

DEPARTMENT OF COMPUTER SCIENCE

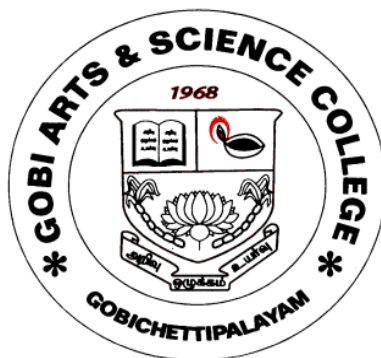
M.C.A. (COMPUTER APPLICATIONS)

(Students admitted during 2025-2026 Onwards)

(Under CBCS with Outcome Based Education (OBE) Pattern)

SYLLABUS

I TO IV SEMESTER



GOBI ARTS & SCIENCE COLLEGE

(Govt. Aided Autonomous Co-educational Institution, Affiliated to
Bharathiar University, Coimbatore, Accredited with 'A' Grade by NAAC (4th cycle)
and Recognised as a STAR College by DBT, Government of India)

**KARATTADIPALAYAM POST,
GOBICHETTIPALAYAM - 638453
ERODE DISTRICT.**

GOBI ARTS & SCIENCE COLLEGE (Autonomous)

Vision

Social and Economic upliftment of the people of this area through value based quality Education.

Mission

Committed to serve the society with humility and trust, devoid of exploitation; to impart value based higher education, particularly to the socially and economically deprived sections of this area; to make students of this institution worthy citizens of our glorious motherland.

DEPARTMENT OF COMPUTER SCIENCE

Vision

To inculcate better programming skills among rural area students.

Mission

To impart value based technical education and educate students towards the design and development of software products for the benefit of computer industry and society.

GOBI ARTS & SCIENCE COLLEGE (AUTONOMOUS) : GOBICHETTIPALAYAM
SCHEME OF EXAMINATIONS - M.C.A. (COMPUTER APPLICATIONS) (25 BATCH)

No.	Course Code	Course	Total Hours	Hrs/ Exam	Maximum Marks		Total Marks	Credits
					CIA	EOS		
		SEMESTER - I						
1	23P3CA01	OPEN SOURCE SCRIPTING TOOLS	60	3	25	75	100	4.0
2	23P3CA02	JAVA & JSP	60	3	25	75	100	4.0
3	23P3CA03	DESIGN AND ANALYSIS OF ALGORITHMS	60	3	25	75	100	4.0
4	23P3CA04	OPERATING SYSTEMS	60	3	25	75	100	4.0
5	23P3CA05	ELECTIVE - I : OBJECT ORIENTED ANALYSIS & DESIGN	60	3	25	75	100	3.0
6	23P3CAPA	PROGRAMMING LAB - I : (PYTHON)	60	3	25	75	100	3.0
7	23P3CAPB	PROGRAMMING LAB - II : (JAVA & JSP)	60	3	25	75	100	3.0
		SEMESTER - II						
8	23P3CA06	.NET PROGRAMMING	60	3	25	75	100	4.0
9	23P3CA07	RELATIONAL DATABASE MANAGEMENT SYSTEM	60	3	25	75	100	4.0
10	23P3CA08	SOFTWARE PROJECT MANAGEMENT & TESTING	60	3	25	75	100	4.0
11	23P3CA09	TCP/IP PROTOCOL SUITE & CYBER SECURITY	60	3	25	75	100	4.0
12	23P3CA10	ELECTIVE - II : CLOUD COMPUTING	60	3	25	75	100	3.0
13	23P3CAPC	PROGRAMMING LAB - III : (.NET)	60	3	25	75	100	3.0
14	23P3CAPD	PROGRAMMING LAB - IV : (CLIENT/SERVER)	60	3	25	75	100	3.0
		SEMESTER - III						
15	23P3CA11	INTERNET OF THINGS	75	3	25	75	100	4.0
16	25P3CA12	DATA ANALYTICS	60	3	25	75	100	4.0
17	23P3CA13	DATA WAREHOUSING & MINING	60	3	25	75	100	4.0
18	23P3CA14	ELECTIVE - III : MACHINE LEARNING	60	3	25	75	100	3.0
19	23P3CAPE	PROGRAMMING LAB - V : (IoT)	60	3	25	75	100	3.0
20	23P3CAPF	PROGRAMMING LAB - VI : (DATA ANALYTICS)	60	3	25	75	100	3.0
21		SUPPORTIVE PAPER :	60	3	25	75	100	4.0
		SEMESTER - IV						
22	23P3CAV1	PROJECT WORK AND VIVA-VOCE			25	75	100	15.0

TOTAL CREDITS: 90

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Remember; K2-Understanding; K3-Apply; K4-Analyze; K5-Evaluate

I. END OF SEMESTER (EOS) EXAMINATIONS:

1. Part III-Theory: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1	A (Answer All)	$10 \times 1 = 10$	MCQ	75
K2	B (Either or Pattern)	$5 \times 5 = 25$	Short answers	
K3 & K4	C (Either or Pattern)	$5 \times 8 = 40$	Descriptive/Detailed	

2. Practical Examinations: 75 Marks

Knowledge Level	Section		Total
	Practical	Record work	
K3	70	05	75
K4			
K5			

II. CONTINUOUS INTERNAL ASSESSMENT (CIA):

1. Test – I & II: 25 Marks (Theory)

Knowledge Level	Section	Marks	Description	Total
K1	A (Answer All)	$5 \times 1 = 5$	MCQ	25
K2	B (Either or Pattern)	$2 \times 5 = 10$	Short answers	
K3 & K4	C (Either or Pattern)	$1 \times 10 = 10$	Descriptive/Detailed	

2. Test –III: Model Exam 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1	A (Answer All)	$10 \times 1 = 10$	MCQ	75 Marks
K2	B (Either or Pattern)	$5 \times 5 = 25$	Short answers	
K3 & K4	C (Either or Pattern)	$5 \times 8 = 40$	Descriptive/Detailed	

3. Practical Internal Assessment: 25 Marks

Knowledge Level	Section		Total
	Test	Lab Performance	
K3	15	10	25
K4			
K5			

Components of Continuous Internal Assessment (CIA)

Components	Allotment of Internal Assessment Marks for a Maximum of 100 Marks (Converted into 25 Marks)
Two Tests (1 hour) [25+25=50/2]	25
Model Exam (75 Marks Converted into 50 Marks)	50
Learning by doing / Skill Development / Case Study / Innovation / Assignment. (Any Two-5+5 = 10 Marks)	10
Quiz / Term Paper / Composition / Field Visit / Industrial Visit / GD / Skill / Extension Activity etc. (Any Two-5 + 5 = 10 Marks)	10
Seminar	05
CIA Total	100

PROGRAMME SPECIFIC OBJECTIVES

The students will be able to do, on successful completion of programme,

1. Acquire strong fundamentals of computer architecture, theory, open source programming languages and analytical ability to meet the given set of computing requirements.
2. Gain sufficient depth of knowledge related to computer domains, possess technical skills and apply the knowledge effectively in teamwork.
3. Exhibit effective communication, apply the legal and social aspects of modern computing technologies and practice the profession with high regard to ethical responsibilities.
4. Adapt new computing technologies, design and develop software based solutions for real-world problems, catering to the requirements of the enterprises and society.
5. Pursue life-long learning habits in the broad context of technological changes and become leaders in the chosen field.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1: Acquire sound knowledge in the basic concepts of Computer Science including theory and programming acquainting with contemporary trends in computer science domains.

PSO2: Analyze user needs and formulate solutions relating algorithmic principles and programming techniques in par with industry standard.

PSO3: Identify relevant software and tools essential for IT based solutions for a career in information technology oriented concerns and demonstrate an appropriate level of expertise and be prepared.

PSO4: Design and develop applications to provide ethical, legal and social acceptable solutions for computer based technical problems and communicate effectively on teams to manage a project.

PSO5: Possess professional skills in advanced computer science concepts and software development process using broad range of open source programming languages to withstand technological change.

Programme Code:	MCA	Programme Title:	Computer Applications	
Course Code:	23P3CA01	Course Title:	Batch:	2025
Total Hours:	60	Open Source Scripting Tools	Semester:	I
			Credits:	4.0

Course Objective

The course aims

- Provide knowledge on advanced python programming
- Inculcate students to understand and apply text formatting, manipulating SQL and NoSql commands in python
- To understand the importance of python for analyzing data and vizualizing

Course Outcomes (CO)

On the successful completion of the course, students will be able to

Knowledge Level	CO Number	Course Outcome
K1, K2,K3	CO1	Understand the basics of python data and code structures and develop python programs using data structures
K1,K2,K3	CO2	Understand the concepts of functions, modules, objects and classes in python and apply it in programs
K1,K2,K3,K4	CO3	Create databases and manipulate mysql and nosql databases using python commands
K2,K3,K4,K5	CO4	Understand the use of numpy and pandas in python and manipulate structured data files
K3,K4,K5	CO5	Design and develop python programs in the perspective of data analysis and visualize it.

K1 – Remember; **K2** – Understanding; **K3** – Apply; **K4** – Analyze; **K5** - Evaluate

SYLLABUS		
Unit	Content	No. Of Hours
I	Python Data Structures: Creating and manipulating Lists, Tuples, Dictionaries, Sets, Python Code Structures: Iterate multiple sequences, Generate Multiple sequences, Comprehensions: List, Dictionary, Set, Generator.	12
II	Functions: Function declaration, Positional Arguments, Keyword Arguments, Default Parameters, Gathering Positional and Keyword Arguments, Inner Functions, Closures, Lambda functions, Generators, Decorators, Modules: Import, Packages, Objects and Classes: Class, Inheritance, Overriding, Get and Set Attributes, Method Types.	12
III	Text Formatting: New style, Regular Expressions: match, search, replace patterns, Relational Database Connectivity: Working with SQL, Data definition and manipulation using SQL statements, NoSQL Data sources: Redis-Strings, Lists, Hashes,Sets,Sorted Sets, Bits.	12
IV	Numpy: Creating arrays, Reshaping, Retrieving elements. Array math, Pandas: Creating Dataframe and Series, Reading and writing from/to structured data files, Indexing, Selecting, Assigning, Summarizing Functions and Maps.	12

V	Data Manipulation: Grouping and Sorting methods, Changing data types, dealing with missing values, Renaming and Combining data, Data Visualization and Distributions: Visualizing using Line, Bar, Scatter charts, Heatmaps, Histograms, density plots, Case Studies.	12
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Text Books:

1. Bill Lubanovic, “*Introducing Python Modern computing in Simple Packages*”, O'Reilly, 2019. (Unit I, II, III,IV).
2. Mohd. Abdul Hameed, “*Python for Data Science*”, Wiley India Private Limited, 2021. (Unit IV,V)

Reference Books:

1. Wesley J. Chun, “*Core Python Programming*”, Second Edition, Pearson Education, Inc, 2010.
2. Dr. R. Nageswara Rao, “*Core Python Programming*”, Third Edition, Dreamtech Press, 2022.
3. Reema Thareja, “*Problem Solving and Programming with Python*”, OxfordUniversity Press, 2018.

E-references:

1. <https://www.tutorialspoint.com/python>
2. https://swayam.gov.in/nd1_noc19_cs59/preview
3. <https://www.python.org/>
4. <https://nptel.ac.in/courses/106/106/106106182/>
5. <https://www.w3schools.com/python/>

Mapping with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	H	H	M
CO2	S	S	S	M	S
CO3	S	S	S	H	H
CO4	M	H	S	S	S
CO5	H	H	S	S	S

S-Strong; H-High; M- Medium; L-Low

Programme Code:	MCA	Programme Title:	Computer Applications	
Course Code:	23P3CA02	Course Title:	Batch:	2025
Total Hours:	60	JAVA & JSP	Semester:	I
			Credits:	4.0

Course Objective

The course aims

- To understand the objectives of JAVA language and key concepts of the JAVA Language.
- To understand the Packages, Thread Modeling and Applet Classes of JAVA and Design Model program based upon the concepts.
- To learn Event Handling and Developing Servlets, Design relevant program to implement the concept.
- To understand the importance of JDBC objects in JAVA and Learn JSP and its implementations.
- To understand the Session and Thread management and implement the concept of these management.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

Knowledge Level	CO Number	Course Outcome
K1, K2	CO1	Understand the JAVA language and the extended support of JAVA for OOPs.
K2, K3, K4	CO2	Understand the procedure of designing package, multithreaded model, applet classes and its implementations.
K2, K3, K4	CO3	Learn event handling concepts, servlet designing concepts and its implementations.
K1, K3, K4	CO4	Familiarise the JDBC object services make use this services for database access. Developing JSP and its features.
K2, K4, K5	CO5	Understand Sessions and Thread management, implement the concepts in program.

K1 – Remember; **K2** – Understanding; **K3** – Apply; **K4** – Analyze; **K5** - Evaluate

SYLLABUS		
Unit	Content	No. of Hours
I	AN OVERVIEW OF JAVA: Object oriented programming, class Fundamentals, Methods, Constructors, this Keyword, Overloading Methods, Overloading Constructors, Using Object as Parameters, Returning objects, INHERITANCE: Inheritance Basics, Using Super, Creating a Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes.	12
II	PACKAGES AND INTERFACES: Packages, Access Protection, Interfaces, Exception Handling, Exception Types, Uncaught Exceptions, Using try and Catch, Multiple Catch Clauses, Nested try Statements, throw, throws, finally, Multithreaded Programming, The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities, THE APPLET CLASS: Applet Basics, The HTML Applet Tag, Passing Parameters to Applets.	12

III	EVENT HANDLING: Event classes, Event Listener Interfaces, Handling Mouse Events, Handling Keyboard Events, Adapter Classes, DEVELOPING SERVLETS: The Architecture of Java Servlet, The Basics Servlet Architecture, Generic servlet and Httpservlet, The Life Cycle of a Servlet, Building a Basic Servlet.	12
IV	OVERVIEW OF JDBC: Basic JDBC operations, Essential Classes, Jdbc Drivers, STATEMENT INTERFACES: Connection, Statement Objects, ExecuteQuery, Execute Update methods, Prepared Statements, Callable Statements, Resultsets, Programs with Resultset objects, JSP OVERVIEW: How JSP works, JSP syntax and semantics, JSP Development Model, Components of JSP, Developing JSP pages, JSP Actions, JSP Expression, Scriptlet, Implicit Object Declaration.	12
V	REQUEST DISPATCHING: Anatomy of Request Processing, JSP Include Actions, Passing Parameters, Forwarding Requests, SESSION AND THREAD MANAGEMENT: Hidden Fields, URL Rewriting, Cookies, Manipulating Sessions, Programming with session management. Passing Arguments, SUBROUTINES: Calling function, Passing Arguments, Call by reference.	12

Text Books:

1. HERBERT SCHILDT , “*JAVA2, THE COMPLETE REFERENCE*”, Tata McGraw Hill Publishing, 2011 (UNITS I-III)
2. PHIL HANNA , “*THE COMPLETE REFERENCE JSP 2.0*”, Tata McGraw Hill Publishing, Edition 2011 (Units IV, V)

Reference Book:

1. **Herbret Schild**, “Java: A Beginner's Guide”, Sixth Edition, Tata McGraw Hill Publishing, 2014.

E-references:

1. <https://www.tutorialspoint.com/java/>
2. <https://www.guru99.com/java-tutorial.html>
3. <https://beginnersbook.com/java-tutorial-for-beginners-with-examples/>

Mapping with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	M	M
CO2	S	H	H	S	M
CO3	S	H	H	S	M
CO4	S	H	H	S	M
CO5	S	S	S	M	M

S-Strong; H-High; M- Medium; L-Low

Programme Code:	MCA	Programme Title:	Computer Applications	
Course Code:	23P3CA03	Course Title:	Batch:	2025
Total Hours:	60	Design and Analysis of Algorithms	Semester:	I
			Credits:	4.0

Course Objective

The course aims

- To solve a given problem using an algorithm.
- To understand various algorithm design and implementation.
- To analyze the efficiency of algorithm and apply in real time applications.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

Knowledge Level	CO Number	Course Outcome
K1, K3	CO1	Get knowledge about algorithms and determines their time complexity. Demonstrate specific search and sort algorithms using divide and conquer technique.
K2, K3, K4	CO2	Gain good understanding of Greedy method and its algorithm.
K3, K4	CO3	Able to describe about graphs using dynamic programming technique.
K2, K3, K4	CO4	Explore the traversal and searching technique and apply it for trees and graphs.
K2, K3, K4	CO5	Demonstrate the concept of backtracking & branch and bound technique.

K1 – Remember; K2 – Understanding; K3 – Apply; K4 – Analyze; K5 - Evaluate

SYLLABUS		
Unit	Content	No. of Hours
I	Introduction: What is an algorithm?, Algorithm specification, performance analysis - Divide and Conquer: General method, Binary search, Finding the maximum and minimum, Merge sort, Quick sort, Strassen's matrix multiplication.	12
II	The Greedy method: The General method, Knapsack problem, Job sequencing with deadlines, Minimum cost spanning tree: Prim's algorithm, Kruskal's algorithms. Optimal storage on tapes, Single source shortest paths.	12
III	Dynamic programming: The general method, Multistage graphs, All Pairs shortest paths, 0/1 Knapsack, Reliability Design, The Traveling Sales Person problem, Flow shop scheduling.	12
IV	Basic Traversal and search Techniques: Techniques for binary trees, Techniques for graphs, Connected components and Spanning trees, Biconnected components and DFS.	12
V	Backtracking: The general method, The 8 Queen problem, Sum of subsets, Graph coloring, Hamiltonian cycles, Knapsack problem - Branch and Bound: 0/1 Knapsack problem, Traveling salesperson problem.	12

Text Book:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, *“Fundamentals of computer algorithms”*, Galgotia publications Pvt. Ltd, (UNIT - I to V), 2013.

Reference Books:

1. Anany Levitin, *“Introduction to the Design And Analysis Of Algorithms”*, Pearson Education Pvt Ltd, 2013.
2. Kaushal Kishor Rastogi, *“Design And Analysis Of Algorithms”*, First Edition, Global Academic Publishers, 2013.
3. R Manjula Devi, R Devi Priya, R C Suganthe, *“Design And Analysis Of Algorithms”*, Charulatha publishers, 2010.

E-references:

1. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
2. http://ignou.ac.in/userfiles/SandeepFINAL_Unit1_Intro_21-03-2013.pdf
3. <https://www2.cs.duke.edu/courses/fall08/cps230/Book.pdf0>

Mapping with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	M	M
CO2	S	H	M	L	L
CO3	S	H	M	L	L
CO4	S	H	H	M	L
CO5	S	M	M	L	L

S-Strong; H-High; M- Medium; L-Low

Programme Code:	MCA	Programme Title:	Computer Applications	
Course Code:	23P3CA04	Course Title:	Batch:	2025
Total Hours:	60	Operating Systems	Semester:	I
			Credits:	4.0

Course Objective

The course aims

- To study the basic concepts and functions of operating systems. Understand the structure and functions of OS. Learn about Processes, Threads and Scheduling algorithms. Understand the principles of concurrency and Deadlocks.
- To introduce mobile application development for android platform.
- To learn skills for creating and deploying android applications.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

Knowledge Level	CO Number	Course Outcome
K1, K2	CO1	Understand the fundamental components, concepts, history and system calls of operating system.
K2, K3, K4	CO2	Understand various process states in an operating system and its implementation using mutual exclusion primitives.
K1, K2, K4, K5	CO3	Understand the problems of deadlock and analyze deadlock prevention and recovery techniques along with the design of real storage management strategies.
K1, K3, K4, K5	CO4	Describe Android platform, Architecture and features.
K1, K2, K4	CO5	Design User Interface and develop activity for Android Application. Working with image views, clock views and graphics.

K1 – Remember; **K2** – Understanding; **K3** – Apply; **K4** – Analyze; **K5** – Evaluate

SYLLABUS		
Unit	Content	No. of Hours
I	Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor - Multicore Organization - Operating system overview-objectives and functions - Evolution of Operating System - Computer System Organization- Operating System Structure and Operations- System Calls - System Programs Operating System Generation and System Boot.	12
II	Process Concept - Process Scheduling – Operations on Process - Interprocess Communication – Threads Overview - Multicore Programming - Multithreading Models - Windows 7 Thread and SMP Management - Process Synchronization - Critical Section Problem - Mutex Locks – Semaphores – Monitors - CPU Scheduling and Deadlocks.	12
III	Main Memory-Contiguous Memory Allocation – Segmentation – Paging – Virtual MemoryDemand Paging - Page Replacement – Allocation – Thrashing - Allocating Kernel Memory.	12

IV	Introduction to Android Operating System – Java JDK – Android SDK – Android Development Tools – Android Virtual Device – Emulators – Intent – Activity – Activity Life Cycle.	12
V	Designing your user interface with View: TextView – Button – ImageButton – EditText – CheckBox – ToggleButton – RadioButton & RadioGroup – Progress Bar – AutoCompleteTextView – Spinner – ListView – GridView – ImageView – ScrollView – CustomToastAlert.	12

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012. (UNIT I to III)
2. Prasanna Kumar Dixit, “Android”, Vikas Publishing Private Limited, 2014. (UNIT IV,V)

Reference Books:

1. William Stallings, “Operating Systems – Internals and Design Principles”, 7th Edition, Prentice Hall, 2011.
2. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Addison Wesley, 2001.
3. Pradeep Kothari, “Android Application Development”, Dreamtech Press, 2016.
4. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd, 2010.

E-references:

1. <https://www.studytonight.com/operating-system/cpu-scheduling>
2. https://www.tutorialspoint.com/operating_system
3. <https://www.slideshare.net/rajendraprasadalladi/operating-system-overview-concepts-ppt>
4. <https://www.tutorialspoint.com/android/>
5. <https://developer.android.com/guide>

Mapping with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	H	S
CO2	S	S	S	M	M
CO3	H	S	S	H	H
CO4	M	S	S	S	H
CO5	S	S	H	S	H

S-Strong; H-High; M-Medium; L-Low

Programme Code:	MCA	Programme Title:	Computer Applications	
Course Code:	23P3CA05	Course Title:	Batch:	2025
Total Hours:	60	Elective - I : Object Oriented Analysis & Design	Semester:	I
			Credits:	3.0

Course Objective

The course aims

- To learn the concepts of object-oriented themes and design techniques.
- To understand the various steps performed during analysis and object design process.
- To learn the concepts of modeling and UML.

Course Outcomes (CO)

On the successful completion of the course students will be able to

Knowledge Level	CO Number	Course Outcome
K1	CO1	Understand the concept of Object-Oriented development and modeling techniques.
K2, K4	CO2	Analyze the problem and construct object, dynamic and functional models for applications.
K2, K3	CO3	Gain knowledge about the various steps performed during object design.
K2, K1	CO4	Explain the concept of modeling and building blocks of UML.
K3, K5	CO5	Build models for applications using UML diagrams.

K1-Remember; **K2**-Understanding; **K3**-Apply; **K4**-Analyze; **K5**-Evaluate

SYLLABUS		
Unit	Content	No. of Hours
I	INTRODUCTION - Meaning of Object-Oriented, Object-Oriented Development, Object-Oriented Themes, MODELLING AS A DESIGN TECHNIQUE: Modeling, The Object Modeling Technique, Objects and Classes, Links and Associations, Advanced Link and Association Concepts, Generalization and Inheritance, Grouping Constructs.	12
II	ANALYSIS: Overview of Analysis, Problem Statement, Automated Teller Machine Example, Object Modeling, Dynamic Modeling, Functional Modeling, Adding Operations, Iterating the Analysis.	12
III	OBJECT DESIGN: Overview of Object Design, Combining the Three Models, Designing Algorithms, Design Optimization, Implementation of Control, Adjustment of Inheritance, Design of Associations, Object Representation, Physical Packaging, Documenting Design Decisions.	12
IV	INTRODUCTION TO MODELING: The importance and principles of modeling, Object Oriented Modeling, INTRODUCTION TO UML: Brief History of UML, An Overview and a Conceptual Model of the UML, BUILDING BLOCKS OF THE UML: Things, Relationships, Diagrams, Rules and Common Mechanisms in the UML, Systems Architecture, Class Diagrams, Use Case Diagrams.	12

V	Object Diagrams, Collaboration Diagrams, Sequence Diagrams, State Chart Diagrams, Activity Diagrams, Component Diagrams and Deployment Diagrams, CASE STUDY: Modeling of a building access control application.	12
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Text Books:

1. James Rumbaugh, Michael Blaha, William Premerlani, Frederick Eddy, William Lorensen, “*Object-Oriented Modeling and Design*”, Prentice-Hall of India Pvt. Ltd, 2002 (UNITS I to III).
2. Pieere Alian Muller, “*Instant UML*”, First Indian Reprint, Shroff Publishers & Distributors, 2000 (UNITS IV & V).
3. Gredy Booch, James Rumbaugh, Ivar Jacobson,” *The Unified Modeling Language User Guide*”, Second Edition Reprint, Addison Wesley Publication, 2011 (UNIT IV).

Reference Books:

1. Sudha Sadasivam.G, “*Object - Oriented Analysis and Design*”, First Edition, Mac Millan Publisher India Ltd, 2010.
2. Michael R. Blaha, James R. Rumbaugh, “*Object-Oriented Modeling and Design with UML*”, Second Edition, Pearson Education, 2013.
3. Mahesh P. Matha, “*Object-Oriented Analysis and Design Using UML- An Introduction to Unified Process and Design Patterns*”, Prentice Hall of India, 2008.
4. Daminni Grover, “*Object-Oriented Analysis and Design with UML*”, I. K. International Publishing House Pvt. Ltd, 2012.

E-references:

1. https://www.tutorialspoint.com/object_oriented_analysis_design/
2. <https://nptl.ac.in/courses/122105022/27>
3. <https://nptl.ac.in/courses/122105022/28>

Mapping with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	H	M
CO2	H	M	H	S	S
CO3	S	S	H	S	H
CO4	S	S	H	H	M
CO5	S	H	S	H	S

S - Strong; H - High; M - Medium; L - Low

Programme Code:	MCA	Programme Title:	Computer Applications	
Course Code:	23P3CA06	Course Title:	Batch:	2025
Total Hours:	60	.Net Programming	Semester:	II
			Credits:	4.0

Course Objective

The course aims

- To understand the fundamentals of ASP.NET Framework and C# Programming.
- To learn the concepts of State Management, Validation, ADO.Net and design web pages using data source control.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

Knowledge Level	CO Number	Course Outcome
K1, K2	CO1	Understand the fundamentals of .Net Framework and C# Programming.
K1, K2, K3	CO2	Remember the ASP.Net fundamentals and work with directives and web server controls.
K3, K4, K5	CO3	Acquire knowledge about Validation Controls, Session Management and write appropriate .Net programs.
K2, K3, K4, K5	CO4	Learn how to apply different ADO.Net objects for connecting a back end with asp server controls, write programs and analyze it.
K1, K2, K3, K4, K5	CO5	Design, develop and host web pages applying various data source controls.

K1 – Remember; **K2** – Understanding; **K3** – Apply; **K4** – Analyze; **K5** - Evaluate

SYLLABUS		
Unit	Content	No. of Hours
I	THE .NET FRAME WORK: Languages, CLR, Namespace, Assemblies, ASP.NET: File Types, Stages in ASP.NET request, Code behind, global.asx files, Web.config files, C#.NET Programming: Variables, Data Types, Scope, Conditional Structure, Loop Structure, Functions and Subroutines.	12
II	ASP.NET FUNDAMENTALS: Page Directives, Page Events, Cross Page Posting, ASP.NET SERVER CONTROLS: Types of Server controls, Building, Working and Applying styles to server controls, WEB SERVER CONTROLS: TextBox, Button, HyperLink, ListBox, Radio Button, Calender, Adrotator - Events and methods.	12
III	VALIDATION SERVER CONTROLS: Client side Validation, Validation controls, Regular Expressions, Programming with Validation, STATE MANAGEMENT: Session states, Understanding session object in ASP.NET, Query strings, Cookies, Hidden Field, ViewState, Programming with state Management.	12
IV	DATA MANAGEMENT WITH ADO.NET: Common ADO.NET operations, ADO.NET Namespace and Classes, Objects - Connection, Command, Data Reader, DataSet, Data Tables using parameters, Programming with ADO.NET.	12
V	DATA BINDING: Data Source controls – Sql Data source control, DATA	12

	SOURCE CONTROL CATCHING: Storing Connection, USING BOUND LIST CONTROLS WITH DATA SOURCE CONTROL: Grid View-Templates, Paging, Using Template field columns, Editing, Deleting, List view binding, Form view binding , Programs for binding.	
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Text Books:

1. THE COMPLETE REFERENCE ASP.NET, MATHEW MAC DONALD, Tata McGraw Hill Publishing, Edition, 2002 (UNIT-I).
2. PROFESSIONAL ASP.NET 4 IN C# AND VB, BILL EVJEN, SCOTT HANSELMAN & DEVIN RADER, Wiley Publishing, Reprint- 2011 (UNIT II-V).

E-references:

1. <https://www.tutorialspoint.com/asp.net>
2. <https://www.w3schools.com/asp.net>

Mapping with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	M	M
CO2	S	S	H	H	M
CO3	S	H	S	S	S
CO4	H	S	S	S	S
CO5	H	H	S	S	S

S-Strong; **H**-High; **M**- Medium; **L**-Low

Programme Code:	MCA	Programme Title :	Computer Applications	
Course Code:	23P3CA07	Course Title:	Batch:	2025
Total Hours:	60	Relational Database Management System	Semester:	II
			Credits:	4.0

Course Objective

The course aims

- To learn the concepts of database systems and relational model.
- To practice conceptual data model using ER diagrams for database design.
- To learn SQL and use normal forms to reduce anomalies in relations.
- To understand the concept of database security and transaction processing.

Course Outcomes (CO)

On the successful completion of the course students will be able to

Knowledge Level	CO Number	Course Outcome
K1	CO1	Understand and describe the concepts of database system and relational model.
K2, K3	CO2	Construct ER diagrams for database applications.
K3	CO3	Write advanced SQL queries for data retrieval.
K2, K4	CO4	Gain knowledge about normalization techniques and use normal forms to design a relational database system effectively.
K2, K5	CO5	Explain the concept of database security and transaction processing. Develop application programs using RDBMS to maintain data.

K1-Remember; K2-Understanding; K3-Apply; K4-Analyze; K5-Evaluate

SYLLABUS		
Unit	Content	No. of Hours
I	Introduction to Databases - Introduction, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of Using the DBMS Approach, A Brief History of Database Applications – Overview Of Database Languages and Architectures – Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client/Server Architectures for DBMSs, Classification of Database Management Systems.	12
II	Conceptual Data Modeling Using Entities and Relationships – Using High Level Conceptual Data Models for Database Design, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, ER Diagrams Naming Conventions, and Design Issues, Relationship Types of Degree Higher than Two – Basic Relation Model – Relation Model Concepts, Relational Model Constraints and Relational Database Schemas.	12
III	SQL: Data Definition, Constraints, and Basic Queries and Updates – SQL	

	Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL – SQL Advanced Queries – Complex SQL Retrieval Queries, View(Virtual Tables) in SQL.	12
IV	Introduction to Normalization Using Functional and Multivalued Dependencies – 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, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.	12
V	Introduction to Database Security – Introduction to Database Security Issues, Discretionary Access Control Based On Granting and Revoking Privileges, Mandatory Access Control and Role-Based Access Control for Multilevel Security, SQL Injection. – Foundations of Database Transaction processing – Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Transaction Support in SQL.	12

Text Book:

1. Ramez Elmars, Shamkant B. Navathe , “*Database Systems Models, Languages, Design and Application Programming*”, Sixth Edition, Pearson Education,2013 (Units I to V).

Reference Books:

1. Raghu Ramakrishnan, Johannes Gehrke, “*Database Management Systems*”, Second Edition, McGraw Hill, 2000.
2. Shio Kumar Singh, “*Database Systems, Concepts, Designs and Application*”, Second Edition, Pearson Education, 2013.
3. C. J. Date, A. Kannan, S. Swamynathan, “*An Introduction to Database Systems*”, Eighth Edition, Pearson Education, 2013.
4. Thomas M. Connolly, Carolyn E. Begg, “*Database Systems, A Practical Approach to Design, Implementation and Management*”, Fourth Edition, Pearson Education, 2012.

E-references:

1. <https://nptel.ac.in/courses/106/105/175/2>
2. <https://www.tutorialspoint.com/sql/sql-rdbms-concepts.html>
3. <https://beginnersbook.com/2015/04/rdbms-concepts/>
4. <https://www.guru99.com/relational-data-model-dbms.html>

Mapping with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	S	H	M
CO2	H	S	H	M	H
CO3	S	M	H	H	S
CO4	H	S	S	H	S
CO5	S	H	S	S	H

S-Strong; H-High; M-Medium; L- Low

Programme Code:	MCA	Programme Title :	Computer Applications	
Course Code:	23P3CA08	Course Title:	Batch:	2025
Total Hours:	60	Software Project Management & Testing	Semester:	II
			Credits:	4.0

Course Objective

The course aims

- To learn about the activities involved in software project management.
- To understand various techniques for effort estimation.
- To learn about Resources and various testing techniques.

Course Outcomes (CO)

On the successful completion of the course students will be able to

Knowledge Level	CO Number	Course Outcome
K1, K2	CO1	Learn about Software Project Management Basics, Project planning and various development models.
K1, K2, K3	CO2	Learn about Software Effort Estimation, Activity Planning and Risk Management.
K1, K2, K3	CO3	Understand and identify Resource Allocation, Monitoring and Control, Managing People in Software Environments and Working Team Management.
K1, K2, K3, K4, K5	CO4	Design and conduct Black box, White box and Integration testing Types.
K1, K2, K3, K4, K5	CO5	Know about System and Acceptance Testing, Performance Testing and Regression Testing.

K1-Remember; **K2**-Understanding; **K3**-Apply; **K4**-Analyze; **K5**-Evaluate

SYLLABUS		
Unit	Content	No. of Hours
I	Introduction to Software Project Management: Introduction - Why is Software Project Management Important? - What is a Project? - Software Projects versus Other Types of Project - Contract Management and Technical Project Management - Activities Covered by Software Project Management - Plans, Methods and Methodologies - Some Ways of Categorizing Software Projects - Stakeholders - Setting Objectives - The Business Case - Project Success and Failure - What is Management? - Management Control - Traditional versus Modern Project Management Practices - An Overview of Project Planning: - Selection of an Appropriate Project Approach: Introduction - Build or Buy? - Choosing Methodologies and Technologies - Software Processes and Process Models - Choose of Process Models - Structure versus Speed of Delivery - The Waterfall Model - Spiral Model - Software Prototyping - Other Ways of Categorizing Prototypes - Incremental Delivery – Dynamic Systems Development Method - Rapid Application Development - Agile Methods - Extreme Programming (XP) - Scrum - Managing Iterative Processes -Selecting the Most Appropriate Process Model.	12

II	Software Effort Estimation: Introduction - Where are Estimates Done? - Problems with Over - and Under-Estimates - The Basis for Software Estimating - Software Effort Estimation Techniques - Bottom-up Estimating - The Top-down Approach and Parametric Models - Expert Judgment - Estimating by Analogy - Albrecht Function Point Analysis - Function Points Mark II - COSMIC Full Function Points - COCOMO II: A Parametric Productivity Model - Cost Estimation - Staffing Pattern - Effort of Schedule Compression - Activity Planning: Introduction - The Objective of Activity Planning - When to Plan - Project Schedules - Projects and Activities - Sequencing and Scheduling Activities - Network Planning Models - Formulating a Network Model - Adding the Time Dimension - The Forward Pass - The Backward Pass - Identifying the Critical Path - Activity Float - Shortening the Project Duration - Identifying Critical Activities - Activity-on-Arrow Networks - Risk Management: Introduction - Risk - Categories of Risk - A Framework for Dealing with Risk - Risk Identification - Risk Assessment - Risk Planning - Risk Management - Evaluating Risk to the Schedule - Applying the PERT Technique - Monte Carlo Simulation - Critical Chain Concepts.	12
III	Resource Allocation: Introduction - The Nature of Resources - Identifying Resources Requirements - Scheduling Resources - Creating Critical Paths - Counting the Cost - Being Specific - Publishing the Resource Schedule - Cost Schedules - The Schedule Sequence - Monitoring and Control: Introduction - Creating the Framework - Collecting the Data - Review - Project Termination Review - Visualizing Progress - Cost Monitoring - Earned Value Analysis - Prioritizing Monitoring - Getting the Project Back to Target - Change Control - Software Configuration Management (SCM) - Managing People in Software Environments: Introduction - Understanding Behavior - Organizational Behaviour: A Background - Selecting the Right Person for the Job - Instruction in the Best Methods - Motivation - The Oldham-Hackman Job Characteristics Model - Stress - Health and Safety - Working in Team: Introduction - Becoming a Team - Decision Making - Organization and Team Structure - Coordination Dependencies - Dispersed and Virtual Teams - Communication Genres - Communication Plans - Leadership.	12
IV	White Box Testing: What is White Box Testing? - Static Testing - Structural Testing - Challenges in White Box Testing - Black Box Testing: What is Black Box Testing? - Why Black Box Testing? - When to do Black Box Testing? - How to do Black Box Testing? - Integration Testing: What is Integration Testing? - Integration Testing as a Type of Testing - Integration Testing as a Phase of Testing - Scenario Testing - Defect Bash.	12
V	System and Acceptance Testing: System Testing Overview - Why is System Testing Done? - Functional Versus Non-Functional Testing - Functional System Testing - Non-Functional Testing - Acceptance Testing - Performance Testing: Introduction - Factors Governing Performance Testing - Methodology for Performance Testing - Tools for Performance Testing - Process for Performance Testing - Regression Testing: What is Regression Testing? - Types of Regression Testing - When to do Regression Testing? - How to do Regression Testing? - Best Practices in Regression Testing.	12

Text Books:

1. Bob Hughes And Mike Cotterell And Rajib Mall, “*Software Project Management*”, Tata McGraw Hill - Fifth Edition Tenth reprint 2014 [For Unit I - Unit III].
2. Srinivasan Desikan & Gopalaswamy Ramesh, “*Software Testing Principle and Practices*”, Pearson Education, 2006 [For Unit IV - and Unit V].

Reference Books:

1. Milind Limaye, “*Software Quality Assurance*”, Tata Mc Graw Hill, Edition, 2011, ISBN (13) : 978-0-07-107252-6.
2. Daniel Galin, “*Software Quality Assurance*”, Pearson Education Edition, 2009, ISBN 978-81-317-2395-1.
3. Kamna Malik, Praveen Choudhary, “*Software Quality*”, Tata Mc Graw Hill Edition, 2010, ISBN-13-978-0-07-024873-1.
4. Ron Patton, “*Software Testing*”, 2nd Edition, Sams Publishing, 2005.
5. Glenford J. Myers, Corey Sandler, Tom Badgett, “*The Art of Software Testing*”, 3rd Edition, John Wiley & Sons, Inc., Hoboken, New Jersey, 1979.

E-references:

1. <https://en.wikipedia.org/wiki/software-engineering/>
2. <https://www.computerscience.org/software-quality-assurance/>
3. <https://www.predictiveanalyticstoday.com/quality-control/>
4. http://barbie.uta.edu/~mehra/Book1_The Art of Software Testing.pdf
5. <https://www.softwaretestinghelp.com/practical-software-testing-new-free-ebook-download/>

Mapping with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	S	S
CO2	S	H	M	M	M
CO3	S	M	S	H	S
CO4	M	M	S	S	S
CO5	S	H	M	M	M

S-Strong; **H**-High; **M**-Medium; **L**- Low

Programme Code:	MCA	Programme Title :	Computer Applications	
Course Code:	23P3CA09	Course Title:	Batch:	2025
Total Hours:	60	TCP/IP Protocol Suite & Cyber Security	Semester:	II
			Credits:	4.0

Course Objective

The course aims

- To help the students to understand the concepts of networking.
- To enable the students to learn the technologies behind internet.
- To help the students to understand the protocols used in internet.
- To help the students to learn about network security.

Course Outcomes (CO)

On the successful completion of the course students will be able to

Knowledge Level	CO Number	Course Outcome
K1, K2, K3	CO1	Understand the networking topology.
K2, K3, K4, K5	CO2	Understand the switching technologies and IP addresses.
K2, K3, K4, K5	CO3	Evaluate the various protocols for network layer data transfer.
K2, K3, K4, K5	CO4	Comprehend the transport layer session.
K2, K3, K4, K5	CO5	Understand the use of Crypto security.

K1-Remember; K2-Understanding; K3-Apply; K4-Analyze; K5-Evaluate

SYLLABUS		
Unit	Content	No. of Hours
I	OSI Model & TCP/IP protocol suite: OSI model; TCP/IP protocol suite, addressing, Wired LAN, Wireless LAN, Point to point WAN, Switched WAN, Connecting devices.	12
II	Network Layer: Packet switching at network layer, Network layer services, IPv4 addressing: Classful addressing, Classless addressing, Special addresses, NAT. Forwarding of IP Packets, Delivery, Forwarding, Structure of a router.	12
III	IPv4: Datagrams, Fragmentation, Options, Checksum. ARP: Address mapping, ARP protocol, ARP package. ICMPv4: Messages, Debugging tools, ICMP package. Unicast Routing Protocols: Intra and inter domain routing, Distance vector routing, RIP, Link state routing, OSPF, Path vector routing: BGP.	12
IV	Transport Layer: Transport layer services, Transport layer protocols, UDP: User datagram, UDP services, UDP applications, UDP package. TCP: TCP services, TCP features, Segment, A TCP connection, TCP features, Segment, TCP connection, State transition diagram, Windows in TCP, Flow control, Error control, Congestion control, TCP timers, Options. <i>Self study: TCP Options</i>	12

V	Cryptography & Network Security: Introduction – Traditional ciphers – Modern ciphers – Asymmetric key ciphers – Message integrity – Message authentication – Digital signature – Entity authentication & Key management.	12
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Text Book:

1. Behrouz A. Forouzan, “TCP/IP protocol suite”, Tata Mc Graw Hill Education Pvt. Ltd, Fourth Edition, 2010.

Reference Books:

1. Craig Hunt, “TCP/IP Network Administration”, O'Reilly, Third Edition, 2002.
2. Charles M. Kozierok, “The TCP/IP Guide: A Comprehensive, Illustrated Internet Protocols Reference”, No Starch Press, 2005.
3. Douglas E Comer, “Internet Working with TCP/IP”, PHI, Fourth Edition, 1998.
4. Karanjit S. Siyan, “TCP/IP Unleashed”, Sams, Third Edition, 2002.

E-references:

1. <https://www.redbooks.ibm.com/redbooks/pdfs/gg243376.pdf>
2. http://xahlee.info/linux/tcp_ip_tutorial.html
3. <http://www.steves-internet-guide.com/internet-protocol-suite-explained/>

Mapping with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	M	S
CO2	H	H	M	L	L
CO3	L	M	S	S	M
CO4	M	S	S	S	M
CO5	S	L	S	M	S

S-Strong; H-High; M-Medium; L- Low

Programme Code:	MCA	Programme Title :	Computer Applications	
Course Code:	23P3CA10	Course Title:	Batch:	2025
Total Hours:	60	Elective - II : Cloud Computing	Semester:	II
			Credits:	3.0

Course Objective

The course aims

- To learn the basic concepts of Cloud Computing.
- To Understand Cloud Computing technologies and storage.
- To be aware of services and Azure Platform Architecture.

Course Outcomes (CO)

On the successful completion of the course students will be able to

Knowledge Level	CO Number	Course Outcome
K1, K2	CO1	Remember the basic concepts of Cloud computing.
K1, K2	CO2	Understand the concept of cloud computing technologies and its business values.
K1, K2, K3	CO3	Understand the Cloud storage and standards.
K1, K2, K4	CO4	Analyze the importance of Software as service.
K1, K2, K4	CO5	Analyze on Azure Platform Architecture.

K1-Remember; K2-Understanding; K3-Apply; K4-Analyze; K5-Evaluate

SYLLABUS		
Unit	Content	No. of Hours
I	CLOUD COMPUTING BASICS: Cloud Computing Overview, Applications, Intranets and the Cloud, First Movers in the Cloud. YOURS ORGANIZATION & CLOUD COMPUTING: When you can use cloud computing, Benefits, Limitations, Security Concerns, Regulatory Issues. CLOUD COMPUTING WITH THE TILTANS: Google,EMC,NetAPP,Microsoft,Amazon,Salesforce.com,IBM,Part nerships	12
II	THE BUSINESS CASE FOR GOING TO THE CLOUD: Cloud Computing Services, How Those Applications Help Yours Business, Deleting Datacenter, CRM PLATFORMS: Salesforce.com, Thomsan Reuters. CLOUD COMPUTING TECHNOLOGY: Hardware and infrastructure ,Clients, Security, Networks, Services	12
III	ACCESSING THE CLOUD: Platforms, Web Applications, Web APIs, Web Browsers. CLOUD STORAGE: Overview, Cloud Storage Providers. STANDARDS: Applications, Client, Infrastructure, Service	12
IV	CLOUD COMPUTING AT WORK: Software as a Service- Overview, Driving Forces, Company Offerings, Industries. SOFTWARE PLUS SEVICES: Overview, Mobile Device Integration, Providers, Microsoft Online	12

V	UNDERSTANDING WINDOWS AZURE PLATFORM ARCHITECTURE: The Windows Azure Developer Portal, Creating & Running projects in the Azure Development Platform, Using Azure Application Templates for Visual Studio, Taking Advantage of Auxiliary Cloud services, Developing Applications & Services to Azure Cloud. ANALYZING THE WINDOWS AZURE OPERATING SYSTEM: A Quick Tour of the Windows Azure OS, The lifecycle of a Windows Azure Services, Securing & Isolating services and Data, Assuring Fabric Controller Availability, Virtualizing Windows Servers for Azure	12
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Text Books:

1. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, "Cloud Computing : A Practical Approach", McGraw Hill Education(India) Education 2017(Unit – I to IV).
2. Roger Jennings, "Cloud Computing with the Windows Azure Platform", ArEmm International, New Delhi, Edition 2013(Unit - V).

Reference Books:

1. Barrie Sosinsky, "Cloud Computing Bible", Willey ,First Edition, 2011.
2. Rajkumar Buyya, Christian Vecchida, S.ThamaraiSelvi, " Mastering Cloud Computing", McGraw Hill Education, First Edition, 2013.
3. Antony T.Velte, Toby J. Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach", McGraw Hill Education, First Edition, 2010.
4. A.Srinivasan, J-Suresh, "Cloud Computing - A Practical Approach for Learning and Implementation", Pearson, First Edition, 2014.

E-references:

1. https://en.wikipedia.org/wiki/Cloud_computing
2. <https://www.investopedia.com/terms/c/cloud-computing.asp>
3. https://cloudcomputing.ieee.org/images/files/education/studygroup/Cloud_Computing_Definition_Reference_Architecture_and_General_Use_Cases.pdf

Mapping with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	L
CO2	S	M	S	H	H
CO3	S	S	M	S	S
CO4	M	H	H	S	S
CO5	L	H	S	S	S

S-Strong; H-High; M-Medium; L- Low

Programme Code:	MCA	Programme Title:	Computer Applications	
Course Code:	23P3CA11	Course Title:	Batch:	2025
Total Hours:	75	Internet of Things	Semester:	III
			Credits:	4.0

Course Objective

The course aims

- To understand the fundamental concepts in Internet of Things.
- To provide examples for various Sensors.
- To familiarize with various IoT Protocols.
- To understand the importance of IoT Physical devices and model simple applications.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

Knowledge Level	CO Number	Course Outcome
K1, K2, K4	CO1	Ability to comprehend the basics in IoT and its Applications.
K2, K3, K4	CO2	Knowledge about real time communication and the physical devices.
K2, K4,	CO3	Ability to comprehend the basics in RaspberryPi.
K2, K3, K4, K5	CO4	Ability to design Assembler that involve these concepts/similar problems.
K2, K3, K4, K5	CO5	Ability to provide algorithmic solutions/approaches to new problems.

K1 – Remember; **K2** – Understanding; **K3** – Apply; **K4** – Analyze; **K5** – Evaluate

SYLLABUS		
Unit	Content	No. Of Hours
I	Introduction to IoT - IoT terms and Basic Definitions - Disambiguation of IoT vs IoE vs M2M vs others - Characteristics of IoT - IoT ecosystem - Enabling Technologies in IoT – Sensors - Edge Devices - Embedded Systems – Communications - Wireless Sensor Networks - Cloud computing - Digital Twin - Big Data analysis - Applications of IoT - Marketplace of IoT - Vision of IoT - IoT Reference model: Level 1 : Physical devices and controllers - Level 2: Connectivity - Level 3 : Edge computing - Level 4 : Data Accumulation - Level 5 : Data abstraction - Level 6 : Applications - Level 7 : Collaboration and processes - Security in IoT.	15
II	Transducers - Work flow and classification – Sensors - Work flow and classification - DAC and ADC - Types of sensors - Actuators – Classification - Interfacing to Embedded Systems - Wireless Sensor Networks and Technologies - Origin and History – Architecture - Network topologies in WSN - Issues and Challenges in WSN - Security in WSN - Participating wireless sensor technologies – RFID - LoRa.	15
III	Protocol Classification – MQTT - XMPP - DDS – AMQP – COAP –REST - Comparisons.	15
IV	Introduction to RaspberryPi - Exploring the RaspberryPi Learning Board - RaspberryPi Operating Systems - Operating System Setup on RaspberryPi - RaspberryPi commands - Programming RaspberryPi with Python.	15

V	RaspberryPi Assembler - ARM Registers – Memory – Debugging -Branching - Control Structures - Addressing Modes.	15
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Text Books:

1. Srinivasan K.G., Siddesh G.M., Hanumantha Raju R., “Internet of Things”, CenGage Publications, 2017 (UNITS I to IV).
2. Stephen Smith, “Raspberry Pi Assembly Language Programming”, Apress, 2019 (UNIT V).

Online Reference Books:

1. Roger Ferrer Ibanez, William J. Pervin, “Raspberry Pi Assembler”, 2018 (Unit-V).
2. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, Wiley Publications, 2013.
3. Cuno Pfister, “Getting started with the Internet of Things; Connecting, Sensors and Microcontrollers to the cloud”, Maker Media Inc., 2011.

Mapping with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	H	M	H
CO2	S	S	H	M	S
CO3	S	S	H	H	S
CO4	S	S	H	H	H
CO5	H	S	H	H	S

S-Strong; **H**-High; **M**- Medium; **L**-Low

Programme Code:	MCA	Programme Title:	Computer Applications	
Course Code:	25P3CA12	Course Title:	Batch:	2025
Total Hours:	60	Data Analytics	Semester:	III
			Credits:	4.0

Course Objective

The course aims

- To explore the concepts of huge data complexities and the need of data analytics.
- To provide basic understanding on Hadoop framework, HDFS and MapReduce.
- To understand how data is processed, imported and exported in R. Apply statistical techniques in big data and visualize it in graphics.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

Knowledge Level	CO Number	Course Outcome
K2	CO1	Understand the basics of big data, various types of analytics and applications of big data in business context.
K1, K2	CO2	Understand the limitations of traditional approaches and the need of Hadoop framework, HDFS, MapReduce for analyzing big data.
K1, K2, K3	CO3	Gaining Knowledge on Importing and Exporting Data in R, Manipulating Data in R.
K1, K2, K3, K4, K5	CO4	Understand how to process data in R using functions, analyze the category of plots and Visualize plots for data analysis.
K1, K2, K3, K4, K5	CO5	Apply group manipulation and statistical techniques, design and develop R programs for big data analytics.

K1 – Remember; K2 – Understanding; K3 – Apply; K4 – Analyze; K5 - Evaluate

SYLLABUS		
Unit	Content	No. Of Hours
I	OVERVIEW OF BIG DATA - What is big data, History of big data, Types of data, Elements of big data, BIG DATA ANALYTICS - Types of Analytics, Applications of big data analytics, EXPLORING THE USE OF BIG DATA IN BUSINESS CONTEXT - Social Networking, Preventing Fraudulent Activities	12
II	UNDERSTANDING HADOOP - Hadoop Ecosystem, Hadoop Distributed File System architecture, blocks, nodes, using HDFS files, Features of HDFS, UNDERSTANDING MAPREDUCE FRAMEWORK: MapReduce Framework, Working of MapReduce, Exploring map and reduce functions	12
III	READING DATASETS and EXPORTING DATA FROM R: Using the C and Scan commands, Reading Multiple Data from Large Files, Exporting Data from R, MANIPULATING DATA IN R: Creating Data Subsets, Merging Data Sets.	12
IV	PROCESSING DATA IN R: Putting Your Data into Shape, Managing Data in R using Data Frames, WORKING WITH FUNCTIONS IN R: Using	12

	Functions Instead of Scripts, Using Arguments in Functions, PERFORMING GRAPHICAL ANALYSIS IN R: Using Base Histogram Plots, ggplot2 for analysis.	
V	GROUP MANIPULATION - Apply, Aggregate, Plyr, Select, Fiter, Slices, ITERATING WITH PURRR: Map, Map with specified types, BASIC STATISTICS: Summary, Correlation, T-tests, Case Study – Analytics in Health Care	12

Text Books:

1. Big Data Black Book, DT Educational Services, Dreamtech Press, 2016 (Units I- IV).
2. Jared P.Lander, R for Everyone - Advanced Analytics and Graphics, Addison Wesley Data & Analytics Series, Pearson India Education Services, Second Edition, 2018 (Unit V).

Reference Books:

1. Seema Acarya, Subashini Chellappan, Big data and Analytics, Wiley publications, First Edition, 2015.
2. Dr. Mark Gardener, Beginning R- The Statistical Programming Language, Wiley Publications, 2014.

E-references:

1. <https://www.tutorialspoint.com/r/index.htm>
2. <https://www.w3schools.com/r/default.asp>
3. <https://www.datamentor.io/r-programming/examples/>

Mapping with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	H	L	S
CO2	S	S	H	M	M
CO3	H	H	S	S	M
CO4	H	H	S	S	S
CO5	M	M	S	S	S

S-Strong; H-High; M- Medium; L-Low

Programme Code:	MCA	Programme Title:	Computer Applications	
Course Code:	23P3CA13	Course Title:	Batch:	2025
Total Hours:	60	Data Warehousing & Mining	Semester:	III
			Credits:	4.0

Course Objective

The course aims

- To introduce the concepts of Data warehousing and mining.
- To learn the tools, algorithms and techniques used for knowledge discovery in databases.
- To understand Architecture and other important tools of Data warehousing.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

Knowledge Level	CO Number	Course Outcome
K1, K2, K3	CO1	Classify Data mining systems and preprocess data for mining applications.
K1, K2, K4	CO2	Analyze large sets of data to acquire useful information using data mining techniques.
K2, K5	CO3	Design and deploy appropriate classification techniques and know the mining of complex types of data.
K1,K2, K4, K5	CO4	Know the need, building blocks , components and Architecture of data warehousing
K1, K2, K5	CO5	Understand dimensional modeling and OLAP in Data warehousing.

K1 – Remember; **K2** – Understanding; **K3** – Apply; **K4** – Analyze; **K5** – Evaluate

SYLLABUS		
Unit	Content	No. of Hours
I	Data Mining: Introduction - The process of knowledge discovery in databases, components, Kinds of data applicable for data mining, Data mining functionalities, Classification of data mining systems. Data Preprocessing - Data Cleaning, Data Integration and Transformation, Data Reduction.	12
II	Data Mining Primitives and Architectures - Data mining primitives, Query language, Architectures of data mining systems- Characterization and Comparison - Concept description, Data Generalization and Summarization-based characterization : Attribute-Oriented induction, Efficient implementation of Attribute-Oriented Induction, Mining Descriptive Statistical Measures.	12
III	Classification and Prediction - Issues, Classification by Decision Tree Induction and Back Propagation, Other classification methods, Prediction, Classifier accuracy. Mining Complex Types of Data - Mining Multimedia Databases, Mining Text Databases.	12

IV	Data Warehousing: Overview And Concept: The Compelling Need for Data Warehousing: Escalating need for Strategic Information, Operational versus Decision-Support Systems, Data Warehousing - The only viable solution, Data Warehouse Defined. Data Warehouse: The Building Blocks: Defining Features, Data Warehouses and Data Marts, Overview of the components, Metadata in the Data Warehouse. Architecture And Infrastructure: The Architectural Components - Understanding Data Warehouse Architecture, Architectural Framework, Technical Architecture.	12
V	Data Design And Data Preparation: Principles of Dimensional Modeling - From Requirements to Data Design, The STAR Schema, STAR Schema Keys, Advantages of the STAR Schema. Dimensional Modeling: Advanced Topics - Updates to the Dimension Tables, Miscellaneous Dimensions, The Snowflake Schema. Information Access And Delivery: OLAP in the Data Warehouse: OLAP Definitions and Rules, OLAP Characteristics, Major Features and Functions, OLAP Models: The MOLAP Model, The ROLAP Model, ROLAP Versus MOLAP.	12

Text Books:

1. Jiawel Han, Microline Kamber, “*Data Mining Concepts And Techniques*”, Harcourt, India Pvt. Ltd, First Edition, 2015 (UNIT I to III).
2. Paulraj Ponniah, “*Data Warehousing Fundamentals*”, A Wiley Interscience publications, 2014 (UNITS IV & V).

Reference Books:

1. Peter Adriaans, Dolf Zantinge, “*Data Mining*”, Addison Wesley, 2013.
2. Alnx berson, Stephen smith, Kurt Thearling, “*Building Data Mining Applications For CRM*”, Tata McGraw Hill Publishing, 2010 (UNIT – V).

E-references:

1. <https://www.tutorialspoint.com>
2. <https://www.microstrategy.com>
3. <https://en.m.wikipedia.org>

Mapping with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	M	H	H
CO2	H	S	H	L	H
CO3	H	S	M	H	H
CO4	S	S	H	H	M
CO5	S	H	M	H	H

S-Strong; H-High; M-Medium; L-Low

Programme Code:	MCA	Programme Title:	Computer Applications	
Course Code:	23P3CA14	Course Title:	Batch:	2025
Total Hours:	60	Elective – III : Machine Learning	Semester:	III
			Credits:	3.0

Course Objective

The course aims

- To make the students learn the basic concepts of machine learning.
- To impart the knowledge of different types of learning algorithms used in machine learning.
- To enable the students to know the application of machine learning with example problems.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

Knowledge Level	CO Number	Course Outcome
K1, K2	CO1	Describe the three broad categories of machine learning approaches and understand the process of machine learning activities.
K1, K2, K3	CO2	Understand the aspects of model selection and its performance. Explain the role of feature engineering in machine learning.
K2, K3, K4, K5	CO3	Gain the knowledge of widely used classification and regression algorithms for supervised learning.
K2, K3, K4, K5	CO4	Understand the clustering techniques and association rule for unsupervised learning. Describe the basic concepts of neural network.
K2, K3, K4, K5	CO5	Obtain the conceptual and algorithmic knowledge of other types of learning approaches such as representation, active, instance-based and ensemble learning.

K1 – Remember; **K2** – Understanding; **K3** – Apply; **K4** – Analyze; **K5** – Evaluate

SYLLABUS		
Unit	Content	No. of Hours
I	Introduction to Machine Learning – What is machine learning?, Basic machine learning process, Well-posed learning problem, Types of Machine Learning: Supervised learning, Unsupervised learning, Reinforcement learning, Comparison – supervised, unsupervised, and reinforcement learning, Applications of Machine Learning, Languages/Tools used in Machine Learning – Preparing to Model – Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring numerical data, Plotting to explore numerical data with Box plots and Histogram.	12
II	Modelling and Evaluation – Selecting a Model: Predictive models, Descriptive models, Training a Model for Supervised Learning: Holdout method, K-fold Cross-validation method, Bootstrap sampling, Model Representation and Interpretability: Underfitting, Overfitting, Bias and Variance, Evaluating Performance of a Model: classification, regression, clustering, Improving Performance of a Model – Basis of Feature Engineering – What is feature engineering?, Feature extraction algorithms: Principal Component Analysis, Singular Value Decomposition, Overall feature selection approaches.	12

III	Supervised Learning: Classification – Classification Learning Steps, Classification Algorithms – k-Nearest Neighbour(kNN): Working of kNN with Student data set, kNN algorithm, Strengths and Weaknesses of the kNN, Support Vector Machines(SVM): Classification using hyperplanes, Identifying the correct hyperplane in SVM, Maximum margin hyperplane, Kernel trick, Strengths and Weaknesses of SVM – Regression – Regression Algorithms: Simple Linear Regression Algorithm: Slope of the simple linear regression model, No relationship graph, Error in simple regression, Example of simple regression, Multiple Linear Regression, Assumptions in Regression Analysis, Main problems in Regression Analysis.	12
IV	Unsupervised Learning – Clustering: Different types of clustering techniques, k-Medoids: a representative object-based technique, Hierarchical clustering: Agglomerative and divisive clustering methods, Dendrogram representation, Concept of distance measure – Finding Pattern using Association rule: Definition of common terms: Itemset, Support count, Association rule, The apriori algorithm for association rule learning – Basics of Neural Network – Understanding the Structure of Biological Neuron, Exploring the Structure of Artificial Neuron, Types of Activation Functions, Architectures of Neural Network: Single-layer and Multi-layer feed forward network, Learning Process in ANN.	12
V	Representation Learning – Working of Representation Learning with an Example, Independent component analysis, Autoencoders – Active Learning – Heuristics for active learning, Active learning query strategies – Instance-Based(Memory-based) Learning – Radial basis function, Pros and Cons of instance-based learning – Ensemble Learning – Bootstrap aggregation (Bagging), Boosting, Gradient boosting machines(GBM).	12

Text Book:

Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, “Machine Learning”, Pearson India Education Services Pvt. Ltd, 2019 (Units I to V).

Reference Books:

1. Ethem Alpaydin, “Introduction to Machine Learning”, Third Edition, The MIT Press Cambridge, 2014.
2. Shai Shalev-Shwartz, Shai Ben-David, “Understanding Machine Learning from Theory to Algorithms”, Cambridge University Press, 2014.
3. Vinod Chandra, Anand Hareendran, “Artificial Intelligence and Machine Learning”, PHI Learning Private Limited, 2014.

E-references:

1. <https://www.javatpoint.com/machine-learning>.
2. https://www.tutorialspoint.com/machine_learning/machine_learning_introduction.htm
3. <https://www.guru99.com/machine-learning-tutorial.html>

Mapping with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	S	H	M
CO2	H	S	H	M	H
CO3	S	S	M	H	S
CO4	H	S	S	M	S
CO5	S	H	S	S	H

S-Strong; H-High; M-Medium; L-Low

Question Paper Pattern

(Common for Major and Supportive Papers)

For EOS Examinations: 75 Marks

The Question Paper is to be divided into THREE Sections.

Section-A Carries 10 Marks, Section-B Carries 25 Marks and Section-C Carries 40 Marks.

Section-A Contains 10 Multiple Choice Questions. (10 x 1 = 10 Marks)

Two Questions from each unit. (Q. No: 1 to 10)

Section-B Contains 5 Either or Choice Questions. (5 x 5 = 25)

Each Question carries 5 Marks. Both (a) and (b) from the same unit.

Q. No.: 11 (a) or (b) to 15 (a) or (b)

Section-C Contains 5 Either or Choice Questions. (5 x 8 = 40)

Each Question carries 8 Marks. Both (a) and (b) from the same unit.

Q. No.: 16 (a) or (b) to 20 (a) or (b)

For CIA Examinations: 25 Marks

CIA Test I and II Question Paper Pattern: (25 Marks)

Section-A: Five Multiple Choice Questions. (5 x 1 = 5)

Section-B: Two Questions with internal choice. (either or type) (2 x 5 = 10)

Section-C: One Question with internal choice. (either or type). (1 x 10 = 10)

Components of Continuous Internal Assessment (CIA)

Components	Allotment of Internal Assessment Marks for a Maximum of 100 Marks (Converted into 25 Marks)
Two Tests (1 hour) [25+25=50/2]	25
Model Exam (75 Marks Converted into 50 Marks)	50
Learning by doing / Skill Development / Case Study / Innovation / Assignment. (Any Two-5+5 = 10 Marks)	10
Quiz / Term Paper / Composition / Field Visit / Industrial Visit / GD / Skill / Extension Activity etc. (Any Two-5 + 5 = 10 Marks)	10
Seminar	05
CIA Total	100

Programme Code:	ALL P.G.	Programme Title:	Supportive Paper	
Course Code:	23P4CS01	Course Title:	Batch:	2025
Total Hours:	90	Relational Database Management Systems	Semester:	III
			Credits:	3.0

Course Objective

The course aims

- To equip the participants with the relevant quantitative tools and techniques for application in solving managerial problems.
- To understand the role of the DBMS & RDBMS in the organization.
- To understand the concepts include aspects of database design, database languages and database system implementation.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

Knowledge Level	CO Number	Course Outcome
K1	CO1	Describe the fundamental elements of DBMS & RDBMS.
K2	CO2	Understand the architecture and process of the oracle database.
K3	CO3	Attain a good practical understanding of the SQL.
K4	CO4	Enhance programming skill and techniques using PL/SQL.
K5	CO5	Understand the basic concepts of database security.

K1 – Remember; K2 – Understanding; K3 – Apply; K4 – Analyze; K5 – Evaluate

SYLLABUS		
Unit	Content	No. of Hours
I	Introduction to Database Management System (DBMS): History of Database Management Systems-Why Database-Characteristics of Database Management systems. Types of DBMS: The Relational Model-The Hierarchical Model-The Network Model. Introduction to Relational Database Management System (RDBMS): RDBMS terminology-Relational Data Integrity. Principles of Normalization: First Normal Form - Second Normal Form - Third Normal Form - Fourth Normal Form - Fifth Normal Form.	18
II	The Oracle Architecture: Databases - Table spaces – Files – Instances - Tables and Columns - Table Constraints - Users - Schemas - Indexes - Clusters - Views - Sequences - Procedure - Functions - Packages - Triggers - Database Links. Internal Memory Structures - Process Structures - External Structures and Architecture. Hardware Configuration Considerations: StandAlone Hosts - Stand Alone Hosts with Disk Arrays - StandAlone Hosts with Disk Shadowing - StandAlone Hosts with Multiple Databases - Networked Hosts - Networks of Databases - Clustered Servers.	18
III	Introduction to SQL: Characteristics of SQL - Types of SQL - Oracle Data types. SQL Operators and Conditions: Arithmetic – Character – Comparison - Logical and Set Operators. Table: Creating a Table - character width and number precision -	18

	Constraints in create table - Check constraint - Dropping tables - altering tables. SQL Commands: DDL - DCL - DML - Transaction Control - Session Control - System Control -Embedded SQL.	
IV	PL/SQL: PL/SQL Blocks - Variables & Constants - Character Set – Datatypes - PL/SQL Structures. Triggers - Snapshots - Synonyms.	18
V	Database Security: Managing Database Users - Authentication of Users - Creating Users. Roles: Creating Roles - System Defined Roles - Altering & Dropping Roles - Granting & Revoking Roles. Privileges: System Privileges - Object Privileges. Backup & Recovery.	18

Text Books:

1. Alexis Leon, “*ORACLE 7*”, The Application Development Handbook, Comdex Computer Publishing, 1996.
2. Tom Leurs, “*Essential Oracle 7.0*” - Prentice Hall of India Pvt. Ltd., 1996.

Reference Books:

1. George Koch & Kevin Loney, “*Oracle 7.0-Complete Reference*”, Tata Mc Graw Hill.
2. Elnasri Navathe & Addison Wesley “*Fundamentals of Database Systems*”. 2nd edition, 2009.

E-references:

1. <https://www.w3schools.com>
2. <https://www.beginnersbook.com>
3. <https://www.en.m.wikipedia.com>

Mapping with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	M	H	L
CO2	H	S	M	S	H
CO3	H	S	M	H	M
CO4	S	H	H	S	S
CO5	S	H	S	H	H

S - Strong; H - High; M - Medium; L - Low