Scheme & Syllabus
of

Master of Computer Applications (MCA)

(With effect from 2022-2024)

Outcome Based Education
With
CHOICE BASED EDUCATION

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(±ÉÊPÀëtÂPÀªÀµÀð 2022-2024)

P.E.S. College of Engineering

Mandya - 571 401, Karnataka
(An Autonomous Institution Affiliated to VTU, Belagavi
Grant -in- Aid Institution (Government of Karnataka), World Bank Funded College (TEQIP)
Accredited by NBA & NAAC and Approved by AICTE, New Delhi.)

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PÀ£ÁðlPÀ(«.n.AiÀÄÄ, ¨É¼ÀUÁ« CrAiÀÄ°è£À ¸ÁéAiÀÄvÀÛ ¸ÀA¸ÉÜ)

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Preface

PES College of Engineering, Mandya, started in the year 1962, has become autonomous in the academic year 2008-09. Since, then it has been doing the academic and examination activities successfully. The college is running 6 Postgraduate programs. It consists of 4 M.Tech programs, which are affiliated to VTU. Other postgraduate programs are MBA and MCA.

India has become a Permanent Member by signing the Washington Accord. The accord was signed by the National Board of Accreditation (NBA) on behalf of India on 13th June 2014. It enables not only the mobility of our degree globally but also establishes equivalence to our degrees with that of the member nations such as Taiwan and Hong Kong, Ireland, Korea, Malaysia, New Zealand, Russia, Singapore, South Africa, Turkey, Australia, Canada and Japan are among 16 signatories to the international agreement besides the US and the UK. Implementation of Outcome Based Education (OBE), has been the core issue for enabling the equivalence and of Indian degrees and their mobility across the countries.

Our Higher Educational Institution has adopted Credit Based system (CBCS) based semester Structure with OBE Scheme and grading system which provides the flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. There lies a shift in thinking, teaching and learning process moving towards students Centric from Teachers Centric Education which enhances the knowledge, skills & moral values of each student.

Choice Based Credit System (CBCS) provides the options for the students to select from the number of prescribed courses. The CBCS provides a 'cafeteria' type approach in which the students can choose electives from a wide range of courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, adopt an interdisciplinary approach for learning which enables integration of concepts, theories, techniques. These are greatly enhances the skill/employability of students.

In order to increase the Industry Institute Interaction, Internship have been added to the existing curriculum of 2020-21. Further, Research Methodology & IPR and two Self Study Courses have been introduced to enhance their Research ability and Self Learning ability respectively. Lab Components are also included in I & II Semester.

Dr. Umesh D R
Deputy Dean (Academic)
Associate Professor,
Dept. of CS & Engg.,

Dr. R. Girisha Ph.D.
Dean (Academic)
Professor
Dept. of CS & Engg.,

Department of Master of Computer Applications (MCA)

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. The department has published several papers in national and 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. Several reputed companies offered placements to MCA students.

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 22 Credits

II Semester 16 Credits

III Semester 11 Credits

IV Semester 03 Credits

Total credits for core courses are 52 credits

Laboratory Courses

I Semester 1 Credits

II Semester 2 Credits

III Semester 2 Credits

Total credits for Laboratory courses are 05 credits

Elective Courses

II Semester 06 Credits

III Semester 06 Credits

IV Semester 03 Credits

Total credits for Elective courses are 15 credits

Technical Seminar	**:**	01 Credit **(**II Semester)
Societal Project	**:**	03 Credits (III Semester)
MOOC	**:**	02 Credits (IV Semester)
Industry Internship	**:**	04 Credits (IV Semester)
Project work	**:**	18 Credits (IV Semester)

A total of 100 credits for 2 years MCA Programme

MASTER OF COMPUTER APPLICATIONS (MCA)
SCHEME OF TEACHING AND EXAMINATION 2022-2024

I SEMESTER

Sl. No	Course Code	Course Title	Hrs/Week	Credits	Examination		
					Marks		
			L: T: P: H		CIE	SEE	Total
1	P22MCA11	Mathematical Foundation for Computer Applications	3 : 2 : 0 : 5	4	50	50	100
2	P22MCA12	Object Oriented Programming with Java	4 : 0 : 0 : 4	4	50	50	100
3	P22MCA13	UNIX Shell Scripting	3 : 0 : 2 : 5	4	50	50	100
4	P22MCA14	Operating Systems	4 : 0 : 0 : 4	4	50	50	100
5	P22MCA15	Computer Networks	3 : 2 : 0 : 5	4	50	50	100
6	P22MCA16	Research Methodology and IPR	3 : 0 : 0 : 3	2	50	50	100
7	P22MCAL17	Java Programming Lab with Mini Application	0 : 0 : 2 : 2	1	50	50	100
8	P22MHU18	Employability Enhancement Skills-1 (EES-1) *	0 : 2 : 0 : 2	0	50	-	100
9	P22MCA19	Basics of Computer Fundamentals and Programming #	2 : 2 : 0 : 4	0	50	50	100
Total			**34**	**23**	**450**	**400**	**900**

L: Lecture, T: Tutorial, P: Practical, H: Total Hours; CIE: Continuous Internal Evaluation;
SEE: Semester End Examinations
* Taught by Humanities Science and Management Department
# Bridge Course for Non-Computer Science Students

II SEMESTER

Sl. No	Course Code	Course Title	Hrs/Week	Credits	Examination		
					Marks		
			L : T : P : H		CIE	SEE	Total
1	P22MCA21	Web Technologies	3 : 0 : 2 : 5	4	50	50	100
2	P22MCA22	Data Structures with Algorithms	4 : 0 : 0 : 4	4	50	50	100
3	P22MCA23	Database Management Systems	4 : 0 : 0 : 4	4	50	50	100
4	P22MCA24	Software Engineering	4 : 0 : 0 : 4	4	50	50	100
5	P22MCA25X	Elective - I	3 : 0 : 0 : 3	3	50	50	100
6	P22MCA26X	Elective - II	2 : 2 : 0 : 4	3	50	50	100
7	P22MCAL27	Database Management Systems Lab with Mini Application	0 : 0 : 2 : 2	1	50	50	100
8	P22MCAL28	Data Structures with Algorithm Lab	0 : 0 : 2 : 2	1	50	50	100
9	P22MCA29	Technical Seminar	0 : 2 : 0 : 2	1	100	-	100
10	P22MHU210	Employability Enhancement Skills-2 (EES-2) *	0 : 2 : 0 : 2	0	50	-	100
Total			**32**	**25**	**550**	**400**	**1000**

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

ELECTIVES

Sl. No.	Course code	Elective Group - I	Sl. No.	Course code	Elective Group - II
1	P22MCA251	Data Warehousing & Data Mining	1	P22MCA261	Cloud Computing
2	P22MCA252	Model View Control Programming	2	P22MCA262	Artificial Intelligence
3	P22MCA253	System Simulation and Modeling	3	P22MCA263	Object-Oriented Modelling and Design Patterns
4	P22MCA254	Optimization Techniques	4	P22MCA264	Computer Graphics with open GL
5	P22MCA255	Software Testing and Practices	5	P22MCA265	Cyber Security

III SEMESTER

Sl. No	Course Code	Course Title	Hrs/Week	Credits	Examination		
					Marks		
			L : T : P : H		CIE	SEE	Total
1	P22MCA31	Machine Learning using python	4 : 0 : 0 : 4	4	50	50	100
2	P22MCA32	Internet of Things (IOT)	4 : 0 : 0 : 4	4	50	50	100
3	P22MCA33	Management Information System	3 : 0 : 0 : 3	3	50	50	100
4	P22MCA34X	Elective - III	3 : 0 : 0 : 3	3	50	50	100
5	P22MCA35X	Elective - IV	2 : 2 : 0 : 4	3	50	50	100
6	P22MCAL36	Machine Learning Lab with Mini Application	0 : 0 : 2 : 2	1	50	50	100
7	P22MCAL37	IOT Lab	0 : 0 : 2 : 2	1	50	50	100
8	P22MCA38	Project Work Phase-1	0 : 0 : 4 : 4	2	100	-	100
9	P22MCA39	Societal Project	0 : 0 : 6 : 6	3	50	50	100
Total			**32**	**24**	**500**	**400**	**900**

L: Lecture, T: Tutorial, P: Practical, H: Total Hours; CIE: Continuous Internal Evaluation;
SEE: Semester End Examinations

ELECTIVES

Sl. No.	Course code	Elective Group - III	Sl. No.	Course code	Elective Group - IV
1	P22MCA341	Big Data and Analytics	1	P22MCA351	Mobile Application Development
2	P22MCA342	Block chain Technology	2	P22MCA352	Software Project Management
3	P22MCA343	Computer Vision	3	P22MCA353	Deep Learning
4	P22MCA344	Cryptography and Network Security	4	P22MCA354	NOSQL
5	P22MCA345	Business Intelligence - Data Warehousing and Analytics	5	P22MCA355	Digital Image Processing

IV SEMESTER

Sl. No	Course Code	Course Title	Hrs/Week	Credits	Examination		
					Marks		
			L : T : P: H		CIE	SEE	Total
1	P22MCA41	Programming using C# and .NET	2 : 2 : 0 : 4	3	50	50	100
2	P22MCA42X	Elective - V	3 : 0 : 0 : 3	3	50	50	100
3	P22MCA43	MOOC (Massive Open Online Course) (8weeks)	------	2	100	------	100
4	P22MCA44	Industry Internship (6 weeks)	------	4	100	------	100
5	P22MCA45	Project Work Phase - 2	0 : 0 : 6 : 6	16	100	100	200
Total			**13**	**28**	**400**	**200**	**600**

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

ELECTIVES

Sl. No.	Course code	Elective Group - V
1	P22MCA421	Advance Java Programming
2	P22MCA422	Advances in Web Technologies
3	P22MCA423	Enterprise Resource Planning
4	P22MCA424	Principles of User Interface Design
5	P22MCA425	Natural Language Processing

Evaluation Scheme for I, II, III & IV Semester's Core and Elective Courses

Evaluation Scheme						
Scheme	**Weightage**	**Marks**	**Event Break UP**			
CIE	50%	50	**CIE I**	**CIE II**	**Assignment**	**Average of CIE I & CIE II + Assignment**
			40	40	10	50
SEE	50%	50*	**Questions to Set: 5**		**Questions to Answer: 5**	

Note: * The SEE will be conducted for 100 Marks.

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

- The question paper should cover the entire contents of the syllabus.
- Total questions to be set are FIVE, which have internal choice for any THREE units and remaining TWO units' questions are compulsory.
- The students should answer 5 full questions
- Each unit carries equal marks of 20.

SEMESTER-I

Course Code : P22MCA11	Semester : I	L - T - P : 3 : 2 : 0
Course Title : Mathematical Foundation for Computer Applications		
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.
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 –Types of functions, 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.

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.

Textbook:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", 5th Edition, Pearson Education, 2004. (Chapter 1.1 to 1.4 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, Chapter 11.1 to 11.6.)

Reference Books:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th Edition, McGraw Hill Publicatons, 2007.
2. Jayant Ganguly, 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: Apply the principles of counting and set theory.
CO2: Identify the quantifiers and their uses and **Implement** fundamentals of logic theory.
CO3: Exhibit the mathematical induction principle and different methods to **Solve** the given problem.
CO4: Solve the problems using the concepts of relations and functions and **Apply** the different ways of representing relations.
CO5: Identify basic concepts of graph theory to **Solve** the given problem.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	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: P22MCA12	Semester: I	L - T - P: 4: 0: 0
Course Title: Object Oriented Programming with Java		
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 Java program syntax construct.
- Summarize class, member, method and String class and Array concepts give problem statement.
- Outline appropriate fundamental concepts like inheritance, interface, Packages, Enumerations
- Understand Exception handling and multithreading programming concepts.
- Analyze 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, Object 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

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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:

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

CO1: Apply suitable OOPs concepts to develop Java programs for a given scenario.
CO2: Develop Generalization and Runtime Polymorphism Applications
CO3: **Exemplify** the usage of Inheritance, Packages,and Interfaces
CO4: Illustrate exception handling concepts and Multithreading with examples
CO5: Demonstrate Enumerations and Networking Concepts in Java

Mapping with Program Outcomes:

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

Course Code : P22MCA13	Semester : I	L - T - P : 3 : 0 : 2
Course Title : UNIX Shell Scripting		
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.

UNIT-I

Introduction of UNIX **08 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 **08 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 **08 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.

UNIT-IV

Filters **08 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 **08 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.

Laboratory

- Programs given in the list needs to executed in the laboratory.

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 conditions 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:

CO1: Identify UNIX utilities to create and manage simple file processing operations.
CO2: Create file structure with appropriate security.
CO3: Design and **Develop** shell scripts to perform simple and moderate tasks.
CO4: Apply filters and regular expressions to increase the information searching efficiency.
CO5: Design and **Develop** awk scripts using arrays, control and looping statements, and functions

Mapping with Program Outcomes:

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

Course Code : P22MCA14	Semester : I	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 operating systems 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, Disk Scheduling.

Case Study: The Linux Operating System

Linux history; Design Principles; Kernel modules; Process management; Scheduling; Memory management; File systems, Input and output; Inter-process communication.

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:Explain The basics of Operating Systems, services and structure.
CO2:Understand Process concept, coordination and Synchronization, Methods for handling deadlocks .
CO3:Utilize Process Scheduling, Synchronization, deadlock avoidance, prevention and detection, disk scheduling, Memory management algorithms of operating system.
CO4:Identify Memory management techniques.
CO5:Discuss File concepts, allocation methods, Linux operating system.

Mapping with Program Outcomes:

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

Course Code : P22MCA15	Semester : I	L - T - P : 3 : 2 : 0
Course Title : Computer Networks		
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 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

Introduction **10 Hours**

Introduction, Uses of Computer Networks, Network Hardware, Network Software: Protocol Hierarchies, Design Issues for the Layers, Reference Models: The OSI Reference Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP/IP Reference Models, Example Networks: Internet, Architecture of the Internet, Who's Who in the International Standards World, Physical Layer - Guided Transmission Media, Digital Modulation and Multiplexing

UNIT-II

The Data Link Layer **10 Hours**

Data link Layer Design issues, Error Detection codes, Sliding Window Protocols (Stop and Wait, Go-Back-N (GBN) and Selective Repeat (SR), Medium Access Control - The Channel Allocation Problem, Multiple Access Protocols, Ethernet.

UNIT-III

The Network Layer **12 Hours**

Network Layer Design issues, Routing algorithms- The Optimality Principal, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical routing, Congestion Control Algorithms, Quality of Service, Internetworking

UNIT-IV

The Network Layer in the Internet **10 Hours**

The Network Layer in the internet- IP version 4 Protocol, IP version 6 protocol: The Main IPv6 Header, Extension Headers, Internet Control Protocols: ICMP — The Internet Control Message Protocol, ARP—The Address Resolution Protocol, DHCP—The Dynamic Host Configuration Protocol

UNIT-V

The Transport and Application Layers **10 Hours**

The Transport Layer - Introduction and Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Connection-Oriented Transport: TCP the Application Layer - Principles of Network Applications, Web and HTTP, Electronic Mail in the Internet, DNS, Socket Programming

Text Books:

1. Computer Networks, Andrew S. Tanenbaum, David J Wetherall, 5th Edition, 2012, Pearson Education, Pearson Publication, ISBN-1978-81-317-8757-1
2. Data Communications and Networking, Forouzan, B. A., 5th Edition, 2013, McGraw-Hill, ISBN: 978-0-07-337622-6

Reference Books:

1. James F. Kurose, Keith W. Ross: Computer Networking: A Top-Down Approach, 5thEdition, Addison-Wesley, 2012.
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.

Note: Students has to implement the applications of computer networks using NS2 simulator

Course Outcomes:

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

CO1: Identify the basic terminologies used for computer networking and data communication model with its components.
CO2: Analyze the design issues, services, interfaces for data flow in networks.
CO3: Illustrate the routing table for a given subnet using various routing algorithm.
CO4: Discuss various internet control protocols.
CO5: Determine application layer protocols used for process to Process Communication.

Mapping with Program Outcomes:

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

Course Code : P22MCA16	Semester : I	L - T - P : 3 : 0 : 0
Course Title : Research Methodology and IPR		
Credits : 2	Contact Period : 25 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Analyse Objective, Types and defining a research problem
- Discuss searching, review of literature and Writing about the literature reviewed
- Demonstrate Research surveys and Research design
- Illustrate Data Collection and Data Preparation process.
- Discuss about Report Writing and Intellectual Property (IP)

UNIT-I

Research Methodology Introduction and Defining the Research Problem **05 Hours**

Research Methodology Introduction

Introduction, Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Research Methods versus Methodology, Research Process, Criteria of Good Research.

Defining the Research Problem

Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, an Illustration.

UNIT-II

Reviewing the literature **05 Hours**

Place of the literature review in research, Bringing clarity and focus to your research problem, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Writing about the literature reviewed.

UNIT-III

Design of Sample Surveys and Research Design **05 Hours**

Design of Sample Surveys

Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs

Research Design

Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs.

UNIT-IV

Data Collection and Data Preparation **05 Hours**

Data Collection

Introduction, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.

Data Preparation

Data preparation process, Questionnaire checking, Editing, Coding, Classification, Tabulation, Graphical Representation, Data Cleaning, Data Adjusting.

UNIT-V

Report Writing and Intellectual Property (IP) Acts **05 Hours**

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

Intellectual Property (IP) Acts: Introduction to IP: Introduction to Intellectual Property (IP), different types of IPs and its importance in the present scenario, Patent Acts: Indian patent acts 1970. Copy right acts: Copyright Act 1957.

Text Books:

1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.
2. Research Methodology a step-by- step guide for beginners. (For the topic Reviewing the literature) Ranjit Kumar SAGE Publications Ltd 3rd Edition, 2011 Study Material.
3. Intellectual property, Debirag E. Bouchoux, Cengage learning, 2013.

Reference Books:

1. Research Methods: the concise knowledge base Trochim, Atomic Dog Publishing, 2005.
2. Conducting Research Literature Reviews: From the Internet to Paper Fink A Sage Publications, 2009.

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

CO1: **Identify** the types, methods of the given research problem
CO2: **Discuss** searching and writing reviewed literature
CO3: **Illustrate** Research surveys and Research design
CO4: **Demonstrate** Data Collection and Data Preparations with examples.
CO5: **Illustrate** the Statistics concept and 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	3	2	3	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCAL17	Semester : I	L - T - P : 0 : 0 : 2
Course Title : Java Programming Lab with Mini Application		
Credits : 1	Contact Period : 2 Hrs/week, Exam: 3 Hrs	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 for real time application
- Understand Exception handling and multithreading programming for given problem
- Outline the front end GUI tools applet, swing and develop client server 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. Read a string from console and appends it to the resultant string

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 is WorkDay ( ) 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).

NOTE : Students should implement a mini application using Java concepts

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

CO: Design and **Implement** OOPs concepts and exception handling, multithreading, networking for a given scenario

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	-	2	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MHU18	Semester : I	L - T - P : 0 : 2 : 0
Course Title : Employability Enhancement Skills-1 (EES-1)		
Credits : 0	Contact Period : 32 Hrs, Exam: 2 Hrs	Weightage : CIE : 100%

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

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

UNIT - I

06 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

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 - II

06 hours

Preposition: Introduction to prepositions, Importance of usage of positions, 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

06 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

06 hours

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

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

UNIT - V

08 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 Power point 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 Edit ion", First Edition, Norman Lewis, Goyal Publisher.
2. "Essential English Grammar", Raymond Murphy, Cam bridge 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 themselves

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 : P22MCA19	Semester : I	L - T - P : 2 : 2 : 0
Course Title : Basics of Computer Fundamentals and Programming		
Credits : 0	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 fundamental concepts of Digital Logic, Operation of Computers, Memory Locations and Addresses.
- Design an algorithm and flowchart for the given problems 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.

UNIT - I

10 Hours

Binary Numbers, Number Base Conversion,Octal and Hexadecimal Numbers, Complements: r's and (r-1)s complements, comparison between 1's and 2's complements, Binary Code, Binary Storage and Registers, Binary Logic, Integrated Circuits.
Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance, Multiprocessors and Multicomputer.

UNIT - II

10 Hours

Memory Locations and Addresses, Memory Operations, Instructions and Instruction sequencing, Addressing Modes, Basic Input/output Operations, Stack and Queues, Subroutines: subroutine Nesting and Processor Stack, Introduction to Interrupts and Direct Memory Access(DMA).

UNIT - III

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, programming examples.

UNIT - IV

10 Hours

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, The while statement, the do..while statement, the for statement, nested loops, jumps in loops, the continue statement, The meaning of an array, one dimensional and two dimensional arrays, declaration and initialization of arrays, Need for user defined functions, category of functions, recursion, passing arrays to functions, passing string to functions, programming examples.

UNIT - V

10 Hours

Declaring and initialing string variables, arithmetic operations on characters, putting strings together, comparison of two strings, string handling functions. Defining a structure, declaring structure variables, accessing structure members, Unions. Understanding pointers, Defining and opening a file, closing a file, input/output operations on files, error handling during I/O operations, random access files, programming examples.

Text Books:

1. Digital Logic and Computer Design,M.Morris Mano,2013,Pearson
2. Computer Organization, Carl Hamcher Zvonko Vranesic Saftwat Zaky, 5th Edition.
3. Programming in ANSI C, Balagurusamy, 6th Edition onwards.

Reference Books:

1. The C Programming Language, Brian W Kernighan, Dennis M Ritchie, PHI, 2nd 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: Demonstrate the Basic concepts of Digital Logic, Ooperational concepts of Computer, Memory locations, Addressing modes and Instructions.
CO2: Construct Algorithms and flow chart for simple programs
CO3: Identify the logic, data types, operators for given C programs.
CO4: Analyze the suitable decision making statements, different looping statements, functions and arrays for given C programs.
CO5: Develop C programs based on string, structure, files and pointers.

Mapping with Program Outcomes:

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

Course Code : P22MCA21	Semester : II	L - T - P : 3 : 0 : 2
Course Title : Web Technologies		
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 fundamental concept of web foundations. .
- Outline XHTML and CSS style sheets to create the document.
- Summariz**e** fundamental and dynamic XHTML documents using JavaScript.
- Outline the concepts of XML to design the web page.
- Demonstrate client/server application for a given problem using PHP .

UNIT-I

Fundamentals of Web and Web Foundations **08 Hours**

Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, the Web Programmers Toolbox**.**

Evolution of the Web, Peak into the History of the Web, Internet Applications, Networks, TCP/IP, Higher Level Protocols, Important Components of the Web, Web Search Engines, Application Servers.

UNIT-II

Introduction to XHTML Cascading Style Sheets **08 Hours**

Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links. Lists, Tables, Forms, Frames.

Cascading Style Sheets: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The and tags.

UNIT-III

Basics of JavaScript and JavaScript Execution Environment **08 Hours**

Basics of JavaScript and HTML Documents: Overview of JavaScript, Object orientation and JavaScript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts, Examples.

The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Text Box and password Elements, The DOM2 Event Model.

UNIT-IV

Dynamic JavaScript and XML **08 Hours**

Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements

Introduction, Syntax, Document structure, Document Type definitions, Namespaces; XML schemas, Displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processors, Web services.

UNIT-V

Introduction to PHP **08 Hours**

Introduction to PHP: Origins and uses of PHP, Overview of PHP. General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files, Cookies; Session Tracking.

Text Book:

1. Robert W. Sebesta: Programming the World Wide Web, 8th Edition, Pearson education, 2015.

Reference Books:

1.Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2009.

2.Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide Web How to program, 3rd Edition, Pearson Education / PHI, 2004.

3. Luke Welling, Laura Thomson, "PHP and MySQL Web Development", 5th Edition, Pearson Education, 2016.

List of 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 page to demonstrate the usage of different tags:
   a) Image insertion
   b) Table-1st sem MCA marks card creation.

3. To create a simple XHTML page to demonstrate the usage of different tags:
   a) Forms which includes text box, check box, radio buttons…
   b) Audio and Video file insertion.

4. To create an XHTML with CSS script code 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.

5. Develop and demonstrate a XHTML file that includes JavaScript script for the following problems:
   a) Input: A number n obtained using prompt
      Output: The first n Fibonacci numbers
   b) Input: A number n obtained using prompt
      Output: A table of numbers from 1 to n and their squares using alert.

6. Develop and demonstrate different positioning element using JavaScript an XHTML document .
   a) Absolute positioning
   b) Relative positioning.

7. Develop and demonstrate using JavaScript script, a XHTML document that contains three images, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them.

8. Write dynamic JavaScript code that includes multi-Validating Registration Form

9. Develop dynamic JavaScript code to create a html page to create online exam paper format with 4 optional answer.

10. 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.

11. Create an XSLT style sheet for one student element of the document 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. and use it to create and display of that element.

12. Write a PHP program to input previous reading and present reading and prepare an electricity bill.

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

CO1: Understand the fundamental concepts of web.
CO2: Illustrate with example CSS tags.
CO3: Implement static and dynamic JavaScript document.
CO4: Design client/server program using PHP for a given problem.
CO5: Develop web page according to customer needs 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	3	-	-	-	-	-	-	-	-	-
CO2	2	3	2	-	-	-	-	-	-	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-
CO4	3	1	2	-	2	-	-	-	-	-	-	-
CO5	2	2	2	1	-	-	2	-	-	-	2	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA22	Semester : II	L - T - P : 4 : 0 : 0
Course Title : Data Structures with Algorithms		
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:

- Determine the impact of structuring data to achieve efficiency of a solution to a problem.
- Analyse and develop programs to implement standard data structures such as stacks, queues, lists.
- Apply important algorithmic design paradigms and methods of analysis
- Explain the importance of designing efficient algorithms by comparing different complexity classes.
- Possess the ability to design simple algorithms for solving computing problems

UNIT-I

Introduction to Data Structures **11 Hours**

Definition, Classification of Data Structures.

The Stack and Recursion

Definition and examples: Primitive operations, Example, Representing stacks: Implementing the pop operation,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.

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

UNIT-II

Queues and Linked Lists **11 Hours**

Queue: The queue and its sequential representation: operation of queue, Priority queue, Array implementation of a priority queue.

Linked lists: Inserting and removing nodes from a list, Linked implementations of stacks, get node and free node operations, Linked implementation of queues, Linked list as a data structure, Example of list operations, Array implementation of lists, allocating and freeing dynamic variables, Linked lists using dynamic variables.

UNIT-III

Introduction and fundamentals of Algorithm Efficiency **10 Hours**

Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Analysis Framework, Asymptotic Notations and Basic efficiency classes.

Brute Force, Divide and Conquer

Selection Sort and Bubble Sort, String Matching, Merge-sort, Binary tree Traversals and related properties.

UNIT-IV

Decrease-and-Conquer **10 Hours**

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

Transform and-Conquer, Space and Time Tradeoffs

Presorting, Balanced Search Trees, sorting by Counting, Input Enhancement in String Matching.

UNIT-V

Dynamic Programming **10 Hours**

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

Greedy Technique

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

Text Books:

1. Data Structures Using C and C++ by Yedidyah Langsam and Moshe J. Augenstein and Aaron M Tenanbanum, 2nd Edition,PHI.
2. Anany Levitin: Introduction to the Design and Analysis of Algorithms, 2nd edition, Pearson Education, 2003.

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.
4. Coremen T.H., Leiserson C.E., and Rivest R.L.: Introduction to Algorithms, PHI, 1998
5. "Analysis and design of Algorithms", Padma Reddy, Sri Nandi Publications, 2009
6. 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: Apply the data structures for suitable real time applications.
CO2: Choose and **implement** the appropriate data structures to solve computational problems
CO3: Discuss the basic concepts of algorithms.
CO4: Design and **develop** efficient algorithm for a given problem.
CO5: Determine complexity of algorithms for different types of problems.

Mapping with Program Outcomes:

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

Course Code : P22MCA23	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.
- Understand the relational data model concepts.
- Illustrate queries using SQL for a DBMS application.
- Apply the Normalization concepts to normalize the database and 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:

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: Identify appropriate Primary key and foreign key in an ER model, specify structural constraints on each relationship.
CO4: Compose data retrieval queries in SQL based on assumption and requirements.
CO5: Design and Develop a database application using relation schema with the help of normalization and **Utilize** 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	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	1	-	-	-	-	-	-	-
CO5	3	2	1	1	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA24	Semester : II	L - T - P : 4 : 0 : 0
Course Title : Software Engineering		
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 different types of process models used in 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, 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:

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

CO1: Identify various phases of software process and its significance.
CO2: Understand the professional and ethical responsibilities of a Software Engineer.
CO3: Analyze different system models in software design**.**
CO4: Analyze project management and risk management activities for a given scenario.
CO5: Design software engineering concepts to 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	-	1	-	-	-	-	-	-
CO2	2	3	2	1	-	-	-	-	-	-	-	-
CO3	3	2	2	-	2	1	-	-	-	-	-	-
CO4	2	3	2	2	-	-	-	-	1	-	-	-
CO5	2	2	2	-	2	-	-	-	1	-	-	-
3-Strong; 2-Medium; 1-Low												

ELECTIVE GROUP – I

Course Code : P22MCA251	Semester : II	L - T - P : 3 : 0 : 0
Course Title : Data Warehousing & Data Mining		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Understand the concepts of Data warehousing Architecture and Implementation.
- Describe the Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment
- 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 **8 Hours**

Introduction, Operational Data Stores (ODS), Extraction Transformation Loading (ETL), Data Warehouses, and Guidelines for Data Warehouse Implementation, Data Warehouse Metadata.
OLAP : Introduction, Characteristics of OLAP systems, Data Cube Operations, Guidelines for OLAP Implementation

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 **8 Hours**

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

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 **08 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.

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 Books:

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 theassociation rules to extract appropriate pattern in massive data.
CO4: Describe the different classification techniques
CO5: Illustrate the clustering techniques and outlier analysis in detail for better organization and retrieval of data

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 : P22MCA252	Semester : II	L - T - P : 3 : 0 : 0
Course Title : Model View Control Programming		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	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
- Summarise knowledge of frameworks in the development of Web application
- Analyze the performance of Web frameworks
- Understand MVC based applications using MEAN

UNIT-I

08 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

UNIT-II

08 Hours

Introduction to AngularJS-Key concepts of AngularJS, the core module of AngularJS, The angular global object, AngularJS modules Two-way data binding **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

UNIT-III

08 Hours

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-IV

Creating a MEAN CRUD Module **09 Hours**

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 edit-article view, The list-articles view

UNIT-V

07 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().

Text Books:

1. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication McGraw Hill, 2006
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and SunitBelpure, Publication Wiley, 2009

Reference Book:

1. Marjie T. Britz - Computer Forensics and Cyber Crime: An Introduction – Pearson, 2013
2. Chwan-Hwa (John) Wu,J. David Irwin - Introduction to Computer Networks and Cybersecurity - CRC Press, 2013
3. Bill Nelson, Amelia Phillips, Christopher Steuart - Guide to Computer Forensics and Investigations - cengage Learning, 2013

Course Outcomes:

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

CO1: **Summarize** the concepts of Model, view and controller
CO2: **Apply** Model, view and controller for developing applications using MEAN
CO3: **Design** Web entities for developing web applications using MEAN Frameworks
CO4: **Implement** MVC Framework for enterprise application
CO5: **Apply** MongoDB CRUD operations

Mapping with Program Outcomes:

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	2	3	3	-	2	-	2	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-
CO5	3	3	2	2	-	-	2	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA253	Semester : II	L - T - P : 3 : 0 : 0
Course Title : System Simulation and Modeling		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	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 **08 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 **08 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 **08 Hours**

Characteristics of queuing systems; Queuing notation Simulation Examples: Queuing, Inventory System

UNIT-IV

General Principles **08 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 **08 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.

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: **Identify** the basic concepts in simulation and modelling with respect to real time system.
CO2: **Dertermine** 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: **Discuss** 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	-	-	1	-	-	-	-	-	-	-
CO2	3	3	3	-	2	-	-	-	-	-	-	-
CO3	3	2	3	-	-	2	-	-	-	-	-	-
CO4	3	3	2	-	-	2	-	-	-	-	-	-
CO5	3	3	2	-	-	2	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA254	Semester : II	L - T - P : 3 : 0 : 0
Course Title : Optimization Techniques		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Understand the origin nature and applications of OR study.
- Identify the general model of a LPP and learn to Formulate a mathematical model of a LPP for the given data. Learn to solve the given LPP by different techniques.
- Understand the role of duality in sensitivity analysis
- Analyze different methods to minimize the total transportation and assignment cost in the given problem.
- Learn the concepts of game theory and Metahueristics

UNIT-I

08 Hours

Introduction and Overview of the OR Modeling Approach: The origin of OR, the nature of OR, the impact of OR, defining the problem and gathering data, Formulating a mathematical model, deriving solutions from the model, testing the model, preparing to apply the model, implementation.
Introduction to Linear Programming: Formulation of linear programming problem (LPP), examples, Graphical solution, the LP Model, Special cases of Graphical method, assumptions of Linear Programming (LP), additional example.

UNIT-II

08 Hours

Solving LPP - the Simplex Method:The essence of the simplex method, setting up the simplex method, algebra of the simplex method, the simplex method in tabular form, special cases in the simplex method, tie breaking in the simplex method.
Adopting to other model forms (Two Phase method, Big-M method), Post optimality analysis.

UNIT-III

08 Hours

Duality Theory and Sensitivity Analysis: The essence of duality theory, economic interpretation of duality, primal dual relationship, Properties.
Adapting to other primal forms, the role of duality in sensitive analysis- all types of changes, the dual simplex method. (Problems)

UNIT-IV

08 Hours

Transportation Problems: The transportation problem, General model Initial basic feasible solution by North West corner rule , Vogel's approximation method , Least cost method. Optimal solution by Stepping stone method, u-v method . Unbalanced Transportation problems and Non degeneracy in a Transportation problems.
Assignment problem: General model a special algorithm for the assignment problem Unbalanced Assignment problems, Hungarian method, Maximization problems.

UNIT-V

08 Hours

Game Theory: The formulation of two persons, zero sum games, solving simple games- a prototype example, Games with Mixed Strategies, Using Dominance property, graphical solution procedure.
Metaheuristics: The nature of Metaheuristics, Tabu Search, Simulated Annealing, Generating Algorithms.

Text Books:

1. Frederick S.Hillier& Gerald J.Lieberman, Introduction to Operations Research: Concepts and cases, 9th Edition, Tata McGraw Hill, 2013.
   (Chapters 1.1 to 1.3, 2.1 to 2.6, 3.2 to 3.4, 4.1 to 4.7, 6.1 to 6.6 , 7.1,8.1 to 8.4, 13.1 to 13.4, 14.1 to 14.4)
2. Hamdy A Taha, Operations Research - An Introduction, 8th Edition, Pearson Education, 2007.

Reference Books:

1. Operations Theory and Applications, J.K. Sharma, 5th edition, MacMillan, 2009.
2. Wayne L. Winston, Operations Research Applications and Algorithms, 4th Edition, Cingage Learning, 2003.
3. Richard Bronson and Govindasami Naadimuthu, Theory and Problems of Operations Research, Schaum's Outline, Tata McGraw Hill, 2nd Edition, 1997.

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

CO1: Understand quantitative methods and techniques for model formulation and applications that are used in solving business decision problems.
CO2: Analyze and **Solve** linear programming problems using graphical method and simplex method in different forms **Identify** different methods of solving a LPP.
CO3: Identify the role of duality and sensitivity analysis in OR study.
CO4: Apply different methods to solve transportation and assignment problems for minimum cost.
CO5: Analyze the competitive situations by game theory approach.

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	2	1	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	1	-	-	-	-	-	-	-
CO5	3	2	1	1	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA255	Semester : II	L - T - P : 3 : 0 : 0
Course Title : Software Testing & Practices		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Demonstrate the basic definitions and fundamental concepts in software testing.
- Analyse & identify the different types of errors and fault models
- Discuss various software testing issues and solutions in software unit test, integration and system testing.
- Illustrate the different software testing techniques
- Analyse & identify the approaches for Test Execution and test strategies to test design specifications document.

UNIT-I

Basics of Software Testing **08 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 **08 Hours**

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

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 **08 Hours**

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 **08 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 **08 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	-	-	-	-	-
CO3	3	2	2	1	-	-	-	-	-	-	-	-
CO4	3	2	2	1	-	-	-	-	-	-	-	-
CO5	3	2	2	1	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

ELECTIVE GROUP – II

Course Code : P22MCA261	Semester : II	L - T - P : 2 : 2 : 0
Course Title : Cloud Computing		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	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 **08 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 **08 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 **08 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 **08 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 **08 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: Identify basic concepts and terminologies of cloud computing

CO2: Determine the appropriate cloud services for a given application.

CO3: Analyze the comparative advantages and disadvantages of Virtualization technology.

CO4: Illustrate 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												

Course Code : P22MCA262	Semester : II	L - T - P : 2 : 2 : 0
Course Title : Artificial Intelligence		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	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 **08 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 **08 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 **08 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 **08 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 **08 Hours**

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

Text Books:

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 Outcomes:
On completion of this course, the students should 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: Discuss 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 : P22MCA263	Semester : II	L - T - P : 2 : 2 : 0
Course Title : Object-Oriented Modelling and Design Patterns		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	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 **08 Hours**

What is Object Orientation? What is OO development? Modeling as Design Technique: Modeling; abstraction; the three models.

Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Advanced object and class concepts; Association ends; N-array associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data.

UNIT-II

State Modeling and Advanced State Modeling **08 Hours**

State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior.

Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model.

UNIT-III

Interaction Modeling, Advanced Interaction Modeling, Process Overview, System Conception **08 Hours**

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.

UNIT-IV

08 Hours

System 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.

UNIT-V

Patterns and Design Patterns **08 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.

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	-	1	-	-	-	-	-	-	-
CO2	3	2	2	1	1	-	-	-	-	-	-	-
CO3	3	2	2	1	1	-	-	-	-	-	-	-
CO4	3	2	2	1	1	-	-	-	-	-	-	-
CO5	2	2	2	1	1	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA264	Semester : II	L - T - P : 2 : 2 : 0
Course Title : Computer Graphics with Open GL		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Understand the basics of Application Programming Interface (API) implementation in OpenGL.
- Understand the mathematical and theoretical principles of computer graphics
- Discuss the device-level algorithms for implementing OpenGL primitives.
- 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 techniques of Computer animation.
- Describe mathematical specification of Bezier Spline Cueves.

UNIT-I

Graphics Output Primitives and Attributes **08 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, Fill area primitives, Polygon fill areas, OpenGL polygon fill area functions, General scan line polygon fill algorithm, Fill methods for areas with irregular boundaries, Open GL fill area attribute functions.

UNIT-II

Two – Dimensional and Three - Dimensional Geometric Transformations **08 Hours**

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

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

UNIT-III

Two Dimensional Viewing **08 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-IV

Three Dimensional Viewing **08 Hours**

The three dimensional viewing concepts, Three dimensional viewing pipeline, Three dimensional viewing coordinate parameters, Transformation from world to viewing coordinates, Projection transformations, Orthogonal projections, Oblique parallel projections, Perspective projections, The viewport transformation and three dimensional screen coordinates.

UNIT-V

Curves and Computer Animation **08 Hours**

Bezier spline curves, Raster methods for computer animation, Design of animation sequences, Traditional animation techniques, General computer animation functions.

Text book:

1. Donald Hearn, M.Pauline Baker, Computer Graphics with Open GL, Pearson (Indian Edition), Fourth Edition. Chapters and topics [2.9, 3.1-3.5, 3.9, 3.10, 3.14-3.16, 4.10, 4.13, 4.14, 5.1-5.5, 5.10-5.15, 5.17, 6.1-6.3, 6.5-6.10, 7.1-7.9, 8.10, 13.1-13.4]

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:

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

CO1: **Understand** the basic concepts of Computer graphics interfaces in OpenGL to draw simple objects.
CO2:**Analyze** line drawing, clipping algorithms and rasterization techniques and interaction with input devices
CO3:**Develop** mathematical transformations and vector techniques in the production of computer graphics.
CO4: **Identify** and apply different types of viewing. shading and projections to create 2D or 3D images in OpenGL.
CO5:**Construct** a scene and generate views of the scene by applying suitable viewing transformation algorithms.

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	-	-	-	-	-	-	-
CO3	2	2	3	-	1	-	-	-	-	-	-	-
CO4	3	2	2	-	1	-	-	-	-	-	-	-
CO5	2	2	3	-	1	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA265	Semester : II	L - T - P : 2 : 2 : 0
Course Title : Cyber Security		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Apply IT ACT (Cyber law) to the given case/problem and infer from the given case and analyse the gap if exists and analyse the working of cyber security principles in designing the system.
- Discuss tools and methods used in Cybercrime
- Analyse Security Challenges and Attacks on Mobile/Cell Phones
- Analyse the given problem develop a strategy to mitigate the problem and articulate consequences on Society and National Economy.
- Discuss Social, Political Ethical and Psychological Dimensions on Cybercrime

UNIT-I

Introduction to Cybercrime **08 Hours**

Introduction, Cybercrime: Definition and Origins of the word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes.

Cyberoffenses: How Criminals Plan the Attacks

Categories of Cybercrime. How Criminals Plan Attacks? Social Engineering, Cyber stalking, Cybercafe and Cybercrimes, Botnets, Attack Vector, The Indian ITA 2000.

UNIT-II

Tools and Methods used in Cybercrime **08 Hours**

Introduction, Proxy Server and Anonymizers, Phishing, Password Cracking, Keyloggers and Spyware, Virus and Worms, Trojan Horses and backdoors, Steganography, DOS and DDOS attack, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

UNIT-III

Cybercrime: Mobile and Wireless Devices **08 Hours**

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing, Security Challenges posed by Mobile Devices, Attacks on Mobile/Cell Phones.

Phishing and Identity Theft

Introduction, Phishing – Methods of Phishing, Phishing Techniques, Phishing Toolkits and Spy Phishing. Identity Theft – PII, Types of Identity Theft, Techniques of ID Theft

UNIT-IV

Understanding Computer Forensics **08 Hours**

Introduction, historical background of Cyber forensics, Need for Computer Forensics, Cyber forensics and Digital Evidence, Digital Forensics Life Cycle. Forensics and Social Networking Sites: The Security / Privacy Threats, Special Toolkit and Techniques.

Forensics of Hand-Held devic Understanding Cell Phone Working Characteristics, Hand-held devices and digital Forensics. Toolkits of Hand-Held Device Forensics. An illustration on Real life Use of Forensics

UNIT-V

Cybercrime and Cyberterrorism: Social, Political Ethical and Psychological Dimensions 08 Hours
Introduction, Intellectual Property in the Cyberspace, The ethical dimension of Cybercrimes, The Psychology, Mindset and shoes of Hackers and Cybercriminals, Sociology of Cybercriminals, Information Warefare: perception or An Eminent Reality.

Text Book:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, by Nina Godbole and Sunit Belapure, Wiley.

Reference Books:

1. Marjie T. Britz - Computer Forensics and Cyber Crime: An Introduction - Pearson
2. Chwan-Hwa (John) Wu,J. David Irwin - Introduction to Computer Networks and Cyber security – CRC Press.
3. Bill Nelson, Amelia Phillips, Christopher Steuart - Guide to Computer Forensics and Investigations - Cengage Learning.

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

CO1: **Explain** cyber security concepts and applications
CO2: **Discuss** tools and methods used in Cybercrime
CO3: **Analyze** Security Challenges and Attacks on Mobile/Cell Phones
CO4: **Illustrate** appropriate techniques to solve cyber security threats
CO5: **Explain** Social, Political Ethical and Psychological Dimensions on Cybercrime

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	1	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	1	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCAL27	Semester : II	L - T - P : 0 : 0 : 2
Course Title : Database Management Systems Lab with Mini Application		
Credits : 1	Contact Period : 2 Hrs/Week, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Understand and evaluate the role of database management systems in information technology applications.
- 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
- Apply the concepts and techniques relating to query processing by SQL engines.
- Develop a database application using any of the front-end commercial application products (Visual Basic, etc.)

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.

Note: Students have to implement a mini application using Database concepts.

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

CO: Construct an ER-model, Relation schema for a given problem and **Exhibit** SQL queries for data retrieval based on requirements.

Mapping with Program Outcomes:

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

Course Code : P22MCAL28	Semester : II	L - T - P : 0 : 0 : 2
Course Title : Data Structures with Algorithm Lab		
Credits : 1	Contact Period : 2 Hrs/Week, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Demonstrate the basic concepts of algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Implement 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 greedy techniques.

1. 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.

2. 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).

3. Write C program using recursive function
   a. To find the nth factorial
   b. To print the nth Fibonacci number
   c. To solve Tower of Hanoi problem

4. Write C Program to simulate the working of a queue of integers using arrays. Provide the following operations:
   a. Insert
   b. Delete
   c. Display

5. Implement 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

6. Implement a menu driven program in c for the following operation on Singly Linked List (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

7. 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.

8. Sort a given set of elements using Selection sort method and determine the time required to sort the elements.

9. Implement Pattern-Matching using Brute Force technique.

10. Write a program to print all the nodes reachable from a given starting node in a digraph using BFS method.

11. Write a program check whether a given graph is connected or not using DFS method.

12. Implement Horspool algorithm for String Matching.

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

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

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

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

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

CO: Design algorithms using various techniques with appropiate data structures 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	-	1	1	-	-	1	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA29	Semester : II	L - T - P : 0 : 0 : 2
Course Title : Technical Seminar		
Credits : 1	Contact Period : 2 Hrs/Week	Weightage : CIE : 100%

Guidelines for Technical Seminar:

- Each student must present a unique topic on emerging technologies.
- The CIE marks awarded for Technical Seminar shall be based on the evaluation of Seminar Report and Presentation skill with Question-and-Answer session in the ratio of 40:60.

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

CO1: Analyze relevant topic in computer science / research-based knowledge.
CO2: Enhance self-learning skills.
CO3: Compilation of information with 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	-	3	-	2	-	2	-
CO3	-	-	-	-	-	-	3	-	3	-	-	-
3-Strong; 2-Medium; 1-Low												

Scheme of Evaluation:

Course code	Title	Internal (CIE)		Total Marks
		Report	Presentation	
P22MCA29	Technical Seminar	40	60	100

Rubrics for Technical Seminar Presentation Assessment

Particulars	Excellent (12)	Good (10)	Satisfactory (8)	Poor (4)	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 (10)	Good (8)	Satisfactory (5)	Poor(2)	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 efficiently.	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 the HOD

Course Code : P22MHU210	Semester : II	L - T - P : 0 : 2 : 0
Course Title : Employability Enhancement Skills-2 (EES-2)		
Credits : 0	Contact Period : 32 Hrs, Exam: 2 Hrs	Weightage : CIE : 100%

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

06 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

07 hours

Vocabulary builder - Gaining increased momentum 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.

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.

UNIT–III

07 hours

Sharpen your axe!!
Vedic mathematics:
Vinculum and de- vinculum, subtractions using vinculum. Nihilism multiplication: For numbers close to base values, multiplication of any two digit numbers or three digits number using crises 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.

Get hands on multiplication tables, increasing the speed in basic arithmetic operations. Classification of numbers.

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.

Thorough with fractions and decimal values. Applications of tabulated fractions. Product of means and extremes.

UNIT–IV

Analytical Reasoning 1: series **06 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.

Basic knowledge of letter positions, Different number series for example–even, odd, prime, opposite etc.

UNIT–V

06 hours

Number system:

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.

Basic arithmetic operations, knowledge about quotient and remainders, multiples and factors.

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.

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	-	-	3	2	-	3	1	1	-
CO5	2	3	3	-	-	3	2	-	3	1	1	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA31	Semester : III	L - T - P : 4 : 0 : 0
Course Title : Machine Learning using python		
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 and comprehend the basics of python programming
- Understand the basic knowledge of the use of dataframes and visualization techniques in python
- Learn how to build and evaluate the supervised and un supervised models
- Understand the various classification problems
- Discuss the different clustering methods

UNIT – I

11 Hours

Introduction To Machine Learning
Introduction to Analytics and Machine Learning, Why Machine Learning? Framework for Developing Machine Learning Models, Why Python?, Python Stack for Data Science, Getting Started with Anaconda Platform, Introduction to Python

UNIT – II

11 Hours

Descriptive Analytics
Working with DataFrames in Python, Handling Missing Values, Exploration of Data using Visualization

UNIT – III

Linear Regression **10 Hours**
Simple Linear Regression, Steps in Building a Regression Model, Building Simple Linear, Regression Model, Model Diagnostics, Multiple Linear Regression.

UNIT – IV

10 Hours

Classification Problems
Classification Overview, Binary Logistic Regression, Credit Classification, Gain Chart and Lift Chart, Classification Tree (Decision Tree Learning).

UNIT – V

10 Hours

Advanced Machine Learning
Scikit-Learn Library for Machine Learning, Advanced Machine Learning Algorithms.
Clustering
Overview, How Does Clustering Work? K-Means Clustering, Creating Product Segments Using Clustering, Hierarchical Clustering.

Text Book:
1. Machine Learning using Python, Manaranjan Pradhan, U Dinesh Kumar, Wiley India Pvt. Ltd., 2019 (Chapters: 1, 2, 4, 5, 6.3, 6.5, 7)

Reference Books:

1. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf, 2013.
2. Learning with Python: How to Think Like a Computer Scientist Paperback – Allen Downey , Jeffrey Elkner, 2015.
3. Jake Vander plas, "Python Data Science Handbook: Essential tools for working with data", O'Reilly Publishers, I Edition.
4. Hands-On Machine Learning with Scikit-Learn and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems, Aurelien Geron, O'Reilly Publisher , I edition, 2017

Course Outcomes:

After completion of this course the student will be able to

CO1: Apply appropriate data analysis techniques for model building and visualization of the data analysis using python built in functions

CO2: Design and **Develop** supervised and unsupervised learning models for a given problem

CO3: Evaluate the machine learning models using various measuring techniques

CO4: Distinguish between different classification techniques

CO5: Implement various learning algorithms for the given dataset.

Mapping with Program Outcomes:

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

Course Code : P22MCA32	Semester : III	L - T - P : 4 : 0 : 0
Course Title : Internet of Things (IOT)		
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:

- 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

10 Hours

Introduction: IoT definition , Characteristics of IoT , Physical Design of IoT, Logical Design of IoT ,IoT Protocols , IoT Levels & Deployment Templates
Domain Specific IoT : Introduction , Home Automation , Cities, Environment, Energy , Retail, Logistics, Agriculture, Industry, Health & Lifestyle

UNIT-II

11 Hours

IOT and M2M; Introduction, Difference between IoT and M2M,
SDN and NFV for IoT : Software Defined Networking, Network Function Virtualization
IoT System management with NETCONF-YANG- Need for IoT Systems management
Simple Network Management Protocol(SNMP); Network Operator Requirements NETCONF;YANG; IoT Systems management with NETCONF-YANG; NETOPEER

UNIT-III

11 Hours

IoT Platforms Design Methodology: Introduction; IoT Design Methodology; Case Study on IoT System for Weather Monitoring; Motivation 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

IOT Physical Devices & Endpoints: 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 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

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: Explain the application areas of IOT.
CO3: Acquire knowledge M2M Technology and IoT system management.
CO4: Develop design methodologies and develop IoT system using python.
CO5: Implement 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	1
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA33	Semester : III	L - T - P : 3 : 0 : 0
Course Title : Management Information System		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Demonstrate the Role of information system in the Today's Global Business
- Discuss business intelligence of software industry & IT infrastructure
- Illustrate the digital marketing and managing knowledge in Industry
- Analyse the decision making concepts for building and managing information systems in an organization
- Discuss the project management principles for managing the system

UNIT-I

Information Systems in Global Business Today **08 Hours**

The Role of Information Systems in Global Business Today, Perspective on Information Systems, Contemporary Approaches to Information Systems Global E-Business and collaboration: Business Process and Information Systems, Types of Business Information Systems, The Information Systems Function in Business. Information Systems. What is an Organization? How Information Systems Impact Organizations and Business Firms.

UNIT-II

Information Technology Infrastructure **08 Hours**

IT Infrastructure, Infrastructure Components, Contemporary Hardware Platform Trends, Contemporary Software Platform Trends.

Foundation of Business Intelligence: Databases and Information Management

Organizing Data in a Traditional File Environment, the Database Approach to Data Management, Using Database to Improve Business Performance and Decision Making.

UNIT-III

Key system Applications for the Digital Age **08 Hours**

Enterprise Systems, Supply Chain Management Systems, Customer Relationship Management Systems, Enterprise Applications: New Opportunities and Challenges

E-Commerce: Digital Markets, Digital Goods

Electronic Commerce and the Internet, M-Commerce, Electronic Commerce, Electronic Commerce payment systems.

UNIT-IV

Managing Knowledge **08 Hours**

The Knowledge Management Landscape, Enterprises-Wide Knowledge Management Systems, Knowledge Work Systems **Enhancing Decision Making** Decision Making and Information Systems, Systems for Decision support, Executive support systems (ESS) and the Balanced Scorecard.

UNIT-V

Building and Managing Systems **08 Hours**

Systems as Planned Organizational Change, Overview of Systems Development, Alternative Systems-Building Approaches, Application Development for the digital firm.

Managing Projects the Importance of Project Management, Selecting Projects, Establishing the Business Value of Information Systems, Managing Project Risk.

Text Book:

1. Kenneth C.Laudon, Jane P.Laudon: Management Information Systems Managing the Digital Firm, 12thEdition, Pearson Education, 2015.

Reference Books:

1. Kenneth C. Laudon, Jane P. Laudon: Management Information Systems Managing the Digital Firm, 1st Edition, Pearson Education, 2010.
2. Laudon & Laudon: Essentials of Management Information Systems, 8thEdition, Pearson Education, 2009.
3. McLeod & Schell: Management Information Systems, 10th Edition, Pearson Education, 2007.

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

CO1: **Explain** the importance and role of information in present global business
CO2: **Outlines** the information in business intelligence and IT infrastructure
CO3: **Understands** digital marketing and how to manage knowledge
CO4: **Analyses** the role of information in decision support systems in an organization
CO5: **Understands** the principles for project management and system management

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												

ELECTIVE GROUP – III

Course Code : P22MCA341	Semester : III	L - T - P : 3 : 0 : 0
Course Title : Big Data and Analytics		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	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.
- Outline the management of NoSQL data.
- Summarise different types of analytics.
- Understand the various data visualization techniques.

UNIT-I

Getting an Overview of Big Data and Hadoop Ecosystem **08 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 **08 Hours**

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 **08 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 **08 Hours**

Comparing Reporting and Analysis, Reporting, Analysis, The Analytic Process, Types of Analytics, Basic Analytics, Advanced Analytics, Operational zed 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 **08 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.

Text book:

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, BM Corporation, 2012
3. Big Data Analytics with R and Hadoop, Vignesh Prajapati, 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: Analyze the significance and importance of Big Data and Analytics
CO2: Determine the HADOOP and Map Reduce technologies associated with Big Data analytics
CO3: Apply big data for business decisions and strategy.
CO4: Identify appropriate models of data analysis to solve hidden solutions to business-Related challenges.
CO5: Apply Visualization tools for data representation effectively for given real time solutions

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 : P22MCA342	Semester : III	L - T - P : 3 : 0 : 0
Course Title : Block chain Technology		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- To understand the basic concepts of distributed computing on which Blockchain technology
- To Illustrate concept of Decentralization and its relationship with blockchain technology.
- To understand that how various security services in Cryptography
- Outline the technical concepts related to Bitcoin cryptocurrency
- Explain the underlying principles, features, and components of Ethereum blockchain

UNIT-I

Blockchain **08 Hours**

Distributed systems, CAP theorem, Byzantine Generals problems, Consensus. The history of blockchain, Introduction to blockchain, various technical definitions of blockchains, Generic elements of a blockchain, Features of a blockchain, Applications of blockchain technology, Tiers of blockchain technology, Consensus in blockchain, CAP theorem and blockchain,

UNIT-II

Decentralization **08 Hours**

Decentralization using blockchain, Methods of decentralization, Blockchain and full ecosystem decentralization, Smart contract, Decentralized organizations, Decentralized autonomous organizations, Decentralized autonomous corporations, Decentralized autonomous societies, Platforms for decentralization

UNIT-III

Cryptographic primitives **08 Hours**

Symmetric cryptography, Asymmetric cryptography, Public and private keys, Hash functions: Compression of arbitrary messages into fixed length digest. Easy to compute, Pre-image resistance, Second pre-image resistance, Collision resistance, Message Digest(MD), Secure Hash Algoriths (SHAs),Merkle trees, Patricia trees, Distributed hash tables(DHTs), Digital signatures, Elliptic Curve Digital signature algorithm(ECDSA)

UNIT-IV

Bitcoin **08 Hours**

Bitcoin definition, Transactions, The transaction life cycle, The transaction structure Types of transaction, The structure of a block, The structure of a block header, The genesis block, The bitcoin network, Wallets, Smart Contacts-History, Definition, Ricardian contracts, Smart contract templates, Oracles, Smart Oracles, Deploying smart contracts on a blockchain, The DAO.

UNIT-V

Ethereum **08 Hours**

Introduction, Ethereum clients and releases, The Ethereum stack, Ethereum blockchain, Currency (ETH and ETC), Forks, Gas, The consensus mechanism, The world state, Transactions, Contract creation transaction, Message call transaction, Elements of the Ethereum blockchain, Ethereum virtual machine (EVM), Accounts, Block, Ether, Messages, Mining.

Text Book:

1. Imran Bashir "Mastering BlockChain", Packt.

Reference Books:

1. Mastering Bitcoin: Programming the Open Blockchain Paperback-2017 by Andreas M O'rielly Bitcoin Press, 2016.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. and cryptocurrency technologies: a comprehensive introduction. Princeton

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

CO1: Analyze the block chain applications in a structure manner.
CO2: Explain the modern concepts of block chain technology systematically.
CO3: Illustrate the Public and private keys, Digital signature.
CO4: Identify and explain the modern currencies and its market usage.
CO5: Apply the learning of solidity and de-centralized apps on Ethereum

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	1	-	-	-	-	-	-	-
CO4	3	2	2	1	1	-	-	-	-	-	-	-
CO5	3	2	2	1	1	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA343	Semester : III	L - T - P : 3 : 0 : 0
Course Title : Computer Vision		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Understand computer vision
- Learn Image representation and Image analysis
- Discuss different filters
- Identify the image enhancement techniques
- Learn different compression techniques

UNIT-I

Introduction to Computer Vision and Image Processing **08 Hours**

Overview: Computer Imaging, Computer Vision, Image Processing, Computer Imaging Systems, Human Visual Perception: The Human Visual System, Spatial Frequency Resolution, Brightness Adaptation, Temporal Resolution. Image Representation: Binary Images, Gray-Scale Images, Color Images, Multispectral Images. Digital Image File Formats.

UNIT-II

Image Analysis **08 Hours**

Introduction: overview, System Model. Preprocessing: Region-of-Interest Image Geometry, Image Algebra, Spatial Filters. Edge/Line. Detection: Roberts Operator, Sobel Operator, Prewitt Operator, Laplacian Operators, Hough Transform. Segmentation: Overview, Region Growing and SHrsinking, Clustering Techniques, Boundary Detection, Morphological Filtering. Discrete Transforms: Fourier Transform, Cosine Transform, Wavelet Transform. Feature Extraction and Analysis: Feature Vector and Feature Spaces, Binary Object Features.

UNIT-III

Image Restoration **08 Hours**

Introduction: System Model, Noise, Noise Removal Using Spatial Filters: Order Filters, Mean Filters, Adaptive Filters-Minimum Mean-Square Error Filter. Frequency Domain Filters: Inverse Filter, Wiener Filter, Constrained Least-Squares Filter, Geometric Mean Filters, Notch Filter. Geometric Transforms: Spatial Transforms.

UNIT-IV

Image Enhancement **08 Hours**

Introduction, Gray-Scale Modification: Histogram Modification, Adaptive Contrast Enhancement, Color. Image Sharpening: Highpass Filtering, High-Frequency Emphasis, Homomorphic Filtering, Unsharp Masking. Image Smoothing: Mean and Median Filtering, Lowpass Filtering.

UNIT-V

Image Compression **08 Hours**

Introduction: Fidelity Criteria, Compression System Model. Lossless Compression Methods: Huffman Coding, Run-Length Coding, Lempel-Ziv Welch Coding, Arithmetic Coding. Lossy Compression Method: Gray-Level Run-Length Coding, Block Truncation Coding, Vector Quantization, Differential Predictive Coding, Transform Coding, Hybrid Methods.

Text Book:
1.Scott E Umbaugh,"Computer vision and Image processing", International Edition

Reference Books:
1. Robert Haralick and Linda Shapiro,"Computer and Robot Vision", Vol I,II,AddisonWesley, 1993.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision: Thomson Learning.

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

CO1:Describe human visual perception and computer vision
CO2:Explain region growing and shrinking methods
CO3:Apply different edge and line detection operators
CO4:Identify different lossless and lossy compression methods
CO5:Analyse image smoothing filters

Mapping with Program Outcomes:

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

Course Code : P22MCA344	Semester : III	L - T - P : 3 : 0 : 0
Course Title : Cryptography and Network Security		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	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 **08 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 **08 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 **08 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 Pretty Good Privacy (PGP), S/MIME. **08 Hours**
IP Security
IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

UNIT-V

Web Security **08 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: Identify security services for a given network model
CO2: Understand various data encryption schemes and apply on a network model
CO3: Discuss various authentication functions and its applications
CO4: Determine security management of a given IP network model
CO5: Analyse 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	-	-	-	-	-	-
CO2	3	3	3	-	-	3	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	2	3	2	-	-	2	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA345	Semester : III	L - T - P : 3 : 0 : 0
Course Title : Business Intelligence - Data Warehousing and Analytics		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	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 modelling
- Identify the metrics, KPIs and make recommendation to achieve the business goal in a given business scenario
- Interpret enterprise reports and design enterprise dashboard

UNIT-I

Introduction to Business Intelligence **08 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) **08 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 **08 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 **08 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 **08 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.

Course Outcomes:
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 objectivesusing 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	-	-	-	-	-	-	-
CO3	3	2	2	-	2	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

ELECTIVE GROUP – IV

Course Code : P22MCA351	Semester : III	L - T - P : 2 : 2 : 0
Course Title : Mobile Application Development		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	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 **07 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 **08 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 **08 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 **08 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: Supported Android Sensors, Introducing Virtual Sensors, monitoring a Device's Movement and Orientation, Introducing the Environmental Sensors.

UNIT-V

Maps, Geocoding, And Location-Based Services **09 Hours**

Using Location-Based Services, Selecting a Location Provider, Finding Your Current Location, Best Practice for Location Updates, Using the Geocoder.

Audio, Video, And Using The Camera: Playing Audio and Video: Introducing the Media Player, Preparing Audio for Playback, Preparing Video for Playback, Using Audio Effects, Using the Camera for Taking Pictures: Camera Settings and Image Parameters.

Text Book:

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 Book:

1. Jerome (J.F.) DiMarzio: Android A Programmer's Guide, Tata McGraw-Hill, 2010.
2. B.M. Harwani: Android Programming, Pearson, 2013.

Note: In tutorial, some of the Programs based on the concepts are developed and executed, to get practical knowledge on Mobile Application development and at the end of the course students should come out with case study, which carries a weightage of 20% of CIE.

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

CO1: Understand the Fundamentals of Mobile Application Development.
CO2: **Describe** 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

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	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 : P22MCA352	Semester : III	L - T - P : 2 : 2 : 0
Course Title : Software Project Management		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Discuss the scope of software project management and adapt the software project evaluation principles.
- Explain the project planning approach and apply the software effort estimation techniques.
- Determine the appropriate process model and produce activities plan
- Manage the risks, monitor the progress of projects and manage the change control.
- Handle the resource allocation and practice the software quality standards.

UNIT I

Introduction to Software Project Management and Project Evaluation: Importance of Software Project Management, Activities, Methodologies, Categorization of Software Projects, Setting objectives, Management Principles, Management Control, Project portfolio Management, Cost-benefit evaluation technology, Risk evaluation.

UNIT II

Project Planning and Effort Estimation: Stepwise Project Planning, Basics of Software estimation, Effort estimation techniques, COSMIC Full function points, COCOMO II A Parametric Productivity Model.

UNIT III

Project Approach Selection and Activity Planning: Software process and Process Models, Choice of Process models, Rapid Application development, Agile methods, Extreme Programming, SCRUM, Objectives of Activity planning, Project schedules, Activities, Sequencing and scheduling, Network Planning models, Forward Pass and Backward Pass techniques, Critical path (CRM) method.

UNIT IV

Risk Management and Project Monitoring: Risk identification, Assessment, Monitoring, PERT technique, Framework for Management and control, Collection of data Project termination, visualizing progress, Cost monitoring, Earned Value Analysis-Project tracking, Change control - Software Configuration Management.

UNIT V

Resource Allocation and Software Quality: Resource Allocation, Creation of critical paths, Software Quality in Project Planning, Software Quality Models, Product and Process Metrics and Quality Management, Quality Management Systems, Process Capability Models.

Text Book:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management, 6th Edition, Tata McGraw Hill, New Delhi, 2018.

(Chapters: 1.1 to 1.16, 2.1 to 2.6, 3, 4.1 to 4.5, 4.13 to 4.16, 5.1 to 5.13, 6, 7.1 to 7.12, 8.1 to 8.5, 9, 13.1 to 13.5, 13.7 to 13.10)

Reference Books:

1. Robert K. Wysocki: Effective Software Project Management, Wiley Publication, 2011.
2. Walker Royce: Software Project Management, Addison-Wesley, 1998. 3. Gopalaswamy Ramesh: Managing Global Software Projects, McGraw Hill Education (India), Fourteenth Reprint, 2013.

Course Outcomes:

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

CO1: Apply the practices and methods for successful software project management
CO2: Identify techniques for requirements, policies and decision making for effective resource management
CO3: Illustrate the evaluation techniques for estimating cost, benefits, schedule and risk
CO4: Understand a framework for software project management plan for activities, risk, monitoring and control
CO5: Design a framework to handle the resource allocation and practice the software quality standards.

Mapping with Program Outcomes:

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

Course Code : P22MCA353	Semester : III	L - T - P : 2 : 2 : 0
Course Title : Deep Learning		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Recall the concepts of machine learning.
- Illustrate fundamental principles of deep networks.
- Demonstrate various deep learning networks.
- Analyze various layers in deep networks.
- Evaluate training, debugging, evaluating a Deep network architecture.

UNIT-I

Review of Machine learning and Foundations of Neural Networks and Deep Learning **08 Hours**
The math behind Machine learning-Linear algebra and Statistics, evaluating models, Neural Networks, Training Neural Networks, Activation Functions, Loss Functions, Hyperparameters.

UNIT-II

Fundamentals of Deep Networks **08 Hours**
Defining Deep Learning, Common architectural principles of Deep Networks-Parameters, Layers, Activation functions, Loss functions, Hyperparameters, Building blocks of Deep Networks-RBMs, and Autoencoders.

UNIT-III

Major architectures of Deep Networks **08 Hours**
Convolutional Neural Networks-Biological inspiration, Intuition, CNN architecture overview, Input Layers, Convolutional layers, Pooling layers, Fully Connected layers, Recurrent Neural Networks-Modelling the time dimension, 3D Volumetric input, General RNN architecture, LSTM networks, Domain specific Applications, When do I need deep learning?

UNIT-IV

Tuning Deep Networks **08 Hours**
Basic concepts, Matching Input data and Network architectures, Relating Model Goal and Output layer, Working with layer count, Parameter count, and memory, Weight initialization strategies, Using activation functions, Understanding learning rates, Controlling epochs and Mini-batch size, How to use regularization, using network statistics from the tuning.

UNIT-V

Tuning Specific Deep Network Architectures **08 Hours**
CNN-Common Convolutional Architectural patterns, Configuring Convolutional layers, Configuring Pooling layers, Transfer learning, Recurrent Neural Networks (RNN)-Network Input data and input layers, Output Layers, Training the network, Debugging common issues with LSTMs, Padding and Masking, Evaluation and Scoring with masking.

Text Book:

1. Josh Patterson and Adam Gibson, Deep Learning, A practitioner's approach, First edition, Shroff Publishers and Distributors Pvt. Ltd., 2017

Reference Books:

1. DouweOsinga, Deep learning Cookbook, Shroff Publishers and Distributors Pvt. Ltd., 2018.
2. Ian Goodfellow and YoshuaBengio and Aaron Courville, Deep Learning, MIT Press, Jan 2017

Note: At the end of the course students should come out with various Case study Report which covers the concept of Deep Learning Networks that is discussed in Tutorial class. It carries a weightage of 20% marks of CIE.

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

CO 1: **Outline** the machine learning techniques along with knowledge base.
CO2: Discuss the applications deep neural networks.
CO3: Apply various deep networks.
CO4: Illustrate the various deep learning models.
CO5: Demonstrate a specific deep network architecture.

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	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	1	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA354	Semester : III	L - T - P : 2 : 2 : 0
Course Title : NOSQL		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Understand fundamentals concepts of NOSQL, Storing data in NOSQL and Accessing data in NOSQl.
- Outline the CRUD operations.
- Understand how Hive provides a SQL for Hadoop Map Reduce tasks.
- Choose the right database to facilitate ease of application development.
- Apply the actions to perform with the PHP driver and few functions to execute in the MongoDB shell.

UNIT-I

Introduction to NOSQL **08 Hours**

Definition of NOSQL, History of NOSQL and Different NOSQL products, Exploring MongoDB Java/Ruby/Python, Interfacing and Interacting with NOSQL

UNIT-II

NOSQL Basics **08 Hours**

NOSQL Storage Architecture, CRUD operations with MongoDB, Querying, Modifying and Managing NOSQL Data stores, Indexing and ordering datasets (MongoDB/CouchDB/Cassandra)

UNIT-III

Advanced NOSQL **08 Hours**

NOSQL in CLOUD, Parallel Processing with Map Reduce, BigData with Hive

UNIT-IV

Working with NOSQL **08 Hours**

Surveying Database Internals, Migrating from RDBMS to NOSQL, Web Frameworks and NOSQL, using MySQL as a NOSQL

UNIT-V

Developing Web Application with NOSQL and NOSQL Administration **08 Hours**

PHP and MongoDB, Python and MongoDB, Creating Blog Application with PHP,NOSQL Database Administration

Text Books:

1. Professional NOSQL,Shashank Tiwari,WROX Press.

2. The Definitive Guide to Mongo DB, The NOSQL Database for cloud and Desktop Computing Eelco Plugge, Peter Membreyand Tim Hawkins APress.

Reference Books:

1. MongoDB Basics,Peter Membrey ,David Hows , Eelco Plugge, 1st Edition, 2014, Apress.
2. Web Development with MongoDB and NodeJS , Mithun Satheesh ,Bruno Joseph D'mello, Jason Krol,2nd Edition, Kindle Edition.

Note: At the end of the course students should come out with case study, It carries a weightage of 20% of CIE.

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

CO1: Explain the concepts of unstructured data
CO2: Analyze and Manage the Data using CRUD operations
CO3: Develop the applications using NoSQL
CO4: Apply the concept of Map Reduce in the real world application development
CO5: Develop web application using PHP and MangoDB in the NOSQL framework

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	-	-	-	-	-	-	-
CO4	3	2	2	-	1	-	-	-	-	-	-	-
CO5	3	2	2	-	1	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA355	Semester : III	L - T - P : 2 : 2 : 0
Course Title : Digital Image Processing		
Credits : 3	Contact Period : 40 Hrs, Exam: 3 Hrs	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 **08 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 **08 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 **08 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 **08 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 **08 Hours**

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

Image Compression: Image Compression Models, Compression Algorithm and its types.

Text Books:

1."Digital Image Processing", Rafael C. Gonzalez and Richard E.Woods Pearson Education, 2009, 3rd Edition.

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

Reference Books:

1."Fundamentals of Digital Image Processing", Anil K. Jain, Pearson Edition, 2001. ISBN: 9788120309296, 8120309294

2. "Digital Image Processing" S. Jayaraman and others. ISBN: 9780070144798, 0070144796

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

CO1: Design different image processing stages for given problem statement
CO2: Identify spatial/frequency domain using various methods
CO3: Implement image enhancement & segmentation technique for a given image
CO4: Illustrate image restoration algorithms
CO5: 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	2	1	1	-	1	-	-	-	-	-
CO3	3	3	2	1	1	-	1	-	-	-	-	-
CO4	3	3	2	1	-	-	1	-	-	-	-	-
CO5	3	3	2	1	1	-	1	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCAL36	Semester : III	L - T - P : 0 : 0 : 2
Course Title : Machine Learning Lab with Mini Application		
Credits : 1	Contact Period : 2 Hrs/Week, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Learn how to design and program Python applications
- Understand data pre-processing, analysis and data visualization using Python libraries
- Implementation of Supervised learning models on dataset to do prediction
- Implementation of unsupervised learning models with performance analysis

1. Write simple python programs to understand the Basic Libraries such as Statistics, Math, Numpy and Scipy
2. Python programs to show the usage of Python Libraries for ML application such as Pandas, Matplotlib and Seaborn
3. Write a Python program to implement Simple Linear Regression
4. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
5. Implementation of Decision tree using sklearn and its parameter tuning
6. Implementation of KNN using sklearn
7. Implementation of Logistic Regression using sklearn
8. Implementation of K-Means Clustering

Note: Implement a mini application using Python choosing an appropriate data set

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

CO: Design and **Implement** the Machine Learning algorithms using Pyton language

Mapping with Program Outcomes:

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

Course Code : P22MCAL37	Semester : III	L - T - P : 0 : 0 : 2
Course Title : IOT Lab		
Credits : 1	Contact Period : 2 Hrs/Week, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Demonstrate the IoT architecture and design for a given problem
- Apply IOT architecture for a given problem Analyse the application protocol
- Transport layer methods for the given business case.
- Design and develop an application for the given problem
- Develop python program for the given problem and verify the output

1. Run some python programs on Pi like:
    a. Read your name and print Hello message with name
    b. Read two numbers and print their sum, difference, product and division.
    c. Word and character count of a given string
    d. Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input
    e. Print a name'n' times, where name and n are read from standard input, using for and while loops. Handle Divided by Zero Exception.
    f. Print current time for 10 times with an interval of 10 seconds.
    g. Read a file line by line and print the word count of each line.
2. Get input from two switches and switch on corresponding LEDs
3. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
4. Switch on a relay at a given time using CRON, where the relay's contact terminals are connected to load.
5. Access an image through a Pi Web CAM
6. Control a light source using web page.
7. Implement an intruder system that sends an alert to the given email.
8. Get the status of a bulb at a remote place (on the LAN) through web
9. Get an alarm from a remote area (through LAN) if smoke is detected.
10. The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.

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

CO: Design and develop IOT applications using Rasbery Pi and Supported components
Mapping with Program Outcomes:

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

3-Strong; 2-Medium; 1-Low

Course Code : P22MCA38	Semester : III	L - T - P : 0 : 0 : 4
Course Title : Project Work Phase - 1		
Credits : 2	Contact Period : 4 Hrs/Week, Exam: 3 Hrs	Weightage : CIE : 100%

Project Work Phase - 1 Guidelines:

- Students in consultation with the guide / co-guide if any, shall pursue a literature survey and complete the preliminary requirements of the selected Project work.
- Each student shall prepare a relevant introductory project document, and present a seminar.
- CIE marks shall be awarded by a commitee comprising of HOD as Chairman, Guide / co guide if any, and a senior faculty of the department.
- The CIE marks awarded for project work phase -1, shall be based on the evaluation of Project Report, Project Presentation skill, with Question-and-Answer session in the ratio of 50:50
- There is no SEE for this course.

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

CO1: **Analyse** the objective, impact and relevance of the project
CO2: **Formulate** problem definition by acquiring information from various sources
CO3: **Build** the report efficiently by following ethical values
CO4: **Demonstrate** the gaps analyzed in the project work

Mapping with Program Outcomes:

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

Scheme of Evaluation:

Course code	Title	Internal (CIE)	External (SEE)		Total Marks
			Seminar/ Presentation	Report	
P22MCA38	Project Work Phase - 1	100	50	50	100

Rubrics for Project Work Phase - 1 Presentation Assessment

Particulars	Excellent (10)	Good (8)	Satisfactory (5)	Poor (2)	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 Project Work Phase - 1 Report Assessment

Particulars	Excellent (10)	Good (8)	Satisfactory (5)	Poor(2)	Final Score
Objective, relevance, impact	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;	
Problem definitation	State the problem clearly and identify underline issues;	Adequately define the problem;	Fails to define the problem adequately;	Doesn't identify the problem;	
Literature study	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 existing study and the limitations of the existing systems not very satisfactory; limited information	
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.	
Grammar & Spelling, Report Format	Very few spelling errors, correct punctuation, grammatically correct, complete sentences; All required elements of the report are present and completed	Occasional lapses in spelling, punctuation, grammar, but not enough to seriously distract the reader; All required elements of the report are present and completed to a satisfactory standard.	Less technical details, sentences are not framed properly and with a few spelling mistakes; All required elements are provided but in a haphazard way	Numerous spelling errors, non-existent or incorrect punctuation, and/or severe errors in grammar that interfere with understanding; Key elements of the report are not provided. Overall	

	efficiency.			presentation of the document is not to a professional standard.	
				Total Score	

Rubrics for Project Work Phase - 1 Presentation Assessment (out of 50 marks) =

Rubrics for Project Work Phase - 1 Report Assessment (out of 50 marks) =

Total Marks (Out of 100 marks) =

Signature of the Guide / Coordinator

Name: Signature of the HOD

Course Code : P22MCA39	Semester : III	L - T - P : 0 : 0 : 6
Course Title : Societal Project		
Credits : 3	Contact Period : 6 Hrs/Week, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Societal 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 based on emerging trends.
- 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
  - References

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: **Analyse** 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	2	2	-	-	-	-	3	-
CO2	-	2	3	-	2	-	-	-	-	-	2	2
CO3	3	3	3	-	3	-	-	-	-	1	-	-
CO4	3	1	3	-	2	-	3	-	-	-	3	-
CO5	-	-	-	-	2	-	2	-	3	-	-	-
3-Strong; 2-Medium; 1-Low												

Scheme of Evaluation:

Course code	Title	Internal (CIE)	External (SEE)			Total Marks
			Mini Project Work	Report	Viva-Voce	
P22MCA39	Societal Project	50	30	10	10	100

Rubrics for Societal Project Assessment

	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 with Questionnaire	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	
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	

Total Marks (Out of 50 marks) =

Signature of the Guide / Coordinator

Name: Signature of the HOD

IV SEMESTER

Course Code : P22MCA41	Semester : IV	L - T - P : 2 : 2 : 0
Course Title : Programming using C# and .NET		
Credits : 3	Contact Period : 40 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

UNIT-I

Getting started with .NET Framework 4.5 **03 Hours**

Benefits of .NET Framework, Architecture of .NET Framework 4.5, Components of .NET Framework 4.5: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, BCL, Windows Forms, ASP .NET and AJAX, ADO .NET, Windows workflow Foundation, Windows Presentation Foundation, Windows Communication Foundation, Widows Card Space and LINQ.

Introducing C# **05 Hours**

Need of C#, C# Pre-processor Directives, Creating a Simple C# Console Application, Identifiers and Keywords. Data Types, Variables and Constants: Value Types, Reference Types, Type Conversions, Boxing and unboxing, Variables and Constants. Expression and Operators: Operator Precedence, Using the ?? (Null Coalescing) Operator, Using the :: (Scope Resolution) Operator and Using the is and as Operators. Control Flow statements: Selection Statements, Iteration Statements and Jump Statements.

UNIT-II

Namespaces, Classes, Objects and Structures **08 Hours**

Namespaces, The System namespace, 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, Using methods as class members, Passing an object as an argument to a method, Returning a Value from a Method and Describing Access Modifiers. Constructors and destructors: using parameterized constructor in a class, calling a destructor of a class. Static Classes and Static Class Members. Properties: Read-only Property, Static Property, Accessibility of accessors and Anonymous types. Indexers, Structs: Syntax of a struct and Access Modifiers for structs.

UNIT-III

Object- Oriented Programming **04 Hours**

Encapsulation: Encapsulation using accessors and mutators, Encapsulation using Properties.
Inheritance: Inheritance and Const ructors , 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.

Delegates and Events and Exception Handling **04 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/finally statement, throw statement, Checked and Unchecked Statements.

UNIT-IV

Graphical User Interface with Windows Forms **09 Hours**

Introduction, Windows Forms, Event Handling: A Simple Event- Driven GUI, Visual Studio Generated GUI Code, Delegates and Event- Handling Mechanism, Another Way to Create Event Handlers, Locating Event Information. Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, Mouse-Event Handling, Keyboard-Event Handling. Menus, Date TimePicker Control, LinkLabel Control, ListBox Control, CheckedListBox Control, ComboBox Control, ListView Control, TabControl Control and Multiple Document Interface (MDI) Windows.

UNIT-V

Data Access with ADO.NET & Web App Development with ASP.NET **07 Hours**

Understanding ADO.NET: Architecture of ADO.NET, typed Vs. Untyped dataset, Data reader: 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.

Introduction to Web App Development with ASP.NET, Web Basics, Multitier Application Architecture, Your First Web Application: Building WebTime Application, Examining WebTime.aspx's Code-Behind File

Text Books:

1. .NET 4.5 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Dreamtech Press. (Chapters: 1,3, 4, 5, 6, 7, 12)
2. Paul Deitel and Harvey Deitel: C# 2010 for Programmers, 4th Edition, Pearson Education. (Chapters: 14,15,19)

References Books:

1. Andrew Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, Wiely-Appress.
2. Bart De Smet: C# 4.0 Unleashed, Pearson Education- SAMS Series.
3. Hebert Shildt: Programming in C# 4.0, Tata McGraw Hill.

Course Outcomes:

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

CO1: Understand the components of .NET technologies

CO2: Demonstrate the object-oriented concepts of C# for application developments

CO3: **Identify** and implement events and exception handling within .NET application environment.

CO4: Design and Develop windows forms applications to process events in response to user interaction with GUI controls

CO5: Create database driven ASP.NET web applications to solve the real time problems

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	3	2	1	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	2	-	-	-	-	-	-	-
CO5	3	2	-	-	1	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

ELECTIVE GROUP – IV

Course Code : P22MCA421	Semester : IV	L - T - P : 3 : 0 : 0
Course Title : Adavance Java Programming		
Credits : 3	Contact Period : 40 Hrs Exam: 3 Hrs	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 JSP and its services
- Familiarize how to create JAR and Java bean
- Outline annotation and Database connection with any front end.
- Outline to use various beans in different applications

UNIT-I

09 Hours

Servlet : Servlet Structure, Servlet packaging, HTML Building utilities, Lifecycle, Single Thread Model Interface, Handling Client request: Form Data, HTTP Request Headers.
Generating Server Response: HTTP Status Codes, HTTP Response Headers, Handling Cookies, Session Tracking.

UNIT-II

07 Hours

Introduction to JSP: 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 form JSP, Limiting Java Code in JSP, Using JSP Expressions, Comparing Servlets And JSP, Writing Scriptlets. For Example: Using Scriplets to make parts of JSP Conditional, Using declarations, Declaration Examples

UNIT-III

08 Hours

JSP Controlling the structure: Structure of generated Servlets and Java Beans, Controlling the structure of generated Servlets: The JSP Page directive, Import Attribute, Session Attribute, isElignore attribute, Buffer and Autoflush Attribute, 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 File; Manifest file,
Working with Java Beans: Introspection, Customizers', Bean Properties: Simple properties, Design pattern events, Creating bound properties, Bean Methods, Beaninfo class, Persistence.

UNIT-IV

08 Hours

Annotations: Built-in Annotations with examples, Custom Annotation.
JDBC : Talking to Database, Immediate Solutions, Essentials JDBC program, using prepared statement object, and Interactive SQL tool. JDBC in Action Result sets, Batch updates, Mapping, Basic JDBC datatypes, Advanced JDBC data types, immediate solutions

UNIT-V

08 Hours

EJB and Server Side Components Models: 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, Message Driven 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. Vol 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. Development Enterprise Java Components. Enterprise JavaBeans 3.1. O'reilly (Chapters 1,2,3,4,5,6,7,8,9,10,11)

Reference Books:

1. Michel Siklora, EJB 3 Developer Guide, A Practical Guide For Developers And Architects to the Enterprise Java Beans Standard,Shroff Publishers and Distributers Private Limited July2008.
2. Herbert Schildt The Java Complete Reference, 8th Edition, Comprehensive coverage of the Java Language, Tata Mc Graw Hill Edition.

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: Develop java bean program using java bean rules
CO4: Develop application using JDBC Concepts
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	-	-	-	-	-	-	-
CO2	3	3	3	-	2	-	-	-	-	-	-	-
CO3	3	3	3	-	2	-	-	-	-	-	-	-
CO4	3	3	3	-	2	-	2	-	2	-	2	-
CO5	3	3	3	-	2	2	2	-	2	-	2	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA422	Semester : IV	L - T - P : 3 : 0 : 0
Course Title : Adavances in Web Technologies		
Credits : 3	Contact Period : 40 Hrs Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Summarize the concept on use of CGI and Perl programs.
- Design the Web Pages using Ruby and rails for the given problem.
- Outline the concepts of AngularJS to design the web pages.
- Summarize the fundamental concept and layout components of Bootstrap.
- Demonstrate client/server application for a given problem.

UNIT-I

The Basics of Perl and Perl for CGI Programming **08 Hours**

Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples.

The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; A survey example; Cookies.

UNIT-II

Introduction to Ruby and Rail **08 Hours**

Introduction to Ruby : Origins and uses of Ruby, Scalar types and their operations, Simple input and output, Control statements, Arrays, Hashes, Methods,Classes, Code blocks and iterators, Pattern matching.

Rail: Overview of Rails, Document requests, processing forms, Rails applications with Databases, Layouts.

UNIT-III

Introduction to Angular JS **08 Hours**

Angular JS: General Features, Core Features, Concepts, Advantages, Disadvantages, MVC Architecture, First application, Directives, Expressions, Controllers, Filters, Tables, HTML DOM, Modules, Forms, Includes, AJAX, Views, Scopes, Services.

UNIT-IV

Introduction to Bootstrap **08 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.

UNIT-V

Bootstrap Layout Components **08 Hours**

Dropdown menus,options, Button Groups , Button Groups as Radio Buttons and Checkboxes, Buttons with Dropdowns, Dropup Menus, Navigation Elements, Tabular Navigation, Basic Pills Navigation, Stackable Navigation, Dropdowns, Navigation Lists, Tabbable Navigation, Navbar, Forms, Navbar Menu Variations,

Breadcrumbs, Pagination, Pager, Labels, Badges, Typographic Elements, Hero Unit, Page Header, Thumbnails, Alerts, Progress Bars, Media Object, Miscellaneous, Wells, Helper Classes.

Text Books:

1. Robert W. Sebesta: Programming the World Wide Web, 8th Edition, Pearson education, 2015.
2.AngularJS Up & Running- Shyam Seshadri, Brad Green, 1st Edition, 2014, O'Reilly.
3 Jake Spurlock: "Bootstrap: Responsive Web Development", O'Reilly Media, 2014.

Reference Books:

1.Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2009.
2.Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide Web How to program, 3rdEdition, Pearson Education / PHI, 2004.

Reference links: https://www.tutorialspoint.com/angularjs
https://www.tutorialspoint.com/angularjs/angularjs_tutorial.pdf

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

CO1: Illustrate the use of CGI and Perl programs.
CO2: Develop presentation web page using Ruby and rails for the given problem.
CO3: Implement web application using Angular JS.
CO4: Demonstrate web applications using Bootstrap for the given problem
CO5: Design web application according to customer needs 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	3	1	2	-	-	-	-	-	-	-
CO2	2	3	2	1	-	-	-	-	-	-	-	-
CO3	2	2	2	1	2	-	-	-	-	-	-	-
CO4	3	2	2	1	-	-	-	-	-	-	-	-
CO5	2	2	3	1	2	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA423	Semester : IV	L - T - P : 3 : 0 : 0
Course Title : Enterprise Resource Planning		
Credits : 3	Contact Period : 40 Hrs Exam: 3 Hrs	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 **08 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 **08 Hours**

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

UNIT-III

Business Modules **08 Hours**

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

UNIT-IV

ERP Market **08 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 **08 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												

Course Code : P22MCA424	Semester : IV	L - T - P : 3 : 0 : 0
Course Title : Principles of User Interface Design		
Credits : 3	Contact Period : 40 Hrs Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

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

- Provide fundamental knowledge on Usability of Interactive system
- Understand the Guidelines, Principles, and Theories on designing effective user interface.
- Learn techniques involved in designing real-time Interface
- Discuss Mobile User Interface and its Display technology
- Understand mobile user interface control, Lateral Access, Labels and Indicators.
- Identify different user interface and design.

UNIT-I

08 Hours

Introduction, Usability Goals and Measures, Usability Motivations, Universal Usability, Goal for our Profession, Guidelines, Principles, Theories.

UNIT-II

08 Hours

Introduction, Organizational Design to Support Usability, The four Pillars of Design, Development Methodologies, Ethnographic Observation, Participatory Design, Scenario Development, Legal Issues, Expert Reviews, Usability Testing and Laboratories, Surveys Instruments Acceptance Tests, Evaluation during active use

UNIT-III

08 Hours

Introduction, Example of Direct-Manipulation, 3D Interfaces, Tele operation, Virtual and Augmented Reality, Task-Related Menu Organization, Single Menus, Combinations of Multiple Menus, Content Organization, Fast Movement through Menus, Data Entry with Menus: Form Fillin, Dialog Boxes and Alternatives, Audio Menus and Menus for small Display.

UNIT-IV

08 Hours

Introduction, Error Messages, Display Design, Web Page Design, Window Design, Types of visual Information, Classifying Information, Organizing with Information Architecture, Information Design and Ordering Data, Patterns for Displaying Information.

UNIT-V

08 Hours

Understanding Our Users, Control and Confirmation, Patterns for Control and Confirmation, Lateral access and Mobile space, Follow the principles of way finding and Norman's Interaction Model, Patterns for Lateral access, Understanding Our Users, Label and Indicators in the Mobile Space, Patterns for Labels and Indicators

Text Books:

1. Shneiderman Plaisant Cohen Jacobs: Designing the User Interface, 5th Edition, Pearson Education, 2010
2. Steven Hoober, Eric Berkman: Designing Mobile Interfaces-Shroff/O'Reilly First Indian Reprint, 2011.

Reference Books:

1. Alan J Dix et al.: Human-Computer Interaction, 2nd Edition, Prentice-Hall India, 1998.
2. Wilber O Galitz: The Essential guide to User Interface Design- An Introduction to GUI Design, Principles and Techniques, Wiley-Dreamtech India PVT. Ltd, 1998.

Course Outcomes:

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

CO1: Describe User interface Guidelines, Principles and Theories and evaluate standard user interface design

CO2: Design Direct Manipulation, Balancing Function and Fashion in UI

CO3: **Design** Mobile User Interface and its Display of Information

CO4: Illustrate Mobile UI Control Confirmation, Labels and Indicators

CO5: Analyze and **Explain** different Techniques in Real-Time interface design

Mapping with Program Outcomes:

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

Course Code : P22MCA425	Semester : IV	L - T - P : 3 : 0 : 0
Course Title : Natural Language Processing		
Credits : 3	Contact Period : 40 Hrs Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)

The objectives of this course are to

- Understand the algorithms available for the processing of linguistic information and computational properties of natural languages
- Conceive basic knowledge on various morphological, syntactic and semantic NLP tasks
- Familiarize various NLP software libraries and data sets publicly available.
- Develop systems for various NLP problems with moderate complexity.
- Learn various strategies for NLP system evaluation and error analysis.

UNIT-I

08 Hours

Introduction to NLP NLP – introduction and applications, NLP phases, Difficulty of NLP including ambiguity; Spelling error and Noisy Channel Model; Concepts of Parts-of-speech and Formal Grammar of English.

UNIT-II

08 Hours

Language Modelling: N-gram and Neural Language Models Language Modelling with N-gram, Simple N-gram models, Smoothing (basic techniques), Evaluating language models; Neural Network basics, Training; Neural Language Model, Case study: application of neural language model in NLP system development

UNIT-III

08 Hours

Parts-of-speech Tagging Parts-of-speech Tagging: basic concepts; Tagset; Early approaches: Rule based and TBL; POS tagging using HMM, Introduction to POS Tagging using Neural Model.

UNIT-IV

08 Hours

Parsing Basic concepts: top down and bottom up parsing, treebank; Syntactic parsing: CKY parsing; Statistical Parsing basics: Probabilistic Context Free Grammar (PCFG); Probabilistic CKY Parsing of PCFGs.

UNIT-V

08 Hours

Semantics Vector Semantics; Words and Vector; Measuring Similarity; Semantics with dense vectors; SVD and Latent Semantic Analysis; Embeddings from prediction: Skip-gram and CBOW; Concept of Word Sense; Introduction to WordNet

Text Book:

1. Jurafsky Dan and Martin James H. “Speech and Language Processing” ,3rd Edition, 2018.

Reference Books:

1. Jurafsky D. and Martin J. H., “Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, 2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.
2. Goldberg Yoav “A Primer on Neural Network Models for Natural Language Processing”.

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

CO1: **Describe** the concepts and applications of natural language processing
CO2: **Demonstrate** understanding of the relationship between NLP and statistics & machine learning.
CO3: **Apply** various models in NLP applications
CO4: **Develop** parsing methods in NLP systems
CO5: D**emonstrate** wordnet in NLP systems

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	2	-	2	-	-	-	-	-	-	-
CO4	2	2	3	2	1	-	-	-	-	-	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	-
3-Strong; 2-Medium; 1-Low												

Course Code : P22MCA43	Semester : IV	L - T - P : -----
Course Title : MOOC (Massive Open Online Course)		
Credits : 2		Weightage : CIE : 100%

MOOC (Massive Open Online Course) (P22MCA43)
Guidelines for MOOC:

- The student has to choose minimum 8 weeks NPTEL online course recommended by the Department.
- The student can register MOOC anytime during I/II/III/IV semester, but evaluation / consideration will be done only at the end of 4th semester.
- The CIE marks awarded for MOOC is based on seminar report, presentation skill with question answer session and NPTEL score in the ratio 30:30:40 respectively.
  NPTEL score is calculated as follows

  NPTEL Score x 1.5 = [Subject to a Maximum of 100 Marks]
  [Ex. -1: If NPTEL Score is 52 then the CIE will be = (52 x 1.5) = 78
  Ex. -2: If NPTEL Score is 80 then the CIE will be = (80 x 1.5) = 100

Scheme of Evaluation:

Course code	Title	Internal (CIE)			Total Marks
		Seminar/ Presentation	Report	NPTEL Score	
P22MCA43	MOOC	30	30	40%	100

Course Code : P22MCA44	Semester : IV	L - T - P : -----
Course Title : Industry Internship		
Credits : 4		Weightage : CIE : 100%

Industry Internship (P22MCA44)
Guidelines for Industry Internship:

- The students shall undergo internship in the industry for a period of 6 weeks after completion of the second semester and before commensment of 4th semester but evaluvation will happen only during the 4th semester.
- The internship shall be carried out in industry / R&D labs / institutions.
- The same should be presented by the student along with the report at the end of 4th semester and will be evaluated by the internal panel of members constituted by the Head of the Department (HOD) for 100 marks.
- The report format for the internship shall be as equivalent as the Project Report as prescribed by the Department.

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

CO1. Analyse the industry/research work environment with emphasis on organizational structure, job process in various departments
CO2. Explore modern tools and technologies used in company
CO3. Demonstrate the industry study through self-learning capabilities with presentation and detailed report

Mapping with Program Outcomes:

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

Scheme of Evaluation:

Course code	Title	Internal (CIE)		Total Marks
		Seminar/ Presentation	Report	
P22MCA44	Industry Internship	50	50	100

Industry Internship (P22MCA44)

Rubrics for Internship Presentation Assessment

	Excellent (10)	Good (8)	Satisfactory (5)	Poor (2)	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 (10)	Good (8)	Satisfactory (5)	Poor (2)	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 / Technol ogy used	Complete information is provided about tools/technology.	Average technical details on tools / technology usage.	Less technical details.	No details about tools/technology	
Code Implementation and validation	Implementation and validation of code is adequately explained and expected results are properly shown	Implementation and validation of code explanation is good and expected results are okay	Implementation , validation of code explanation and expected results are not up to the mark	Implementation and validation of code explanation is not done and expected results are incorrect	
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 Grammar & Spelli ng	All required elements of the report are present and completed efficiently; Very few spelling errors,correct punctuation, grammatically correct, complete sentences.	All required elements are present but some of them are not given completely; Grammatical mistakes not corrected.	All required elements are provided but in a haphazard way; sentences are not framed properly and with a few spelling mistakes	Key elements of the report are not provided. Overall presentation of the document is not to a professional Standard; severe errors in grammar that interfere with understanding.	
				Total Score	

Rubrics for Internship Presentation Assessment (out of 50 marks) =

Rubrics for Intership Report Assessment (out of 50 marks) =

Total Marks (Out of 100 marks) =

Signature of the Guide/Co-ordinator

Name: Signature of the HOD

Course Code : P22MCA45	Semester : IV	L - T - P : 0 : 0 : 6
Course Title : Project Work Phase - 2		
Credits : 16	Contact Period : 6 Hrs/Week, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Project Work Phase - 2 (P22MCA45)

Guidelines for Project:

- This is an individual project for duration of minimum of 4½ months.
- The candidate should carry out the project in any industry or R&D institution or educational institution under a guide/co-guide.
- The candidate has to present the work carried out before the examiners during the final examination.
- The work out carried out should be free from plagiarism.
- The literature study may be clearly written which may be summary of existing project and highlight of what are the functionalities that are proposed to this project.
- Student shall indicate the different research papers, documents refereed as a part of the literature study.
- Students are encouraged and appreciated to do paper publication in an indexed Journal such as scopus, web of science etc. / journal with impact factor / conference in leading avenues like IEEE, Springer etc. during their project work as an added advantage.
- The student shall present the progress about the project to the panel of members constituted by the Head of the Department (HOD).

Course Outcomes:

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

CO1: Apply Software Engineering principles on a software project.
CO2: Analyse and solve 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: Compile detail report with effective presentation.

Mapping with Program Outcomes:

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

Scheme of Evaluation:

Course code	Title	Internal (CIE)	External (SEE)		Total Marks
			Dissertation Ealuvation	Viva Voce	
P22MCA45	Project Work Phase - 2	100	50	50	100

P22MCA45 Project Work Phase - 2 : Internal (CIE)

Rubrics for Project Work Assessment (CIE)

	Excellent (20)	Good (15)	Satisfactory (10)	Poor (5)	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	
Literature survey and problem formulation	Detailed and extensive explanation of the specifications and the limitations of the existing systems; All objectives of the proposed work are well defined;	Collects a great deal of information and good study of the existing systems; Good justification to the objectives;	Moderate study of the existing systems collects some basic information; Only some objectives of the proposed work are well defined;	Explanation of the specifications and the limitations of the existing systems not very satisfactory; limited information; Incomplete justification to the objectives proposed;	
Design of the proposed work	Appropriate design methodology and properly justified; Steps to be followed to solve the defined problem are clearly specified	Design methodology not properly justified; Methodology to be followed is specified but detailing is not done	Design methodology not defined properly; Steps to be followed to solve the defined problem are not specified properly	Design methodology not defined properly; Steps are mentioned but unclear; Without justification to objectives	
Implementation and testing	Implementation and validation of code is adequately explained and expected results are properly shown	Implementation and validation of code explanation is good and expected results are okay	Implementation, validation of code explanation and expected results are not up to the mark	Implementation and validation of code explanation is not done and expected results are incorrect	
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	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	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	

	contact with audience and clear voice with good spoken language	language but less eye contact with Audience		with audience and unclear voice	
				Total Score	

Total Marks for Project work Phase-2 (out of 100 marks) =

Signature of the Guide
Name:

Signature of the HOD

P22MCA45 Project Work phase-2: Dissertation Evaluation

Rubrics for Project Dissertation Evaluation

	Excellent (5)	Good (3)	Satisfactory (2)	Poor (1)	Final Score
Relevance of the topic in the present context	Relevance and impact of the project is made clear, and the report addresses them in a focused and logical manner	Relevance and impact of the project is made clear, and the report addresses them	Relevance and impact are stated ambiguously	The report does not clearly address any of them	
Originality of the topic	Innovative system	Add on to existing system	Changes to existing system	Code migration for existing system	
Literature study	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 existing study and the limitations of the existing systems not very satisfactory; limited information	
Problem definition with functional requirements	State the problem clearly and identify underline issues; strong description of the functional requirements of the project	Adequately define the problem; In-sufficient description of the functional requirements of the project	Fails to define the problem adequately; In-sufficient description of the functional requirements of the project	Doesn't identify the problem; poor description of the functional requirements of the project	
Experimental observation / Theoritical modelling,	Shows excellent understanding of experimental procedure and theory thoughts	Shows good understanding of experimental procedure and theory thoughts	Shows minimal understanding of experimental procedure e and theory thoughts	Shows no understanding of experimental procedure e and theory thoughts	
Result presentation, Discussion	Results are presented in very appropriate manner;	Results are presented in good manner;	Results presented are not much satisfactory;	Results presented are not much satisfactory;	
Conclusion, Future scope and References	Project work is well summarized and concluded; Future enhancement in the project are	Project work is well concluded; Future enhancement in the project are Specified; Sources are	Project work summary and conclusion not very appropriate; Future enhancement in the project are	Project work summary and conclusion not very appropriate; Future enhancement in the project are not	

	well specified; Sources are Acknowledged with full reference details	acknowledged with bare reference details	specified; Sources are acknowledged with partial reference details	specified; Sources are not acknowledged	
Overall presentation of the Thesis	All required elements of the report are present and completed efficiently	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	
Plagiarism Check	Uniqueness 90% and above	Uniqueness between 85% to 89%	Uniqueness between 80% to 84%	Uniqueness less than 75% to 79%	
Paper Publication	Paper is presented in conference / published in reputed journals	Paper is accepted in conference / journal	Paper is submitted in conference / journal and waiting for the review	Paper is not submitted to any conference / journal	
				Total Score	

Total Marks for Project Work phase-2 Dissertation Assessment (out of 50 marks) =

Signature of the Internal Examiner Signature of the External Examiner

Name:

P22MCA45 Project Work phase-2 : Viva-Voce

Rubrics for Viva-Voce

Particulars	Excellent (10)	Good (8)	Satisfactory (5)	Poor (2)	Final Score
Presentation of background of work undertaken	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	
Presentation of suitability of work chosen	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	
Presentation of finalization of work	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	
Presentation of results, discussion of results and conclusion	Results are presented in very appropriate manner; Project work is well summarized and concluded	Results are presented in good manner; Project work is well concluded;	Results presented are not much satisfactory; Project work summary and conclusion not very appropriate;	Results presented are not much satisfactory; Project work summary and conclusion not very appropriate;	
Overall performance	Contents of presentations are appropriate and well delivered; Proper eye contact with audience and clear voice with good spoken language	Contents of presentations are appropriate and well delivered; Clear voice with good spoken language but	Contents of presentations are appropriate but not well delivered; Eye contact with only few people and unclear voice	Contents of presentations are not appropriate and not well delivered; Poor eye contact with audience and unclear voice	

		less eye contact with Audience			
				Total Score	

Total Marks for Project Work phase-2 Viva-Voce Assessment (out of 50 marks) =

Signature of the Internal Examiner

Name:

Signature of the External Examiner

Name: