Scheme & Syllabus
of
Master of Computer Applications (MCA)
(With effect from 2022-2024)

Outcome Based Education
With
CHOICE BASED EDUCATION

₹ÀoÀåPÀæªÀÄ
(±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£ÁøIPÀ(«.n.AiÀÄÀ, °É¥ÀUÁ« CrAiÀÄ®èêÀ ÁéAiÀÄvÀÛ ²ÀÄÉÜ)
Ph: 08232- 220043, Fax: 08232 – 222075, Web: www.pescemandya.org
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.,
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

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Hrs/Week</th>
<th>Credits</th>
<th>Examination Marks</th>
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<tr>
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<td>SEE</td>
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**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

<table>
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<td>Data Structures with Algorithms</td>
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<td>Database Management Systems</td>
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**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

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<td>P22MCA251</td>
<td>Data Warehousing &amp; Data Mining</td>
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<td>P22MCA261</td>
<td>Cloud Computing</td>
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<td>P22MCA252</td>
<td>Model View Control Programming</td>
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<td>P22MCA262</td>
<td>Artificial Intelligence</td>
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<td>3</td>
<td>P22MCA253</td>
<td>System Simulation and Modeling</td>
<td>3</td>
<td>P22MCA263</td>
<td>Object-Oriented Modelling and Design Patterns</td>
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<td>4</td>
<td>P22MCA254</td>
<td>Optimization Techniques</td>
<td>4</td>
<td>P22MCA264</td>
<td>Computer Graphics with open GL</td>
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<td>5</td>
<td>P22MCA255</td>
<td>Software Testing and Practices</td>
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<td>P22MCA265</td>
<td>Cyber Security</td>
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#### III SEMESTER

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<td>Machine Learning using python</td>
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<td>P22MCA32</td>
<td>Internet of Things (IOT)</td>
<td>4 : 0 : 0 : 4</td>
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<td>P22MCA34X</td>
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<td>P22MCA35X</td>
<td>Elective - IV</td>
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<td>Machine Learning Lab with Mini Application</td>
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<td>IOT Lab</td>
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<td>Project Work Phase-1</td>
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<td>Societal Project</td>
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### ELECTIVES

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<th>Sl. No.</th>
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<td>P22MCA341</td>
<td>Big Data and Analytics</td>
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<td>P22MCA351</td>
<td>Mobile Application Development</td>
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<td>P22MCA342</td>
<td>Block chain Technology</td>
<td>2</td>
<td>P22MCA352</td>
<td>Software Project Management</td>
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<td>P22MCA343</td>
<td>Computer Vision</td>
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<td>P22MCA353</td>
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<td>4</td>
<td>P22MCA344</td>
<td>Cryptography and Network Security</td>
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<td>P22MCA354</td>
<td>NOSQL</td>
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<td>P22MCA345</td>
<td>Business Intelligence - Data Warehousing and Analytics</td>
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<td>P22MCA355</td>
<td>Digital Image Processing</td>
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#### IV SEMESTER

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<td>P22MCA41</td>
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<td>P22MCA42X</td>
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<td>P22MCA43</td>
<td>MOOC (Massive Open Online Course) (8weeks)</td>
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<td>P22MCA44</td>
<td>Industry Internship (6 weeks)</td>
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ELECTIVES

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<td>P22MCA421</td>
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<td>2</td>
<td>P22MCA422</td>
<td>Advances in Web Technologies</td>
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<td>P22MCA423</td>
<td>Enterprise Resource Planning</td>
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<td>P22MCA424</td>
<td>Principles of User Interface Design</td>
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<td>5</td>
<td>P22MCA425</td>
<td>Natural Language Processing</td>
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Evaluation Scheme for I, II, III & IV Semester’s Core and Elective Courses

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Weightage</th>
<th>Marks</th>
<th>Event Break Up</th>
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<tr>
<td>CIE</td>
<td>50%</td>
<td>50</td>
<td>CIE I</td>
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<tr>
<td>SEE</td>
<td>50%</td>
<td>50*</td>
<td>Questions to Set: 5</td>
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Note: * The SEE will be conducted for 100 Marks.

Scheme of SEE Question Paper (100 Marks)

- 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.
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

UNIT-II  
12 Hours
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

UNIT-IV  
10 Hours
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:

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:

<table>
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<tr>
<th>CO's</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
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3-Strong; 2-Medium; 1-Low
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

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 indexOff() and last IndexOf(), Changing the case of characters within a string, String Buffer and String Builder.

A Closer Look at Methods and Classes

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**

**Exploring Collection Framework**
Collections Overview, The Collection Interfaces, The collection Classes. The Arrays Class

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

### Reference Books:
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:

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3-Strong; 2-Medium; 1-Low
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
Introduction, UNIX Architecture, Features of UNIX.
General-Purpose Utilities: cal, date, who, printf, tty, stty, uname, passwd, echo, tput, bc, lock, script.
Handling Ordinary Files: cat, cp, rm, mv, wc, file.

UNIT-II

File Attributes
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
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
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
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:
   (Chapters: 2.1, 2.2, 3, 4, 5.1-5.4, 5.7, 5.8, 8, 10, 12, 13, 14, 15)

Reference Books:

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:

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3-Strong; 2-Medium; 1-Low
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

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

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:

Reference Books:

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:

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3-Strong; 2-Medium; 1-Low
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

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

UNIT-V
The Transport and Application Layers 10 Hours
Text Books:

Reference Books:

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:

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3-Strong; 2-Medium; 1-Low
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
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

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.


**Text Books:**

**Reference Books:**

**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:**

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

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:**

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3-Strong; 2-Medium; 1-Low
Course Learning Objectives (CLOs)
The objectives of this course are to:

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

UNIT - I

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


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 PowerPoint in professional circuits

**Watch the Time:** Organizing Yourself, Time Saving Techniques, Understanding Priorities Based Time Roles, Procrastination, Different Methods of Splitting Time, Efficient Time Utilization, Value of Time, Streamlining Daily Routine, Big rock theory, Spent time matrix, Urgency vs Importance, Time bound goal management, 10 time management mistakes, Essential habits for better time management.

**Reference Books:**
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 usage 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:**

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

Reference Books:

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

CO1: **Demonstrate** the Basic concepts of Digital Logic, Operational 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:

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

UNIT-II

Introduction to XHTML Cascading Style Sheets 08 Hours
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 <span> and <div> 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.

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:

Reference Books:

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:

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3-Strong; 2-Medium; 1-Low
Course Title: Data Structures with Algorithms

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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
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
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
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
Insertion Sort, Depth First search and Breadth First Search, Topological sorting, Algorithms for Generating Combinatorial Objects.
Transform and-Conquer, Space and Time Tradeoffs
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:

Reference Books:

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:

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3-Strong; 2-Medium; 1-Low
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:**
   (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)

**Reference Book:**

**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:**

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3-Strong; 2-Medium; 1-Low
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


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.


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:
   (Chapters: 1, 2, 3, 4, 5, 6, 7, 8, 11, 17, 18, 22, 23)

Reference Books:

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:

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3-Strong; 2-Medium; 1-Low
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:
Reference Books:
1. Jiawei Han and Micheline Kamber, Data Mining - Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publisher.

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

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

Mapping with Program Outcomes:

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3-Strong; 2-Medium;1-Low
Course Code : P22MCA252
Semester : II
L - T - P : 3 : 0 : 0

Course Title : Model View Control Programming

| Credits | 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
09 Hours

Creating a MEAN CRUD Module

Implementing the AngularJS MVC module-Creating the AngularJS module service, Setting up the AngularJS module controller, Implementing the AngularJS module views, The create() method of the AngularJS controller, The find() and find One() methods of the AngularJS controller, The update() method of the AngularJS controller, The delete() method of the AngularJS controller

Implementing the AngularJS module views- The create-article view, The view-article view, The 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 save().
Text Books:

Reference Book:

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:

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3-Strong; 2-Medium; 1-Low
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

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:

Reference Books:
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: Determine 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:

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3-Strong; 2-Medium; 1-Low
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

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

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

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

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:**
   (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)

**Reference Books:**

**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:

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

Reference Book:

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:

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3-Strong; 2-Medium; 1-Low
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

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:**

**Reference Books:**

**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:**

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

References Books:

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:

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3-Strong; 2-Medium; 1-Low
### Course Title: Object-Oriented Modelling and Design Patterns

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#### 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

**System Design** 08 Hours

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:
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:

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:

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3-Strong; 2-Medium; 1-Low
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 Bezier Spline Curve.
- Describe mathematical specification of Bezier Spline Curves.

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, Open GL 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:

Reference Books:

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:

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3-Strong; 2-Medium; 1-Low
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

Cyberoffenses: How Criminals Plan the Attacks

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

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

UNIT-V

Cybercrime and Cyberterrorism: Social, Political Ethical and Psychological Dimensions  08 Hours

Text Book:

Reference Books:

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:

<table>
<thead>
<tr>
<th>CO's</th>
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</table>

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

   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:

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


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.


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


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 appropriate data structures for a given problem

Mapping with Program Outcomes:

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

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3-Strong; 2-Medium; 1-Low

Scheme of Evaluation:

<table>
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<tr>
<th>Course code</th>
<th>Title</th>
<th>Internal (CIE)</th>
<th>Total Marks</th>
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<tr>
<td>P22MCA29</td>
<td>Technical Seminar</td>
<td>40 60</td>
<td>100</td>
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</table>
Rubrics for Technical Seminar Presentation Assessment

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Excellent (12)</th>
<th>Good (10)</th>
<th>Satisfactory (8)</th>
<th>Poor (4)</th>
<th>Final Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of the topic at analyze level</td>
<td>Demonstrates in depth knowledge; answered all questions with elaboration</td>
<td>Adequate knowledge on most of the topics. Answered all questions but failed to elaborate</td>
<td>Superficial knowledge of topic; only able to answer basic questions</td>
<td>Does not have any knowledge; Unable to answer questions</td>
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<tr>
<td>Organization of the presentation</td>
<td>Presented in logical sequence; introduction and background give proper context key points and conclusions are clear and well presented</td>
<td>Most information presented in logical sequence; clear introduction; adequate background; some irrelevant information</td>
<td>Problems with sequencing, lacks clear transitions; incomplete or overly detailed introduction, emphasis given to less important information</td>
<td>Little or no organization, difficult to follow; missing or ineffective introduction; confusing background; key points unclear</td>
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</tr>
<tr>
<td>Level of Understanding</td>
<td>Sufficient for understanding and presented very effectively</td>
<td>Sufficient for understanding and presented well</td>
<td>Sufficient for understanding but not clearly presented</td>
<td>Too brief or insufficient for understanding or too detailed</td>
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</tr>
<tr>
<td>Presentation Skills</td>
<td>Clear articulation, steady delivery rate, good posture and eye contact, confident and appropriately dressed</td>
<td>Clear articulation but not very polished. Able to recover from minor mistakes. Appropriately dressed</td>
<td>Occasional eye contact, incorrect pronunciations, and Voice fluctuation.</td>
<td>Inaudible or too loud, no eye contact, delivery rate is too slow or too fast, not in formal attire</td>
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<tr>
<td>Visually</td>
<td>Visually pleasing and easy to read; good use of white space, colour, backgrounds; images and Graphics support.</td>
<td>Adequate layout, but with some fonts, colours, backgrounds difficult to read</td>
<td>Difficult to read, cluttered appearance; images improperly sized; some distracting graphics or animations</td>
<td>Confusing layout, text extremely difficult to read; many graphics, sounds, animations distract from the presentation</td>
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</tbody>
</table>

**Total Score**
### Rubrics for Seminar Report Assessment

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Excellent (10)</th>
<th>Good (8)</th>
<th>Satisfactory (5)</th>
<th>Poor(2)</th>
<th>Final Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective, relevance, impact and conclusion</strong></td>
<td>The purpose and objective, relevance and impact of the topic is made clear, and the report addresses them in a focused and logical manner.</td>
<td>The purpose and objective, relevance and impact of the topic is made clear, and the report addresses them.</td>
<td>Purpose and objectives are stated ambiguously</td>
<td>The report does not clearly address any of them.</td>
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</tr>
<tr>
<td><strong>Grammar &amp; Spelling</strong></td>
<td>Very few spelling errors, correct punctuation, grammatically correct, complete sentences.</td>
<td>Occasional lapses in spelling, punctuation, grammar, but not enough to seriously distract the reader.</td>
<td>Less technical details, sentences are not framed properly and with a few spelling mistakes</td>
<td>Numerous spelling errors, non-existent or incorrect punctuation, and/or severe errors in grammar that interfere with understanding.</td>
<td></td>
</tr>
<tr>
<td><strong>References</strong></td>
<td>Sources are Acknowledged with full reference details.</td>
<td>Sources are acknowledged with bare reference details.</td>
<td>Sources are acknowledged with partial reference details.</td>
<td>Sources are not acknowledged.</td>
<td></td>
</tr>
<tr>
<td><strong>Report Format</strong></td>
<td>All required elements of the report are present and completed efficiently.</td>
<td>All required elements of the report are present and completed to a satisfactory standard.</td>
<td>All required elements are provided but in a haphazard way</td>
<td>Key elements of the report are not provided. Overall presentation of the document is not to a professional standard.</td>
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</table>

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 Title: Employability Enhancement Skills-2 (EES-2)

<table>
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<tr>
<th>Course Code</th>
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<th>Contact Period</th>
<th>Exam</th>
<th>Weightage</th>
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<td>0</td>
<td>32 Hrs</td>
<td>2 Hrs</td>
<td>CIE : 100%</td>
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</tbody>
</table>

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**

**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**

**Number system:**

Introduction, **Integers:** Remainder zero concept, Odd and Even Integers, Negative and positive integers, power number a^n, 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:**

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:

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3-Strong; 2-Medium; 1-Low
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 unsupervised models
- Understand the various classification problems
- Discuss the different clustering methods

UNIT – I
Introduction To Machine Learning

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

UNIT – III
Linear Regression
Simple Linear Regression, Steps in Building a Regression Model, Building Simple Linear, Regression Model, Model Diagnostics, Multiple Linear Regression.

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

UNIT – V
Advanced Machine Learning

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:
2. Learning with Python: How to Think Like a Computer Scientist Paperback – Allen Downey , Jeffrey Elkner, 2015.

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:

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3-Strong; 2-Medium; 1-Low
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**
Reference Books

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:

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3-Strong; 2-Medium; 1-Low
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

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

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

Text Book:

Reference Books:

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:

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3-Strong; 2-Medium; 1-Low
ELECTIVE GROUP – III

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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

UNIT-II

Understanding MapReduce Fundamentals and HBase 08 Hours

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

Scheme & Syllabus of MCA, PESCE, Mandya (2022 – 2024)
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:

Reference Books:
1. Big Data and Analytics – Seema Acharya and Subhashini C – Wiley India.

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:

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3-Strong; 2-Medium; 1-Low
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 Algorithms (SHAs),Merkle trees, Patricia trees, Distributed hash tables(DHTs), Digital signatures, Elliptic Curve Digital signature algorithm(ECDSA)

UNIT-IV
Bitcoin 08 Hours

UNIT-V
Ethereum 08 Hours
Text Book:
1. Imran Bashir "Mastering BlockChain", Packt.

Reference Books:
1. Mastering Bitcoin: Programming the Open Blockchain Paperback-2017 by Andreas M O'rielly
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:

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3-Strong; 2-Medium; 1-Low
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

UNIT-II
Image Analysis 08 Hours

UNIT-III
Image Restoration 08 Hours

UNIT-IV
Image Enhancement 08 Hours

UNIT-V
Image Compression 08 Hours
Text Book:

Reference Books:

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:

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3-Strong; 2-Medium; 1-Low
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

Classical Encryption Technique
Symmetric Cipher Model, Substitution Techniques, Transposition Techniques.

UNIT-II
Block Ciphers, Data Encryption Standard and Advanced Encryption Standard 08 Hours

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:

Reference Books:

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:

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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


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:

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

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 objectives using KPIs at multiple levels
CO5: Design an enterprise dashboard that depicts the key performance indicators which helps in decision making.

Mapping with Program Outcomes:

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3-Strong; 2-Medium; 1-Low
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

UNIT-II
Getting Started 08 Hours
Creating Applications and Activities

UNIT-III
Building User Interfaces 08 Hours

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.

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:

Reference Book:

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:

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3-Strong; 2-Medium; 1-Low
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


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


UNIT IV


UNIT V

**Text Book:**
   (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:**

**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:**

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3-Strong; 2-Medium; 1-Low
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

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:

Reference Books:
2. Ian Goodfellow and Yoshua Bengio 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:

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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.

Reference Books:

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 MongoDB in the NoSQL framework

Mapping with Program Outcomes:

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3-Strong; 2-Medium; 1-Low
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 Frequency Domain: Image smoothing frequency domain filtering, Image sharpening frequency domain filtering.

UNIT-III
Image Restoration
08 Hours

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:

Reference Books:

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:

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

Mapping with Program Outcomes:

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</table>

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

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L - T - P : 0 : 0 : 2

Credits : 1
Contact Period : 2 Hrs/Week, Exam: 3 Hrs
Weightage : CIE : 50% SEE : 50%
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 committee 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:

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3-Strong; 2-Medium; 1-Low

Scheme of Evaluation:

<table>
<thead>
<tr>
<th>Course code</th>
<th>Title</th>
<th>Internal (CIE)</th>
<th>External (SEE)</th>
<th>Total Marks</th>
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<tr>
<td>P22MCA38</td>
<td>Project Work Phase - 1</td>
<td>100</td>
<td>50</td>
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<tr>
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<th>Seminar/ Presentation</th>
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<td>Report</td>
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</table>

Scheme & Syllabus of MCA, PESCE, Mandya (2022 – 2024) Page 97
### Rubrics for Project Work Phase - 1 Presentation Assessment

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Excellent (10)</th>
<th>Good (8)</th>
<th>Satisfactory (5)</th>
<th>Poor (2)</th>
<th>Final Score</th>
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<tbody>
<tr>
<td>Knowledge of the topic at analyze level</td>
<td>Demonstrates in depth knowledge; answered all questions with elaboration</td>
<td>Adequate knowledge on most of the topics. Answered all questions but failed to elaborate</td>
<td>Superficial knowledge of topic; only able to answer basic questions</td>
<td>Does not have any knowledge; Unable to answer questions</td>
<td></td>
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<tr>
<td>Organization of the presentation</td>
<td>Presented in logical sequence; introduction and background give proper context key points and conclusions are clear and well presented</td>
<td>Most information presented in logical sequence; clear introduction; adequate background; some irrelevant information</td>
<td>Problems with sequencing, lacks clear transitions; incomplete or overly detailed introduction, emphasis given to less important information</td>
<td>Little or no organization, difficult to follow; missing or ineffective introduction; confusing background; key points unclear</td>
<td></td>
</tr>
<tr>
<td>Level of Understanding</td>
<td>Sufficient for understanding and presented very effectively</td>
<td>Sufficient for understanding and presented well</td>
<td>Sufficient for understanding but not clearly presented</td>
<td>Too brief or insufficient for understanding or too detailed</td>
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</tr>
<tr>
<td>Presentation Skills</td>
<td>Clear articulation, steady delivery rate, good posture and eye contact, confident and appropriately dressed</td>
<td>Clear articulation but not very polished. Able to recover from minor mistakes. Appropriately dressed</td>
<td>Occasional eye contact, incorrect pronunciations, and Voice fluctuation.</td>
<td>Inaudible or too loud, no eye contact, delivery rate is too slow or too fast, not in formal attire</td>
<td></td>
</tr>
<tr>
<td>Visuals</td>
<td>Visually pleasing and easy to read; good use of white space, colour, backgrounds; images and Graphics support.</td>
<td>Adequate layout, but with some fonts, colours, backgrounds difficult to read</td>
<td>Difficult to read, cluttered appearance; images improperly sized; some distracting graphics or animations</td>
<td>Confusing layout, text extremely difficult to read; many graphics, sounds, animations distract from the presentation</td>
<td></td>
</tr>
</tbody>
</table>

**Total Score**
## Rubrics for Project Work Phase - 1 Report Assessment

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Excellent (10)</th>
<th>Good (8)</th>
<th>Satisfactory (5)</th>
<th>Poor(2)</th>
<th>Final Score</th>
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<tbody>
<tr>
<td><strong>Objective, relevance, impact</strong></td>
<td>The purpose and objective, relevance and impact of the topic is made clear, and the report addresses them in a focused and logical manner;</td>
<td>The purpose and objective, relevance and impact of the topic is made clear, and the report addresses them;</td>
<td>Purpose and objectives are stated ambiguously;</td>
<td>The report does not clearly address any of them;</td>
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<tr>
<td><strong>Problem definition</strong></td>
<td>State the problem clearly and identify underline issues;</td>
<td>Adequately define the problem;</td>
<td>Fails to define the problem adequately;</td>
<td>Doesn't identify the problem;</td>
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<tr>
<td><strong>Literature study</strong></td>
<td>Detailed and extensive explanation of the specifications and the limitations of the existing systems</td>
<td>Collects a great deal of information and good study of the existing systems</td>
<td>Moderate study of the existing systems collects some basic information</td>
<td>Explanation of the existing study and the limitations of the existing systems not very satisfactory; limited information</td>
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<tr>
<td><strong>References</strong></td>
<td>Sources are Acknowledged with full reference details.</td>
<td>Sources are acknowledged with bare reference details.</td>
<td>Sources are acknowledged with partial reference details.</td>
<td>Sources are not acknowledged.</td>
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<tr>
<td><strong>Grammar &amp; Spelling, Report Format</strong></td>
<td>Very few spelling errors, correct punctuation, grammatically correct, complete sentences; All required elements of the report are present and completed</td>
<td>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.</td>
<td>Less technical details, sentences are not framed properly and with a few spelling mistakes; All required elements are provided but in a haphazard way</td>
<td>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</td>
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<td>efficiency.</td>
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<td>presentation of the document is not to a professional standard.</td>
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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:

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3-Strong; 2-Medium; 1-Low

Scheme of Evaluation:

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</table>
## Rubrics for Societal Project Assessment

<table>
<thead>
<tr>
<th>Identification of problem domain and detailed analysis</th>
<th>Excellent (10)</th>
<th>Good (8)</th>
<th>Satisfactory (5)</th>
<th>Poor (2)</th>
<th>Final Score</th>
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<tbody>
<tr>
<td>Detailed and extensive explanation of the purpose and need of the project</td>
<td>Good explanation of the purpose and need of the project</td>
<td>Average explanation of the purpose and need of the project</td>
<td>Minimal explanation of the purpose and need of the project</td>
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<tr>
<th>Study of the existing system and feasibility of project proposed</th>
<th>Excellent (10)</th>
<th>Good (8)</th>
<th>Satisfactory (5)</th>
<th>Poor (2)</th>
<th>Final Score</th>
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<tbody>
<tr>
<td>Detailed and extensive explanation of the specifications and the limitations of the existing systems</td>
<td>Collects a great deal of information and good study of the existing systems</td>
<td>Moderate study of the existing systems collects some basic information</td>
<td>Explanation of the specifications and the limitations of the existing systems not very satisfactory; limited information</td>
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<tr>
<th>Design &amp; Implementation Methodology</th>
<th>Excellent (10)</th>
<th>Good (8)</th>
<th>Satisfactory (5)</th>
<th>Poor (2)</th>
<th>Final Score</th>
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<tbody>
<tr>
<td>Division of problem into modules and good selection of computing framework; Appropriate design methodology and properly justified</td>
<td>Division of problem into modules and good selection of computing framework; Design methodology not properly justified</td>
<td>Division of problem into modules but inappropriate selection of computing framework; Design methodology not defined properly</td>
<td>Partial division of problem into modules and inappropriate selection of computing framework; Design methodology not defined properly</td>
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<tr>
<th>Project Demonstration &amp; Presentation with Questionnaire</th>
<th>Excellent (10)</th>
<th>Good (8)</th>
<th>Satisfactory (5)</th>
<th>Poor (2)</th>
<th>Final Score</th>
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<tbody>
<tr>
<td>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</td>
<td>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</td>
<td>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</td>
<td>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</td>
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<thead>
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<th>Report</th>
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<td>All required elements of the report are present and completed efficiency</td>
<td>All required elements of the report are present and completed to a satisfactory standard</td>
<td>All required elements are provided but in a haphazard way</td>
<td>Key elements of the report are not provided. Overall presentation of the document is not to a professional standard.</td>
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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

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

UNIT-III
Object- Oriented Programming  04 Hours
Delegates and Events and Exception Handling 04 Hours

UNIT-IV

Graphical User Interface with Windows Forms 09 Hours

UNIT-V

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

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)
   (Chapters: 14,15,19)

References Books:
2. Bart De Smet: C# 4.0 Unleashed, Pearson Education- SAMS Series.

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:

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3-Strong; 2-Medium; 1-Low
ELECTIVE GROUP – IV

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<th>Semester : IV</th>
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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


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, isElgignore 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


**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:**

**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:**

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3-Strong; 2-Medium; 1-Low
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

UNIT-V

Bootstrap Layout Components
08 Hours
Text Books:

Reference Books:

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

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:

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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

UNIT-IV
ERP Market  
08 Hours

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:
Reference Books:

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:

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3-Strong; 2-Medium; 1-Low
Course Title: Principles of User Interface Design

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

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

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:

Reference Books:

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:

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3-Strong; 2-Medium; 1-Low
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

**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

**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

**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

**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

**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:


Reference Books:

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**: Demonstrate wordnet in NLP systems

Mapping with Program Outcomes:

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</tbody>
</table>

3-Strong; 2-Medium; 1-Low
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

\[
\text{NPTEL Score} \times 1.5 = \text{[Subject to a Maximum of 100 Marks]}
\]

[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:

<table>
<thead>
<tr>
<th>Course code</th>
<th>Title</th>
<th>Internal (CIE)</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Seminar/</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Presentation</td>
<td>Report</td>
</tr>
<tr>
<td>P22MCA43</td>
<td>MOOC</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>
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 commencement of 4th semester but evaluation 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:

<table>
<thead>
<tr>
<th>CO's</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>CO2</td>
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<tr>
<td>CO3</td>
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</tr>
</tbody>
</table>

3-Strong; 2-Medium; 1-Low

Scheme of Evaluation:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Internal (CIE)</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Seminar/Presentation</td>
<td>Report</td>
</tr>
<tr>
<td>P22MCA44</td>
<td>Industry Internship</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>
### Industry Internship (P22MCA44)

#### Rubrics for Internship Presentation Assessment

<table>
<thead>
<tr>
<th></th>
<th>Excellent (10)</th>
<th>Good (8)</th>
<th>Satisfactory (5)</th>
<th>Poor (2)</th>
<th>Final Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowledge on Industry experience /Research work</strong></td>
<td>Demonstrates in depth knowledge about Industry / Research processes; answered all questions with elaboration</td>
<td>Knowledge to a limited extent on major processes. Able to answer most of the questions though not elaborate</td>
<td>Superficial knowledge of topic; only able to answer basic questions</td>
<td>Does not have any knowledge; Unable to answer questions</td>
<td></td>
</tr>
<tr>
<td><strong>Organization of the presentation</strong></td>
<td>Presented in logical sequence; Introduction and background given in proper context; Key points and conclusions are clear and less references and citations</td>
<td>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</td>
<td>Emphasis given to less important information</td>
<td>Little or no organization, difficult to follow; missing or ineffective introduction; confusing background; key points unclear</td>
<td></td>
</tr>
<tr>
<td><strong>Usage of Modern tools and technologies</strong></td>
<td>Effectively utilized appropriate tools and technologies for implementation.</td>
<td>Developed applications, though not very effectively. Fair enough.</td>
<td>Sufficient for understanding but not clearly elaborated about usage of tools and technologies</td>
<td>Too brief or insufficient for understanding or too detailed</td>
<td></td>
</tr>
<tr>
<td><strong>Presentation Skills</strong></td>
<td>Clear articulation about tools/technology, steady delivery rate, good posture and eye contact, confident and appropriately dressed</td>
<td>Good Articulation about tools/technology and not very polished. Not able to realize minor mistakes. Presentable attire</td>
<td>Refers to slides to make points, occasional eye contact, incorrect pronunciations, and Voice fluctuation.</td>
<td>No clarity in sentence, Inaudible or too loud, no eye contact, delivery rate is too slow or too fast, not in formal attire</td>
<td></td>
</tr>
<tr>
<td><strong>Visuals</strong></td>
<td>Visually pleasing and easy to read; good use of white space, colour, backgrounds; images and Graphics support.</td>
<td>Good visuals but can be improved largely.</td>
<td>Difficult to read, cluttered appearance; images improperly sized; some distracting graphics or animations</td>
<td>Confusing layout, text extremely difficult to read; many graphics, sounds, animations distract from the presentation</td>
<td></td>
</tr>
</tbody>
</table>

**Total Score**
# Rubrics for Internship Report Assessment

<table>
<thead>
<tr>
<th>Purpose and Objective of Internship</th>
<th>Excellent (10)</th>
<th>Good (8)</th>
<th>Satisfactory (5)</th>
<th>Poor (2)</th>
<th>Final Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>The purpose and objective of the Internship report is made clear, and the report addresses the objective(s) in a focused and logical manner.</td>
<td>Documented well but with slight ambiguity in analyzing the problems</td>
<td>Purpose and objectives are stated ambiguously</td>
<td>The report does not clearly address the objective(s) of Internship.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Documenting the essence of Tools / Technology used</th>
<th>Complete information is provided about tools/technology.</th>
<th>Average technical details on tools / technology usage.</th>
<th>Less technical details.</th>
<th>No details about tools/technology</th>
</tr>
</thead>
</table>

| 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 & Spelling | 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. |

<table>
<thead>
<tr>
<th>Total Score</th>
</tr>
</thead>
</table>

Rubrics for Internship Presentation Assessment (out of 50 marks) = Rubrics for Internship Report Assessment (out of 50 marks) = Total Marks (Out of 100 marks) =

Signature of the Guide/Co-ordinator
Name: 

Signature of the HOD
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:

<table>
<thead>
<tr>
<th>CO's</th>
<th>PO1</th>
<th>PO2</th>
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Scheme of Evaluation:

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<thead>
<tr>
<th>Course code</th>
<th>Title</th>
<th>Internal (CIE)</th>
<th>External (SEE)</th>
<th>Total Marks</th>
</tr>
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<tbody>
<tr>
<td>P22MCA45</td>
<td>Project Work Phase - 2</td>
<td>100</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Evaluation Area</td>
<td>Excellent (20)</td>
<td>Good (15)</td>
<td>Satisfactory (10)</td>
<td>Poor (5)</td>
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<td>----------------------------------------------------------</td>
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</tr>
<tr>
<td><strong>Identification of problem domain and detailed analysis</strong></td>
<td>Detailed and extensive explanation of the purpose and need of the project</td>
<td>Good explanation of the purpose and need of the project</td>
<td>Average explanation of the purpose and need of the project</td>
<td>Minimal explanation of the purpose and need of the project</td>
</tr>
<tr>
<td><strong>Literature survey and problem formulation</strong></td>
<td>Detailed and extensive explanation of the specifications and the limitations of the existing systems; All objectives of the proposed work are well defined;</td>
<td>Collects a great deal of information and good study of the existing systems; Good justification to the objectives;</td>
<td>Moderate study of the existing systems collects some basic information; Only some objectives of the proposed work are well defined;</td>
<td>Explanation of the specifications and the limitations of the existing systems not very satisfactory; limited information; Incomplete justification to the objectives proposed;</td>
</tr>
<tr>
<td><strong>Design of the proposed work</strong></td>
<td>Appropriate design methodology and properly justified; Steps to be followed to solve the defined problem are clearly specified</td>
<td>Design methodology not properly justified; Methodology to be followed is specified but detailing is not done</td>
<td>Design methodology not defined properly; Steps to be followed to solve the defined problem are not specified properly</td>
<td>Design methodology not defined properly; Steps are mentioned but unclear; Without justification to objectives</td>
</tr>
<tr>
<td><strong>Implementation and testing</strong></td>
<td>Implementation and validation of code is adequately explained and expected results are properly shown</td>
<td>Implementation and validation of code explanation is good and expected results are okay</td>
<td>Implementation, validation of code explanation and expected results are not up to the mark</td>
<td>Implementation and validation of code explanation is not done and expected results are incorrect</td>
</tr>
<tr>
<td><strong>Project Demonstration &amp; Presentation</strong></td>
<td>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</td>
<td>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</td>
<td>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</td>
<td>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</td>
</tr>
<tr>
<td>Contact with audience and clear voice with good spoken language</td>
<td>Language but less eye contact with audience</td>
<td>With audience and unclear voice</td>
<td>Total Score</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
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<td>---------------------------------</td>
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<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>Excellent (5)</th>
<th>Good (3)</th>
<th>Satisfactory (2)</th>
<th>Poor (1)</th>
<th>Final Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Relevance of the topic in the present context</strong></td>
<td>Relevance and impact of the project is made clear, and the report addresses them in a focused and logical manner</td>
<td>Relevance and impact of the project is made clear, and the report addresses them</td>
<td>Relevance and impact are stated ambiguously</td>
<td>The report does not clearly address any of them</td>
<td></td>
</tr>
<tr>
<td><strong>Originality of the topic</strong></td>
<td>Innovative system</td>
<td>Add on to existing system</td>
<td>Changes to existing system</td>
<td>Code migration for existing system</td>
<td></td>
</tr>
<tr>
<td><strong>Literature study</strong></td>
<td>Detailed and extensive explanation of the specifications and the limitations of the existing systems</td>
<td>Collects a great deal of information and good study of the existing systems</td>
<td>Moderate study of the existing systems collects some basic information</td>
<td>Explanation of the existing study and the limitations of the existing systems not very satisfactory; limited information</td>
<td></td>
</tr>
<tr>
<td><strong>Problem definition with functional requirements</strong></td>
<td>State the problem clearly and identify underline issues; strong description of the functional requirements of the project</td>
<td>Adequately define the problem; In-sufficient description of the functional requirements of the project</td>
<td>Fails to define the problem adequately; In-sufficient description of the functional requirements of the project</td>
<td>Doesn't identify the problem; poor description of the functional requirements of the project</td>
<td></td>
</tr>
<tr>
<td><strong>Experimental observation / Theoretical modelling</strong></td>
<td>Shows excellent understanding of experimental procedure and theory thoughts</td>
<td>Shows good understanding of experimental procedure and theory thoughts</td>
<td>Shows minimal understanding of experimental procedure e and theory thoughts</td>
<td>Shows no understanding of experimental procedure e and theory thoughts</td>
<td></td>
</tr>
<tr>
<td><strong>Result presentation, Discussion</strong></td>
<td>Results are presented in very appropriate manner;</td>
<td>Results are presented in good manner;</td>
<td>Results presented are not much satisfactory;</td>
<td>Results presented are not much satisfactory;</td>
<td></td>
</tr>
<tr>
<td><strong>Conclusion, Future scope and References</strong></td>
<td>Project work is well summarized and concluded; Future enhancement in the project are</td>
<td>Project work is well concluded; Future enhancement in the project are Specified; Sources are</td>
<td>Project work summary and conclusion not very appropriate; Future enhancement in the project are</td>
<td>Project work summary and conclusion not very appropriate; Future enhancement in the project are</td>
<td></td>
</tr>
<tr>
<td></td>
<td>well specified; Sources are acknowledged with full reference details</td>
<td>acknowledged with bare reference details</td>
<td>specified; Sources are acknowledged with partial reference details</td>
<td>specified; Sources are not acknowledged</td>
<td></td>
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<tr>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------</td>
<td>------------------------------------------</td>
<td>---------------------------------------------------------------</td>
<td>------------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Overall presentation of the Thesis</strong></td>
<td>All required elements of the report are present and completed efficiently</td>
<td>All required elements of the report are present and completed to a satisfactory standard</td>
<td>All required elements are provided but in a haphazard way</td>
<td>Key elements of the report are not provided. Overall presentation of the document is not to a professional standard</td>
<td></td>
</tr>
<tr>
<td><strong>Plagiarism Check</strong></td>
<td>Uniqueness 90% and above</td>
<td>Uniqueness between 85% to 89%</td>
<td>Uniqueness between 80% to 84%</td>
<td>Uniqueness less than 75% to 79%</td>
<td></td>
</tr>
<tr>
<td><strong>Paper Publication</strong></td>
<td>Paper is presented in conference / published in reputed journals</td>
<td>Paper is accepted in conference / journal</td>
<td>Paper is submitted in conference / journal and waiting for the review</td>
<td>Paper is not submitted to any conference / journal</td>
<td></td>
</tr>
</tbody>
</table>

**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:
### Rubrics for Viva-Voce

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Excellent (10)</th>
<th>Good (8)</th>
<th>Satisfactory (5)</th>
<th>Poor (2)</th>
<th>Final Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Presentation of background of work undertaken</strong></td>
<td>Detailed and extensive explanation of the specifications and the limitations of the existing systems</td>
<td>Collects a great deal of information and good study of the existing systems</td>
<td>Moderate study of the existing systems collects some basic information</td>
<td>Explanation of the specifications and the limitations of the existing systems not very satisfactory; limited information</td>
<td></td>
</tr>
<tr>
<td><strong>Presentation of suitability of work chosen</strong></td>
<td>Detailed and extensive explanation of the purpose and need of the project</td>
<td>Good explanation of the purpose and need of the project</td>
<td>Average explanation of the purpose and need of the project</td>
<td>Minimal explanation of the purpose and need of the project</td>
<td></td>
</tr>
<tr>
<td><strong>Presentation of finalization of work</strong></td>
<td>Division of problem into modules and good selection of computing framework; Appropriate design methodology and properly justified</td>
<td>Division of problem into modules and good selection of computing framework; Design methodology not properly justified</td>
<td>Division of problem into modules but inappropriate selection of computing framework; Design methodology not defined properly</td>
<td>Partial division of problem into modules and inappropriate selection of computing framework; Design methodology not defined properly</td>
<td></td>
</tr>
<tr>
<td><strong>Presentation of results, discussion of results and conclusion</strong></td>
<td>Results are presented in very appropriate manner; Project work is well summarized and concluded</td>
<td>Results are presented in good manner; Project work is well concluded;</td>
<td>Results presented are not much satisfactory; Project work summary and conclusion not very appropriate;</td>
<td>Results presented are not much satisfactory; Project work summary and conclusion not very appropriate;</td>
<td></td>
</tr>
<tr>
<td><strong>Overall performance</strong></td>
<td>Contents of presentations are appropriate and well delivered; Proper eye contact with audience and clear voice with good spoken language</td>
<td>Contents of presentations are appropriate and well delivered; Clear voice with good spoken language but</td>
<td>Contents of presentations are appropriate but not well delivered; Eye contact with only few people and unclear voice</td>
<td>Contents of presentations are not appropriate and not well delivered; Poor eye contact with audience and unclear voice</td>
<td></td>
</tr>
<tr>
<td>less eye contact with Audience</td>
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<tr>
<td>------------------------------</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total Score</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

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: