Javascript and HTML documents.
- Dynamic documents with javascript and XML
- PHP and SQL-working with forms and database.

Laboratory:
- Programs supplementing the concepts covered in tutorials.
- Students are expected to build mini application using the above concepts.

Topics to be covered for Self Study:
- web foundation fundamentals- Higher Level Protocols, Important Components of the Web,Http, web toolbox.
- XHTML tags- Frames, Css-Box model, span and div tag.
- JavaScript- Pattern matching using regular expressions ,DOM2 event model.
- Dynamic JavaScript- Slow Movement of Elements, Dragging and Dropping Elements.
- PHP and SQL-Basic concepts of PHP, control statements, pattern matching, Architecture for database access.

Reference Books:
1. Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson education, 2012.
2. M. Srinivasan: Web Technology Theory and Practice, Pearson Education, 2012.
3.Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2009.
4.H.M Deitel,P.J Deitel: Internet and World Wide Web , How to program,3rd Edition.
5. Jon Duckett: Beginning web programming with Html, Xhtml ,CSS and Javascript.

Lab programs

1. To create a simple XHTML home page which consist of P.E.S.C.E College history to demonstrate the usage of different tags:
   a. Paragraph
   b. Line break
   c. Heading
   d. Hyperlink to web page which consist of
      I. List of departments in college
      II. List of staff names in M.C.A. dept
      III. List of subjects of all semester of M.C.A using nested list
      IV. Frames of all above webpages.
2. To create a simple XHTML home page which consist of P.E.S.C.E MCA department history that links to different HTML pages to demonstrate the usage of different tags:
   a. Image insertion
   b. Table-1st sem MCA marks card creation
   c. Forms which includes text box, check box, radio buttons…
   d. Audio and Video file insertion.
3. To create an XHTML with CSS script for the creation of 1st sem MCA time table to demonstrate the usage of :
   a. Border properties
   b. Margin and padding which includes all subject code followed by subject name followed by staff name.
4. Write JavaScript code that contains :
   a. To demonstrate different positioning element.
   b. To display the calendar using JavaScript code by inputing the year from the user
5. Write dynamic JavaScript code that contains:
   a. Multi-Validating Registration Form
   b. To create a html page to create online exam paper format with 4 optional answer.
6. Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.

   b) Create an XSLT style sheet for one student element of the above document and use it to create and display that element
7. Write a PHP program to input previous reading and present reading and prepare an electricity bill
8. Using PHP and MySQL, develop a program to accept book information viz. Accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.

NOTE: Students have to Develop a mini application for any real time system which includes above concepts.

Course Outcomes
After completion of this course the student will be able to

CO: Construct and Implement webpage using XHTML, CSS, JavaScript, XML and PHP script for a given problem.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	3	2	2	-	2	1	-	-	-	-	1	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA16	Semester : I	L - T - P : 0 - 0 - 2
Course Title : C Programming Lab		
Credits : 1	Contact Period : 32 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand C programming development environment, compiling, debugging, linking and executing a program
- Apply and practice Mathematical and logical ability to solve the problems.
- Choose appropriate fundamental concepts and looping statements for problem definition
- Understand and apply the in-built functions and customized functions for solving the problems
- Implement the complex programs using arrays and structures
- Use pointers, memory allocation techniques and use of files to solve variety of problems

List of Programs

1. a) Given the 3 digit register number along with marks of 5 subjects for 100 marks of a student, write a program to display the grade of the student according to the following condition.
    - Minimum passing marks is 35 in all subjects
    - Average Score >= 35 and < 50 no grade "Pass"
    - Average Score of 50 to 60 percent is grade 'D'
    - Average Score > 60 and <= 70 percent is grade 'C'
    - Average Score > 70 and <= 80 percent is grade 'B'
    - Average Score > 80 and <= 90 percent is grade 'A'
    - Average Score >90 grade 'S'

   b) Write a C Program to find the roots of quadratic equation $ax^2 + bx + c = 0$
2. a) A class of n students take an annual examination in m subjects. A program to read the marks obtained by each student in various subjects and to compute and print the total marks obtained by each of them. The program should uses two for loops, one for controlling the number of students and the other for controlling the number of subjects. Since both the number of students and the number of subjects are requested by the program, the program may be used for a class of any size and any number of subjects.
   The outer loop includes three parts:
   (1) reading of roll-numbers of students, one after another,
   (2) inner loop, where the marks are read and totaled for each student, and
   (3) printing of total marks and declaration of grades.
   b) The program evaluates the square root for five numbers. The variable count keeps the count of numbers read. When count is less than or equal to 5, goto read; directs the control to the label read; otherwise, the program prints a message and stops.
3. write a c program
   a) An election is contested by 5 candidates. The candidates are numbered from 1 to 5 and the voting is done by marking the candidate number on the ballot paper . Write a c program to read the ballots and count the votes cast for each candidate using an array variable COUNT**.** In case, a number is read outside the range 1 to 5 , the ballot should be considered as a 'Spoilt Ballot' and the program should also count the number of Spoilt

Ballot.

b) To generate N prime numbers using any of the loop construct.

4. write a c program
   a) To convert from decimal number to binary number
   b)To convert from binary number to decimal number
5. a)Write a program to compute and print a multiplication table for numbers 1 to 5 as shown below

	1	**2**	**3**	**4**	**5**
1	**1**	**2**	**3**	**4**	**5**
2	**2**	**4**	**6**	**8**	**10**
3	**3**	**6**	**-**	**-**	**-**
4	**4**	**8**	**-**	**-**	**-**
5	**5**	**10**	**-**	**-**	**25**

   b) Write C Program to find cos(x) upto n terms using following series
   $1- x^2/2! + x^4/4! - x^6/6!+\cdots\cdots$
6. a) Write a program using a two-dimensional array to compute and print the following information from the table of data given below.

	Item-1	**Item-2**	**Item-3**
Salesgirl #1	310	275	365
Salesgirl #2	210	190	325
Salesgirl #3	405	235	240
Salesgirl #4	260	300	380

   a) Total value of sales by each girl.
   b) Total value of each item sold.
   c) Grand total of sales of all item by all girls.

   b) Write a c program to multiply two matrices considering the appropriate size of two matrices.
7. write a c program
   a) To accept square matrix of size n*n and find sum of diagonal elements, sum of all the elements, upper diagonal elements and lower diagonal elements using functions
   b) To find transpose of a matrices using functions, transpose using function and display the matrices using function
8. a) Write a program to store the string "United Kingdom" in the array country and display the string under various format specifications.

   b) The names of employees of an organization are stored in three arrays, namely first_name, second_name, and last_name. Write a program to concatenate the three parts into one string to be called name.
9. Write a c program
   a)To check whether the two strings are equal or not **without** using string functions
   b) To insert a Substring in a given string using string functions
10. write a c program
    a) To extract substring from a given string using string functions
    b) To extract **k** characters from one string from position **i** and store in another string
11. write a c program
    a) To find factorial of a number using recursion
    b) To find the value of x^n using recursion
12. Write a C program using structures to maintain information about N student list, Information consist of student name, register no, marks of 3 subjects and to display information of

Name, marks of 3 subjects and average marks of given register number

13. Write a C program to accept and display structure members such as roll no, name, class and attendance using pointers
14. Write a c program
    a) to illustrate the use of pointers in arithmetic operations.
    b) using pointers to determine the length of a character string.
15. Write a program
    a) To read data from the keyboard, write it to a file called INPUT, again read the same data from the INPUT file, and display it on the screen
    b) Write a program to open a file named INVENTORY and store in it the following data

Item name	Number	Price	Quantity	Value
AAA-1	111	17.50	115	2012.50
BBB-2	125	36.00	75	2700.00
CCC-3	247	31.75	104	3302.00

Extend the program to read this data from the file INVENTORY and display the inventory table with the value of each item in the separate column as shown in the table.

Course outcomes
On completion of this course, the students should be able to:

CO: **Design** and **Compile** C Program using C syntax

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	3	3	-	2	2	3	-	-	-	2	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA17	Semester : I	L - T - P : 0 - 0 - 2
Course Title : UNIX Programming Lab		
Credits : 1	Contact Period : 32 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Familiarize students to work on Linux environment.
- Make students to write structured shell programs and execute them.
- Implement the shell scripts to access user required information from the system.
- Understand how the data files (or directories) are organized and stored in unix
- Make use of I/O redirection, piping, quoting filters, metacharacters, basic regular expression etc. while building shell scripts
- Make use of shell and awk flow control and conditional branching constructs.

List of Programs

1. a). Write a shell script that accepts two integers as its arguments and compute the value of first number raised to the power of second number
   b) Write a shell script that accepts a pathname and creates all the components in that path name as directories .For example, if the script is named mpc, then the command mpc a/b/c/d should create directories a,a/b,a/b/c,a/b/c/d.
2. Write a shell script that accepts two file name as arguments, checks if the permission for these files are identical and if the permissions are identical, output common permissions otherwise output each file name followed by its permissions.
3. Write a shell script to create a menu that displays the today's date, present working directory, the number of current users, attributes of a particular file and process status of the system based on the user choice
4. a) Write a shell script that accepts valid login-in names as arguments and prints there corresponding home directories, if no arguments are specified, print a suitable error message.
   b) Write a shell script that accept one or more file names as arguments and convert all of them to upper case, provided they exist in current directory.
5. Write a shell script to implement terminal locking (similar to the lock command). It should prompt the user for a password. After accepting the password entered by the user, it must prompt again for the matching password as confirmation and if match occurs, it must lock the keyboard until a matching password is entered again by the user, note that the script must be return to disregard BREAK, control –D. no time limit need be implemented for the lock duration.
6. Write a shell script that displays all the links to a file specified as the first argument to the script. The second argument, which is optional, can be used to specify in which the search is to begin, if this second argument is not present, the search is to begin in current working directory. In either case, the starting directory as well as all its subdirectories at all levels must be searched. The script need not include any error checking.
7. a) Write a shell script that accepts as file-name as argument and display its creation time if file exist and if it does not send output error message.
   b) Write a shell script using expr command to read in a string and display a suitable message if it does not have at least 10 characters.
8. Write a shell script that compute gross-salary for an employee, according to the rule given below. If basic salary is < 15000 then HRA=10% of basic and DA=90% of basic.

If basic salary is >=15000 then HRA=5% of basic and DA=98% of basic

9. Write a shell script that delete all lines containing a specific word in one or more file supplied as argument to it.
10. a) Write a shell script that gets executed display the message either "Good Morning" or "Good Afternoon" or "Good Evening" depending upon time at which the user logs-in.
    b) Write a shell script to find a file/s that matches a pattern given as command line argument in the home directory, display the contents of the file and copy the file into the directory ~/mydir
11. Write a shell script that accept a list of file names as its arguments, count and report occurrence of each word that is present in the first argument file on other argument files.
12. Write a shell script that accept the file name, starting and ending line number as arguments and display all the lines start with starting line number to ending line number..
13. Write an awk script to calculate the total and average marks of students and also print the result as PASS if all subjects marks are >=35 else print FAIL. [Input file should contain Reg. No., Name and Marks in 3 subjects]
14. Write an awk script to find out total number of books sold in each discipline as well as total book sold using associate array down table as given below.
    i. Electrical 34
    ii. Mechanical 67
    iii. Electrical 80
    iv. Computer Science 43
    v. Mechanical 65
    vi. Civil 198
    vii. Computer Science 64
15. Write an awk script to delete duplicated line from a text file . The order of the original lines must remain unchanged.

Course outcomes
On completion of this course, the students should be able to:

CO: Identify and use UNIX/Linux utilities to **Create** and manage simple file processing operations, organize directory structures with appropriate security, **Develop** shell scripts to perform repetitive tasks and **Create** awk scripts using arrays, control and looping statements, and functions

Note: In the Examination each student pick one question from a lot of all the 15 question

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	3	2	1	-	1	1	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MHU101	Semester : I	L - T - P : 1 - 0 - 0
Course Title : Effective Communication Development (ECD)*		
Credits : 1	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand the basic rules of sentence structure
- Summarize the usage of preposition and conjunctions
- Outline the importance of vocabulary builder
- Understand the individual writing skills
- Explain SWOT, Goal Setting and Resume Building

UNIT – I

6 Hours

Subject Verb Agreement: Basic rules of sentence structure, Usage of singular and plural, Usage of appropriate verb, Introduction to phrases, Construction of Simple sentences and Compound Sentences, Introduction to parts of speech

UNIT – II

8 Hours

Tenses : Identification of tenses, Past tense, Present tense, Future tense, Indicators of tenses, Introduction to verb tenses, Past perfect, Past progressive, Past perfect progressive, Present perfect progressive, Future perfect, Future progressive

Articles : Introduction to articles, Exploring the usage of 'a', 'an' and 'the', Golden rules of articles, Differentiating between definite and indefinite articles, Understanding the exceptions of definite and indefinite articles

UNIT – III

8 Hours

Vocabulary builder - Getting off a good start: How to test your present vocabulary, how to start building your vocabulary, how to talk about personality types, how to talk about doctors, how to talk about various practitioners, how to talk about science and scientists, how to talk about liars and liars. Each of these sessions includes origin of words and related words, Etymology, tools to assess and follow up the progress

UNIT – IV

4 Hours

Writing Skills 1: Sentence Formation, Punctuation, Avoiding Cliché, Different Types of Writing Formats, Importance of Writing Skills, Formal and Informal Style of Writing

UNIT – V

6 Hours

SWOT: Identifying the individual's Strengths, Weakness, Opportunities and Threats by using SWOT Matrix, Difference between internal and external factors, Aids on utilizing strengths to maximum effect for both personal and professional growth, Aids to identify the origin of the weakness and take corrective measures, Aids to use one's strengths to identify and maximise both personal and professional opportunities, Identifying the external factors/change in the external environment that can pose threats, Tackling threats appropriately.

Goal Setting: Understanding of the meaning of 'Goals', Understanding the importance of goals, Necessity of goals, 5 myths of goals, Long term and Short term goals, SMART goal setting technique.
Resume Building: Meaning of Resume, Difference between Resume, Curriculum Vitae and Bio-data, Difference between creating a resume and building a resume, Importance of resume, Importance of Academic achievements, Importance of extracurricular achievements, Importance of striking a balance between curricular and co-curricular activities, Value of an all-rounder, Structure of a resume, Importance of building resume from 1st Year Engineering
Etiquettes: What are Etiquettes, Importance of Professional Etiquettes, Importance of First Impression, Professional presence, Importance of Formal dressing, Decoding the formal dress code, Professional body language, Importance of Microsoft Powerpoint in professional circuits
Watch the Time: Organizing Yourself, Time Saving Techniques, Understanding Priorities Based Time Roles, Procrastination, Different Methods of Splitting Time, Efficient Time Utilization, Value of Time, Streamlining Daily Routine , Big rock theory, Spent time matrix, Urgency vs Importance, Time bound goal management, 10 time management mistakes, Essential habits for better time management

Reference Books:

1. "Word Power Made Easy New Revised and Expanded Edition", First Edition, Norman Lewis, Goyal Publisher.
2. "Essential English Grammar", Raymond Murphy, Cambridge University Press, new edition
3. "The 7 habits of Highly Effective People" by Stephen R. Covey

Course outcomes
On completion of this course, the students should be able to:

CO1: Rectify Indianism and have better ability to frame grammatically correct sentences and usuage of tenses and article
CO2: Exhibit knowledge of correct pronunciation of words
CO3: Increase the number of words in his/her day-to-day usage of vocabulary
CO4: Confidently attempt writing grammatically correct English paragraphs and express themselve
CO5: Reflect elevated standard of learning through the implementation of creative cognitive technique

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	-	-	3	2	-	3	-	2	-
CO2	2	3	3	-	-	3	2	-	3	-	2	-
CO3	2	3	3	-	-	3	2	-	3	-	2	-
CO4	2	3	3	-	-	3	2	-	3	-	2	-
CO5	2	3	3	-	-	3	2	-	3	-	2	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA21	Semester : II	L - T - P : 4 - 1 - 0
Course Title : Data Structures Using C		
Credits : 4.5	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Explain the concept of data structures, pointers, arrays and structures.
- Compare dynamic and static structure implementation.
- Analyse and develop programs to implement standard data structures such as stacks, queues, lists and trees to achieve efficiency of a solution to a problem.
- Describe the concept of recursion.
- Demonstrate various searching and sorting techniques.

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UNIT-I

Introduction to Data Structures **09 Hours**

Information and meaning: Abstract data types, Sequences as value definitions, ADT for varying length character Strings, Data types in C, Pointers in C, Data structures. Arrays : Array as an ADT, Using one-dimensional arrays, Implementing one-dimensional arrays, Arrays as parameters, Two-dimensional arrays. Structures: Implementing structures, Structure, Unions parameters.

UNIT-II

The Stack **08 Hours**

Definition and examples: Primitive operations, Example, The stack as an ADT, Representing stacks: Implementing the pop operation, Testing for exceptional conditions, Implementing the push operations, Examples for infix, postfix, and prefix expressions, Basic definition and Examples, Program to evaluate a postfix expression, Converting an expression from infix to postfix, Program to convert an expression from infix to postfix, Applications of Stacks: Expression evaluations, Recursion.

Recursion **04 Hours**

Recursive definition and processes: Factorial function, Fibonacci sequence, Binary search, Tower of Hanoi problem.

UNIT-III

Queues and Lists **12 Hours**

The queue and its sequential representation: The queue as ADT, Insert operation, Priority queue, Array implementation of a priority queue. Linked lists: Inserting and removing nodes from a list, Linked implementations of stacks, getnode and freenode operations, Linked implementation of queues, Linked list as a data structure, Example of list operations, Header nodes, Array implementation of lists, Limitations of array implementation, allocating and freeing dynamic variables, Linked lists using dynamic variables, Non integer and non-homogenous lists, Other list structures: Circular lists, Doubly linked lists, Application of Linked Lists: Stacks, Queues, Priority queues.

UNIT-IV

Searching **06 Hours**

Basic Search Techniques: Algorithmic notations, Sequential searching, Searching an ordered table, Indexed sequential search, Binary search, Interpolation search, Tree searching: Inserting into a Binary search tree, Deleting from a binary search tree, Hashing : Resolving hash clashes by open addressing, Choosing a hash function.

Binary Trees **04 Hour**

Binary search tree and Operations, tree traversals, AVL Tree and operations, Threaded binary trees.

UNIT-V

Sorting **09 Hours**

Bubble sort, Quick sort, Selection sort, Tree Sorting: Binary Tree sort, Heap sort, Insertion sorts: Simple insertion, Shell sort, Address calculation sort, Merge and Radix sort.

Text Book:

1. Data Structures Using C and C++ by Yedidyah Langsam and Moshe J. Augenstein and Aaron M Tenanbanum, 2nd Edition,PHI. (chapters: 1, 2, 3, 4, 5, 6, 7).

Reference Books:

1. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2nd Edition, Pearson Education Aisa, 1997.
2. Richard F Giberg and Behrouz A Forouzan: Data Structures – A Pseudo code Approach with C, 2nd Edition, Cengage Learning
3. Robert Kruse, C L Tondo, Bruce Leung and Shashi Mogalla: Data Structures and Program Design in C 2nd Edition, Pearson Education.

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Course outcomes

On completion of this course, the students should be able to:

CO1: Apply advance C programming concepts such as pointers, dynamic memory allocation, structures to develop solutions to solve particular problems

CO2: Choose and **implement** the appropriate data structures and algorithms for a specified application

CO3: Select own ADT according to the application needs and illustrate the recursive function with examples

CO4: Identify and **apply** efficient searching algorithm for a given problem

CO5: Choose and **implement** suitable sorting algorithm for a given problem

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	1	-	1	-	-	-	-	-
CO3	3	1	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	1	-	-	-	-	-	-	-
CO5	3	2	2	-	1	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA22	Semester : II	L - T - P : 3 - 2 - 0
Course Title : Object Oriented Programming With C++		
Credits : 4	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand the fundamentals of object-oriented concept and different parameter passing techniques in functions .
- Explain the concept of class,objects,constructors, destructors and relatioships among them .
- Outline the concept of friend function,operator overloading, and class template .
- Summarize various types of inheritance for a given problem which allows reusability and virtual function concept.
- Demonstarte I/O operations and exception handling mechanism.

UNIT-I

Introduction OOPs Concepts and Modular Programming with Functions **11 Hours**

Object Oriented paradigm, Structured vs Object Oriented Paradigm. Elements of Object oriented Programming: Object, Classes, Encapsulation & data abstraction, Inheritance, Polymorphism etc., C++ Overview, different data types, operators, expressions, const & volatile qualifiers, arrays and strings, reference variables.

Modular programming with functions

Function Components, argument passing, inline functions, default arguments, function overloading, function templates and recursive functions.

UNIT-II

Classes and Objects **10 Hours**

Introduction, Class Specification, Class Objects, access members, defining member functions, data hiding, constructors, static data members, functions, scope resolution operator, passing objects as function arguments, returning objects from functions, const member function , arrays of objects, pointer to objects.

Constructors and destructors

Constructors, parameterized constructors, multiple constructors in a class, constructors with default arguments, dynamic initialization of objects, copy constructor, dynamic constructors, destructors

UNIT-III

Friend functions, Operator overloading and Class templates **10 Hours**

Friend functions and friend classes, Operator overloading concept and rules , Operator overloading using friend functions such as ++, --, [ ] etc. Class templates.

UNIT-IV

Inheritance Virtual functions & Polymorphism **11 Hours**

Base Class, Inheritance & protected members, protected base class inheritance, inheriting multiple base classes, Constructors, Destructors & Inheritance. Passing parameters to base Class Constructors, Granting access, Virtual base classes, Virtual function- Calling a Virtual function through a base class reference, Virtual attribute is inherited, Virtual functions are hierarchical, pure virtual functions, abstract classes using Virtual functions, Early & late binding.

UNIT-V

I/O Streams and Exception Handling, STL **10 Hours**

IO Stream basics, output operator <<, input >>, additional I/O operators, overloading the output operator <<, overloading the input operator >>, file input & output, manipulators.

Exception Handling

Exception handling fundamentals, Exception handling options.

STL: An overview, containers, vectors, lists, maps.

Text Books:

1. Object- oriented programming with C++,E Balguruswamy, Tata McGraw Hill, 2008.
2. Mastering C++ , K R Venugopal, RajkumarBuyya, Tata McGraw Hill, 2nd Edition, Tata McGraw Hill, 2013.

Reference Books:

1. The Complete Reference C++, Herbert Schildt, 4th Edition, Tata McGraw Hill, 2010.
2. C++ Primer, Stanley B.Lippman, JoseeLajoie, 5th Edition, Pearson Education, 2005.

Course outcomes

On completion of this course, the students should be able to:

CO1: Demonstrate object-oriented concept and different parameter passing techniques in functions for the given problem.

CO2: Identify class, objects, constructors, destructors and relationships among them for a given problem.

CO3: Apply friend function, operator overloading, and class template for specific problem statement.

CO4: Identify and **apply** various types of inheritance for a given problem which allows reusability and virtual function concept.

CO5: Design file and develop I/O operations and exception handling mechanism

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	-	2	-	-	-	-	-	-	-
CO2	2	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-
CO4	2	3	3	-	-	-	2	-	-	-	2	-
CO5	2	2	2	-	2	-	2	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA23	Semester : II	L - T - P : 4 - 0 - 0
Course Title : Operating Systems		
Credits : 4	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Define what operating systems are and its concepts.
- Identify the services provided by the operating system and learning different operating structure.
- Understand process management and coordination with classic synchronization problems.
- Evaluate various CPU scheduling algorithm problems and analyze methods for handling deadlocks.
- Discuss different memory management techniques such as contiguous, paging, segmentation and virtual memory.
- Explain file system and its implementation, mass storage and its scheduling

UNIT-I

10 Hours

What operating systems do, Computer System organization, Computer System architecture, Operating System structure, Operating System operations, Process management, Memory management, Storage management, Protection and security, Distributed system, Special-purpose systems, Computing environments, Open source Operating systems-Linux, Operating System Services, User-Operating System interface, System calls, Types of system calls, System programs, Operating System design and implementation, Operating System structure, Virtual machines, Operating system debugging – Failure Analysis, Performance Tuning, Operating System generation, System boot.

UNIT-II

10 Hours

Process concept, Process scheduling, Inter-process communication. Multi-Threaded Programming: Overview, Multithreading models, Thread Libraries, Threading issues. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple-Processor scheduling.

UNIT-III

12 Hours

Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware, Semaphores, Classical problems of synchronization, Deadlocks: System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection and recovery from deadlock.

UNIT-IV

10 Hours

Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Segmentation. Virtual Memory Management: Background; Demand paging; Page replacement; Allocation of frames; Thrashing.

UNIT-V

10 Hours

File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection, File-System Structure, Directory Implementation, Allocation Methods, Free-Space Management, Overview of Mass-Storage Structure, Disk Scheduling, Disk Management.

Text Book:

1.Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts, 8th edition, Wiley India.

Reference Books:

1. D.M.Dhamdhere, Operating systems - A concept based Approach, 2nd Edition, Tata McGraw- Hill, 2002.
2. William Stallings, "Operating Systems-Internals and Design Principles" Pearson, 6th edition.

Course outcomes

On completion of this course, the students should be able to:

CO1: Define operating system goals, utilities, services and structures.
CO2: Explain process concepts, communication and evaluate various CPU scheduling algorithm problems
CO3: Understand process synchronization and Identify methods for handling deadlocks
CO4: Analyze and **Explain** different memory management techniques.
CO5: Explain how files are organized, manipulated and how data on disk is organized and scheduled.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	2	-	-	-	-	-
CO2	2	3	3	1	-	-	1	-	-	-	-	-
CO3	3	2	2	1	-	-	1	1	-	-	-	-
CO4	3	2	2	1	-	-	1	-	-	-	-	-
CO5	3	2	2	-	-	-	1	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA24	Semester : II	L - T - P : 4 - 0 - 0
Course Title : Database Management Systems		
Credits : 4	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Define DBMS terms and illustrate the components of DBMS.
- Design a relational Database schema , ER -Model for real time database applications.
- Illustrate queries using SQL for a DBMS application.
- Apply the Normalization concepts to normalize the database.
- Describe the concepts of DBMS transactions, concurrency control and crash recovery.

UNIT-I

Introduction **08 Hours**

Introduction, An example, Characteristics of Database approach, Actors on the screen, Workers behind the scene, Advantages of using DBMS approach, A brief history of database applications, when not to use a DBMS. Data models, schemas and instances, Three-schema architecture and data independence, Database languages and interfaces, The database system environment; Centralized and client-server architectures; Classification of Database Management systems.

UNIT-II

Entity-Relationship Model **10 Hours**

Using High-Level Conceptual Data Models for Database Design; An Example Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two.

UNIT-III

Relational Model and Relational Algebra **10 Hours**

Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping.

UNIT-IV

SQL **12 Hours**

SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL, Basic queries in SQL, More complex SQL Queries. Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL; Additional features of SQL; Database programming issues and techniques; Embedded SQL, Dynamic SQL; Database stored procedures and SQL / PSM.

UNIT-V

Database Design and Transaction Management **12 Hours**

Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form.
Transaction : The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concurrency Control; Performance of locking; Transaction Support in SQL; Introduction to Crash Recovery.

Text Books:

1. Elmasri and Navathe, Fundamentals of Database Systems, 5th Edition, Pearson Education, 2007. (Chapters 1, 2, 3 except 3.8, 5, 6.1 to 6.5, 7.1, 8, 9.1, 9.2 except SQLJ, 9.4, 10)
2. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw-Hill, 2003.(Chapters 16)

Reference Book:

1. Silberschatz, Korth and Sudharshan, Database System Concepts, 5th Edition, Mc-GrawHill, 2006.

Course Outcomes [CO]
On completion of this course, the students should be able to:

CO1: Demonstrate the basic concepts of DBMS with Data model.
CO2: Design an ER-diagram for a given problem description.
CO3: Apply basic and complex queries using SQL to retrieve the information.
CO4: Design the relation schema with the help of normalization.
CO5: Illustrate transaction processing, concurrency control and crash recovery.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	1	-	-	-	-	-	-	-
CO3	3	2	1	-	1	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-
CO5	3	2	-	1	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA25	Semester : II	L - T - P : 0 - 0 - 3
Course Title : Data Structures Lab		
Credits : 1.5	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Implement and understand the use of homogeneous and heterogeneous data types to solve mathematical problems.
- Implement and manipulate linear and non linear data structures.
- Implementations of data structures and to recognize the advantages and disadvantages of the different implementations.
- To code and Execute recursive functions.
- Demonstrate various sorting and searching algorithms

List of Programs

1. Write a C program to add, multiply and check the equality of two rational numbers using structure.
2. Write a C Program to construct a stack of integers and to perform the following operations on it:
   a. Push
   b. Pop
   c. Display
   The program should print appropriate messages for stack overflow, stack underflow, and stack empty.
3. Write a C Program to convert and print a given valid parenthesized infix arithmetic expression to postfix expression. The expression consists of single character operands and the binary operators + (plus), - (minus), * (multiply) and / (divide).
4. Write a C Program to evaluate a valid suffix/postfix expression using stack. Assume that the suffix/postfix expression is read as a single line consisting of non-negative single digit operands and binary arithmetic operators. The arithmetic operators are + (add), - (subtract), * (multiply) and / (divide).
5. Write C program using recursive function
   a. To find the nth factorial
   b. To print the nth fibonacci number
   c. To solve Towers of Hanoi problem.
6. Write C Program to simulate the working of a queue of integers using arrays.
   Provide the following operations:
   a. Insert
   b. Delete
   c. Display
7. Write a C Program to simulate the working of a circular queue of integers using an array. Provide the following operations:
   a. Insert
   b. Delete
   c. Display
8. Implement a menu driven program in c for the following operation on Singly LinkedList(SLL) of student Data with the fields:USN,Name,Branch,Sem
   a. Create a SLL of N students Data.
   b. Display the status of SLL and count the number of nodes
   c. perform insertion at the beginning/end of SLL.

d. perform Deletion at the beginning /end of SLL.
e. Exit

9. Write a C Program to construct a stack of integers using singly linked list and to perform the following operations:
   a. Push
   b. Pop
   c. Display
10. The program should print appropriate messages for stack overflow and stack empty.
    Write a C Program to support the following operations on a doubly linked list where each node consists of integers:
    a. Create a doubly linked list by adding each node at the front.
    b. Delete the node of a given data, if it is found, otherwise display appropriate message.
    c. Display the contents of the list.

11. Write a C program to search a number using
    a. sequential searching technique.
    b. binary searching technique.

12. Write a C Program
    a. To construct a binary search tree of integers.
    b. To traverse the tree using all the methods i.e., inorder, preorder and postorder.
    c. To display the elements in the tree.

13. Implement a c program for both the following methods to sort student information by **student USN**
    a. Bubble sort
    b. Quick sort

14. Implement a c program for both the following methods to sort employee information by **employee salary**
    a. Selection sort
    b. Merge sort

Course outcomes
On completion of this course, the students should be able to:

CO: Develop C programs for solving Data Structure problems using suitable algorithms.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	3	2	1	-	1	1	-	-	1	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA26	Semester : II	L - T - P : 0 - 0 - 3
Course Title : Object Oriented Programming With C++ Lab		
Credits : 1.5	Contact Period : 48 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Classify and implement arrays, class, member functions and function overloading concept to get a clear understanding of object-oriented concepts.
- Outline function template and dynamic constructor.
- Summarize operator overloading and generic programming.
- Extend inheritance and friend function concept.
- Illustrate virtual class and virtual function's in object-oriented programming.

List of Programs

1. a. Write c++ program to find Eldest and Youngest person age using Array's
   b. Write c++ program to find length of a string and copying the strings.
2. Write a program for swapping two integers using i) values parameters ii) Pointer parameters iii) reference parameters
3. Define a **STUDENT** class with USN, Name, and Marks in 3 tests of a subject. Declare an array of 10 STUDENT objects. Using appropriate functions, find the average of the two better marks for each student. Print the USN, Name and the average marks of all the students.
4. Given that an **EMPLOYEE** class contains following members:
   Data member: Eno, Ename, basic, DA, IT, Net_ sal
   Member function: to read the data, to print data members.
   Write a C++ program to read the data of N employees and compute Net_ sal of each employee. Also modify the basic salary of any employee based on the Eno. (DA = 51% of basic, Income tax(IT) = 20% of the gross salary and net salary = basic + DA - IT)
5. Write a C++ program to create a class called **COMPLEX** and implement the following **overloading functions** ADD that return a complex number:
   (i) ADD (a, s2) – where 'a' is an integer (real part) and s2 is a complex number
   (ii) ADD (s1, s2) – where s1 and s2 are complex numbers
6. Write a C++ program to create **function template** for swapping of different data types and demonstrate swapping of characters, integers and double data types.
7. Write a C++ program to concatenate two or more strings into one string by allocating memory to objects at the time of their construction using **dynamic constructor.**
8. Write a C++ program to create a class called MATRIX using a 2-dimensional array of integers. Implement the following operations by **overloading the operator** == which checks the compatibility of two MATRIX to be added and subtracted. Perform the addition and subtraction by **overloading the operators** + and – respectively. Read the MATRIX by overloading >> operator & display the result by **overloading the operator** <<.

```
if(m1 == m2)
{
    m3 = m1 + m2;
    m4 = m1 - m2;
}
else display error.
```

9 Write a **class template** to represent a generic vector. Include member functions to perform the following tasks:
   a. To create the vector.
   b. To modify the value of a given element.
   c. To multiply the vector by a scalar value.
   d. To display the vector in the form (10, 20, 30,…..)

10 Write a C++ program to create a class called **COMPLEX** to overload + operator using **friend functions** and display the sum of 2 complex numbers.

11 Write a C++ program to input 2 numbers and to find their product by using
   a) single inheritance public derivation
   b) **single inheritance private derivation**

12 Write a C++ program to create a class called **STUDENT** with USN, name, sem, Class **INTERNAL** with internal marks of 3 subjects, class **EXTERNAL** with external marks of 3 subjects and class **RESULT** which displays N student details with their total marks in every subject and total marks of all the subjects with **multipath inheritance with virtual class.**

13 Write a C++ program to calculate the area of a triangle and rectangle using derived classes and display the result using **virtual functions**

Note: In the examination each student picks one question from the above questions.

Course outcomes
On completion of this course, the students should be able to:

CO: Develop and implement simple programs using classes and objects in C++ for a given problem.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	3	2	3	-	2	1	-	-	1	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA27	Semester : II	L - T - P : 0 - 0 - 3
Course Title : Database Management Systems Lab		
Credits : 1.5	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Provide a strong formal foundation in database concepts, technology and practice to the students.
- Familiarize the students with the database environments towards an information-oriented, data-processing oriented framework.
- Understand the relational data model and introduction to systematic database design approaches including conceptual design, and logical design
- Present the concepts and techniques relating to query processing by SQL engines.
- Develop a database application using any of the front end commercial application product (Visual Basic, etc.)

List of Programs

1. Construct an ER-model and Database schema for the following database for a Banking Enterprise
   BRANCH(branch-name:string, branch-city:string, assets:real)
   ACCOUNT(accno:int, branch-name:string, balance:real)
   DEPOSITOR(customer-name:string, accno:int)
   CUSTOMER(customer-name:string, customer-street:string, customer-city:string)
   LOAN(loan-number:int, branch-name:string, amount:real)
   BORROWER(customer-name:string, loan-number:int)

   a. Create the above tables by properly specifying the primary keys and the foreign keys
   b. Enter at least five tuples for each relation
   c. Find all the customers who have at least two accounts at the *Main* branch.
   d. Find all the customers who have an account at *all* the branches located in a specific city.
   e. Demonstrate how you delete all account tuples at every branch located in a specific city.

2. Construct an ER-model and Database Schema for a Video Library scenario
   CUSTOMER(cust_no: integer,cust_name: string)
   MEMBERSHIP(Mem_no: integer, cust_no: integer)
   CASSETTE(cass_no:integer, cass_name:string, Language: String)
   ISS_REC(iss_no: integer, iss_date: date, mem_no: integer, cass_no: integer)
   a. Create the above tables by properly specifying the primary keys and the foreign keys.
   b. Enter at least five tuples for each relation.
   c. List all the customer names with their membership numbers.
   d. List all the issues for the current date with the customer names and cassette names.
   e. Create a view which lists outs the iss_no, iss_date, cust_name, cass_name

3. Construct an ER-model and Database Schema for a student-Lab scenario.
   STUDENT(stud_no: integer, stud_name: string, class: string)
   CLASS(class: string, descrip: string)
   LAB(mach_no: integer, Lab_no: integer, description: String)

ALLOTMENT(Stud_no: Integer, mach_no: integer, dayof week: string)

a. Create the above tables by properly specifying the primary keys and the foreign keys.
b. Enter at least five tuples for each relation.
c. List all the machine allotments with the student names, lab and machine numbers
d. How many students class wise have allocated machines in the labs
e. Create a view which lists out the stud_no, stud_name, mach_no, lab_no, dayofweek

4. Construct an ER-model and Relation schema for a airline flight information

Flights (no: integer, from: string, to: string, distance: integer, Departs: time, arrives:time, price:real)

Aircraft (aid: integer, aname: string, cruisingrange: integer)

Certified (eid: integer, aid: integer)

Employees (eid: integer, ename: string, salary: integer)

Note: That the Employees relation describes pilots and other kinds of employees as well, every pilot is certified for some aircraft, and only pilots are certified to fly.

a. Create the above tables by properly specifying the primary keys and the foreign keys.
b. Enter at least five tuples for each relation.
c. Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80, 000.
d. For each pilot who is certified for more than three aircrafts, find the *eid* and the maximum *cruisingrange* of the aircraft for which she or he is certified.
e. Find the names of pilots whose *salary* is less than the price of the cheapest route from Bengaluru to Frankfurt.

5. Construct an ER-model and Database schema for a Album song Information.

MUSICIAN(ssn:integer, name:string, address:string, phone:integer)

PLAYS(id:integer, ssn:integer)

INSTRUMENT(id:integer, iname:string, m_key:integer)

PERFORMS(ssn:integer, title:string)

SONG(title:string, Author,aid:integer)

ALBUM(aid:integer, title:string , c_date:date, format:string, producer_ssn:integer)

a. Create the above tables by properly specifying the primary keys and the foreign keys.
b. Enter at least five tuples for each relation.
c. List musician name,title of the song which he has played the album in which song has occulted.
d. List the details of songs which are performed by more than 3 musicians.
e. List the different instruments played by the musicians and the average number of musicians who play the instrument.

Course Outcomes [CO]
On completion of this course, the students should be able to:

CO: Design Relation schema for the given problem and specify the attributes and key attributes, **Analyze** and **Identify** appropriate Primary key and foreign key in an ER model, specify structural constraints on each relationship, **Implement** data retrieval queries in SQL based on assumption and requirements.

Note: In Examination students has to select one program out of five programs

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	3	3	3	-	2	1	-	-	1	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MHU201	Semester : II	L - T - P : 1 - 0 - 0
Course Title: Professional Communication Development. (PCD)*		
Credits : 1	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Recognize common mistakes done by an individual in the course of his/her communication
- Enable the individual to build his/her creative thinking (thinking in English)
- Understand the correct usage of Preposition and conjunctions
- Effective Email writing skill and Blogs
- Explain the concept of root words and the related words

UNIT–I

6 Hours

Sentences: Introduction to simple and compound sentences, Techniques to build simple and compound sentences, Rules for constructing a complex sentence, Introduction to punctuation, Introduction to active and passive voice

UNIT–II

8 Hours

Preposition: Introduction to prepositions, Importance of usage of prepositions, Rectifying common errors in context to using preposition, Right usage of common prepositions like in, on, under, behind, below etc.
Conjunctions: Introduction to conjunctions, Understanding the importance of usage of conjunctions, Usage of different conjunctions in a compound sentence, Understanding the meaning of conjunction like yet, since, until, however, but etc.

UNIT–III

Vocabulary builder - Gaining increased momentum **6 Hours**

How to talk about actions– Verbs that accurately describe human activities, excursions into expressive terms good and evil, doing saying, wishing and pleasing. how to talk about various speech habits– words that explore in depth all the degrees and kinds of talk and silence, **how to insult your enemies–** terms for describing a disciplinarian, toady, dabbler, provocative woman, flag-waver, possessor of a one track mind, free thinker, sufferer from imaginary ailments, various manias and phobias, **how to flatter your friends**– terms for describing friendliness, energy, honesty, mental keenness, bravery, charm, sophistication ,etc.

UNIT–IV

4 Hours

Writing Skills 2 : Format for e-mail writing. Format for Letter Writing. Some common errors. .Creative Writing. Blog Writing

UNIT–V

8 Hours

Vocabulary builder - Finishing with a feeling of complete success.
How to talk about common phenomena and occurrences– Words for poverty and wealth, direct and indirect emotions, not calling spade a spade, banter and other light talk, animal like contentment, homesickness and different kind of secrecy. Excursions into terms expressive of goodness, of hackneyed

phraseology, of human similarity to various animals, of kinds of sound, etc. How to react to the new words you meet in your reading.

How to talk about what goes on - Verbs that show exhaustion, criticism, self-sacrifice, repetition, mental stagnation, hinting, soothing, sympathizing, indecision, etc. How you can increase your vocabulary by picking your friends brains.

How to talk about a variety of personal characteristics: Adjectives that describe insincere humility, dissatisfaction, snobbery, courtesy to women, financial embarrassment, sadness, etc. How increasing your vocabulary has begun to change the intellectual climate of life.

Reference Books:

1. "Word Power Made Easy New Revised and Expanded Edition", First Edition, Norman Lewis, Goyal Publisher.
2. "Essential English Grammar" by Raymond Murphy, published by Cambridge University Press.

Course outcomes

On completion of this course, the students should be able to

CO1: Amplified level of confidence to express themselves in English.
CO2: Elevated standard of learning through the implementation of creative cognitive techniques.
CO3: Understand the correct usage of Prepositions and Conjunctions.
CO4: Write Emails, Letters and Creative passages.
CO5: Apply the knowledge of vocabulary in his speaking and writing.

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	-	-	3	2	-	3	1	1	-
CO2	2	3	3	-	-	3	2	-	3	1	1	-
CO3	2	3	3	-	-	3	2	-	3	1	1	-
CO4	2	3	3	-	-	3	2	-	3	1	1	-
CO5	2	3	3	-	-	3	2	-	3	1	1	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA31	Semester : III	L - T - P : 2 - 2 - 0
Course Title : Programming with Java		
Credits : 3	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)

The objectives of this course are to:

- Understand Java program syntax construct
- Summarize class, member, method and String class and Array concepts give problem statement
- Outline appropriate fundamental concepts interface, exception handling and overriding
- Understand multithreading programming and generics
- Analyze applet, swing, networking and collection frame work

UNIT-I

Java Programming Fundamentals **10 Hours**

The Java Language, The Key Attributes of Object-Oriented Programming, The Java Development Kit, A First Simple Program, The Java Keywords, Identifies in Java.

Introducing Data Types and Operators

Java's Primitive Types, Literals, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Shorthand Assignments, Type conversion in Assignments, Operator Precedence.

Program Control Statements

Input characters from the Keyword, Use break, Use continue**.**

Introduction to Classes, Objects and Methods

Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Constructors, Parameterized Constructors, The new operator Revisited, Garbage Collection and Finalizers, The this Keyword.

More Data Types and Operators

Arrays, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, the For-Each Style for Loop, Strings

UNIT-II

String Handling **10 Hours**

String Fundamentals, The String Constructors, Three String-Related Language Features, The Length() Method, Obtaining the characters within a string, String comparison, using indexOf() and last IndexOf(), Changing the case of characters within a string, String Buffer and String Builder.

A Closer Look at Methods and Classes

Controlling Access to Class Members, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes, Varargs: Variable-Length Arguments.

UNIT-III

Inheritance **11 Hours**

Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Using super to Call Super class constructors, Using super to Access Super class Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why Overridden Methods, Using Abstract Classes, Using final, The Object Class.

Interfaces

Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces

Packages

Package Fundamentals, Packages and Member Access, Importing Packages, Static Import

UNIT-IV

Exception Handling **10 Hours**

The Exception Hierarchy, Exception Handling Fundamentals, The Consequences of an Uncaught Exception, using multiple catch clauses, Catching subclass Exceptions, try blocks can be nested, throwing an Exception, A Closer look at Throwable, using finally, using throws, Java's Built-in Exceptions.

Multithreaded Programming

Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, Synchronization, using Synchronization Methods, The Synchronized Statement , Thread Communication using notify(), wait() and notifyAll(), suspending, Resuming and stopping Threads.

UNIT-V

Enumerations, Auto boxing **11 Hours**

Enumerations, Java Enumeration are class types, TheValues() and Valueof() Methods, Constructors, methods, instance variables and enumerations, Autoboxing, Annotations(metadata)

Networking with Java.net

Networking fundamentals, The Networking classes and Interfaces, The Inet Address class, The Socket Class, The URL class, The URL Connection Class, The Http URL Connection Class.

Exploring Collection Framework

Collections Overview, The Collection Interfaces, The collection Classes. The Arrays Class

.

Text Books:

1. Java Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGraw Hill Edition 2013. (Chapters:1,2,3,4,5,6,7,8,9,10,11,12,13,15,22,23,24,25,26)

Reference Books:

1. Java Programming by Hari Mohan Pandey, Pearson Education, 2012.
2. Java 6 Programming, Black Book, KoGenT, Dreamtech Press, 2012.
3. Java 2 Essentials, Cay Hortsmann, second edition, Wiley

Course Outcomes [CO]

On completion of this course, the students should be able to:

CO1: Understand the basic programming constructs of Java. Apply suitable OOP concepts to develop Java programs for a given scenario.

CO2: Illustrate the concepts of Generalization and runtime polymorphism applications

CO3: Exemplify the usage of Packages, Interfaces, Exceptions and Multithreading

CO4: Demonstrate Enumerations, Wrappers, Auto boxing, Generics, collection framework and I/O operations

CO5: Implement the concepts of networking using Java network classes

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	-	2	-	2	-	-	-	-	-
CO2	3	2	3	-	2	-	1	-	-	-	-	-
CO3	2	2	3	-	2	-	1	-	-	-	-	-
CO4	3	2	2	-	2	-	1	-	-	-	-	-
CO5	2	2	2	-	2	-	1	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA32	Semester : III	L-T-P : 4 - 0 - 0
Course Title : Software Engineering		
Credits : 3	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand different types of process models used in Software Engineering, the Agile method and Extreme programming of Software Engineering.
- Explain different types of software requirements and dependability issues.
- Apply system models, Architectural Design, ,System organization and object oriented design using UML.
- Understand the concept of Component-based , Distributed Software engineering and Risk management, Managing people, Teamwork
- Explain the concept of Project scheduling, Estimation Techniques and Software Testing in Project management.

UNIT-I

Overview, Software Process and Agile Software Development **10 Hours**

Introduction: Professional Software Development Attributes of good software, software engineering diversity, IEEE/ ACM code of software engineering ethics, case studies.
Software Process models: waterfall, incremental development, reuses oriented, Process Activities, The rational Unified process.
Agile Software Development: Agile methods, Plan-driven and agile Development, Extreme Programming, Agile project management, Scaling agile methods.

UNIT-II

Requirement Engineering, Dependability and security **10 Hours**

Requirements Engineering: Functional and non-functional requirements, the software requirements document, Requirements specification, Requirements engineering processes, Requirement elicitation and analysis, Requirements validation, Requirements management.
Dependability and security: Dependability properties, availability and reliability, safety and security.

UNIT-III

System Modeling, Architectural Design, Design and implementation **10 Hours**

System Modeling: Context models, Interaction models, Structural models, Behavioral models, Model-driven Engineering.
Architectural Design: Architectural Design decision, architectural patterns, architectural views.
Design and implementation: object oriented design using UML, design patterns, implementation issues.

UNIT-IV

Component-based, Distributed software engineering and project management **12 Hours**

Component-based software engineering: Components and component model, CBSE process, Component composition.
Distributed Software engineering: Distributed system issues, Client-server computing, Architectural patterns for distributed systems.
Project Management: Risk Management, managing people, Team work.

UNIT-V

Project planning and software testing **10 Hours**

Project Planning: software pricing, plan driven development, Project scheduling, Estimation Techniques, project duration and staffing.

Software Testing: Unit testing, component testing, system testing, user testing.

Text Book:

1. Ian Sommerville: Software Engineering, 9th edition, Person Education Ltd, 2011. (Chapters-: 1, 2, 3, 4, 5, 6,7,8,11,17, 18, 22, 23)

Reference Books:

1. Pankaj Jalote, Software Engineering Wiley India Pvt. Ltd. (2010)
2. Roger S Pressman: Software Engineering-A Practitioners approach, 6th edition, McGraw-Hill, 2010.
3. Hans Van Vliet: Software Engineering Principles and Practices, 3rd Edition, Wiley-India, 2010

Course outcomes (CO's):
On completion of this course, the students should be able to

CO1: Identify various types of software process and significance of software process activities.
CO2: Able to **Distinguish** between different types of software requirements.
CO3: Analyze different system models and architectural models**.**
CO4: Describe concept of Component-based, Distributed Software engineering and team work
CO5: Analyze and **Design** software engineering concepts to solve the problems.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	1	-	-	-	-	-	-
CO2	2	3	-	1	-	-	1	-	-	-	-	-
CO3	3	2	2	1	2	-	1	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-
CO5	2	2	2	2	2	1	1	1	2	3	2	1
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA33	Semester : III	L-T-P : 2 - 2 - 0
Course Title : Python Programming		
Credits : 3	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)

The objectives of this course are to:

- Understand the basic building blocks in python.
- Implement the concepts of Object Oriented Skills in Python
- Apply the necessary data structures includes list, tuple and dictionary in the required fields.
- Understands about files and its applications.
- Develop the ability to write database applications in Python

UNIT-I

10 Hours

Introduction to Python: Installing Python, Simple program using Python, Expressions and Values, Variables and Computer Memory, Describing code, multiple line statements.

Designing and using functions: Functions provided by Python, Tracing function calls in memory model, omitting return statement.

Working with Text: Creating Strings of Characters, Using Special Characters in Strings, Creating a Multiline String, Printing Information, Getting Information from the Keyboard.

UNIT-II

10 Hours

Control Structures Choices: A Boolean Type, Choosing Statements to Execute, Nested If Statements, Remembering the Results of a Boolean Expression Evaluation

A Modular Approach to Program Organization: Importing Modules, Defining Your Own Modules, Testing Code Semi automatically grouping Functions.

Using Methods: Modules, Classes, and Methods, Calling Methods the Object-Oriented Way, Exploring String Methods, Underscores.

UNIT-III

10 Hours

Storing Collections of Data Using Lists: Storing and Accessing Data in Lists, modifying Lists, Operations on Lists, Slicing Lists, Aliasing, List Methods, Working with a List of Lists.

Repeating Code Using Loops: Processing Items in a List, Processing Characters in Strings, Looping Over a Range of Numbers, Processing Lists Using Indices, Nesting Loops in Loops, Looping Until a Condition Is Reached, Repetition Based on User Input, Controlling Loops Using Break and Continue .

UNIT-IV

10 Hours

Reading and Writing Files : Kinds of files, Opening a File, Techniques for Reading Files, Files over the Internet, Writing Files, and Writing Algorithms That Use the File-Reading Techniques, Multiline Records.

Storing Data Using Other Collection Types: Storing Data Using Sets, Storing Data Using Tuples,Storing Data Using Dictionaries, Inverting a Dictionary, Using the In Operator on Tuples , Sets, and Dictionaries, Comparing Collections.

UNIT-V

12 Hours

Pyhton for Django: Rendering Templates into HTML and Other Formats, Understanding Models, Views, and Templates, Separating the Layers (MVC) - Models, Views, Templates, Overall Django Architecture, Defining and Using Models, Using Models, Templates and Form Processing, Setting up the Database, Using a Database Server, Using SQLite, Creating the Tables.

Text books:

1. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf, 2013.
2. Jeff Forcier, Paul Bissex, Wesley Chun: Python Web Development with Django, Addison-Wesley, 2008.

Reference books:

1. Ascher, Lutz: Learning Python, 4th Edition, O'Reilly, 2009.
2. Exploring Python, Timothy A. Budd, Mc Graw Hill Education, 2009.
3. Learning with Python: How to Think Like a Computer Scientist Paperback – Allen Downey , Jeffrey Elkner, 2015

Course outcomes

On completion of this course, the students should be able to:

CO1: Explain basic principles of Python programming language
CO2: Implement the problems in terms of real world objects using OOPs technology.
CO3: Implement the concepts List, Dictionaries, Sets and Tuples for optimized data storage.
CO4: Identify the commonly used operations involving file systems.
CO5: Demonstrate MVC architecture with respect to Django framework

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	1	-	-	-	-	-	-	-
CO3	3	3	3	-	1	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA34	Semester : III	L-T-P : 4 - 0 - 0
Course Title : Object-Oriented Modelling and Design Patterns		
Credits : 3	Contact Period : 52 Hrs, Exam: 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objective (CLO)
The objectives of this course are to:

- Demonstrate the basic of object oriented concepts
- Identify various relationship like association, aggregation, composition and generalization
- Construct various UML models including use case diagrams, sequence diagrams, class diagrams, state diagrams and activity diagrams based on Rumbaugh approach
- Discuss properties and functions of system design and class design for the ATM as a case study
- Illustrate properties, function and standard categories of patterns along with case studies

UNIT-I

Introduction, Modeling Concepts, Class Modeling and Advanced Class Modeling **10 Hours**

What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history.
Modeling as Design Technique: Modeling; abstraction; the three models.
Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.
Advanced object and class concepts; Association ends; N-array associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips.

UNIT-II

State Modeling and Advanced State Modeling **10 Hours**

State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.
Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips.

UNIT-III

10 Hours

Interaction Modeling, Advanced Interaction Modeling, Process Overview, System Conception and Domain and Application analysis

Interaction Modeling: Use case models; Sequence models; Activity models.
Use case relationships Procedural sequence models; Special constructs for activity models.
Process Overview: Development stages; Development life cycle.
System Conception: Devising a system concept; elaborating a concept; preparing a problem statement.
Overview of analysis; Domain class model; Domain state model; Domain interaction model Iterating the analysis. Application Analysis.
Application interaction model; Application class model; Application state model; adding operations.

UNIT-IV

12 Hours

System Design and Class Design

Overview of system design; Estimating performance; Making a reuse plan; Breaking a system into sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling

global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.
Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.

UNIT-V

Patterns and Design Patterns **10 Hours**

What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description. Introduction, structural decomposition, Organization of work, Model View Controller; Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber; Management Patterns: Command processor; Whole Part, Master Slave, View Handler;

Text Books:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education / PHI, 2005. (Chapters 1 to 15)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2006. (Chapters 1, 3)

Reference Book:

1. Rumbaugh, Blaha, Premerhani, Eddy, Lorensen; Object Oriented Modeling and Design, PHI Latest Edition

Course outcomes

On completion of this course, the students should be able to:

CO1: Understand the fundamentals of object oriented concepts

CO2: Illustrate the importance of object oriented modelling and object oriented system is developed based on unified modelling language(UML)

CO3: Design class diagram, state diagram and interaction diagram for the real time problems

CO4: Apply the properties and functions of system design and class design

CO5: Discuss standard suitable patterns for the particular problems

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	1	1	-	-	-	-	-	-	-
CO4	3	2	2	1	-	-	-	-	-	-	-	-
CO5	3	2	2	1	1	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Elective Group-I

Course Code : P18MCA351	Semester : III	L-T-P : 3 - 2 - 0
Course Title : Computer Networks		
Credits : 4	Contact Period : 52 Hrs, Exam: 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand the fundamental concepts of computer networking.
- Understand data transformation and data transmission.
- Discuss various inter networking devices and transmission of data in inter-networks using routing algorithms
- Apply various error detection and correction techniques in transmission of data.
- Distinguish various LANs

UNIT-I

Computer Networks and the Internet **10 Hours**

What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and THrsoughput in Packet-Switched Networks, Protocol Layers and Their Service Models, Networks Under Attack, History of Computer Networking and the Internet

UNIT-II

Application Layer **10 Hours**

Principles of Network Applications, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications.

UNIT-III

Transport Layer **10 Hours**

Introduction and Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion Control

UNIT-IV

The Network Layer **10 Hours**

Introduction, Virtual Circuit and Datagram Networks, What's Inside a Router? The Internet Protocol (IP): Forwarding and Addressing in the Internet, Routing Algorithms, Broadcast and Multicast Routing

UNIT-V

The Link Layer : Links, Access, Networks and LANs **12 Hours**

Introduction and Services, Error-Detection and -Correction Techniques, Multiple Access Protocols, Link-Layer Addressing, Ethernet, Switched Local Area Networks, Link Virtualization: A Network as a Link Layer

Wireless and Mobile Networks

Introduction, Wireless Links and Network Characteristics, Wi-Fi: 802.11 Wireless LANs.

Text Book:

1. James F. Kurose, Keith W. Ross: Computer Networking: A Top-Down Approach, 5thEdition, Addison-Wesley, 2012. Chapters: 1, 2.1 - 2.6, 3, 4.1- 4.5, 4.7, 5.1-5.5, 6.1-6.3

Reference Books:

1. Behrouz A. Forouzan: Data Communications and Networking, 4thEdition, Tata McGraw-Hill, 2006.
2. William Stallings: Data and Computer Communication, 8thEdition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. David: Computer Networks – A Systems Approach, 4thEdition, Elsevier, 2007.

Course outcomes

On completion of this course, the students should be able to

CO1: Describe basic terminologies used for computer networking and data communication model with its components.
CO2: Classify various categories of networks and types of inter-networking devices with their functions
CO3: Explain the roles and functions of each layer of TCP/IP.
CO4: Analyse the routing table for a given subnet using various routing algorithm.
CO5: Identify how error free transmission held between two end nodes.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	2	1	-	-	-	-	-	-	-
CO2	3	2	-	-	2	-	-	-	-	-	-	-
CO3	3	1	1	2	1	-	-	-	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-	-	-	-
CO5	3	2	-	1	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA352	Semester : III	L-T-P : 3 - 2 - 0
Course Title : Accountancy and Financial Management		
Credits : 4	Contact Period : 52 Hrs, Exam: 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Illustrate the basic accounting concepts and the process of preparation of Trial Balance.
- Apply the knowledge of Ratio Analysis, Liquidity Ratios, Leverage Ratios.
- Explain fundamentals of Funds Flow and Cash Flow Statements and nature of cost accounting.
- Outline the various Classification of Budgets, Fixed and Flexible Budgets.
- Identify and Apply importance of working capital management and make them learn to estimate the working capital needs and capital budgeting process of firms.

Course content

UNIT-I

Financial Accounting and Final Accounts **12 Hours**

Financial Accounting: An Overview - Accounting Concepts. Principles & Standards, Journals, Ledger Posting, Trial Balance
Final Accounts: Trading Account, Profit and Loss Account, Balance sheet(Simple Problems)

UNIT-II

Financial Statement Analysis **10 Hour**

Financial statements - Introduction, Uses of Financial Analysis, Nature of Ratio Analysis, Liquidity Ratios, Leverage Ratios, Activity Ratios, Profitability Ratios, Du Point Analysis

UNIT-III

Funds Flow, Cash Flow statements and Fundamentals of Cost Accounting **10 Hours**

Funds Flow, Cash Flow statements: Meaning, uses, and limitations of Funds Flow and Cash Flow Statements, Preparation of Funds Flow and Cash Flow Statements (Simple problems).
Fundamentals of Cost Accounting: Nature of Cost Accounting, Objectives, Advantages of Cost Accounting, Methods of Costing, Types of costing, Elements of Cost, Fixed, Variable and Mixed cost, Cost Sheet or Cost Statement**.**

UNIT-IV

Variable (Marginal)Costing and Profit Planning, Budgetary Control **10 Hours**

Costing, Marginal Costing, Differences between Absorption Costing and Marginal Costing, CVP Analysis, Break-even analysis, Break-even Chart, Utility of CVP Analysis, Budgetary control - Meaning, Budgetary control as a management tool, Limitations, Classification of Budgets, Fixed and Flexible Budgets.

UNIT-V

Working Capital Management and Capital Budgeting **10 Hours**

Concept of Working Capital, Determinants of Working Capital, Estimating Working Capital Needs, Financing Current Assets.
Capital Budgeting: Nature of Investment Decisions, Investment Evaluation Criteria *Ca*pital Budgeting Process, PBP, ARR, NPV, PI, IPR, NPV VS. IRR.

Text Books:

1. Accounting for Management, Jawahar Lal, 4th Edition, Himalaya Publishing, 2006. Chapters: 1,2,3,4,5,6,7,10,11,12,13,24,25,27
2. Financial Management, I M Pandey, 9th Edition, Vikas Publishing, 2005, Chapters: 8, 25, 27

Reference Books:

1. Financial and Management Accounting, S N Maheshwari, SultaChand & Sons, 2005.
2. Accounting for Management, Richard M Lynch, and Robert' W Williamson, 3rd Edition, Tata McGraw Hill, 2006.
3. Accountancy, Sukhla Grewal, 1st Edition, Sultan Chand & Sons, 2007.
4. Advanced Accounting, R Gupta and Radha Swamy, 10th Edition, Sultan Chand & Sons, 2001.

Course outcomes

On completion of this course, the students should be able to:

CO1: Extend to Prepare books of accounts for a given set of business transaction and prepare the Financial Statement of sole trading concerns and companies.
CO2: Demonstrate and **analyze** ratio analysis, liquidity ratio.
CO3: Compare Fund Flow Statement, Cash Flow Statement and calculate various ratios for analysis of financial statements and interpret the financial reports of sole trading concern and companies.
CO4: Demonstrate the understanding of fundamentals of cost and variable costing.
CO5: Explain the working capital requirements.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	3	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	1	-	-	-	-
CO4	3	2	2	-	1	-	-	-	-	-	-	-
CO5	3	2	1	-	1	-	-	-	1	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA353	Semester : III	L-T-P : 3 - 2 - 0
Course Title : Computer Graphics		
Credits : 4	Contact Period : 52 Hrs, Exam: 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand the basic output primitives and its attributes to draw geometric objects using algorithm.
- Describe 2D and 3D geometric transformations of an object.
- Demonstrate the design of 2D and 3D viewing transformation using different algorithms of an object.
- Outline of the basic sequence and technique of computer animation.
- Describe mathematical specification of Bezier Spline curve.

UNIT-I

Graphics Output Primitives and Attributes **10 Hours**

Introduction to open GL, Coordinate reference frames, Specifying two dimensional world coordinate reference frame in Open GL, Open GL point functions, Open GL line functions, Line drawing algorithms, Circle generation algorithms, Ellipse generation algorithms.

UNIT-II

Two – Dimensional Geometric Transformations **10 Hours**

Basic two dimensional geometric transformations, Matrix representations and homogeneous coordinates, Inverse transformations, Two dimensional composite transformations, Other two dimensional transformations.

UNIT-III

Three - Dimensional Geometric Transformations **10 Hours**

Three dimensional Translation, Rotation, Scaling, Other three dimensional transformations, Affine transformations, Open GL geometric transformation functions.

UNIT-IV

Two Dimensional Viewing **10 Hours**

The two dimensional viewing, Clipping window, Normalization and viewport transformations, Clipping algorithms, Two dimensional point clipping, Two dimensional line clipping algorithms, Polygon fill area clipping, Curve clipping, Text clipping.

UNIT-V

Three Dimensional Viewing **12 Hours**

The three dimensional viewing concepts, Three dimensional viewing pipeline, Three dimensional viewing coordinate parameters, Transformation from world to viewing coordinates, Projection transformations. Bezier spline curves, Raster methods for computer animation, Design of animation sequences, Traditional animation techniques.

Text book:

Donald Hearn, M.Pauline Baker, Computer Graphics with Open GL, Pearson (Indian Edition), Fourth Edition.

Reference Books:

1. Edward Angel, 'Interactive Computer Graphics' – A top down approach using Open GL, Pearson, Fifth Edition
2. Peter Shirley, Steve Marschner, 'Computer Graphics, Cengage Learning (Indian edition), 2009.

Course Outcomes [CO]
On completion of this course, the students should be able to:

CO1: Illustrate the basic concepts of computer graphics interfaces in OpenGL to draw simple objects.
CO2: Discuss mathematical transformation and vector technique for 2D, 3D geometric objects.
CO3: Design a scene and generate views of the scene by applying suitable transformation algorithms.
CO4: Identify the rasterization techniques and interaction with input devices.
CO5: Design a curve using Bezier Spline curves specification in mathematically.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	1	-	-	-	-	-	-	-
CO2	2	2	2	-	1	-	-	-	1	-	-	-
CO3	2	2	3	-	1	-	-	-	1	-	-	-
CO4	3	2	2	-	1	-	-	-	1	-	-	-
CO5	2	2	3	-	1	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA354	Semester : III	L-T-P : 3 - 2 - 0
Course Title : Graph Theory and Combinatorics		
Credits : 4	Contact Period : 52 Hrs, Exam: 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Develop the ability to identify different types of graphs, and simple applications of graphs
- Compare planar, dual graphs and their importance with chromatic number and chromatic polynomial of a given graph.
- Classify the different types of trees, Apply Dijkstra's algorithm to find the shortest path from single source to all other vertices. Prim's and the Kruskal's algorithm to construct the minimal spanning trees.
- Apply the principles of inclusion and exclusion theorem, generalization principle for the given problem with generating functions.
- Apply methods to solve simple recurrence relations of second and third order.

UNIT-I

10 Hours

Introduction to Graph Theory : Definitions and examples, finite and infinite graphs ,sub graphs, Operations on graphs, complements, and Graph isomorphism,

Vertex degree, Euler Trails and circuits ,complements, , Hamilton paths and cycles. Application of Graphs-Konigsberg Bridge problem, Travelling salesmen problem ,Utility problem, Seating arrangement problem.

UNIT-II

11 Hours

Planar graphs, Kuratowski's two graphs, different representations of a planar graphs, Eulers formula, Detection of planarity.Geometric dual ,Geometric dual .

Cutsets, some properties of a cut-set Graph colouring, chromatic number, chromatic partitioning and chromatic polynomials.

UNIT-III

11 Hours

Trees: Definitions, properties, and examples, rooted trees, trees and sorting, Weighted trees and prefix codes.

Optimization: Dijkstra's shortest path algorithm, minimal spanning trees - The algorithms of Kruskal and Prim, Transport networks - Maxflow,Min-cut theorem

UNIT-IV

10 Hours

The principle of inclusion and exclusion: The principle of inclusion and exclusion, Generalizations of the principle, derangements, Nothing is in its right place, Rook polynomials.

Generating functions: Introductory examples, Definition and examples– calculational techniques, partitions of integers, the exponential generating function, The summation operator.

UNIT-V

10 Hours

Recurrence relations: First order linear recurrence relation, the second order linear homogeneous recurrence relation with constant coefficients,

Third and higher –order Homogeous Recurennce relations,The non homogeneous recurrence relation, The method of generating functions for second order recurrence relations.

Text Books:

1. Discrete and Combinatorial Mathematics, Ralph P.Grimaldi &B.V.Ramana ,5th Edition, PHI/Pearson education.
2. Graph Theory with Applications to Engineering and Computer Science - Narsing Deo.

Reference Books:

1. Graph Theory and Combinatorics , Dr. D.S. Chandrasekharaiah, Prism, 2005.
2. Introduction to Graph Theory, Chartrand Zhang, TMH, 2006.

Course outcomes

On completion of this course, the students should be able to:

CO1: Identify different parameters of graphs and its applications.
CO2: Demonstrate planar graphs and its properties of a given properties to detect planarity of a given graph.
CO3: Apply optimization techniques to construct a minimal spanning tree of a graph, prefix code for a given message.
CO4: Apply the principle of Inclusion and Exclusion, generating functions to solve the given problem.
CO5: Discuss simple recurrence relation of second and third order.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	-	-	-	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA36	Semester : III	L-T-P : 0 - 0 - 2
Course Title : Java Programming Lab		
Credits : 1	Contact Period : 32 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand Constructor Overloading and Overriding for a given problem statement
- Familiarize Standard String class and Array Class methods
- Outline appropriate fundamental concepts interface, exception handling and overriding for real time application
- Understand multithreading programming for given problem
- Outline the front end GUI tools applet, swing and develop client server programs

List of Programs

1 Write a java program to demonstrate reading data from keyboard and command line arguments

2 Write a java program to demonstrate constructor overloading and method overloading

3 Write a java Program to implement Inner class and demonstrate its Access Protections

4 Write a Java Program to demonstrate the addition of two matrices in Java

5 Write a program in Java for String handling which performs the following:

i) Checks the capacity of StringBuffer objects.
ii) Reverses the contents of a string given on console and converts the resultant string in upper case.

Reads a string from console and appends it to the resultant string of ii

6 Write a java program to implement inheritance (Multilevel Inheritance)

7 Write a java program to create an interface and implement it in class

8 Write a java program to implement Exception Handling (using Nested try catch and finally).

9 Write a java program to create a class (extending thread) and use methods thread class to change name, priority, --- of the current thread and display the same

10 Write a JAVA program using Synchronized Threads, which demonstrates Producer Consumer concept.

11 Complete the following:

1. Create a package named shape.
2. Create some classes in the package representing some common shapes like Square, Triangle, and Circle.
3. Import and compile these classes in other program.

12 Write a JAVA Program

Create an enumeration Day of Week with seven values SUNDAY through SATURDAY.
Add a method is Workday( ) to the DayofWeek class that returns true if the value on which it is called is MONDAY through FRIDAY.
For example, the call DayOfWeek.SUNDAY.isWorkDay ( ) returns false

13 Create an Applet to Scroll a Text Message from right to left across the applet window

14 Write a Java Swing Applet which accepts a text from a JtextField and display the same text with selected font size and font colour using JLabel

15 Write a Java Program to implement Client Server(Client requests a file, Server responds to client with contents of that file which is then display on the screen by Client – Socket Programming).

Course outcomes
On completion of this course, the students should be able to:

CO: **Design** and **Build** Program using java concept constructor, Inheritance, Multithreading, Enumerations, Collection and networking given real time problem

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	-	3	-	2	2	3	-	-	-	2	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA37	Semester : III	L-T-P : 0 - 0 - 2
Course Title : Python Programming Lab		
Credits : 1	Contact Period : 32 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- To understand programming skills in core Python.
- To differentiate the syntax of python from other programming languages
- To understand Object Oriented Skills in Python.
- To develop the skill of designing Graphical user Interfaces in Python.
- To develop the ability to write database applications in Python.

List of Programs

1. Write a program to sum all the elements from n1 to n2 where n1 and n2 are positive integers
2. Input an array of n numbers and find separately the sum of positive numbers and negative numbers.
3. Write a program to search an element using linear search
4. Write a program to search an element using binary search.
5. Write a program to simulate stack.
6. Using a stack evaluate an arithmetic expression.
7. Write a program to multiply two matrices.
8. Write a program to find the roots of a quadratic equation
9. Write a program to Insert a number in a sorted array.
10. Write a Python Program to check whether the given string is palindrome or not using built in string manipulation methods.
11. Write a Python Program to read a word and prints the number of letters, vowels and percentage of vowels in the word using dictionary
12. Write a Python Program to check a given sentence is a pangram or not using function/Module.
13. Write a Python Event driven Program for file operations Press
    1: to open file in read mode
    2: open the file in write mode
    3: current position of the file pointer
    4: Reposition the pointer at the beginning
    5: exit.
14. Write an Object oriented Python program to create two Time objects: currentTime, which contains the current time; and breadTime, which contains the amount of time it takes for a bread maker to make bread. Then we'll use addTime to figure out when the bread will be done. Write the printTime function to display the time when the bread will be done by the bread maker.

Course outcomes
On completion of this course, the students should be able to:

CO: Develop basic concepts of python programming with sequences and OOPs concepts

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	1	1	-	-	1	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA38	Semester : III	L-T-P : 0 - 0 - 2
Course Title : Object-Oriented Modelling and Design Patterns Lab		
Credits : 1	Contact Period : 32 Hrs, Exam: 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Explain the usecase diagram and activity diagram
- Explain the class diagram and state diagram
- Illustrate pattern and different types of patterns
- Apply rules related to design pattern
- Select various design pattern for different problem statement

List of Programs
Part - A

1. Use rational rose software to design UML diagrams and demonstrate the **Polymorphism** design patterns and implement using java programs
2. Use rational rose software to design UML diagrams and demonstrate the **Publisher-subscriber** design patterns and implement using java programs
3. Use rational rose software to design UML diagrams and demonstrate the **Client-Dispatcher** design patterns and implement using java programs
4. Use rational rose software to design UML diagrams and demonstrate the **Façade** design patterns and implement using java programs
5. Use rational rose software to design UML diagrams and demonstrate the **Model View Controller** design patterns and implement using java programs

Part – B

Students in a team, have to develop a mini application in Java which includes the following concepts

1. Software development life cycle (SDLC)
2. Using any of the following patterns **Controller, Publisher-subscriber, Client-Dispatcher, Façade, Model View Controller.**

Mini application is evaluated along with the report, carries a Weightage of 50% of CIE

Course outcomes
On completion of this course, the students should be able to:

CO: Develop a mini application using design patterns.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	3	2	2	1	2	-	1	-	1	-	2	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MHU301	Semester : III	L-T-P : 1 - 0 - 0
Course Title : Aptitude and Reasoning Development-BEGINNER (ARDB)*		
Credits : 1	Contact Period : 32 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Solve the mathematical calculations easily and quickly using the methods of Vedic mathematics.
- Compare the different types of series such as A.P., G.P., H.P.
- Explain divisibility rules, properties of different types of numbers.
- Analyze the concept of power cycle, and find last digit and last two digits.
- Explain the concepts behind the logical reasoning modules such as arrangement, ratio, proportion blood relations and Directions.

UNIT-I

Sharpen your axe!! **8 Hours**

Vedic mathematics:

Viniculum and de- viniculum, subtractions using viniculum . Nikhilum multiplication: For numbers close to base values, multiplication of any two digit numbers or three digits number using criss cross method. Finding the square, square root, cubes, cube root of two digit and three digit numbers quickly. Approximation in multiplication and division. Checking the answer using digital sum method

Percentage calculations and ratio comparison

Percentage calculations : Percentage rule for calculating , percentage values through additions, percentage– fraction table, approximation in calculating percentages. Application based problems

Ratio comparison: calculations method for ratio compressions: 1. the cross multiplication method, 2. percentage value compression method 3. numerator and denominator percentage change method. Method for calculating the value of percentage change in the ratio. Application based problems.

UNIT-II

Analytical Reasoning 1: series **6 Hours**

Number series: Standard patterns of number series, pure series: perfect square, square cube, prime, combination of this series. Difference series, ratio series, mixed series, geometric series, two-tier arithmetic series, three-tier arithmetic series, change in the order for difference series, change in the order for ratio series, sample company questions.

Letter series : Alphabet and Alphanumeric series, finding the missing term based on logic learnt in number series module, continuous pattern series, correspondence series. sample company questions.

Picture series : image analysis, addition deletion rotation or modification of lines or shapes.
Understanding the symmetry of the image. Mirror image analysis. sample company questions.

UNIT-III

Number system: **6 Hours**

Introduction, **Integers:** Remainder zero concept, Odd and Even Integers, Negative and positive integers, power number a^x, properties of a perfect square number. **Prime number:** General method to identify the prime number, properties of prime numbers. Euler's number. **Factorial number:** Wilson's theorem, important results on factorial. **Divisor:** number of divisors, sum of divisors, number expressed as the product of two factors.

Divisibility rules: divisibility of a whole number by a whole number, divisibility of an expression by an expression. **Modulus concept:** divisibility rules in modulus, rules of operations in modulus. **Finding one remainder:** One divisor, remainder of ($a^n – b^n$), remainder for more than one divisor.
Unit digit: Concept of power cycle, finding last two digits**.** Number of trailing zeroes.

UNIT-IV

Simple equations, Ratio Proportions and Variations: 6 Hours

Simple equations: Linear equations-Linear equations in one variable, linear equation in two variables, Different methods of solving linear equations in two variables– Method of elimination, Method of substitution, Method of cross multiplication. Format of equations that can be converted to linear equations, Linear equations of three variables, Inequalities and its properties. Advanced problems on Simple equations. Age problems.

Ratio Proportions and Variations: Understanding the meaning and difference between ratio, proportion and variation. Properties of ratio, Comparison of more than two quantities, Proportion, Properties of proportion - Componendo, Dividendo, Invertendo, Alternendo. Continued proportion, Mean proportion. Variation - Direct variation, Indirect variation, Joint variation, Short cut methods to solve problems on variation.

UNIT-V

Building the fundamentals of logical reasoning: 6 Hours

Arrangement:
Approach to tackle questions, Different types of arrangement– Linear arrangement, Circular arrangement. Selection, Double line map. Possible ways of arrangement– Words or numbers, left side only, right side only, left right alternate, increasing or decreasing order, interchange vs push, Strategy for solutions– some tips for quick answers, general strategy.

Directions:
Basics. Pythagorean theorem, Pythagorean triplets, Solving problems for practice.

Blood relations :
Some typical relations that we come across, family tree, Structuring the given problem step by step. Suggested methods– Backtracking, drawing family tree. Problems on blood relations and professions.

Reference Books:

1. The Trachtenberg speed system of basic mathematics, published by Rupa publications.
2. CAT Mathematics by Abhijith Guha. published by PHI learning private limited.
3. Quantitative aptitude by Dr. R. S Agarwal, published by S.Chand private limited.
4. Verbal reasoning by Dr. R. S Agarwal , published by S. Chand private limited.
5. Quantitative aptitude for CAT by Arun Sharma, published by McGraw Hill publication.
6. Analytical reasoning by M.K Pandey BSC PUBLISHING.CO.PVT.LTD

Course outcomes

On completion of this course, the students should be able to:

CO1: Solve mathematical calculations in less duration compared to the conventional method.
CO2: Give examples for AP, GP and HP and differentiate between them.
CO3: Apply divisibility rules, power cycle method and evaluate the significance of the number system module.
CO4: Point out the errors in the problems concerning inequalities and solve simple equations and problems based on ratio, proportion and variation.
CO5: Solve the problems based on blood relations, directions and arrangement.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	-	-	3	2	-	3	1	1	-
CO2	2	3	3	-	-	3	2	-	3	1	1	-
CO3	2	3	3	-	-	3	2	-	3	1	1	-
CO4	2	3	3	-	2	3	2	-	3	1	1	-
CO5	2	3	3	-	2	3	2	-	3	1	1	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA41	Semester : IV	L - T - P : 2 - 2 - 0
Course Title : Design & Analysis of Algorithms		
Credits : 3	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithm.
- Apply important algorithmic design paradigms and methods of analysis (Brute-Force, Divide-and-conquer, greedy, dynamic etc.)
- Explain the importance of designing efficient algorithms by comparing different complexity classes.
- Synthesize efficient algorithm in fundamental areas in computer science and engineering.

UNIT-I

Introduction and the fundamentals of the Analysis of Algorithm Efficiency **12 Hours**

Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Fundamental data Structures. Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms.

UNIT-II

Brute Force **10 Hours**

Selection Sort and Bubble Sort, Sequential Search and String Matching,

Divide and Conquer

Merge-sort, Quick-sort, Binary Search, Binary tree Traversals and related properties.

UNIT-III

Decrease-and-Conquer **10 Hours**

Insertion Sort, Depth First search and Breadth First Search, Topological sorting, Algorithms for Generating Combinatorial Objects.

Transform-and-Conquer

Presorting, Balanced Search Trees, Heaps and Heap sort.

UNIT-IV

Space and Time Tradeoffs **10 Hours**

Sorting by Counting, Input Enhancement in String Matching,

Dynamic Programming

Computing a binomial coefficient, Warshall's and Floyd's Algorithms, The Knapsack Problem and Memory Functions

UNIT-V

Greedy Technique **10 Hours**

Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees

Limitations of Algorithm Power and coping with the limitations of algorithmic power

Lower Bound Arguments, Decision Trees, **P**, **NP** and **NP**-Complete Problems, Backtracking, Branch-and-Bound.

Text Book:

1. Anany Levitin: Introduction to the Design and Analysis of Algorithms, 2nd edition, Pearson Education, 2003.

Reference Books:

1. Coremen T.H., Leiserson C.E., and Rivest R.L.: Introduction to Algorithms, PHI, 1998
2. Horowitz E., Sahani S., Rajasekharan S.: Computer Algorithms, Galgotia Publications, 2001.

Course outcomes

On completion of this course, the students should be able to:

CO1: Discuss the basic concepts of algorithms.
CO2: Illustrate worst-case, best-case and average-case time complexity of algorithms.
CO3: Analyze and compare complexity for different types of algorithm for given a problems.
CO4: Analyze P and NP classes of problems and understand Back tracking.
CO5: Design efficient algorithm for a given problem.

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Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	1	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	2	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA42	Semester : IV	L-T-P : 4 - 0 - 0
Course Title : Advanced Java Programming		
Credits : 3	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand the concept of Servlet and its services.
- Understand the concept of Servlet and its services
- Familiarize how to create packages and interfaces with build Database connection with any front end
- Outline Enterprise Java Bean components
- Outline to use various beans in different applications

UNIT-I

Servlet **10 Hours**

Servlet Structure, Servlet packaging, HTML building utilities, Lifecycle, SingleThreadModel interface, Handling Client Request: Form Data, Handling Client Request: HTTP Request Headers. Generating server Response: HTTP Status codes, Generating server Response: HTTP Response Headers, Handling Cookies, Session Tracking.

UNIT-II

Introduction to JSP **10 Hours**

Overview of JSP: JSP Technology, Need of JSP, Benefits of JSP, Advantages of JSP, Basic syntax,Invoking java code with JSP scripting elements, creating Template Text, Invoking java code from JSP, Limiting java code in JSP, using jsp expressions, comparing servlets and jsp, writing scriptlets. For example Using Scriptlets to make parts of jsp conditional, using declarations, declaration example.

UNIT-III

Controlling the Structure of generated servletsand Java Beans **12 Hours**

Controlling the Structure of generated servlets: The JSP page directive, import attribute, session attribute, isElignore attribute, buffer and autoflush attributes, info attribute, errorPage and iserrorPage attributes, isThreadSafe Attribute, extends attribute, language attribute, Including files and applets in jsp Pages, using java beans components in JSP documents

JAR files, manifest file, Working with Java Beans. Introspection, Customizers, Bean properties: Simple properties, Design Pattern events, creating bound properties, Bean Methods, Bean info class, Persistence.

UNIT-IV

Annotations and JDBC **10 Hours**

Hours Annotations: Built-in Annotations with examples, Custom Annotation.

Talking to Database, Immediate Solutions, Essential JDBC program, using prepared Statement Object, Interactive SQL tool. JDBC in Action Result sets, Batch updates, Mapping, Basic JDBC data types, Advanced JDBC data types, immediate solutions

UNIT-V

EJB and Server Side Component Models **10 Hours**

Introduction to EJB: The Problem domain, Breakup responsibilities, Code Smart not hard, the Enterprise java bean specification, Components Types.

Server Side Component Types: Session Beans, MessageDriven Beans, Entity Beans, The Java Persistence Model. Container services: Dependency Injection, Concurrency, Instance pooling n caching, Transactions, security, Timers, Naming and object stores, Interoperability, Life Cycle Callbacks, Interceptors, platform integration. Developing your first EJB, Models: The Stateless Session Bean, the Stateful Session Bean, the Singleton Session Bean, Message-Driven Beans. EJB and PERSISTENCE. Persistence Entity manager Mapping Persistence objects, Entity Relationships.

Text Books:

1. Marty Hall, Larry Brown. Core Servlets and Java Server Pages. Volume 1: Core Technologies. 2nd Edition. (Chapter 3,4,5,6,7,8,9,10,11,12,13,14).
2. Java 6 Programming Black Book, Dreamtech Press.2012 (Chapter 17, 18, 19, 20, 21, 22, 27, 28, 29, 30)
3. Andrew LeeRubinger, Bill Burke. Developing Enterprise Java Components. Enterprise JavaBeans 3.1.O'reilly. (Chapter 1,2,3,4,5,6,7,8,9,10,11).

Reference Books:

1. Michael Sikora, EJB 3 Developer Guide, A practical guide for developers and architects to the Enterprise Java Beans Standard, Shroff Publishers & Distributors PVT LTD. July 2008
2. Herbert Schildt, Java The Complete Reference, 8th Edition. Comprehensive coverage of the Java Language. Tata McGraw-Hill Edition – 2011.

Course outcomes
On completion of this course, the students should be able to

CO1: Choose the Servlet technology for server side web application
CO2: Identify the JSP technology for server side web application
CO3: Create Java Bean, JAR file for given problem statement
CO4: Design and develop Annotation and data base connection
CO5: Develop Enterprise Java Bean Applications

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	2	-	2	-	2	-	2	-
CO2	3	3	3	-	2	-	2	-	2	-	2	-
CO3	3	3	3	-	2	-	2	-	2	-	2	-
CO4	3	3	3	-	2	-	2	-	2	-	2	-
CO5	3	3	3	-	2	-	2	-	2	-	2	-
3-Strong; 2-Medium; 1-Low												

ELECTIVE GROUP-II

Course Code : P18MCA431	Semester : IV	L-T-P : 3 - 2 - 0
Course Title : Data Warehousing & Data Mining		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand the concepts of Data warehousing Architecture and Implemenation.
- Describe the Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment
- Understand Data mining principles and techniques and Introduce DM as a cutting edge business intelligence
- Discuss the use association rule mining for handling large data to extract patterns
- Illustrate the concept of classification for the retrieval purposes.
- Describe Clustering algorithms and Outlier Analysis.

UNIT-I

Data Warehousing and OLAP **12 Hours**

Introduction, Operational Data Stores (ODS), Extraction Transformation Loading (ETL), Data Warehouses, Data Warehouse Design, and Guidelines for Data Warehouse Implementation, Data Warehouse Metadata.

OLAP : Introduction, Characteristics of OLAP systems, Multidimensional view and Data Cube, Data Cube Implementations, Data Cube Operations, Guidelines for OLAP Implementation, and Overview on OLAP Software.

UNIT-II

Data Mining **08 Hours**

Introduction, Challenges, Data Mining Tasks, Types of Data, Data Preprocessing, Measures of Similarity and Dissimilarity, Data Mining Applications.

UNIT-III

Association Analysis: Basic Concepts and Algorithms **12 Hours**

Frequent Item set Generation, Rule Generation, Compact Representation of Frequent Item sets, Alternative methods for Generating Frequent Item sets, FP-Growth Algorithm, Evaluation of Association Patterns.

UNIT-IV

Classification **08 Hours**

Basics, General Approach to Solve Classification Problem, Decision Tree Induction, Rule Based Classifier, Nearest-Neighbor Classifiers, and Bayesian Classifiers.

UNIT-V

Clustering Techniques and Outlier Analysis **12 Hours**

Overview, Features of Cluster Analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis Methods.

Outlier Analysis: Outlier Detection Methods, Statistical Approaches, Clustering based Approaches, Classification based Approaches.

Text Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson 2005.
2. G. K. Gupta, Introduction to Data Mining with Case Studies, 2nd Edition, PHI, New Delhi, 2012.

Reference Book:

1. Jiawei Han and Micheline Kamber, Data Mining - Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publisher.
2. Michael, J.Berry, Gordon Linoff: "Data Mining Techniques: Marketing, Sales, Customer support", John wiley & sons, 2012.

Course Outcomes:

On completion of this course, the students should be able to:

CO1: Understand the basic concepts of Data Warehousing and OLAP Implementation.
CO2: Discuss the basic concepts, techniques and applications of data mining.
CO3: Illustrate the association rules to extract appropriate pattern in massive data.
CO4: Describe the different classification techniques
CO5: Illustrate the clustering techniques and outlier analysis for a given problem.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	1	-	-	-	-	-	-	-
CO2	3	2	3	1	1	-	-	-	-	-	-	-
CO3	3	2	3	2	1	-	-	-	-	-	-	-
CO4	3	2	2	2	1	-	-	-	-	-	-	-
CO5	3	2	3	2	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA432	Semester : IV	L-T-P : 3 - 2 - 0
Course Title : Digital Image Processing		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand the block schematic of a digital image processing system
- Outline the areas of applications of image processing.
- Outline the knowledge of image enhancement and basic FFT and their applications for image processing.
- Understand the image segmentation, noise models and image restoration.
- Summarize filters for colour image processing, exposure to image compression concepts and algorithms

UNIT-I

Digital Image Fundamentals **10 Hours**

Digital Image Restoration, fundamental Steps in Image Processing, Image processing Application, Overview of Digital Imaging Processing, Physical Aspects of Image Acquisition, Biological Aspects of Image Acquisition, Sampling and Quantization.

UNIT-II

Image Enhancement **11 Hours**

Image Enhancement in Spatial domain, Histogram-Based Techniques, Image Smoothing Spatial Filter, Image Sharpening Spatial Filters.

Image Enhancement in Frequency Domain: Image smoothing frequency domain filtering, Image sharpening frequency domain filtering.

UNIT-III

Image Restoration **11 Hours**

Image Degradation Model, Noise modeling, Image Restoration in Presence of Noise, Periodic Noise and Band Pass and Band Reject Filtering, Image Restoration Techniques.

UNIT-IV

Image Segmentation **10 Hours**

Detection of discontinuities, Edge Detection, Principle of Region Growing.

Morphological Image Processing: Morphological Operators (Dilation and Erosion), opening and closing, Basic Morphological algorithms.

UNIT-V

Colour Image Processing **10 Hours**

Introduction, colour models, pseudo colour Image processing, Full colour processing, colour transformations.

Image Compression: Image Compression Models, Compression Algorithm and Its Types.

Text Book:

1. “Digital Image Processing” S.Sridhar Oxford University Press, 2016, 2nd edition. ISBN 10: 0199459355 ISBN 13: 9780199459353

Reference Books:

1. “Digital Image Processing”, Rafael C. Gonzalez and Richard E. Woods Pearson Education, 2001, 2nd edition. ISBN: 9788131726952, 8131726959
2. “Fundamentals of Digital Image Processing”, Anil K. Jain, Pearson Edition, 2001. ISBN: 9788120309296, 8120309294
3. “Digital Image Processing” S. Jayaraman and others. ISBN: 9780070144798, 0070144796

Course outcomes

On completion of this course, the students should be able to

CO1: Describe different image processing stages for given problem statement
CO2: Discuss spatial/frequency domain using various methods
CO3: Implement image enhancement & segmentation technique for a given image
CO4: Illustrate image restoration algorithms
CO5: Identify and **apply** Image Compression Models for given application

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	1	-	1	-	-	-
CO2	3	3	3	2	1	-	1	-	1	-	-	-
CO3	3	3	3	2	1	-	1	-	1	-	-	-
CO4	3	3	3	2	1	-	1	-	1	-	-	-
CO5	3	3	3	2	1	-	1	-	1	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA433	Semester : IV	L-T-P : 3 - 2 - 0
Course Title : Principles of User Interface Design		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand the knowledge of theories and guidelines of designing the user interfaces.
- Familiarize the need of interactive design principles and their patterns.
- Explore the various interaction styles of user interfaces
- Analyze the user interfaces from both communication perspective and historical perspective
- Familiarize **with** Multimedia document searches

UNIT-I

Introduction, Guideline, principles, and theories: 10 Hours

Introduction: Usability of Interactive Systems: Introduction, Usability Goals and Measures, Usability Motivation, Universal Usability, Goals for our profession.

Guideline, principles, and theories: Introduction, Guidelines, principles, Theories.

UNIT-II

Development process, evaluating interface: 11 Hours

Managing Design Processes: Introduction, Organizational Design to support Usability, The Four Pillars of Design, Development methodologies: Ethnographic Observation, Participatory Design, Scenario Development, Social Impact statement for Early Design Review, Legal Issues. Introduction, Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance tests, Evaluation during Active Use.

UNIT-III

Interaction styles: 10 Hours

Direct manipulation and virtual Environments: Introduction, 3D Interfaces, Tele-operation, Virtual and Augmented Reality Menu Selection, Form Filling and Dialog Boxes: Introduction, Task-Related Menu Organization, Single Menus, Combination of Multiple Menus, Content Organization, Fast Movement Through Menus, Data Entry With Menus, Form Filling, Dialog Boxes and Alternatives, Audio Menus and Menus for Small Displays.

UNIT-IV

Command and Natural Languages, Design Issues, Quality of Service: 10 Hours

Command and Natural Languages, Design Issues: Introduction, Command-organization functionality strategies and structure, Naming and Abbreviations, Natural Language in computing. Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory interfaces, Displays-Small and Large.

Quality of Service: Introduction, Models of Response-Time Impacts, Expectations and Attitudes, User Productivity, Variability in Response time, Frustrating Experiences.

UNIT-V

User Documentation and Online Help, Information Search: 11 Hours

User Documentation and Online Help: Introduction, Online versus paper documentation, Reading from paper versus Displays, Shaping the content of the Manuals, Accessing the Documentation, Online Tutorials and animated demonstrations, Online Communities for User Assistance, The Development Process.

Information Search and Visualization: Introduction, Search in Textual Documents and Database Querying, Multimedia document searches, advanced filtering and Search Interfaces, Information Visualization: Introduction, Data type by task taxonomy, Challenges for information visualization.

Text Books:

1.Ben Shneiderman, Plaisant, Cohen, Jacobs: Designing the User Interface, 5th Edition, Pearson ,Education, 2010

Reference Books:

1. Alan Dix, Janet Finalay, Gregory D AbiwdmRussel Bealel: Human-Computer interaction,III Edition, Pearson ,Education, 2008.
2. Eberts: User Interface Design, Prentice Hall, 1994
3. Wilber O Galitz: The Essential Guide to User Interface Design- An Introduction to GUI Design, Principles and Techniques, Wiley-Dreamtech India Pvt Ltd, 2011

Course outcomes

On completion of this course, the students should be able to:

CO1: Demonstrate the usability of interactive systems with guidelines, principles and theories.
CO2: Apply the process and evaluate UID
CO3: Understand Direct Manipulation and Virtual Environment
CO4: Discuss the command, natural languages and issues in design for maintaining QoS.
CO5: Choose user documentations and information search

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	-	-	-	-	-	-	-	-	-
CO2	2	3	2	-	-	-	-	-	1	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-
CO4	2	3	3	-	1	-	-	-	-	-	-	-
CO5	3	2	3	-	2	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA434	Semester : IV	L-T-P : 3 - 2 - 0
Course Title : Enterprise Resource Planning (ERP)		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- Understand fundamental concepts of ERP systems
- Familiarize implementation of ERP systems and their architecture
- Understand working of different modules in ERP.
- Outline the ERP Market with case studies
- Outline the ERP present and Future Market

UNIT-I

Introduction to ERP **10 Hours**

Overview, Benefits of ERP, ERP and Related Technologies, Business Process Reengineering, Data Warehousing, Data Mining, On–line Analytical Processing, Supply Chain Management

UNIT-II

ERP Implementation **10 Hours**

Implementation of Life Cycle, Implementation Methodology, Hidden Costs, Organizing Implementation, Vendors, Consultants and Users, Contracts, Project Management and Monitoring

UNIT-III

Business Modules **11Hours**

Business Modules in an ERP Package, Finance, Manufacturing, Human Resource, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution

UNIT-IV

ERP Market **11 Hours**

ERP Market Place, SAP AG, PeopleSoft ,Baan Company , JD Edwards World Solutions Company, Oracle Corporation, QAD , System Software Associates.

UNIT-V

ERP–Present and Future **10 Hours**

Turbo Charge the ERP System, EIA, ERP and E–Commerce, ERP and Internet, Future Directions in ERP.

Text Books:

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, 1999.
2. Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, “Concepts in Enterprise Resource Planning”, Thomson Learning, 2001.

Reference Books:

1. Vinod Kumar Garg and N.K .Venkata Krishnan, "Enterprise Resource Planning concepts and Planning", Prentice Hall, 1998.
2. Jose Antonio Fernandz, "The SAP R /3 Hand book", Tata McGraw Hill

Course outcomes
On completion of this course, the students should be able to:

CO1: Discuss Benefits of ERP, Process Re-engineering Project management and Monitoring
CO2: Illustrate the performance of Project implementations Quality management
CO3: **Discuss** various business modules in ERP
CO4: Describe ERP evolves in market place
CO5: Identify ERP with E-Commerce & Internet

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	2	-	2	-	-	-	-	-
CO2	3	3	2	-	2	-	2	-	-	-	-	-
CO3	3	2	3	-	2	-	2	-	1	-	-	-
CO4	3	2	3	-	2	-	2	-	2	-	1	-
CO5	3	3	3	-	2	-	2	-	-	-	1	-
3-Strong; 2-Medium; 1-Low												

ELECTIVE GROUP-III

Course Code : P18MCA441	Semester : IV	L-T-P : 4 - 0 - 0
Course Title : Cryptography & Network Security		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- Understand various security attacks and security services
- Analyze data encryption standard and its policies
- Identify various authentication functions and its applications
- Determine security architecture and management of Internet Protocol
- Comprehend relevant protocol like SSL, TLS etc.,

UNIT-I

Introduction **10 Hours**

OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, Model for Network Security.

Classical Encryption Technique -

Symmetric Cipher Model, Substitution Techniques, Transposition Techniques.

UNIT-II

Block Ciphers, Data Encryption Standard and Advanced Encryption Standard **12 Hours**

Block Cipher Principles, The Data Encryption Standard, Block Cipher Design Principles and Modes of operation, Evaluation Criteria for AES, AES Cipher-Encryption and Decryption, Data Structure, Encryption Round.

Public Key Cryptography and Key Management

Principles of Public Key Cryptosystem, RSA algorithm, Key management, Diffie Hellman Key exchange

UNIT-III

Message Authentication and Hash Function **10 Hours**

Authentication Requirement, Authentication Functions, Message Authentication Code, Hash Functions, Digital Signatures, Digital Signature Standard

Authentication Applications

Kerberos, X.509 Authentication Service.

UNIT-IV

Electronic Mail Security **10 Hours**

Pretty Good Privacy (PGP), S/MIME.

IP Security

IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

UNIT-V

Web Security **10 Hours**

Web security Considerations; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET).

System Security

Intruders, Intrusion Detection, Firewall Design Principles- Characteristics, Types of Firewall and Firewall Configuration.

Text Book:

1. William Stallings, "Cryptography and Network Security – Principles and Practices", 4th Edition, Pearson Education, 2009.
   (Chapters: 1, 2.1-2.3, 3.1, 3.2, 3.5, 5.1,5.2, 6.2, 9.1,9.2, 10.1,10.2, 11.1- 11.4, 13.1, 13.3, 14.1, 4.2, 15.1, 15.2, 16.1-16.6, 17.1-17.3, 18.1, 18.2, 20.1; Exclude the topic not mentioned in the syllabus)

Reference Books:

1.Behrouz A. Forouzan and Debdeep Mukhopadhyay: "Cryptography and Network Security", 2nd Edition, Tata McGraw-Hill, 2010.

2.Atul Kahate, "Cryptography and Network Security" 2nd Edition TMH.

Course outcomes

On completion of this course, the students should be able to:

CO1: Define security services for a given network model
CO2: Describe various data encryption schemes and apply on a network model
CO3: Discuss various authentication functions and its applications
CO4: Describe a security management of a given IP network model
CO5: Identify characteristics of firewall, and configure a firewall

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	2	1	-	-	-	-	-	-	-	-
CO3	3	2	2	-	1	-	-	-	-	-	-	-
CO4	3	2	2	1	1	-	-	-	-	-	-	-
CO5	3	2	2	1	1	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA442	Semester : IV	L-T-P : 4 - 0 - 0
Course Title : Artificial Intelligence		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- Define Artificial intelligence and identify problems for AI. Characterize the search techniques to solve problems and recognize the scope of classical search techniques
- Define knowledge and its role in AI. Demonstrate the use of Logic in solving AI problems.
- Demonstrate handling of uncertain knowledge and reasoning in probability theory.
- Explain Learning methods in AI
- Explain Knowledge Learning, probabilistic models and reinforcement learning in AI

UNIT-I

Intelligent Agents And Searching Methods **12 Hours**

Artificial Intelligence: Introduction : What is AI; Foundations of Artificial Intelligence; History of Artificial Intelligence; The state of Art;

Intelligent Agents: Agent and Environments; Good Behavior; The Nature of Environments; The Structure of Agents;

Problem-solving: Problem-solving agent; searching for solution; Uniformed search strategies;

Informed Search and Exploration: Informed search strategies; Heuristic functions; Online Search agents and unknown environment;

Constraint Satisfaction problems: Constraint satisfaction problems; Backtracking search for CSPs;

Adversarial search: Games; optimal decisions in Games; Alpha-Beta pruning;

UNIT-II

Logic **10 Hours**

Logical Agents: Knowledge-based agents**;** The wumpus world; Logic; propositional logic;
Reasoning patterns propositional logic; Effective propositional interference; Agent based on propositional logic;

First-Order Logic: Representation revisited; Syntax and semantics of first order logic; Knowledge engineering in first order logic;

Interference in First-Order Logic: Propositional verses first-order interference; Unification and lifting;

UNIT-III

Knowledge Representation And Planning **10 Hours**

Knowledge Representation: Ontological engineering; Categories and object; Action, situations and events; Mental events and mental objects; The internet shopping world; Reasoning system for categories; Reasoning with default information; Truth maintenance system;

Planning: The planning problems; Planning with state-space search; Planning graphs; Planning with propositional logic

UNIT-IV

Uncertainty **10 Hours**

Uncertainty: Acting under uncertainty; Interference using full joint distributions; Independence; Bayes's rile and its use;

Probabilistic Reasoning: Representing knowledge in an uncertain domain; The semantic of Bayesian networks; Efficient representation of conditional distribution; Exact interference in Bayesian network

UNIT-V

LEARNING **10 Hours**

Learning: Forms of learning**;** Inductive learning; Learning decision tree; Ensemble learning; Computational learning theory

Text Book:

1. Elaine Rich,Kevin Knight, Shivashanka B Nair:Artificial Intelligence, Tata CGraw Hill 3rd edition. 2013
2. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, Pearson 3rd edition 2013.

References Books:

1. Elaine Rich, Kevin Knight, Shivashankar.B.Nair, "Artificial Intelligence", Tata Mc Graw Hill Publishing Company Limited. Third Edition, 2009.
2. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.
3. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education / PHI, 2002.

Course Outcome (CO):

At the end of this course, the students will be able to

CO1: Analyze the modern view of AI as the study of agents that receive precepts from the environment and perform actions
CO2: Demonstrate awareness of informed search and exploration methods
CO3: Demonstrate about AI techniques for knowledge representation, planning and uncertainty management
CO4: **Create** knowledgebase for decision making and learning methods
CO5: Illustrate the use of AI to solve English Communication problems

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	-	-	-	-	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	-
CO3	3	1	2	2	-	-	-	-	-	-	-	-
CO4	3	2	2	2	1	-	-	-	-	-	-	-
CO5	3	2	1	1	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA443	Semester : IV	L-T-P : 4 - 0 - 0
Course Title : Distributed Computing		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- Understand the concept of distributed computing its characteristics
- Analyze the processing and distributed objects
- Understand the operating systems Issues-1
- Outline the operating systems Issues-II
- Understand the Distributed Transaction Processing

UNIT-I

Introduction: **10 Hours**

Characterization of Distributed Systems - Examples - Resource Sharing and the Web - Challenges - System Models - Architectural and Fundamental Models - Networking and Internetworking - Types of Networks - Network Principles - Internet Protocols - Case Studies.

UNIT-II

Processing and Distributed Objects **12 Hours**

Interprocess Communication - The API for the Internet Protocols - External Data Representation and Marshalling - Client-Server Communication - Group Communication - Case Study - Distributed Objects and Remote Invocation - Communication Between Distributed Objects - Remote Procedure Call - Events and Notifications - Java RMI - Case Study.

UNIT-III

Operating System Issues-I **10 Hours**

The OS Layer - Protection - Processes and Threads - Communication and Invocation – OS Architecture - Security - Overview - Cryptographic Algorithms - Digital Signatures - Cryptography Pragmatics - Case Studies - Distributed File Systems - File Service Architecture - Sun Network File System - The Andrew File System.

UNIT-IV

Operating System Issues-II **10 Hours**

Name Services -Domain Name System - Directory and Discovery Services - Global Name Service - X.500 Directory Service - Clocks, Events and Process States - Synchronizing Physical Clocks - Logical Time And Logical Clocks - Global States - Distributed Debugging - Distributed Mutual Exclusion – Elections – Multicast Communication Related Problems.

UNIT-V

Distributed Transaction Processing **10 Hours**

Transactions - Nested Transactions - Locks - Optimistic Concurrency Control Timestamp Ordering - Comparison - Flat and Nested Distributed Transactions - Atomic Commit Protocols - Concurrency Control in Distributed Transactions - Distributed Deadlocks - Transaction Recovery - Overview of Replication And Distributed Multimedia Systems

Text Book:

1. George Coulouris, Jean Dollimore and Tim Kindberg,Distributed Systems Concepts and Design, Pearson Education, 3rd Edition, 2002.

Reference Books:

1. M.L.Liu, Distributed Computing Principles and Applications, Pearson Education, 2004.
2. Andrew S Tanenbaum , Maartenvan Steen, Distibuted Systems –Principles and Pardigms,Pearson Education, 2002
3. Mugesh Singhal,Niranjan G Shivaratri, Advanced Concepts in Operating Systems,Tata McGraw Hill Edition, 2001.

Course outcomes
On completion of this course, the students should be able to:

CO1: **Describe** the characteristics and challenges of distributed computing
CO2: Discuss the various ways of procedure call used in distributed computing
CO3: **Identify** the issues-I related to distributed computing problem statement
CO4: **Identify** the issues-II related to distributed computing problem statement
CO5: **Illustrate** the distributed transaction processing functionalities

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	2	1	-	-	-	-	-	-	-
CO2	3	2	-	-	2	-	-	-	-	-	-	-
CO3	3	1	1	2	1	-	-	-	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-	-	-	-
CO5	3	2	-	-	1	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA444	Semester : IV	L-T-P : 4 - 0 - 0
Course Title : Cloud Computing		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- Understand the basic concepts of cloud computing
- Identify the challenges of cloud Computing
- Classify various service models of cloud
- Understand virtualization in various levels of cloud computing
- Identify the resource management policies, its mechanism, various storage systems and security issues

UNIT-I

Introduction **10 Hours**

Network centric computing and network centric content, Peer-to-peer systems, Cloud Computing: an old idea, whose time has come, Cloud Computing delivery models & Services, Ethical issues, Cloud vulnerabilities, Challenges,

Cloud Infrastructure

Amazon, Google, Azure & online services, open source private clouds. Storage diversity and vendor lock-in, intercloud, Energy use & ecological impact of data centers, service level and compliance level agreement, Responsibility sharing, user experience, Software licensing.

UNIT-II

Cloud Computing **10 Hours**

Applications & Paradigms, Challenges, existing and new application opportunities, Architectural styles of cloud applications, Workflows coordination of multiple activities, Coordination based on a state machine model -the Zoo Keeper, The Map Reduce programming model, Apache Hadoop, High performance computing on a cloud.

UNIT-III

Cloud Resource Virtualization **10 Hours**

Virtualization, Layering and virtualization, Virtual machine monitors, Virtual machines Performance and security isolation, Full virtualization and par virtualization, Hardware support for virtualization A performance comparison of virtual machines, Virtual machine security, The darker side of virtualization, Software fault isolation.

UNIT-IV

Cloud Resource Management and Scheduling **10 Hours**

Policies and mechanisms for resource management, Applications of control theory to task scheduling on a cloud, Stability of a two level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based web services, Resource bundling, combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, fair queuing, Start time fair queuing.

UNIT-V

Networking Support **12 Hours**

Storage Area Networks, Content Delivery Networks.

Storage systems

Storage models, file systems, databases, DFS, General parallel File system, GFS, Apache Hadoop, Locks & Chubby, TPS & NOSQL databases, Bigdata, Mega store.

Cloud security

Risks, Security, privacy and privacy impacts assessments, Trust.

Text Book:

1. Cloud Computing: Theory and Practice, Dan Marinescu, 1st edition, MK Publishers, 2013.

Reference Books:

1. Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Kai Hwang, Jack Dongarra, Geoffrey Fox. MK Publishers, 2012.
2. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGrawFill, 2010.
3. Cloud Computing-A Hands-on Approach, ArshdeepBahga, Vijay Madisetti, Universities Press, 2014.

Course outcomes

On completion of this course, the students should be able to:

CO1: Define basic concepts and terminologies of cloud computing
CO2: Identify the appropriate cloud services for a given application.
CO3: Assess the comparative advantages and disadvantages of Virtualization technology.
CO4: Describe resource management policies and its implementation in cloud
CO5: Discuss various storage systems and security issues with case studies

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	1	-	-	-	-	-	-	-
CO2	3	2	-	1	-	-	-	-	-	-	-	-
CO3	3	1	-	1	1	-	-	-	-	-	-	-
CO4	3	2	-	1	1	-	-	-	-	-	-	-
CO5	3	2	-	2	1	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

ELECTIVE GROUP-IV

Course Code : P18MCA451	Semester : IV	L-T-P : 4 - 0 - 0
Course Title : Research Methodology		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand the types of research, selection of problem and different research design.
- Analyze the Selection of Appropriate Method for Data Collection.
- Choose the most appropriate types of sampling for a particular research problem.
- Understand the basic concepts of hypothesis and Testing of hypothesis.
- Write a technical report, proposal to analyze data and suggest possible solutions.

UNIT-I

Introduction, Defining the research problem, Research Design: 11 Hours

Introduction - Meaning of research, Types of research, Research and scientific method

Defining the research problem- Selecting the problem, necessity of defining the problem, techniques involved in defining the problem

Research Design – Meaning of research design, Need and features of a good Design, Different research designs

UNIT-II

Methods of Data Collection: 10 Hours

Experiment and Surveys, Collection of Primary data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection

UNIT-III

Design of Sample Surveys: 10 Hours

Sample Design, Sampling and Non sampling Errors, Sample survey v/s Census Survey, Types of Sampling Designs, non probability sampling, probability sampling, random sampling design, Simple numerical problems

UNIT-IV

Data Preparation, Descriptive Statistics, Hypothesis: 10 Hours

Data Preparation - Data Preparation Process, Problems in Preparation Process, Missing Values and Outliers, Types of Analysis, Statistics in Research,

Descriptive Statistics - Measures of Central Tendency, Measures of Dispersion.

Hypothesis – Basic concepts of hypothesis, Testing of Hypothesis

UNIT-V

Essential Report Writing: 11 Hours

Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions of Writing a Research Report

Course outcomes
On completion of this course, the students should be able to:

CO1: **Discuss** various principles and concepts of research types and design.
CO2: **Identify** appropriate method for data collection and processing for current problem statement.
CO3: choose sampling design for given real world problem.
CO4: **Implement** and test concept of hypothesis.
CO5: **Formulate** different steps in writing technical report.

Text Books

1. Kothari CR, "Research Methodology Methods and Techniques " , New Age International, 2014, 3rd Edition, ISBN : 978-81-224-3623-5
2. Krishnaswami KN , Sivakuma AI and Mathiarajan, " Management Research Methodology" , Pearson Education, 2009, ISBN : 9788177585636

Reference Books

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers
2. Levin RI and Rubin, "Statistics for Management ", 7th Edition, Pearson Education, New Delhi, ISBN : 9788177585841
3. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	-	-	-	-	-	-	-	-
CO2	3	2	2	1	1	-	-	-	-	-	-	-
CO3	3	2	2	1	1	-	-	-	-	-	-	-
CO4	3	2	-	1	1	1	-	-	-	-	-	-
CO5	3	2	-	1	1	2	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA452	Semester : IV	L-T-P : 4 - 0 - 0
Course Title : Business Communication		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objective (CLO)
The objectives of this course are to:

- Identify the need and importance of Communication
- Classify the different types of communication and apply efficiently
- Demonstrate Presentations skills in an effective manner
- Explain personal and Interpersonal skills to improve Group Communication
- Apply concise integration of various aspects of communication

UNIT-I

10 Hours

Basics of Communication, Communication: An Overview – Definitions, Nature and Attributes of Communication, Purpose of Communication, Directions of Communication, Types of Communication, Kinds of Communication Network – Internal & External, Channels of Communication, Methods of Communication – Verbal and Non-Verbal

Process of Communication- Objectives of Communication, Basic elements of Communication process, Process of Communication, Models of Communication Process

Effective Communication-Essentials of Effective Communication, 7Cs of Effective Communication, 4Ss of Effective Communication, IMPRESS Model

Barriers to Communication–What is Miscommunication? Barriers of Communication, Categorization of Barriers to Communication, Methods of Overcoming Communication Barriers

UNIT-II

12 Hours

Oral and Non-Verbal Communication- Oral Presentation Skills – Major Areas of Verbal Communications, Purpose of Oral Presentation, Structuring the Presentation, Preparation before Presentation, Starting a Presentation, Introduction to a Presentation, Patterns of Presentation, Types of delivery in Oral Presentations, Organizing the Presentation, Main body of the Presentation, Concluding a Presentation, Basic guidelines for designing the Presentation, Suggestion for Improving Presentation delivery

Listening Skills – Definitions of Listening, Importance of Listening, Difference between Listening and Hearing, Principles of good Listening, Process of Listening, basic Listening modes, approaches to Listening, Types of Listening, Advantages of Listening, Barriers to effective Listening, Common faults of Listening, Methods & Strategies to improve Listening, Guidelines for effective Listening, Ten Commandments of Listening

Interview – Meaning and Definition, Purpose of Interview, Essential features of Interview, Methods of Interview, Styles of Interviewing, Types of Interview, Possible Job interview questions, Handling Job Interview questions

Non-Verbal Communication – Common Indicators of Non-Verbal Communication, Features of Non-Verbal Communication, Types of Non-Verbal Communication (Proxemics, Kinesics, Paralanguage, Oculesics, Artifactics, Tactilics / Haptics)

UNIT-III

Written Communication – Part I **10 Hours**

Business Letters – Meaning of Business Letter, Essentials of a good Business Letter, Basic Considerations, Styles of a Letter Layout, Parts of a Business Letter,

Types of Business Letters –Types of Business Letters, Differences between a memorandum and a Letter
E-Mail Writing –What makes E-mail different?, Origin, Structure of an E-Mail, Signatures, Types of usage of E-Mail, E-Mail Abbreviations and Acronyms, Organizing E-mail messages, E-mail Etiquette, Tips for E-mail Effectiveness, Advantages and Limitations of E-mail
Paragraph Writing – What is a Paragraph?, Classification of a Paragraph, Building Paragraphs, 5-Step Process to Paragraph Development, Prewriting Paragraphs, Coherence and Unity in Paragraph Writing

UNIT-IV

Written Communication – Part II **10 Hours**

Job Application and Resume Writing – Definition of a Job Application Letter, Features of Job Application Letter, Types of Job Application Letter, Contents of an Application Letter, Tips for Drafting an Application Letter, Checklist: Writing Job Application Letters, Resume, Resume vs. Curriculum Vitae, Types of Resumes, Potential Errors with Resume Writing, Essential Parts of a Resume, Ten Key Points in writing effective resume
Report Writing – Definition of a report, Basic Features of a Report, Purpose of a Report, Requirements of a Report, Characteristics of a good Report, Generally accepted Principles of Effective Report Writing, Types of Reports, Parts of a Report, Style of Reports, Report planning, Stages of Report Preparation, Tips on Report Preparation

UNIT-V

10 Hours

Assertiveness – Positive/Negative Thinking, Assertive Rights, Strategies for Assertive Behavior, Indicators of Assertive Behaviour, Success in Relationships, How to say No?, Mental Locks
Body Sport – Positive Gestures, Handshakes, The Gazes, Smiles, Hand Movements, Different Styles of Walking, Voice Modulations
Group Discussions and Interviews–Group Discussions, Strategies for Group Discussions, Interviews, Facing the Interview Board, Body Sport for Interviews, Negotiations

Text Books

1. Sathya Swaroop, Debasish, and Bhagaban Das, "Business Communication". PHI Learning Pvt. Ltd., New Delhi, 2010. ISBN: 978-81-203-3729-9
2. Asha Kaul, "Business Communication", PHI Learning Pvt. Ltd, New Delhi, 2nd Edition, 2010, ISBN: 978-81-203-3848-7

Reference Books

1. P D Chaturvedi and Mukesh Chaturvedi, "Business Communication: Concepts, Cases and Applications", Pearson Education, 2nd Edition, 2007. ISBN: 978-81-317-0172-7

Course outcomes
On completion of this course, the students should be able to:

CO1: **Demonstrate** the need and significance of Communication
CO2: **Build** the different types of communication in Organizations
CO3: **Design** Presentations effectively with positive group communication exchanges
CO4: **Classify** different types in report writing and resume writing
CO5: **Illustrate** Interpersonal skills proficiently and apply the concepts in Business Environment

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	2	-	-	2	-	1	-
CO2	3	3	2	-	-	2	-	-	2	-	1	-
CO3	3	3	2	-	-	2	-	2	2	-	1	-
CO4	3	3	3	-	-	2	-	2	2	-	1	-
CO5	3	2	2	-	-	2	-	-	2	-	1	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA453	Semester : IV	L-T-P : 4 - 0 - 0
Course Title : Software Testing & Practices		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Demonstrate the basic definitions, test case, defect management, execution history, fault taxonomies and levels of testing.
- Discuss the scenario and select the proper testing technique like Boundary Value Testing, Equivalence Class Testing and Decision Table-Based testing
- Compare Traditional view, Alternative life - cycle models
- Illustrate the approaches for Test Execution: from test case specifications to test cases, Scaffolding, Generic versus specific scaffolding
- Outline the test strategies to test design specifications document.

UNIT-I

Basics of Software Testing **10 Hours**

Humans, Errors and Testing, Software Quality; Requirements, Behavior and Correctness, Correctness Vs Reliability; Testing and Debugging; Test Metrics; Software and Hardware Testing; Testing and verification; Defect Management; Execution History; Test Generation Strategies; Static Testing; Test Generation from Predicates.

UNIT-II

A Perspective on Testing, Examples, Boundary Value, Equivalence Class, Decision Table-Based Testing **11Hours**

Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing.

Examples: Generalized pseudo code, The triangle problem, The Next Date function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter, Saturn windshield wiper.

Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing.

Equivalence classes, Equivalence test cases for the triangle problem, Next Date function, and the commission problem, Guidelines and observations. Decision tables, Test cases for the triangle problem

UNIT-III

Path Testing, Data Flow Testing, Levels of Testing, Integration Testing **10Hours**

DD paths, Test coverage metrics, Basis path testing, guidelines and observations.

Definition-Use testing, Slice-based testing, Guidelines and observations.

Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing.

UNIT-IV

Basic principles, Fault-Based Testing **11 Hours**

Sensitivity, redundancy, restriction, partition, visibility, Feedback.

Assumptions in fault-based testing, Mutation analysis, Fault-based adequacy criteria, Variations on mutation analysis.

From test case specifications to test cases, Scaffolding, Generic versus specific scaffolding, Test oracles, Self-checks as oracles, Capture and replay.

UNIT-V

Test Case Selection and Adequacy, Planning and Monitoring the Process, Documenting Analysis and Test **10 Hours**

Test Specification and cases, Adequacy Criteria, Comparing Criteria.

Quality and process, Test and analysis strategies and plans, Risk planning, Monitoring the process, Improving the process, The quality team.

Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.

Text Books:

1. Aditya P Mathur**,** Foundations of Software Testing, Pearson, 2008
2. Paul C. Jorgensen, Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2008.
3.Mauro Pezze, Michal Young, Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2008.

Reference Book:

1. Srinivasan Desikan, Gopalaswamy Ramesh, Software testing Principles and Practices, 2ndEdition, Pearson, 2007.

Course outcomes

On completion of this course, the students should be able to:

CO1: **Explain** Test cases, Error and fault taxonomies, Levels of testing.
CO2: **Classify** different types of testing.
CO3: **Illustrate** traditional view**,** Alternative life - cycle models
CO4: **Choose** approaches for Test Execution: from test case specifications to test cases, Scaffolding, Generic versus specific scaffolding.
CO5: **Identify** and plan strategies to test design specifications document.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	2	1	1	-	1	-	-	-	-	-
CO3	3	2	2	1	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA454	Semester : IV	L-T-P : 4 - 0 - 0
Course Title : Basics of MIS & E-Commerce		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand the basic concepts of information, systems and system development model
- Discuss the differentiate between data, information and knowledge
- Understand system development life cycle (SDLC)
- Identify and describe internet, intranet and extranet and discuss how organizations are using them
- Understand various information system solutions like ERP, CRM, HRM and the issues for implementation of these technology solutions in any organization
- Understand the fundamentals, scope and trends of E-commerce

UNIT-I

Systems Engineering and Technology of Information System **10 Hours**

System concepts, system control, types of systems, handling system complexity, Classes of systems, General model of MIS, Need for system analysis, System analysis for existing system & new requirement, system development model, MIS & system analysis.

Introduction: Data processing, Transaction processing, Application processing, Information system processing, TQM of information systems, Human factors & user interface, Strategic nature of IT decision, MIS choice of information technology.

UNIT-II

Information, Knowledge and Introduction of MIS **10 Hours**

Information concepts, classification of information, methods of data and information collection, value of information, information: A quality product, General model of a human as information processor, Knowledge**.**

MIS: Concept, Definition, Role of the MIS, Impact of MIS, MIS and the user, Management as a control system, MIS support to the management, Management effectiveness and MIS, Organization as system. MIS: organization effectiveness.

UNIT-III

Developing Business/IT Strategies/IT Solutions, Decision Making and DSS **10 Hours**

Planning fundamentals (real world cases), Organizational planning, planning for competitive advantage (SWOT Analysis), Business models and planning. Business/IT planning, identifying business/IT strategies, Implementation Challenges, Change management.

Developing business systems (real world case), SDLC, prototyping, System development process, implementing business system .

Decision making concepts: decision making process, decision-making by analytical modeling, Behavioral concepts in decision making, organizational decision-making.

DSS: Decision structure, DSS components, Management reporting alternatives.

UNIT-IV

C/S Architecture, E-business Technology and Electronic business system **12 Hours**

Client server architecture, implementation strategies.Introduction to E-business, model of E-business, internet and World Wide Web, Intranet/Extranet, Electronic, Impact of Web on Strategic management, Web enabled business management, MIS in Web environment.

Enterprise business system – Introduction, cross-functional enterprise applications, real world case, Functional business system, - Introduction, marketing systems, sales force automation, CIM, HRM, online accounting system.
Customer relationship management, ERP, Supply chain management (real world cases for the above)

UNIT-V

E-commerce **10 Hours**

E-commerce fundamentals: introduction E-commerce, scope of E-commerce, Essential E-commerce processes, Electronic payment processes.
E-commerce applications and issues: E-commerce applications trends, Business to customer E-commerce, web store requirements, Business to Business E-commerce, E-commerce market places, clicks and bricks in E-commerce.

Text Books:

1. Waman S Jawadekar, Management Information System, 4th Edition, Tata McGraw Hill. (Chapters: 1, 6, 7,8,16,18,20)
2. James A O'Brien and George M Marakas, Management Information System, 7th Edition, Tata McGraw Hill, 2006.(Chapters: 7,8,9,10, 11, 12)

Reference Books:

1. Ralph M Stair and George W Reynolds, Principles of Information Systems, 7th Edition, Cengage Learning, 2010 .
2. Steven Alter, Information Systems - The Foundation of E-Business, 4th Edition, Pearson Education, 2001
3. Mahadeo Jaiswal and Monika Mital, Management Information System, ,Oxford University Press.
4. Effy Oz, Management Information Systems, 5th Edition, Cengage Learning, 2006.

Course outcomes (CO's)
On completion of this course, the students should be able to:

CO1: **Understand** the concepts of systems, information, data and knowledge.
CO2: **Implement** SDLC life cycle for real time problems.
CO3: **Understand** about the internet, intranet and extranet.
CO4: **Analyse** the particular information system solutions like ERP, CRM, HRM.
CO5: **Elaborate** the importance of E-commerce.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	1	-	-	-	-	-	-
CO2	3	2	2	1	-	-	-	-	-	-	-	-
CO3	3	2	2	-	2	1	-	-	-	-	-	-
CO4	3	2	2	2	-	-	-	-	1	-	-	-
CO5	3	2	2	-	2	-	-	-	1	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA46	Semester : IV	L-T-P : 0 - 0 - 2
Course Title : Design & Analysis of Algorithms Lab		
Credits : 1	Contact Period : 32 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)

The objectives of this course are to:

- Demonstrate a familiarity with major algorithms and data structures
- Apply important algorithmic design paradigms and methods of analysis
- Apply efficient algorithms in common engineering design situations
- Understand specific algorithms for a number of important computational problems like sorting, searching, and graphs, …etc,
- Illustrate the concept of NP-complete problems and different techniques to deal with them

List of Programs

Implement the following using C/C++ Language.

1 Implement Recursive Binary search and Linear search and determine the time required to search an element. Repeat the experiment for different values of n, the number of elements in the list to be searched and plot a graph of the time taken versus n.

2 a. Sort a given set of elements using Selection sort method and determine the time required sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.

b. Implement Pattern-Matching using Brute Force technique.

3 Sort a given set of elements using Merge sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.

4 Sort a given set of elements using Quick sort method and determine the time required sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.

5 Obtain the Topological ordering of vertices in a given digraph.

6 a. Print all the nodes reachable from a given starting node in a digraph using BFS method.

b. Check whether a given graph is connected or not using DFS method.

7 Sort a given set of elements using the Heapsort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.

8 a. Implement Horspool algorithm for String Matching.

b. Compute the transitive closure of a given directed graph using Warshall's algorithm.

9 a. Implement Floyd’s algorithm for the All-Pairs- Shortest-Paths Problem.

b. Implement 0/1 Knapsack problem using dynamic programming.

10 Find Minimum Cost Spanning Tree of a given undirected graph using Prim’s algorithm.

11 Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.

12 From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.

13 Implement N Queen's problem using Back Tracking.

Note: In the examination questions must be given based on above lots.

Course outcomes
On completion of this course, the students should be able to:

CO: Develop and Analyse various algorithm techniques for developing algorithms.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	3	2	3	2	-	-	2	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA47	Semester : IV	L-T-P : 0 - 0 - 2
Course Title : Advanced Java Programming Lab		
Credits : 1	Contact Period : 32 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand Basic Client/Server using RMI, Two popular Server side development Technology Servlet and JSP
- Familiarize and practice real time applications using Servlet and JSP Technologies
- Choose different methods and techniques for Web development
- Understand JDBC backend process to retrieve the data from database
- Understand Java Bean and Enterprise Java Bean for developing different types of bean for online applications

List of Programs

1 Write a Java Program to implement the Simple Client / Server Application using RMI
2 Write a java servlet program to implement a dynamic HTML using servlet(Username and Password should be accepted using HTML and displayed using a Servlet).
3 Write a JAVA servlet program to download a field and display a link.(a link has to be provided in html,when the link is clicked corresponding file has to be displayed on screen.)
4 Write a JAVA servlet program to implement and demonstrate get() and post methods.(using http servlet class)
5 Write a JAVA Servlet Program using cookies to remember user preferences.
6 Write a java servlet program to implement sessions(Using http session interface)
7 Write a JAVA JSP program to print 10 even and 10 odd numbers.
8 Write a JAVA JSP program to implement verification of a particular user login and display a welcome page.
9 Write a JSP program to demonstrate the nine implicit objects
10 Write a JAVA JSP Program which uses jsp:include and jsp:forward action to display a Webpage
11 Write a JAVA JSP program to get student information through a html And create a java bean class, populate bean and display a welcome page.
12 Write a JSP program to implement all the attributes of page directive tag.
13 Write a JAVA Program to insert data into Student DATA BASE and retrieve info based on particular queries(For example update, delete, search etc…).
14 An EJB application that demonstrates Session Bean (with appropriate business logic).
15 An EJB application that demonstrates MDB (with appropriate business logic).

Note: Students have to solve the above programs; also they have to develop small application in advanced java in a team and have to submit a report with SDLC concept along with a code. Small application carries a weightage of 50% of CIE

Course outcomes
On completion of this course, the students should be able to:

CO1: **Develop** and Develop Client/Server using RMI, Web application using Server Side Technologies Servlet, JSP and Database Connection

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2	3	3		3		2				2	
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA48	Semester : IV	L-T-P : 0 - 0 - 0
Course Title : Technical Seminar		
Credits : 2	Contact Period : 52 Hrs, Exam: 3Hrs	Weightage : CIE : 50%

Seminar Guideline:

Each student must present a unique topic on Computer(Software) related new Emerging Technologies for a period of 30 minutes with presentation slides not less than 30 with a wide coverage of selected topic.

Course outcomes:
On completion of this course, the students should be able to:

CO1: Analyse relevant topic in computing sciences and make valid conclusions on industry/ society/ environment using fundamental/ research based knowledge.
CO2: Enhance self-learning skills.
CO3: Design & Demonstrate effective presentation & report writing.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	2	-	-
CO2	-	2	-	-	3	-	-	-	2	-	-	-
CO3	-	-	-	-	-	-	3	-	3	-	-	-
3-Strong; 2-Medium; 1-Low												

Scheme of Evaluation:

Course code	Title	Internal (CIE)		Total Marks
		Report	Presentation	
P18MCA48	Technical Seminar	20	30	50

Rubrics for Technical Seminar Presentation Assessment

Particulars	Excellent (6)	Good (5)	Satisfactory (3)	Poor (1)	Final Score
Knowledge of the topic at analyze level	Demonstrates in depth knowledge; answered all questions with elaboration	Adequate knowledge on most of the topics. Answered all questions but failed to elaborate	Superficial knowledge of topic; only able to answer basic questions	Does not have any knowledge; Unable to answer questions	
Organization of the presentation	Presented in logical sequence; introduction and background give proper context key points and conclusions are clear and well presented	Most information presented in logical sequence; clear introduction; adequate background; some irrelevant information	Problems with sequencing, lacks clear transitions; incomplete or overly detailed introduction, emphasis given to less important information	Little or no organization, difficult o follow; missing or ineffective introduction; confusing background; key points unclear	
Level of Understanding	Sufficient for understanding and presented very effectively	Sufficient for understanding and presented well	Sufficient for understanding but not clearly presented	Too brief or insufficient for understanding or too detailed	
Presentation Skills	Clear articulation, steady delivery rate, good posture and eye contact, confident and appropriately Dressed	Clear articulation but not very polished. Able to recover from minor mistakes. Appropriately dressed	Occasional eye contact, incorrect pronunciations, and Voice fluctuation.	Inaudible or too loud, no eye contact, delivery rate is too slow or too fast, not in formal attire	
Visuals	Visually pleasing and easy to read; good use of white space, colour, backgrounds; images and Graphics support.	Adequate layout, but with some fonts, colours, backgrounds difficult to read	Difficult to read, cluttered appearance; images improperly sized; some distracting graphics or animations	Confusing layout, text extremely difficult to read; many graphics, sounds, animations distract from the presentation	
				Total Score	

Rubrics for Seminar Report Assessment

Particulars	Excellent (5)	Good (4)	Satisfactory (3)	Poor(1)	Final Score
Objective, relevance, impact and conclusion	The purpose and objective, relevance and impact of the topic is made clear, and the report addresses them in a focused and logical manner.	The purpose and objective, relevance and impact of the topic is made clear, and the report addresses them.	Purpose and objectives are stated ambiguously	The report does not clearly address any of them.	
Grammar & Spelling	Very few spelling errors, correct punctuation, grammatically correct, complete sentences.	Occasional lapses in spelling, punctuation, grammar, but not enough to seriously distract the reader.	Less technical details, sentences are not framed properly and with a few spelling mistakes	Numerous spelling errors, non-existent or incorrect punctuation, and/or severe errors in grammar that interfere with understanding.	
References	Sources are Acknowledged with full reference details.	Sources are acknowledged with bare reference details.	Sources are acknowledged with partial reference details.	Sources are not acknowledged.	
Report Format	All required elements of the report are present and completed efficiency.	All required elements of the report are present and completed to a satisfactory standard.	All required elements are provided but in a haphazard way	Key elements of the report are not provided. Overall presentation of the document is not to a professional standard.	
				Total Score	

Rubrics for Seminar Presentation Assessment (out of 60 marks) =

Rubrics for Seminar Report Assessment (out of 40 marks) =

Total Marks (Out of 100 marks) =

Signature of the Guide / Coordinator

Name: Signature of HOD

Course Code : P18MHU401	Semester : IV	L-T-P : 2 - 0 - 0
Course Title : Aptitude and Reasoning Development ADVANCED (ARDA)*		
Credits : 1	Contact Period : 32 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- Explain different types of functions, representation of different functions on the graphs.
- Describe the properties of quadratic equations and application of quadratic equations.
- Demonstrates the principle of counting, permutation and combination and solve problems conceptually.
- Predict the probabilities in different scenarios and its application in our day-to-day life.
- Analyze the data in a bar graph , pie chart and tabular column and line graph and the combination of these graphs.

UNIT-I

Functions and Quadratic equations: **6 Hours**

Functions: Basic methods of representing functions– Analytical representation, tabular representation, graphical representation of functions. Even and odd functions, Inverse of a function, Shifting of graph. Representation of standard set of equations. Methodology to tackle inverse functions. Graphical process for solving inequalities, graphical view of logarithmic function.

Quadratic equations: Theory, properties of quadratic equations and their roots, the sign of quadratic equation, Equations in more than one variable. Simultaneous equations, number of solutions of the simultaneous equations.

UNIT-II

8 Hours

Permutation and Combination: Understanding the difference between the permutation and combination, Rules of Counting-rule of addition, rule of multiplication, factorial function, Concept of step arrangement, Permutation of things when some of them are identical, Concept of 2^n, Arrangement in a circle.

Probability: Single event probability, multi event probability, independent events and dependent events, mutually exclusive events, non-mutually exclusive events, combination method for finding the outcomes.

UNIT-III

6 Hours

Analytical reasoning 3: Punchline: Introduction, format of the problem, An analysis, Does a suggested statement qualify as a punchline?. If a given statement fits as a punchline, what is its idea or wavelength?, The complete method of solving a punchline problem, Solved examples, conclusion, Sample company questions.

Strengthening and Weakening arguments: Format of the problem, An analysis, Suggested methods, solved examples, conclusion, sample company questions.

Cause and Effect : Cause and Effect—A theoretical discussion, Immediate cause, Principal cause, A quick check– Cause always antecedent. The strategy for solution.

UNIT-IV

6 Hours

Data Sufficiency: Introduction, answer choices in data sufficiency, tips to solve data sufficiency problems, directions of questions, classification of sections in data sufficiency– Number system, Algebra, series and sequence, logical, geometry and mensuration, arithmetic.

UNIT-V

6 Hours

Data Interpretation: Approach to interpretation - simple arithmetic, rules for comparing fractions, Calculating (approximation) fractions, short cut ways to find the percentages, Classification of data– Tables, Bar graph, line graph, Cumulative bar graph, Pie graph, Combination of graphs. Combination of table and graphs

Reference Books:

1. "The Trachtenberg speed system of basic mathematics, published by Rupa publications.
2. CAT Mathematics by Abhijith Guha. published by PHI learning private limited.
3. Quantitative aptitude by Dr. R. S Agarwal, published by S.Chand private limited.
4. Verbal reasoning by Dr. R. S Agarwal , published by S. Chand private limited.
5. Quantitative aptitude for CAT by Arun Sharma, published by McGraw Hill publication.
6. Analytical reasoning by M.K Pandey BSC PUBLISHING.CO.PVT.LTD

Course outcomes
On completion of this course, the students should be able to:

CO1: Analyze the statement critically and solve the questions from verbal logic section.
CO2: Infer the conclusions based on the roots obtained by solving quadratic equations and establish relationship between them.
CO3: Effective solve the problems of permutation and combination.
CO4: Predict different possibilities by the principle of probability.
CO5: Interpret the data given in the graphical format and infer the results.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	-	-	3	2	-	3	-	2	-
CO2	2	3	3	-	-	3	2	-	3	-	2	-
CO3	2	3	3	-	-	3	2	-	3	-	2	-
CO4	2	3	3	-	-	3	2	-	3	-	2	-
CO5	2	3	3	-	-	3	2	-	3	-	2	-
3-Strong; 2-Medium; 1-Low												

V SEMESTER

Course Code : P18MCA51	Semester : V	L - T - P : 4 - 0 - 0
Course Title : Programming using C# and .NET		
Credits : 3	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- Familiarize .NET Framework components and OOPs concepts in c#
- Analyze the concepts of Delegates, Events
- Understand the concepts of ADO.NET
- Outline Windows applications using C# .NET
- Understand web applications using ASP.NET and AJAX

UNIT-I

Getting started with .NET Framework 4.0 and C# **10 Hours**

Understanding Previous Technologies, Benefits of .NET Framework, Architecture of .NET Framework 4.0,.NET Execution Engine, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies .NET Framework Class Library, Windows Forms, ASP .NET and ASP .NET AJAX, ADO .NET, Windows workflow Foundation, Windows Presentation Foundation, Windows Communication Foundation, Widows Card Space and LINQ.

Introducing C#

Creating a Simple C# Console Application, Identifiers and Keywords. System Data Types, Variables and Constants: Value Types, Reference Types, Understanding Type Conversions, Boxing and UnBoxing. Namespaces, The System namespace, .NET Array Types

UNIT-II

Classes, Objects and Object Oriented Programming **11 Hours**

Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and StaticMembers, Properties: Read-only Property, Static Property, Indexers, Structs: Syntax of a struct and Access Modifiers for structs, System. Object Class

Encapsulation: Encapsulation using accessors and mutators, Encapsulation using Properties. Inheritance: Inheritance and Constructors, Sealed Classes and Sealed Methods, Extension methods.

Polymorphism: Compile time Polymorphism/ Overloading, Runtime Polymorphism/ Overriding. Abstraction: Abstract classes, Abstract methods. Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance.

UNIT-III

Delegates, Events, Exception Handling and ADO.NET **11 Hours**

Delegates: Creating and using Delegates, Muticasting with Delegates. Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers.

Exception Handling: The try/catch/throw/finally statement, Custom Exception.System.Exception, Handling Multiple Exception

Data Access with ADO.NET : Understanding ADO.NET: Describing the Architecture of ADO.NET, ADO.NET,ADO.NET Entity Framework. Creating Connection Strings: Syntax for Connection Strings.Creating a Connection to a Database: SQL Server Database, OLEDB Database, ODBC Data Source. Creating a Command Object. Working with DataAdapters: Creating DataSet from DataAdapter.

UNIT-IV

Graphical User Interface with Windows Forms and WPF **10 Hours**

Windows Forms : Introduction, Windows Forms, Event Handling: A Simple Event Driven GUI, Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus, Month Calendar Control, LinkLabel Control, ListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl and Multiple Document Interface (MDI) Windows.

WPF: New WPF Controls**,** WPF Architecture: Presentation Framework, Presentation Core, Windows Base, MIL or Milcore, Working with WPF Windows: Using XAML in WPF 4.0 Applications : Contents of XAML and WPF Applications: XAML Elements Namespace and XAML, XAML Property Syntax, Markup Extensions

UNIT-V

Web App Development and Data Access using ADO.NET **10 Hours**

Introduction, Web Basics, Multitier Application Architecture, Your First Web Application: Building Web- Time Application, Examining Web-Time.aspx's Code-Behind File, Understanding Master pages, Standard Web Controls: Designing a Form, Validation Controls, Grid View Control, Drop DownList, Session Tracking, ASP.NET AJAX : Exploring AJAX, Need for AJAX, AJAX and other Technologies, AJAX Server Controls, Script Manager control, Update Panel, Update Progress Control, Creating Simple Application using AJAX Server Controls.

Text Books:

1. NET 4.0 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Wiley- Dream Tech Press. (Chapters: 1, 10, 11,12,13,14 and 19).
2. Paul Deitel and Harvey Deitel: C# 2010 for Programmers, 4th Edition, Pearson Education. (Chapters: 14, 15, 19 and 27.3)

Reference Books:

1. Andrew Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, Wiley-Appress.
2. Bart De Smet: C# 4.0 Unleashed, Pearson Education- SAMS Series.
3. Herbert Schildt: Complete Reference C# 4.0, Tata McGraw Hill, 2010.

Course outcomes

On completion of this course, the students should be able to:

CO1: Describe the components of .NET technologies

CO2: Apply the object-oriented concepts of C# for applications development

CO3: Select relevant exception handling types to handle errors in applications

CO4: Implement windows forms and process events in response to user interaction with GUI controls

CO5: Create database driven ASP.NET web application and web services

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-
CO3	2	2	1	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	2	-	-	-	-	-	-	-
CO5	3	2	-	-	1	-	-	-	-	-	-	-
S-Strong; M-Medium; L-Low												

ELECTIVES –V

Course Code : P18MCA521	Semester : V	L-T-P : 4 - 0 - 0
Course Title : System Simulation and Modeling		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- Understand whether the simulation is a useful tool for analysis of behavior of the system.
- Ability to understand different types of systems.
- Determine the capabilities and limitations of a system that undergoes simulation study.
- Discuss generators for random number generation for simulation study of a system.
- Analyze the system behaviour based on Input and Output modelling.
- Describe the verification and validation of the system.

UNIT-I

Introduction **10 Hours**

When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study.

UNIT-II

Random-Number Generation **12 Hours**

Properties of random numbers; Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random Numbers.

Random-Variate Generation

Inverse transform technique; Acceptance-Rejection technique.

UNIT-III

Queuing Models **10 Hours**

Characteristics of queuing systems; Queuing notation Simulation Examples: Queuing, Inventory System

UNIT-IV

General Principles **10 Hours**

Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance
Algorithm, World Views, Manual simulation Using Event Scheduling;

Input Modeling

Data Collection; Identifying the distribution with data; Parameter estimation; Goodness of Fit Tests; Chi-Square test, K-S Test.

UNIT-V

Verification and Validation **10 Hours**

Model building, verification and validation; Verification of simulation models; Calibration and validation of models.

Output analysis

Types of simulations with respect to output analysis; Stochastic nature of output data; Measures of performance and their estimation; Output analysis for terminating simulations.

Text Book:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 4th Edition (Listed topics only from Chapters1 to 12)

Reference Books:

1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson / Prentice-Hall, 2006.
2. Averill M. Law: Simulation Modeling and Analysis,4th Edition, Tata McGraw-Hill, 2007.
3. Simulation 5ed Ross Elsevier
4. Theory of modeling and simulation, Zeiglar, Elsevier

Course outcomes

On completion of this course, the students should be able to:

CO1: **Define** the basic concepts in simulation and modelling with respect to real time system.
CO2: **Identify** various simulation models for a given system. And understand the manual Simulation using simulation algorithm.
CO3: Illustrate various random number generators.
CO4: Analyze the input and output modelling for a given system.
CO5: **Illustrate** verification and validation of a given simulation model.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	1	-	-	-	-	-	-	-
CO2	3	2	2	2	1	-	-	-	-	-	-	-
CO3	3	2	2	2	2	-	-	-	-	-	-	-
CO4	3	2	2	2	2	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA522	Semester : V	L-T-P : 4 - 0 - 0
Course Title : Soft Computing		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- Understand basic concepts of Soft Computing
- Familiarize various techniques neural networks
- Understand genetic algorithms and fuzzy systems.
- Outline the hybrid systems
- Summarize soft computing techniques to solve problems

UNIT-I

Introduction to soft computing **10 Hours**

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network

UNIT-II

Artificial neural networks **10 Hours**

Back propagation Neural Networks – Kohonen Neural Network -Learning Vector Quantization - Hamming Neural Network – Hopfield Neural Network- Bi-directional Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines – Spike Neuron Models.

UNIT-III

Fuzzy systems **11 Hours**

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets – Classical Relations and Fuzzy Relations - Membership Functions -Defuzzification – Fuzzy Arithmetic and Fuzzy Measures -Fuzzy Rule Base and Approximate Reasoning – Introduction to Fuzzy Decision Making

UNIT-IV

Genetic algorithms **11 Hours**

Basic Concepts- Working Principles -Encoding- Fitness Function – Reproduction -Inheritance Operators – Cross Over – Inversion and Deletion -Mutation Operator – Bit-wise Operators -Convergence of Genetic Algorithm.

UNIT-V

Hybrid systems **11 Hours**

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination – LR-Type Fuzzy Numbers – Fuzzy Neuron – Fuzzy BP Architecture – Learning in Fuzzy BP- Inference by Fuzzy BP – Fuzzy ArtMap: A Brief Introduction – Soft Computing Tools – GA in Fuzzy Logic Controller Design – Fuzzy Logic Controller

Text Books:

1. N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015.
2. S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd., 2nd Edition, 2011.
3. S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt. Ltd., 2017.

References:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, ―Neuro-Fuzzy and Soft Computing, Prentice-Hall of India, 2002.
2. Kwang H.Lee, ―First course on Fuzzy Theory and Applications, Springer, 2005.
3. George J. Klir and Bo Yuan, ―Fuzzy Sets and Fuzzy Logic-Theory and Applications, Prentice Hall, 1996.
4. James A. Freeman and David M. Skapura, ―Neural Networks Algorithms, Applications, and Programming Techniques, Addison Wesley, 2003.

Course outcomes
On completion of this course, the students should be able to:

CO1: Describe basic concepts of Soft Computing.
CO2: Identify and apply various techniques neural networks for a given problem statement
CO3: Discuss the fuzzy systems and its characteristics
CO4: Identify the genetic algorithms for given application
CO5: Design and **apply** various soft computing techniques for complex problems.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	1	-	-	-	-	-
CO2	3	3	2	-	2	-	1	-	-	-	-	-
CO3	3	2	2	-	-	-	1	-	-	-	-	-
CO4	3	3	2	-	2	-	1	-	-	-	-	-
CO5	3	3	2	1	2	-	1	-	-	-	2	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA523	Semester : V	L-T-P : 4 - 0 - 0
Course Title : Big Data and Analytics		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Explore the significance of Big Data analytics and Analyze Technologies for Handling Big Data and Hadoop Ecosystem.
- Understand the applications using Map Reduce Concepts.
- Discuss the management of NoSQL data.
- Compare different types of analytics.
- Understand the various data visualization techniques.

UNIT-I

Getting an Overview of Big Data and Hadoop Ecosystem **11 Hours**

Big Data, History of Data Management – Evolution of Big Data, Structuring Big Data, Types of Data, Elements of Big Data, Volume, Velocity, Variety ,Veracity ,Big Data Analytics ,Advantages of Big Data Analytics ,Careers in Big Data ,Skills Required, Future of Big Data. Business Intelligence, Preventing Fraud Using Big Data Analytics.

Hadoop Ecosystem, Hadoop Distributed File System, HDFS Architecture, Features of HDFS, MapReduce, Features of MapReduce, Hadoop YARN.

UNIT-II

Understanding MapReduce Fundamentals and HBase **11Hours**

The MapReduce Framework, Exploring the Features of MapReduce, Working of MapReduce, Exploring Map and Reduce Functions, Techniques to Optimize MapReduce Jobs, Hardware/Network Topology, Synchronization, File System, Uses of MapReduce, Role of HBase in Big Data Processing, Characteristics of HBase, Installation of HBase.

UNIT-III

NoSQL Data Management **10 Hours**

Introduction to NoSQL, Characteristics of NoSQL, Evolution of Databases, Aggregate Data Models, Key Value Data Model, Document Databases, Relationships, Graph Databases, SchemaLess Databases, Materialized Views, Distribution Models, Sharding, MapReduce Partitioning and Combining, Composing MapReduce Calculations,CAP Theorem

UNIT-IV

Understanding Analytics and Big Data **10 Hours**

Comparing Reporting and Analysis, Reporting, Analysis, The Analytic Process, Types of Analytics, Basic Analytics, Advanced Analytics, Operationalized Analytics, Monetized Analytics, Characteristics of Big Data Analysis, Points to Consider during Analysis, Frame the Problem Correctly, Statistical Significance or Business Importance? , Making Inferences versus Computing Statistics, Developing an

Analytic Team, Convergence of IT and Analytics, Understanding Text Analytics, Skills required for an Analyst

.

UNIT-V

Data Visualization **10 Hours**

Introducing Data Visualization, Techniques Used for Visual Data Representation, Types of Data Visualization, Applications of Data Visualization, Visualizing Big Data, Deriving Business Solutions, Turning Data into Information, Tools Used in Data Visualization, Proprietary Data Visualization Tools, Open-Source Data Visualization Tools, Analytical Techniques Used in Big Data Visualization, Tableau Products. Relevant Case Studies related to Automation and other Industries : Product Design and Development, Use of Big Data in Preventing Fraudulent Activities, Preventing Fraud Using Big Data Analytics, Use of Big Data in Detecting Fraudulent Activities in Insurance Sector, Fraud Detection Methods, Use of Big Data in Retail Industry, Use of RFID Data in Retail.

Textbook:

1. Big Data: Black Book, DT Editorial Services, Wiley India Pvt Ltd, 2015 Edition.

Reference Books:

1. Big Data and Analytics – Seema Acharya and Subhashini C – Wiley India.
2. Arvind Sathi, ―Big Data Analytics: Disruptive Technologies for Changing the Game, 1st Edition, IBM Corporation, 2012
3. Big Data Analytics with R and Hadoop, VigneshPrajapati, -Packt Publishing 2013
4. Michael Minelli, Michehe Chambers, ―Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today‘s Business‖, 1st Edition, AmbigaDhiraj, Wiely CIO Series, 2013.

Course outcomes
On completion of this course, the students should be able to:

CO1: Describe the significance and importance of Big Data and Analytics
CO2: Analyze the HADOOP and Map Reduce technologies associated with Big Data analytics
CO3: Understand the impact of big data for business decisions and strategy.
CO4: Formulate and use appropriate models of data analysis to solve hidden solutions to business-Related challenges.
CO5: Interpret data findings effectively to any audience visually and in written formats.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	2	1	-	-	-	-	-	-	-
CO2	3	1	-	2	2	-	-	-	-	-	-	-
CO3	3	1	-	2	1	-	-	-	-	-	-	-
CO4	3	1	-	2	2	-	-	-	-	-	-	-
CO5	3	1	-	2	2	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA524	Semester : V	L-T-P : 4 - 0 - 0
Course Title : Service Oriented Architecture		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand the SOA its evolution and web services
- Familiarize the Web services and contemporary SOA -1 and SOA-2
- Outline Principles and layers of Service – Orientation
- Understand business process design in SOA
- Outline the SOA support provided by J2EE & .NET platform

UNIT-I

Introduction o SOA, Evolution of SOA **10 Hours**

Fundamental SOA; Common Characteristics of contemporary SOA; Common tangible benefits of SOA; An SOA timeline (from XML to Web services to SOA); The continuing evolution of SOA (Standards organizations and Contributing vendors); The roots of SOA (comparing SOA to Past architectures).

Web Services and Primitive SOA

The Web services framework; Services (as Web services); Service descriptions (with WSDL); Messaging (with SOAP).

UNIT-II

Web Services and Contemporary SOA – 1 **10 Hours**

Message exchange patterns; Service activity; Coordination; Atomic Transactions; Business activities; Orchestration; Choreography.

Web Services and Contemporary SOA – 2

Addressing; Reliable messaging; Correlation; Polices; Metadata exchange; Security; Notification and eventing.

UNIT-III

Principles of Service – Orientation **11 Hours**

Services-orientation and the enterprise; Anatomy of a service-oriented architecture; Common Principles of Service-orientation; How service orientation principles inter-relate; Service-orientation and object-orientation; Native Web service support for service-orientation principles.

Service Layers

Service-orientation and contemporary SOA; Service layer abstraction; Application service layer, Business service layer, Orchestration service layer; Agnostic services; Service layer configuration scenarios.

UNIT-IV

Business Process Design **10 Hours**

WS-BPEL language basics; WS-Coordination overview; Service-oriented business process design; WS-addresing language basics; WS-ReliableMessaging language basics.

UNIT –V

SOA Platforms **11 Hours**

SOA platform basics; SOA support in J2EE; SOA support in .NET; Integration considerations.

Text Books:

1. Thomas Erl: Service-Oriented Architecture – Concepts, Technology, and Design, Pearson Education, 2005.

Reference Books:

1. Eric Newcomer, Greg Lomow: Understanding SOA with Web Services, Pearson education, 2005.

Course outcomes

On completion of this course, the students should be able to:

CO1: Describe basic concepts of SOA and primitives of SOA

CO2: Identify and apply various web services Contemporary-1 and II for a given problem statement

CO3: Discuss the Principles of Service – Orientation and SOA layers

CO4: Identify Business process design for a given application.

CO5: Identify and apply various SOA platforms for complex problems.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	1	-	-	-	-	-
CO2	3	3	2	-	2	-	1	-	-	-	-	-
CO3	3	3	2	-	-	-	1	-	-	-	-	-
CO4	3	3	2	-	-	-	1	-	-	-	-	-
CO5	3	3	2	-	2	-	1	-	-	-	2	-
3-Strong; 2-Medium; 1-Low												

ELECTIVES –VI

Course Code : P18MCA531	Semester : V	L-T-P : 3 - 2 - 0
Course Title : Information Retrieval & Search Engines		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Outline basic concept of information retrieval and architecture of search engine.
- Apply IR principles to locate relevant information from large collections of data .
- Analyze abstract model of ranking and index construction.
- Summarize Query Transformation and Refinement.
- Understand retrieval systems for web search tasks and evaluating search engines.

UNIT-I

Introduction to information retrieval and architecture of a search engine: 10 Hours

Search Engines and Information Retrieval- What Is Information Retrieval? The Big Issues, Search Engines, Search Engineers .

Architecture of a Search Engine- What is an Architecture? Basic Building Blocks, Breaking It Down.

UNIT-II

Crawls and Feeds, Processing Text: 11 Hours

Crawls and Feeds- Deciding what to search, Crawling the Web, Crawling Documents and Email, Document Feeds, The Conversion Problem, Storing the Documents, Detecting Duplicates.

Processing Text - From Words to Terms, Text Statistics, Document Parsing, Document Structure and Markup, Link Analysis, Information Extraction, Internationalization.

UNIT-III

Ranking with Indexes: 10 Hours

Overview, Abstract Model of Ranking, Inverted indexes, Compression-Entropy and Ambiguity, Delta Encoding, Bit-Aligned Codes, Byte-Aligned Codes, Compression in Practice, Auxiliary Structures, Index Construction, Query Processing- Document-at-a-time Evaluation, Term-at-a-time Evaluation, Optimization Techniques.

UNIT-IV

Queries and Interfaces: 10 Hours

Information Needs and Queries, Query Transformation and Refinement- Stopping and Stemming Revisited Spell Checking and Suggestions, Query Expansion , Relevance Feedback , Context and Personalization, Showing the Results, Cross-Language Search .

UNIT-V

Retrieval Models, Evaluating Search Engines: 11 Hours

Retrieval Models - Overview of Retrieval Models , Probabilistic Models, Ranking Based on Language Models, Complex Queries and Combining Evidence, Web Search, Machine Learning and Information Retrieval

Evaluating Search Engines- Why Evaluate?, The Evaluation Corpus, Effectiveness Metrics, Efficiency Metrics

Text Book:

1. Trevor Strohman, Bruce Croft Donald Metzler, "Search Engines: Information Retrieval in Practice", Kindle Edition, Pearson Education Inc., 2015.

Reference Books

1. Christopher D. Manning, Prabhakar, Raghavan and Hinrich Schutze, " Introduction to Information Retrieval", Cambridge University Press, 2008.
2. William B Frakes, Ricardo Baeza-Yates, "Information Retrieval Data Structures and Algorithms", Pearson Education, 3rd Edition, 2009.
3. Robert. R. Korfhage, "Information Storage & Retrieval", John Wiley & Sons, Inc. New York, NY, USA, 4th Edition, 1997.

Note: At the end of the course students should come out with various Case study Report which covers the concept of Information Retrieval & Search Engines that is discussed in Tutorial class. It carries a Weightage of 15 marks of CIE.

Course outcomes (CO's)
On completion of this course, the students should be able to:

CO1: Apply the concept of Information Retrieval and Search Engine.
CO2: Demonstrate crawling document and detecting duplicates**.**
CO3: Apply IR abstract model to retrieve relevant information.
CO4: Analyze Query Transformation and Refinement.
CO5: Implement different retrieval models and evaluate search engines.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	2	2	-	-	-	-	-	2	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA532	Semester : V	L-T-P : 3 - 2 - 0
Course Title : Business Intelligence - Data Warehousing and Analytics		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Discuss the definition of BI, BI terminologies and framework
- Understand basics of data integration [ETL] in context of data warehousing and multidimensional data modelling
- Analyze the multidimensional data modeling
- Identify the metrics, KPIs and make recommendation to achieve the business goal in a given business scenario
- Generate enterprise reports and design enterprise dashboard

UNIT-I

Introduction to Business Intelligence **10 Hours**

Introduction to digital data and its types – structured, semi-structured and unstructured, Introduction to OLTP and OLAP (MOLAP, ROLAP, HOLAP), BI Definitions & Concepts, BI Framework, Data Warehousing concepts and its role in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities, Business Applications of BI, BI best practices.

UNIT-II

Basics of Data Integration (Extraction Transformation Loading) **10 Hours**

Concepts of data integration, needs and advantages of using data integration, introduction to common data integration approaches, Meta data - types and sources, Introduction to data quality, data profiling concepts and applications, introduction to ETL using Pentaho data Integration (formerly Kettle)

UNIT-III

Introduction to Multi-Dimensional Data Modeling **12 Hours**

Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema, Step-by-step lab guide to analyze data using MS Excel

UNIT-IV

Measures, metrics, KPIs, and Performance management **10 Hours**

Understanding measures and performance, Measurement system terminology, Navigating a business enterprise, role of metrics, and metrics supply chain, ―Fact-Based Decision Making‖ and KPIs, KPI Usage in companies, business metrics and KPIs, Connecting the dots: Measures to business decisions and beyond.

UNIT-V

Basics of enterprise reporting **10 Hours**

A typical enterprise, Reporting perspectives common to all levels enterprise, Report standardization and presentation practices, Enterprise reporting characteristics in OLAP world, Malcolm Baldrige - quality performance framework, balanced scorecard, enterprise dashboard, balanced scorecard vs. enterprise

dashboard, enterprise reporting using MS Access / MS Excel, best practices in the design of enterprise dashboards.

Text Book:

1. R N Prasad and Seema Acharya, "Fundamentals of Business Analytics", 2nd edition, Publisher: WileyIndia, 2016.

Reference Books:

1. David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann
2. Larissa T Moss and Shaku Atre – Business Intelligence Roadmap : The Complete Project Lifecycle for Decision Support Applications, Addison Wesley Information Technology Series
3. Brian Larson - Delivering Business Intelligence with Microsoft SQL Server 2005, Mc Graw Hill.

Note: At the end of the course students should come out with various Case study Report which covers the concept of Business Intelligence - Data Warehousing and Analytics that is discussed in Tutorial class. It carries a Weightage of 15 marks of CIE.

Course outcomes (CO's)

On completion of this course, the students should be able to:

CO1: Understand process associated with BI framework and apply best practices in BI/Data warehousing

CO2: Discuss technology and processes associated with Business Intelligence framework for data integration.

CO3: Design data models and prototypes needed to achieve business objectives.

CO4: Illustrate how effectively a company is achieving key business objectives using KPIs at multiple levels

CO5: Design an enterprise dashboard that depicts the key performance indicators which helps in decision making.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	2	-	-	-	-	-	1	-
CO3	3	2	2	-	2	-	-	-	-	-	1	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA533	Semester : V	L-T-P : 3 - 2 - 0
Course Title : IOT		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Familiarize IOT concepts and its domain
- Analyze the concepts M2M and IOT system management
- Understand the concepts IOT platforms and design methodology
- Outline Raspberry Pi Interfaces
- Understand various applications of IOT

UNIT-I

Introduction & Concepts **10 Hours**

Introduction of IoT; Physical Design of IoT; Logical Designof IoT; IoT Enabling Technologies; IoT Levels & Deployment Templates.

Domain Specific IoTs- Introduction, Home Automation; Cities; Environment; Energy; Retail; Logistics; Agriculture; Industry; Health & Lifestyle

UNIT-II

IoT and M2M **11 Hours**

-Introduction; M2M; Difference between IoT and M2M; SDN and NFV for IoT; IoT System management with NETCONF-YANG- Need for IoT Systems management; SNMP; Network Operator Requirements; NETCONF; YANG; IoT Systems management with NETCONFYANF; NETOPEER

UNIT-III

IoT Platforms Design Methodology **11 Hours**

Introduction; IoT Design Methodology; Case Study on IoT System for Weather Monitoring; Motivating for using Python.

IoT Systems- Logical Design using Python- Introduction; Installing Python; Python Data Types & Data structures; Control Flow; Functions; Modules; Packages; File Handling; Date/Time Operations; Classes.

UNIT-IV

10 Hours

What is an IoT Device; Exemplary Device: Raspberry Pi; About the Board;Linux on Raspberry Pi;Raspberry Pi Interfaces ; Programming Raspberry Pi with Python;

UNIT-V

10 Hours

Case Studies Illustrating IoT: Introduction ;Home Automation ;Cities ;Environment

Case Studies Illustrating IoT(Continued..): Environment ;Agriculture ;Productivity Applications

Text Book

1. Internet of Things - A Hands on Approach**,** Arshdeep Bahga and Vijay Madisetti Universities Press, 2015

Reference Books

1. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, 2nd Edition, Wiley ISBN: 978-1-119-99435-0, 370 pages, January 2012.
2. Vijay Madisetti, Arshdeep Bahga,Internet of Things: A Hands-On Approach Vijay Madisetti, 1st Edition ISBN-10: 0996025529, 2014

Note: At the end of the course students should come out with various Case study Report which covers the concept of IOT that is discussed in Tutorial class. It carries a weightage of 15 marks of CIE.

Course outcomes
On completion of this course, the students should be able to:

Course outcomes
On completion of this course, the students should be able to:

CO1: Recognize the basic concepts of IoT and the vision of IoT from a global context.
CO2: Understand the application areas of IOT.
CO3: Acquire knowledge on M2M Technology and IoT system management.
CO4: Develop design methodologies and develop IoT system using python.
CO5: Use Raspberry Pi interface to develop IoT physical devices. Implement and deploy IoT application.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	2	-	2	-	-	-	-	-
CO5	3	3	2	2	2	-	-	-	-	-	2	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA534	Semester : V	L-T-P : 3 - 2 - 0
Course Title : Machine Learning		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand the basic concepts of learning and decision trees.
- Analyze and comprehend the neural networks and genetic algorithms
- Demonstrate the Bayesian techniques and instant based learning
- Comprehend various learning rule sets.
- Examine analytical learning and reinforced learning

UNIT-I

Introduction, Concept Learning And Decision Trees **10 Hours**

Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Version Spaces and Candidate Elimination Algorithm – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search

UNIT-II

Neural Networks And Genetic Algorithms **10 Hours**

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning.

UNIT-III

Bayesian And Computational Learning Bayes **12 Hours**

Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes. Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier– Bayesian Belief Network – EM Algorithm – Probably Learning – Sample Complexity for Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT-IV

Instant Based Learning And Learning Set Of Rules **10 Hours**

K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Functions – CaseBased Reasoning – Sequential Covering Algorithms – Learning Rule Sets – Learning First Order Rules – Learning Sets of First Order Rules – Induction as Inverted Deduction – Inverting Resolution.

UNIT-V

Analytical Learning And Reinforced Learning **10 Hours**

Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning .

Textbook:

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (INDIAN EDITION), 2013.

Reference Books:

1. EthemAlpaydin, “Introduction to Machine Learning”, 2nd Ed., PHI Learning Pvt. Ltd., 2013.
2. T. Hastie, R. Tibshirani, J. H. Friedman, “The Elements of Statistical Learning”, Springer; 1st edition, 2001.

Note: At the end of the course students should come out with various Case study Report which covers the concept of Machine Learning that is discussed in Tutorial class. It carries a weightage of 15 marks of CIE.

Course Outcome (CO): At the end of this course, the students will be able to

CO 1: **Identify** the learning techniques along with knowledge base.
CO2: Understand the applications of neural network and genetic algorithms.
CO3: Apply Bayesian techniques and derive effectively learning rules.
CO4: Illustrate the various machine learning techniques.
CO5: Distinguish between reinforcement and analytical learning techniques

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	2	-	-	-	-	-	-	-
CO4	3	2	2	1	2	-	-	-	-	-	1	-
CO5	3	2	2	1	2	-	-	-	-	-	1	-
3-Strong; 2-Medium; 1-Low												

ELECTIVES –VII

Course Code : P18MCA541	Semester : V	L-T-P : 3 - 2 - 0
Course Title : Advanced Web Programming		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand concept and syntax of PHP to build web application
- Familiarize web document by Ruby and Rail
- Outline Rich internet with Ajax with XMLHTTP object
- Understand Rich internet with Ajax with XMLHTTP object
- Familiarize Design web sites faster and easier by Bootstrap framework

UNIT-I

Introduction to PHP **10 Hours**

Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching.

Building Web applications with PHP

Form handling, Files, Tracking users, cookies, sessions, Using databases, Handling XML.

UNIT-II

Introduction to Ruby and Introduction to Rails **10 Hours**

Origins and uses of Ruby, Scalar types and their operations ,Simple input and output, Control statements, Arrays, Hashes, Methods, Classes, Codeblocks and iterates, Pattern matching.

Overview of Rails, Document requests, Processing forms, Layouts. Rails applications with Databases.

UNIT-III

Rich Internet Applications With Ajax **11 Hours**

Limitations of Classic Web application model, AJAX principles, Technologies behind AJAX, Examples of usage of AJAX; Asynchronous communication and AJAX application model.

Ajax with XMLHTTP object: Part 1

Creating Ajax Applications: An example, Analysis of example ajax.html, Creating the JavaScript, Creating and opening the XMLHttpRequest object, Data download, Displaying the fetched data, Connecting to the server, Adding Server-side programming, Sending data to the server using GET and POST.

UNIT-IV

Ajax with XMLHTTP object: Part 2 **10 Hours**

Handling multiple XMLHttpRequest objects in the same page, Using two XMLHttpRequest objects, Using an array of XMLHttpRequest objects,AJAX Patterns – Predictive Fetch, Multi-stage download, Periodic Refresh and Fallback patterns, Submission throttling.

UNIT-V

Introduction to Bootstrap. **11 Hours**

What Is Bootstrap? Bootstrap File Structure, Basic HTML Template, Global Styles, Default Grid System, Basic Grid HTML, Offsetting Columns, Nesting Columns, Fluid Grid System, Container Layouts, Responsive Design. Typography, Emphasis Classes, Lists, Code, Tables, Optional Table Classes, Table Row Classes, Forms, Buttons, Images, Icons.

Text Books:

1. **RobertW.Sebesta**: Programming the Worldwide Web, 4th Edn, Pearson, 2012
2. Professional AJAX – Nicholas C Zakas et al, Wrox publications, 2008.
3. Steven Holzner: Ajax: A Beginner's Guide, Tata McGraw Hill, 2014.
4. Jake Spurlock: "Bootstrap: Responsive Web Development", O'Reilly Media, 2014.

Reference Books:

1. Thomas A. Powel: Ajax The Complete reference, McGraw Hill,2008.
2. Aravind Shenoy, Ulrich Sossou: Learning Bootstrap, Packt, Dec 2014.
3. Dana Moore, Raymond Budd, Edward Benson: Professional Rich Internet Applications: AJAX and Beyond, Wiley 2012.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1: Develop Server side scripting language to web application using PHP
CO2: Illustrate with example Ruby on Rails Web Pages using AJAX.
CO3: Identify the technique for creating fast and dynamic web pages by AJAX
CO4: Illustrate with example web pages to be updated asynchronously by exchanging small amounts of Data with the server behind the scenes using AJAX
CO5: **Demonstrate** web application by using front-end framework as Bootstrap.

Note: At the end of the course students should come out with Record/ Report which covers Programmes discussed in Tutorial class. It carries a weightage of 15 marks of CIE

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	2	-	-	-	-	-	-	-
CO2	3	2	2	1	-	-	-	-	-	-	-	-
CO3	3	2	2	1	-	-	-	-	-	-	-	-
CO4	3	2	2	1	2	-	-	-	-	-	-	-
CO5	3	2	2	1	2	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA542	Semester : V	L-T-P : 3 - 2 - 0
Course Title : Enterprise Application Programming		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- Understand Challenges of Enterprise Application Development
- Apply the knowledge of frameworks and Enterprise Application Development Tools
- Design a Java program efficiently using Inheritance, Interfaces and Packages
- Develop Enterprise Application solutions using Design Patterns

UNIT-I

Introduction **11 Hours**

Challenges of Enterprise Application Development, Programming Productivity Response to Demand Integration with Existing Systems Freedom to Choose J2EE Application Scenarios , Multitier Application Scenario ,Stand-Alone Client Scenario, Web-Centric Application Scenario Business-to-Business Scenario , A Note on the MVC Architecture Introduction to Java Programming- The Java Language, The Key Attributes of Object-Oriented Programming, The Java Development Kit, A First Simple Program, Java Keywords

UNIT-II

Classes and Methods **10 Hours**

The Java Class Libraries. Java's Primitive Types, Literals, Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using Parameters, Constructors, Recursion, Understanding Static, Introducing nested and inner classes Inheritance Basics, Interface Fundamentals, Creating an Interface, Implementing an Interface, Package Fundamentals, Packages and Member Access, Importing Packages, Static

UNIT-III

Servlets- **11 Hours**

Servlet Structure, Servlet packaging, HTML building utilities, Lifecycle, Single Thread model interface, Handling Client Request: Form Data, Handling Client Request: HTTP Request Headers. Generating server Response: HTTP Status codes, Generating server Response: HTTP Response Headers, Handling Cookies, Session Tracking

Introduction to EJB- The Enterprise JavaBeans Tier-Business Logic, Enterprise Beans as J2EE Business Objects Enterprise Beans and EJB Containers, Session Beans

UNIT-IV

Implementing JSP tag extensions **10 Hours**

Overview of JSP Technology, Need of JSP, Benefits of JSP, Advantages of JSP, Basic syntax, Invoking java code with JSP scripting elements, creating Template Text, Invoking java code from JSP, Limiting java code in JSP, using JSP expressions, comparing servlets and JSP, writing scriptlets. For example Using Scriptlets to make parts of JSP conditional, using declarations, declaration example

UNIT-V

10 Hours

Persistence Management and Design Patterns- Implementing java persistence using hibernate, Introducing hibernate, exploring the architecture of hibernate, exploring HQL, understanding hibernate O/R mapping, working with hibernate, Implementing O/R mapping with hibernate

Text Book :

1. Inderjeet Singh, Beth Stearns, Mark Johnson and the Enterprise Team "Designing Enterprise Applications"with the Java TM 2 Platform, Enterprise Edition, 2nd Edition ISBN-10: 0201787903
2. Herbert Schildt, Dale Skrien, "Java Fundamentals, A Comprehensive Introduction ", Tata McGraw Hill Edition, 2013, Mc Graw Hill Publication, ISBN-13:9781249006593
3. Marty Hall, Larry Brown, "Core Servlets and Java Server Pages. Volume 1: Core Technologies. 2nd Edition" Pearson Hall, ISBN-13: 97886278043.
4. Prof. M. T. Savaliya, "Advanced Java", Dreamtech Press, Wiley India, ISBN-13:9789351199342

Course outcomes
On completion of this course, the students should be able to:

CO1: Discuss the challenges of enterprise applications
CO2: Apply JAVA class and methods for Enterprise Application Development
CO3: Design and implement web application using servlet and EJB component
CO4: Design and Implement the web application using JSP tag
CO5: Identify the design patterns for specific problem statement

Note: At the end of the course students should come out with Record/ Report which covers Programmes discussed in Tutorial class. It carries a weightage of 15% of CIE

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	2	-	2	-	-	-	2	-
CO2	3	2	2	-	2	-	2	-	-	-	2	-
CO3	3	2	2	-	2	-	2	-	-	-	2	-
CO4	3	2	2	-	2	-	2	-	-	-	2	-
CO5	3	2	2	-	2	-	2	-	-	-	2	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA543	Semester : V	L-T-P : 3 - 2 - 0
Course Title : Model View Control Programming		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- Understand and Discuss different Model View Controller design pattern techniques in various application areas
- Apply knowledge of frameworks in the development of Web application
- Analyze the performance of Web frameworks
- Design and develop MVC based applications using MEAN

UNIT-I

10 Hours

Introduction to MEAN (MongoDB, ExpressJS, AngularJS, NodeJS) Three-tier web application development, Introduction to JavaScript and MEAN,Introduction to Node.js, JavaScript event-driven programming Node.js - event-driven programming, JavaScript closures Node modules, Common JS modules, Node.js core modules, Node.js third-party modules,Node.js file modules Introduction to AngularJS-Key concepts of AngularJS, the core module of AngularJS, The angular global object, AngularJS modules Two-way data binding

UNIT-II

12 Hours

Building Express Web Application - Introduction to Express, Installing Express, Creating your first Express application, The application, request and response objects- The application object, The request object, The response object, External middleware, Implementing the MVC pattern-Application folder structure, Horizontal folder structure, Vertical folder structure, File-naming, conventions, Implementing the horizontal folder structure, Configuring an Express application-Environment configuration files Rendering views, Configuring the view system Rendering EJS views-Configuring the view system 71, Rendering EJS views

UNIT-III

10 Hours

Creating a MEAN CRUD Module Implementing the AngularJS MVC module-Creating the AngularJS module service, Setting up the AngularJS module controller, Implementing the AngularJS module views, The create() method of the AngularJS controller, The find( ) and find One() methods of the AngularJS controller, The update() method of the AngularJS controller, The delete() method of the AngularJS controller Implementing the AngularJS module views- The create-article view, The view-article view, The editarticle view, The list-articles view

UNIT-IV

8 Hours

Introduction to MongoDB - Introduction to NoSQL, Introducing MongoDB, MongoDB sharding, MongoDB CRUD operations-Creating a new document, Creating a document using insert(), Creating a document using update(), Creating a document using save()

UNIT-V

12 Hours

Introduction to Mongoose-Introducing Mongoose ,Connecting to MongoDB, Understanding Mongoose schemas, Creating the user schema and model, Registering the User model, Creating new users using save(), Finding multiple user documents using find(), Reading a single user document using find One(), Updating an existing user document Deleting an existing user document, Extending your Mongoose schema- Defining default values, Using schema modifiers, Predefined modifiers, Custom setter modifiers, Custom getter modifiers

Text Books

1. Amos Q. Haviv,"MEAN Web Development", PACKT Publication, 2014, ISBN 978-1-78398-328-5.
2. Simon Holmes, "Getting MEAN with Mongo, Express, Angular, and Node", MEAP Edition November 2015, ISBN 9781617292033.

Reference Books

1. Angular JS for .NET Developers by Sheppard/Miller/Liptak SAMS 2016

Note: At the end of the course students should come out with Record/ Report which covers Programmes discussed in Tutorial class. It carries a weightage of 15% of CIE

Course outcomes
On completion of this course, the students should be able to:

CO1: Understand MEAN
CO2: Build express web application
CO3: Develop the angular JS and MVC modules services
CO4: Explain about MongoDB
CO5: Apply the knowledge of Mongoose to implement document modeling

Mapping with Program Outcome

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	2	-	2	-	-	-	-	-
CO3	3	3	3	-	2	-	2	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	2	2	-	2	-	-	-	1	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA544	Semester : V	L-T-P : 3 - 2 - 0
Course Title : Mobile Application Development		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- Understand mobile architecture and OS.
- Illustrate effective user interfaces that leverage evolving mobile device capabilities
- Design mobile apps for Android devices.
- Learn about Android Databases such as SQLite
- Explain the sensors, maps and location based services

UNIT-I

Hello, Android **10 Hours**

A Little Background, What Android Isn't, Android: An Open Platform for Mobile Development, Native Android Applications, Android SDK Features, Access to hardware, including camera, GPS and Sensors, Introducing the Open Handset Alliance, What Does Android Run On?, Why Develop for Mobile?, Why Develop for Android?, Introducing the Development Framework

UNIT-II

Getting Started **10 Hours**

Developing for Android, Android Development Tools, Understanding Hello World.

Creating Applications and Activities

What Makes an Android Application?, Introducing the Application Manifest File, Externalizing Resources, Using Resources, The Android Application Lifecycle, Understanding an Application's Priority and Its Process' States, Introducing the Android Application Class, A Closer Look at Android Activities.

UNIT-III

Building User Interfaces **10 Hours**

Fundamental Android UI Design, Android User Interface Fundamentals, Introducing Layouts, Introducing Fragments: The Fragment lifecycle The Android Widget Toolbox.

Intents And Broadcast Receivers: Introducing Intents, Using Intents to Launch Activities, using Intents to Broadcast Events, Broadcasting Events with Intents.

UNIT-IV

Databases Content Providers **10 Hours**

Introducing Android Databases, Introducing SQLite, Content Values and Cursors, Working with SQLite Databases, Creating Content Providers: registering content providers, storing Files in a content Provider.

Hardware Sensors: Using Sensors and the Sensor Manager, Monitoring a Device's Movement and Orientation, Introducing the Environmental Sensors

UNIT-V

Maps, Geocoding, And Location-Based Services **12 Hours**

Using Location-Based Services, Using the Emulator with Location-Based Services, Selecting a Location Provider, Finding Your Current Location, Best Practice for Location Updates, Using Proximity Alerts, Using the Geocoder, Creating Map-Based Activities.

Audio, Video, And Using The Camera: Playing Audio and Video, Manipulating Raw Audio, Creating a Sound Pool, Using Audio Effects, Using the Camera for Taking Pictures, Recording Video, Using Media Effects.

Note: In tutorial, some of the Programs based on the above concepts are developed and executed, to get practical knowledge on Mobile Application development.

Text Books:

1. Reto Meier: Professional Android 4 Application Development. Wiley India Edition, 2012, Reprint: 2017... Chapters: 1, 2, 3,4,5,8,12,13,15.

Reference Books:

1. Jerome (J.F.) DiMarzio: Android A Programmer's Guide, Tata McGraw-Hill, 2010.
2. B.M. Harwani: Android Programming, Pearson, 2013.

Note: At the end of the course students should come out with Record/ Report which covers Programmes discussed in Tutorial class. It carries a weightage of 15% of CIE.

Course outcomes
On completion of this course, the students should be able to:

CO1: Understand the Fundamentals of Mobile Application Development.
CO2: **Create** simple android applications.
CO3: Describe the user interface that leverage evolving mobile device capabilities
CO4: Illustrate of mobile application using android SQLite and content providers and categorize the mobile sensors
CO5: Describe the mobile applications based on maps, location based, audio, video and camera

Model View Controller Programming

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	1	2	-	-	-	-	-	-	-
CO3	3	2	2	1	2	-	-	-	-	-	-	-
CO4	3	2	2	1	2	-	-	-	-	-	-	-
CO5	3	1	1	1	1	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA55	Semester : V	L - T - P : 0 - 0 - 2
Course Title : .NET Lab		
Credits : 1	Contact Period : 32 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Understand the Visual Studio IDE to create and debug Console applications, Windows Forms Application and ASP.NET Web applications.
- Familiarize C# code to demonstrate the concepts Command Line Arguments, Operator Overloading, Object Oriented Techniques,
- Outline the C# concepts of Interfaces, Delegates and Exception handling
- Understand windows applications using C#.NET
- Outline data driven web applications using ADO.NET and ASP.NET

PART A

1. Write a Program in C# to demonstrate Command line arguments processing.
2. Write a Program in C# to demonstrate boxing and Unboxing.
3. Write a program to demonstrate the static members.
4. Find the sum of all the elements present in a jagged array of 3 inner arrays.
5. Using Try, Catch and Finally blocks write a program in C# to demonstrate error Handling.
6. Demonstrate use of virtual and override key words in C# with a simple program.
7. Write a program to demonstrate delegates.
8. Write a program to demonstrate abstract class and abstract methods in C#.
9. Write a program to illustrate the use of different properties in C#.
10. Write a Program in C# to build a class which implements an interface.

PART – B

1. Consider the Database STUDENT consisting of following tables: tbl_Course (CourseID: int, CourseName: string) tbl_Student (USN: string, StudName: string, Address: string, CourseID: int, YrOfAdmsn: int)
Develop suitable windows application using C#.NET having following options:
    1. Entering new course details.
    2. Entering new student details.
    3. Display the details of students (in a Grid) who belong to a particular course.
    4. Display the details the students who have taken admission in a particular year.

2. Consider the Database BLOODBANK consisting of following tables: tbl_BloodGroup (BloodID: int, BloodGroup: string) tbl_Donor (DonorID: int, DonorName: stirng, Address:string, ContactNo: int, DOB: date, Gender: string, Weight: int, BloodID: int)
Develop suitable windows application using C#.NET having following options:
    1. Entering Blood group details.
    2. Entering new donor details.
    3. Display the details of donors (in a Grid) having particular blood group.

4. Display the details of donors (in a Grid) based on gender.
5. Display the details of donors (in a Grid) based on age (above 18), weight (above 45KG) and Gender(user's choice).

3. Consider the Database STUDENT consisting of following tables: tbl_Course (CourseID:int, CourseName: string) tbl_Book (BookID :int, BookTitle: string, Author: string,CourseID: int) tbl_Student (USN: string, StudName: string, CourseID: int) tbl_BookIssue(USN: string, BookID: int, IssueDate: Date)
   Develop suitable windows application using C#.NET having following options:
   1. New Course Entry.
   2. New Book Entry
   3. New Student Entry
   4. Issue of books to a student.
   5. Generate report (display in a grid) showing all the books belonging to particular course.
   6. Generate report (display in a grid) showing all the books issued on a particular date.
   7. Generate report (display in a grid) showing all the books issued to a particular student.

4. Develop a Web Application using C#.NET and ASP.NET for an educational institution. The master page should consist of Institution Name, Logo and Address. Also, it should provide hyperlinks to Departments, Facilities Available and Feedback. Each department page and facilities page should be designed as static pages. The hyperlinks should navigate to these static pages in the form of Content Pages associated with Master Page designed. The Feedback page should have fields to enter Name, Email and Message with Submit and Cancel Buttons. Database should be created to store these three data.

5. Develop a Web Application using C#.NET and ASP.NET for a Bank. The BANK Database should consist of following tables: tbl_Bank (BankID: int, BankName: string) tbl_Branch (BranchID: int, BankID: int, BranchName: string) tbl_Account (AccountNo: int, BankID: int, BranchID: int, CustomerName: string, Address: string, ContactNo: int, Balance: real) (Note: AccountNo and BankID together is a composite primary key).
   The master page of this web application should contain hyperlinks to New Bank Entry, New Branch Entry (of selected Bank), New Customer Entry (based on branch and bank) and Report Generation.
   The hyperlinks should navigate to respective content pages. These content pages provide the fields for respective data entry. The reports should be generated (display in grid) as below:
   1. Display all records of particular bank.
   2. Display all records of a branch of particular bank.
   3. The balance should be displayed for the entered account number (Bank and Branch are input through ComboBox controls and Account number is input through TextBox).

Note: Students are required to execute one question from Part A and one from Part B

Course outcomes
On completion of this course, the students should be able to:

CO: Design and develop standalone applications , backend connectivity using ODBC, ASP.NET Web applications using C#

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	3	2	3	-	3	2	2	-	2	-	2	-
3-Strong; 2-Medium; 1-Low												

Course Code : P18MCA56	Semester : V	L - T - P : 0 - 0 - 6
Course Title : Mini Project		
Credits : 3	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Mini Project Guidelines:

- A team of **TWO** students must develop the mini project. However, during the examination, each student must demonstrate the project individually.
- The team may implement a mini project of their choice.
- The team must submit a **Brief Project Report** (25 to 30 Pages) that must include the following:
  - Introduction
  - Requirements
  - Software Development Process Model Adopted
  - Analysis and Design Models
  - Implementation
  - Testing
- **SEE:** The Report must be valued for 10 marks, 30 marks for Demonstration and 10 marks for Viva-Voce.

Course outcomes:
On completion of this course, the students should be able to:

CO1: **Identify**, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
CO2: **Analyze** and design the project.
CO3: **Apply** acquired knowledge for project development using modern tools and technology
CO4: **Apply** debugging tools for testing the project
CO5: **Demonstrate** the project.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	2	3	2	-	-	-	-	3	-
CO2	-	2	3	-	2	-	-	-	-	-	2	2
CO3	3	3	-	-	-	-	-	-	-	1	-	-
CO4	3	1	3	-	3	-	3	-	-	-	3	-
CO5	-	-	-	-	2	-	2	-	3	-	-	-
3-Strong; 2-Medium; 1-Low												

Scheme of Evaluation:

Course code	Title	Internal (CIE)	External (SEE)			Total Marks
			Project Demonstration	Report	Viva-Voce	
P18MCA56	Mini Project	50	30	10	10	100

Mini Project (P18MCA56)

Rubrics for Mini Project Assessment (CIE)

	Excellent (10)	Good (8)	Satisfactory (5)	Poor (2)	Final Score
Identification of problem domain and detailed analysis	Detailed and extensive explanation of the purpose and need of the project	Good explanation of the purpose and need of the project	Average explanation of the purpose and need of the project	Minimal explanation of the purpose and need of the project	
Study of the existing system and feasibility of project proposed	Detailed and extensive explanation of the specifications and the limitations of the existing systems	Collects a great deal of information and good study of the existing systems	Moderate study of the existing systems collects some basic information	Explanation of the specifications and the limitations of the existing systems not very satisfactory; limited information	
Design & Implementation Methodology	Division of problem into modules and good selection of computing framework ; Appropriate design methodology and properly justified	Division of problem into modules and good selection of computing framework; Design methodology not properly justified	Division of problem into modules but inappropriate selection of computing framework; Design methodology not defined properly	Partial division of problem into modules and inappropriate selection of computing framework; Design methodology not defined properly	
Project Demonstration & Presentation	All defined objectives are achieved as per time; All modules of project are well integrated and system working is accurate; Contents of presentations are appropriate and well delivered;	All defined objectives are achieved; Integration of all modules not done and system working is not very satisfactory; Contents of presentations are appropriate	All defined objectives are achieved; Modules of project are not properly integrated; Contents of presentations are appropriate but not well delivered; Eye contact with only few people	Only some of the defined objectives are achieved; Modules are not in proper working form that further leads to failure of integrated system; Contents of presentations are	

	Proper eye contact with audience and clear voice with good spoken language	and well delivered; Clear voice with good spoken language but less eye contact with Audience	and unclear voice	not appropriate and not well delivered; Poor eye contact with audience and unclear voice	
Report	All required elements of the report are present and completed efficiency	All required elements of the report are present and completed to a satisfactory standard	All required elements are provided but in a haphazard way	Key elements of the report are not provided. Overall presentation of the document is not to a professional standard	
				Total Score	

Course Code : P18MCA57	Semester : V	L - T - P : 0 - 0 - 0
Course Title : Industrial Study Report		
Credits : 1	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50%

Industrial Study Report Guidelines

The Industrial training shall be completed during the period specified in the Scheme of Teaching and Examination.

I. The industrial training can be carried out in any software industry/ hardware industry/ R & D Organization/ Research Institute/ Internshala (AICTE MoU).

II. The Department/college shall nominate staff member/s to facilitate, guide and supervise students under Industrial training.

III. The students shall report the progress of the Industrial training to the guide in regular intervals and seek his/her advice.

IV. After the completion of Industrial training, students shall submit a report to the Head of the Department with the approval of both internal and external guides.

V. A report on Industrial Training is to be submitted by the student. The report has to be evaluated by Internal guide for CIE of 25 marks. The student must give seminar based on Industrial Training before a committee constituted by the department for remaining CIE of 25 marks.

VI. **Failing to undergo Industrial Training:** Industrial Training is one of the head of passing. Completion of Industrial Training is mandatory. If any student fails to undergo /complete the Industrial Training, he/she shall be considered as failed in that Course. The reappearance shall be considered as an attempt.

VII. Industrial Training to be undergone by the students during their IV semester vacation.

Rubrics for Presentation Assessment for Industrial Study

	Excellent (5)	**Good (3)**	**Satisfactory (2)**	**Poor (1)**	**Final Score**
Knowledge on Industry experience /Research work	Demonstrates in depth knowledge about Industry / Research processes; answered all questions with elaboration	Knowledge to a limited extent on major processes. Able to answer most of the questions though not elaborate	Superficial knowledge of topic; only able to answer basic questions	Does not have any knowledge; Unable to answer questions	
Organization of the presentation	Presented in logical sequence; Introduction and background given in proper context; Key points and conclusions are clear and less references and citations	Presented in logical sequence; Introduction and background given in proper context; Key points and conclusions are not clear and well presented most citationed and references	Emphasis given to less important information	Little or no organization, difficult to follow; missing or ineffective introduction; confusing background; key points unclear	
Usage of Modern tools and technologies	Effectively utilized appropriate tools and technologies for implementation.	Developed applications, though not very effectively. Fair enough.	Sufficient for understanding but not clearly elaborated about usage of tools and technologies	Too brief or insufficient for understanding or too detailed	
Presentation Skills	Clear articulation about tools/technology, steady delivery rate, good posture and eye contact, confident and appropriately dressed	Good Articulation about tools/technology and not very polished. Not able to realize minor mistakes. Presentable attire	Refers to slides to make points, occasional eye contact, incorrect pronunciations, and Voice fluctuation.	No clarity in sentence, Inaudible or too loud, no eye contact, delivery rate is too slow or too fast, not in formal attire	
Visuals	Visually pleasing and easy to read; good use of white space, colour, backgrounds; images and Graphics support.	Good visuals but can be improved largely.	Difficult to read, cluttered appearance; images improperly sized; some distracting graphics or animations	Confusing layout, text extremely difficult to read; many graphics, sounds, animations distract from the presentation	
				Total Score	

Rubrics for Internship Report Assessment

	Excellent (5)	**Good (3)**	**Satisfactory (2)**	**Poor (1)**	**Final Score**
Purpose and Objective of Internship	The purpose and objective of the Internship report is made clear, and the report addresses the objective(s) in a focused and logical manner.	Documented well but with slight ambiguity in analyzing the problems	Purpose and objectives are stated ambiguously	The report does not clearly address the objective(s) of Internship.	
Documenting the essence of Tools / Technology used, Grammar & Spelling	Complete information is provided about tools/technology, very few spelling errors, correct punctuation, grammatically correct, complete sentences.	Average technical details on tools / technology usage, Grammatical mistakes not corrected.	Less technical details, sentences are not framed properly and with a few spelling mistakes	No details about tools/technolog y, Numerous spelling errors, non-existent or incorrect punctuation, and/or severe errors in grammar that interfere with understanding.	
Code Development / self learning	Design and Code is self-developed wherever applicable	Design and Code is partially self-developed wherever applicable	Major part of the implementation is copied.	No details about design and development	
Conclusion and References	well summarized and concluded; Multiple references, Citations appropriately placed, Formatted correctly	summary and conclusion is written good; References limited or a few missed citations, format mostly correct.	summary and conclusion is written poorly; References sparse - poor formatted	Inappropriate conclusion and references.	
Report Format	All required elements of the report are present and completed efficiently.	All required elements are present but some of them are not given completely	All required elements are provided but in a haphazard way	Key elements of the report are not provided. Overall presentation of the document is not to a professional standard.	
				Total Score	

Course outcomes:
On completion of this course, the students should be able to:

CO1.Analyse the real-time industry/research work environment with emphasis on organizational structure/job process/different departments and functions / tools /technology.

CO2.Explore to modern tools and technologies.

CO3.Demonstrate self-learning capabilities with an effective report and detailed presentation.

Mapping with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	3	-	-	-	-	2	-	-
CO2	-	-	3	3	3	-	-	-	-	-	2	-
CO3	-	-	-	-	-	3	3	-	3	-	-	-

Rubrics for Presentation Assessment for Industrial Study (out of 25 marks) =

Rubrics for Industry Report Assessment (out of 25 marks) =

Total Marks (Out of 50 marks) =

Signature of the Guide

Name:

Signature of HOD

VI Semester Project Work

Guidelines

1. Students are required to take up individual project in companies or in the college other than the mini project standards already taken up during previous semesters.
2. Project should be real time work, for total of 5 months duration.
3. Project work may be application oriented or research oriented. Therefore the project reports will vary depending on whether it is application oriented project or research based project.
4. Regular project work weekly dairy should be maintained by the students, signed by the external guide and internal guide in order to verify the regularity of the student.(Enclosing the Format)
5. Seminars / Presentation should be given for Synopsis, SRS, Design and project completion levels.
6. Project work is monitored at various levels (Phases) by the internal guide.
7. If project report is not as per the format external guides has right to reject the project
8. Students should present their project demo along with power point slide during their viva-voce exams.

Project Phase-1 (P18MCA61)

Rubrics for Project Phase-1 Assessment

	Excellent (10)	**Good (6)**	**Satisfactory (4)**	**Poor (2)**	**Final Score**
Identification of problem domain and detailed analysis	Detailed and extensive explanation of the purpose and need of the project	Good explanation of the purpose and need of the project	Average explanation of the purpose and need of the project	Minimal explanation of the purpose and need of the project	
Study of the existing system and feasibility of project proposed	Detailed and extensive explanation of the specifications and the limitations of the existing systems	Collects a great deal of information and good study of the existing systems	Moderate study of the existing systems collects some basic information	Explanation of the specifications and the limitations of the existing systems not very satisfactory; limited information	
Objectives and methodology of the proposed work	All objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are clearly specified	Good justification to the objectives; Methodology to be followed is specified but detailing is not done	Only some objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are not specified properly	Incomplete justification to the objectives proposed; Steps are mentioned but unclear; Without justification to objectives	
Design & Implementation	Division of problem into modules and good selection	Division of problem into modules and good selection	Division of problem into modules but inappropriate	Partial division of problem into modules and inappropriate	

Methodology	of computing framework ; Appropriate design methodology and properly justified	of computing framework; Design methodology not properly justified	selection of computing framework; Design methodology not defined properly	selection of computing framework; Design methodology not defined properly	
Project Demonstration & Presentation	All defined objectives are achieved as per time; All modules of project are well integrated and system working is accurate; Contents of presentations are appropriate and well delivered; Proper eye contact with audience and clear voice with good spoken language	All defined objectives are achieved; Integration of all modules not done and system working is not very satisfactory; Contents of presentations are appropriate and well delivered; Clear voice with good spoken language but less eye contact with Audience	All defined objectives are achieved; Modules of project are not properly integrated; Contents of presentations are appropriate but not well delivered; Eye contact with only few people and unclear voice	Only some of the defined objectives are achieved; Modules are not in proper working form that further leads to failure of integrated system; Contents of presentations are not appropriate and not well delivered; Poor eye contact with audience and unclear voice	
				Total Score	

Course outcomes:
On completion of this course, the students should be able to:

CO1: Apply Software Engineering principles on a real software projects.
CO2: Analyse and solve real time problems related to societal, environment, industry, organization etc.
CO3: Apply creative thinking skills for software designs.
CO4: Develop applications / solutions to solve problems using modern tools and technologies.
CO5: Develop capabilities for designing detailed report and effective presentation.

Mapping with Program Outcomes:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	-	-	-	-	-	1	-	-	-	1
CO2	-	3	-	-	-	1	2	-	2	3	2	3
CO3	3	3	3	-	2	-	-	-	-	-	-	-
CO4	-	-	3	2	3	-	3	-	2	-	3	-
CO5	-	-	-	-	-	-	2	-	3	-	1	-

Total Marks for Project Phase-1 (out of 50 marks) =

Signature of the Guide
Name: **Signature of HOD**

Project Phase-2 (P18MCA62)

Rubrics for Project Phase-2 Assessment

	Excellent (10)	Good (6)	Satisfactory (4)	Poor (2)	Final Score
Identification of problem domain and detailed analysis	Detailed and extensive explanation of the purpose and need of the project	Good explanation of the purpose and need of the project	Average explanation of the purpose and need of the project	Minimal explanation of the purpose and need of the project	
Study of the existing system and feasibility of project proposed	Detailed and extensive explanation of the specifications and the limitations of the existing systems	Collects a great deal of information and good study of the existing systems	Moderate study of the existing systems collects some basic information	Explanation of the specifications and the limitations of the existing systems not very satisfactory; limited information	
Objectives and methodology of the proposed work	All objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are clearly specified	Good justification to the objectives; Methodology to be followed is specified but detailing is not done	Only some objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are not specified properly	Incomplete justification to the objectives proposed; Steps are mentioned but unclear; Without justification to objectives	
Design & Implementation Methodology	Division of problem into modules and good selection of computing framework ; Appropriate design methodology and properly justified	Division of problem into modules and good selection of computing framework; Design methodology not properly justified	Division of problem into modules but inappropriate selection of computing framework; Design methodology not defined properly	Partial division of problem into modules and inappropriate selection of computing framework; Design methodology not defined properly	
Project Demonstration & Presentation	All defined objectives are achieved as per time; All modules of project are well integrated and system working is accurate; Contents of	All defined objectives are achieved; Integration of all modules not done and system working is not very satisfactory; Contents of	All defined objectives are achieved; Modules of project are not properly integrated; Contents of presentations are appropriate but	Only some of the defined objectives are achieved; Modules are not in proper working form that further leads to failure of integrated	

	presentations are appropriate and well delivered; Proper eye contact with audience and clear voice with good spoken language	presentations are appropriate and well delivered; Clear voice with good spoken language but less eye contact with Audience	not well delivered; Eye contact with only few people and unclear voice	system; Contents of presentations are not appropriate and not well delivered; Poor eye contact with audience and unclear voice	
				Total Score	

Course outcomes:
On completion of this course, the students should be able to:

CO1:Apply Software Engineering principles on a real software projects.
CO2:Analyse and solve real time problems related to societal, environment, industry, organization etc.
CO3:Apply creative thinking skills for software designs.
CO4:Develop applications / solutions to solve problems using modern tools and technologies.
CO5:Develop capabilities for designing detailed report and effective presentation.

Mapping with Program Outcomes:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	-	-	-	-	-	1	-	-	-	1
CO2	-	3	-	-	-	1	2	-	2	3	2	3
CO3	3	3	3	-	2	-	-	-	-	-	-	-
CO4	-	-	3	2	3	-	3	-	2	-	3	-
CO5	-	-	-	-	-	-	2	-	3	-	1	-

Total Marks for Project work (out of 50 marks) =

Signature of the Guide
Name:

Signature of HOD

Project Dissertation Evaluation (P18MCA63**)**

Rubrics for Project Dissertation Evaluation

	Excellent	**Good**	**Satisfactory**	**Poor**	**Final Score**
Objective, relevance, impact (10)	The purpose and objective, relevance and impact of the project is made clear, and the report addresses them in a focused and logical manner (10)	The purpose and objective, relevance and impact of the project is made clear, and the report addresses them (8)	Purpose and objectives are stated ambiguously (5)	The report does not clearly address any of them (2)	
Originality of the topic	Innovative system (10)	Add on to existing system (8)	Changes to existing system (5)	Code migration for existing system (2)	
Study of the existing system and feasibility of project proposed	Detailed and extensive explanation of the specifications and the limitations of the existing systems (10)	Collects a great deal of information and good study of the existing systems (8)	Moderate study of the existing systems collects some basic information (5)	Explanation of the specifications and the limitations of the existing systems not very satisfactory; limited information (2)	
Problem definition with functional requirements	State the problem clearly and identify underline issues; strong description of the functional requirements of the project (10)	Adequately define the problem; In-sufficient description of the functional requirements of the project (8)	Fails to define the problem adequately; In-sufficient description of the functional requirements of the project (5)	Doesn't identify the problem; poor description of the functional requirements of the project (2)	
Experimental observation / Theoretical modeling	Complete explanation of the key concepts and strong description of the technical requirements of	Complete explanation of the key concepts but in-sufficient description of the technical requirements of the project; (8)	Incomplete explanation of the key concepts and in-sufficient description of the technical requirements of the project; (5)	Inappropriate explanation of the key concepts and poor description of the technical requirements of the project; (2)	

	the project; (10)				
Results presentation and discussion	Results are presented in very appropriate manner (20)	Results are presented in good manner (15)	Results presented are not much satisfactory (10)	Results presented are not much satisfactory (5)	
Conclusion, future work and references	Project work is well summarized and concluded; Future enhancement in the project are well specified; Sources are Acknowledged with full reference details (10)	Project work summary and conclusion not very appropriate; Future enhancement in the project are Specified; Sources are acknowledged with bare reference Details (8)	Project work summary and conclusion not very appropriate; Future enhancement in the project are specified; Sources are acknowledged with partial reference details (5)	Project work summary and conclusion not very appropriate; Future enhancement in the project are not specified; Sources are not acknowledged (2)	
Overall presentation of the Thesis	All required elements of the report are present and completed efficiency (10)	All required elements of the report are present and completed to a satisfactory standard (8)	All required elements are provided but in a haphazard way (5)	Key elements of the report are not provided. Overall presentation of the document is not to a professional standard (2)	
Paper Publication	Paper is presented in conference / published in reputed journals (10)	Paper is accepted in conference / journal (8)	Paper is submitted in conference / journal and waiting for the review (5)	Paper is not submitted to any conference / journal (2)	
				Total Score	

Rubrics for Project Dissertation Assessment (out of 100 marks) =

Total Marks (Out of 100 marks) =

Signature of the Internal / External Examiner

Name:

Viva-Voce (P18MCA64**)**

Rubrics for Viva-Voce

Particulars	Excellent	Good	Satisfactory	Poor	Final Score
Presentation of background of work undertaken	Detailed and extensive explanation of the specifications and the limitations of the existing systems (10)	Collects a great deal of information and good study of the existing systems (8)	Moderate study of the existing systems collects some basic information (5)	Explanation of the specifications and the limitations of the existing systems not very satisfactory; limited information (2)	
Presentation of suitability of work chosen	Detailed and extensive explanation of the purpose and need of the project (10)	Good explanation of the purpose and need of the project (8)	Average explanation of the purpose and need of the project (5)	Minimal explanation of the purpose and need of the project (2)	
Presentation of finalization of work	Division of problem into modules and good selection of computing framework ; Appropriate design methodology and properly justified (20)	Division of problem into modules and good selection of computing framework; Design methodology not properly justified (15)	Division of problem into modules but inappropriate selection of computing framework; Design methodology not defined properly (10)	Partial division of problem into modules and inappropriate selection of computing framework; Design methodology not defined properly (5)	
Presentation of results, discussion of results and conclusion	Project work is well summarized and concluded; Future enhancement in the project are well specified; Sources are Acknowledged with full reference details (40)	Project work is well concluded; Future enhancement in the project are Specified; Sources are acknowledged with bare reference Details (30)	Project work summary and conclusion not very appropriate; Future enhancement in the project are specified; Sources are acknowledged with partial reference details (20)	Project work summary and conclusion not very appropriate; Future enhancement in the project are not specified; Sources are not acknowledged (10)	
Overall performance	Contents of presentations are appropriate and well delivered; Proper eye	Contents of presentations are appropriate and well	Contents of presentations are appropriate but not well delivered;	Contents of presentations are not appropriate and not well delivered;	

	contact with audience and clear voice with good spoken language (20)	delivered; Clear voice with good spoken language but less eye contact with Audience (15)	Eye contact with only few people and unclear voice (10)	Poor eye contact with audience and unclear voice (5)	
				Total Score	

Total Marks for Viva-Voce Assessment (out of 100 marks) =

Signature of the Internal Examiner

Name:

Signature of the External Examiner

Name: