DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY
Chhatrapati Sambhajinagar.

NAAC- 'A+' Grade

CIRCULAR /SU/CM/Revised Syllabus/NEP/03/2025

It is hereby inform to all concerned that, on the recommendation of the Dean, Faculty of Commerce & Management; **the Academic Council at its meeting held on 21 July, 2025 has been accepted *the "following Revised Curriculum at PG Level* as per National Education Policy-2020" *for the implemention of all concernerd affiliated colleges*** under the Faculty of Commerce & Management.

Sr.No.	Courses	Semester
1.	M.C.A	III & IV

This is effective from the Academic Year 2025-26 and Onwards as per appended herewith.

All concerned are requested to note the contents of this circular and bring notice to the students, teachers and staff for their information and necessary action.

University Campus,
Chhatrapati Sambhajinagar
-431 004.
REF.NO. SU/COM/2025-26/366-68
Date:- 25/ 07 /2025.

Deputy Registrar,
Syllabus Section.

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Copy forwarded and Information to necessary action:-

1] The Head, concerned Department,
2] The Director, Board of Examination & Evaluation,
3] The Director, University Network & Information Centre, UNIC, with a **request to upload this Circular on University Website.**
Dr.Babasaheb Ambedkar Marathwada University **Chhatrapati Sambhajinagar.**

Faculty of Commerce and Management Science

REGULATIONS SPECIFIC TO

M.C.A. PROGRAM
Sem – III & IV

Outcome Based Education Pattern Aligned with National Education Policy (NEP) 2020

(Applicable for Affiliated Colleges under the Jurisdiction of University)

Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar (With Effect from 2024-25)

SEMESTER -III

Sem	Course Type	Ref. No	Subject Title	Teaching Scheme			Credit	Marks		
				L	T	P		Int	Ext	Total
III	Mandatory /Major / DSC	MANC501	Advances In Algorithm	3	-	-	3	30	45	75
		MANC502	Web Development using PHP	3	-	-	3	30	45	75
		MANC503	Optimization Techniques	3	1	-	4	40	60	100
		MANC504	Advance Networking	3	1	-	4	40	60	100
	Major/DSE	MANC52X	***Open Elective - IV***	3	-	-	3	30	45	75
	Mandatory /Major / DSC	MANC551	Advances in Algorithm Lab	-	-	2	1		25	25
		MANC552	PHP Lab	-	-	2	1		25	25
	RP	MANC553	Research Project	-	-	4	4	40	60	100
	SEC	MANC554	Research Project -Seminar	-	-	2	2	20	30	50
	Major/DSE	MANC55X	***Open Elective – IV Lab***	-	-	2	1		25	25
			Total				**26**	**230**	**420**	**650**

Open Elective – IV *(Select any One from Following)*

Sr.No	Course Type	Ref. No	Subject Title	Teaching Scheme			Credit	Marks		
				L	T	P		Int	Ext	Total
1.	Major/DSE	MANC521	Linux Admin & Server Config.	3	-	-	3	30	45	75
		MANC555	Linux Admin & Server Config. Lab	-	-	2	1	--	25	25
2.		MANC522	Mobile Application Development Using Android	3	-	-	3	30	45	75
		MANC556	Android Lab	-	-	2	1	--	25	25
3.		MANC523	Cloud Computing	3	-	-	3	30	45	75
		MANC557	Cloud Computing Lab	-	-	2	1	--	25	25
4.		MANC524	Data Visualization using Power BI and Tableau	3	-	-	3	30	45	75
		MANC558	Power Bi & Tableau Lab	-	-	2	1	--	25	25

SEMESTER -IV

Sem	Course Type	Ref. No	Subject Title	Teaching Scheme			Credit	Marks		
				L	T	P		Int	Ext	Total
		MANC559	Seminar	-	4	-	4	40	60	100
	Field Project	MANC560	Project	-	-		16	160	240	400
			Total				**20**	**200**	**300**	**500**

MCA Degree (Two Years Programme)			Marks		
	Credits		Int	Ext	Total
Course Total	96	--	870	1530	2400

PG Diploma (One Year Programme)			Marks		
	Credits		Int	Ext	Total
Course Total	54	--	480	870	1350

Semester-III

Subject Title	:	**Advances in Algorithms**			
Subject Ref. No.	:	**MANC501**	**No. of Credits**	:	3
			Assignments / Sessional		30
			Semester Examination		45

Course Outcomes (COs)

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

CO-1	To introduce students to the fundamental concepts of algorithm design and analysis.
CO-2	To develop the ability to analyze the efficiency of algorithms.
CO-3	To explore various algorithm design paradigms such as Divide and Conquer, Greedy methods, Dynamic Programming, and others.

Pre Requisite	:	Working knowledge of C programming, Basic Computer Architecture-Concepts., Basic algorithms and data structure concepts.
Unit – I	:	**Introduction to Algorithms and Analysis Techniques** Definition and importance of algorithms Characteristics of algorithms Algorithm specification and pseudocode conventions Growth of functions: Asymptotic notation (Big O, Theta, Omega) Recurrences: Solving recurrences using the substitution method, recursion tree, and master theorem Basic complexity analysis: Time and space complexity
Unit – II	:	**Divide and Conquer** Introduction and general approach Examples: Binary Search, Merge Sort, Quick Sort Analyzing time complexity of divide and conquer algorithms Strassen's algorithm for matrix multiplication Closest pair of points problem Analysis and optimization strategies
Unit – III	:	**Greedy Algorithms** Greedy strategy and its application Case studies: Activity Selection, Fractional Knapsack, Huffman Coding Proof of correctness and optimality Minimum Spanning Trees: Prim's and Kruskal's algorithms Shortest Path Algorithms: Dijkstra's algorithm Analysis of greedy algorithms in graph theory
Unit – IV	:	**Dynamic Programming** Principles of optimality and overlapping subproblems Comparison with divide and conquer Case studies: Fibonacci sequence, Longest Common Subsequence (LCS) 0/1
Unit - V		Knapsack problem Matrix Chain Multiplication Bellman-Ford algorithm for shortest paths Techniques for identifying and solving dynamic programming problems
Text Books	:	"Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein (CLRS) "Algorithm Design" by Jon Kleinberg and Éva Tardos "The Design and Analysis of Computer Algorithms" by Alfred V. Aho, John E. Hopcroft, and Jeffrey D. Ullman "Algorithms" by Robert Sedgewick and Kevin Wayne

Subject Title :	**Web Development Using PHP**			
Subject Ref. No.	**MANC502**	No. of Credits	:	03
Assignments/Sessional	:			30
Semester Exam.	:			45

Course Outcomes (COs)

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

CO-1	Write code for implementing basic concept of PHP as loops, conditions, arrays, strings.
CO-2	Connect the My Sql database with PHP for performing operations such as insert, update, delete, retrieve.
CO-3	Implement the concepts of COOKIES and SESSION handling using PHP.
CO-4	Write the programs using concepts of HTML + JAVASCRIPT + PHP + MYSQL.
CO-5	Design the Web portals to fulfill the requirements.

Prerequisite :	Students must have knowledge of HTML, JavaScript.
Unit –I :	**Introduction to PHP** PHP Basics Conditions and Branches Loops Variables and Arrays Strings
Unit –II :	**Form Handling** Dealing with functions Forms Super global variables Super global array A script to acquire user input Importing user input Accessing user input Combine HTML and PHP code Using hidden fields Redirecting the user File upload and scripts Delete a File
Unit –III :	**Cookies , Sessions and Authentication** Using Cookies in PHP Setting a cookie Accessing cookie Destroying Cookie HTTP Authentication Storing Username and Passwords Using Sessions Starting a session Ending a session

	Session Security
Unit – IV :	**Database Operations with PHP** Built-in Database Functions, Connecting to a MySQL, Selecting a Database, Building and Sending the Query to Database Engine, Retrieving , Updating and Inserting Data in database
Unit – V :	**Classes And Objects** Object oriented concepts Define a class Class attributes An Object Creating an object Object properties Object methods Object constructors and destructors Class constants Static method Class inheritance Abstract classes Final keyword Implementing Interface Object serialization Understanding Advance and New Checking for class and method existence Iterators
Reference Books :	1. *PHP and MySQL Web Development* by Luke Welling, and Laura Thomson 2. *PHP, MySQL, and JavaScript* by Robin Nixon 3. *PHP 6 and MySQL 5 for Dynamic Web Sites: Visual QuickPro Guide* by Larry Ullman 4. *PHP Cookbook* by Adam Trachtenberg, and David Sklar 5. PHP Object – Oriented Solution by David Powers 6. *Head First PHP & MySQL* by Lynn Beighley, and Michael Morrison 7. *Beginning PHP and MySQL* From Novice to Professional, Third Edition by W.J. Gilmore

Subject Title		Optimization Techniques			
Subject Ref. No.		MANC503	No. of Credits		4
			Assignments / Sessional		40
			Semester Examination		60

Course Outcomes (COs)

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

CO-1	apply the techniques used in operations research to solve real life problem in industry
CO-2	Develop a report that describes the model and the solving technique, analyse the results and propose recommendations in language understandable to the decision-making processes in Management Engineering(Transportation /Assignment / replacement Models).
CO-3	Formulate Nonlinear and Linear Programming Model
CO-4	Formulation and solution of network problems using graph optimization algorithms
CO-5	Construct linear integer programming models and discuss the solution techniques to solve the integer programming models using branch-and-bound method.
CO-6	Study and develop game theory, practical use of game theory in real life, types of game theory.

Course Objective	The main objective of this course to learn research methodologies, defining hypothesis and its analytical methods. The content also help to solve many real-time problems of operation research such as assignment, transportation, queuing, Linear programming and network problems also.
Prerequisites	Statistical Basic, discrete Mathematics and Data Structure
Unit I	Linear Programming Application areas of Linear Programming Linear Programming – The Graphical method – Graphical Solution methods of Linear Programming problem, Maximization Linear Programming problem, Maximization Problem.
Unit II	Linear Programming – Simplex Method – Phase I and Phase II of the Simplex Method, The Revised Simplex method, Primal and Dual Simplex Method, Simplex Algorithm for maximization case, Simplex Algorithm for minimization case – Two phase method and the Big –M method. Transportation Problem and its solution, Assignment Problem and its solutions by Hungarian Method.
Unit III	PERT & CPM Basic differences between PERT and CPM. , Arrow Networks, time estimates, earliest, expected time, latest – allowable, occurrences time, Forward Pass Computation, Backward Pass Computation, Representation in Tabular Form Critical Path,

	Probability of meeting scheduled date of completion, Calculation on CPM network. Various floats for activities, Critical path updating projects. Operation time cost tradeoff Curve project, Time cost – tradeoff Curve- Selection of schedule based on Cost Analysis, Crashing the network
Unit IV	Integer Programming, Gomory Cutting Plan Methods – Branch and Bound , Queuing Theory. Game theory.
Unit V	Replacement of items that deteriorates. Replacement of items that fails suddenly, Individuals and Group Replacement- Policy, INVENTORY THEORY: Inventory Model Building, Single item deterministic Model, Inventory Control Models without strategies and Inventory, Control Models with shortages.
Text Book	Research Methodology methods and Techniques by C.R. Kothari Operation Research J.K. Sharma Operations Research Kanti Swarup, Gupta P.K. and ManMohan. Operation Research - By Hira Gupta S.Chand publication
Reference Books	Comprehensive Statistical Methods, P.N. Arora, SummetArora, S. Arora Operation Research , A.M. Nataranjan , P. BalaSubramani, A. Tamilaraji

Subject Title	:	**Advance Networking**		
Subject ref. No.	:	**MANC504**		
		No. of credits	:	4
		Assignment/Sessionals	:	40
		Semester Exam	:	60
Course Objectives	:	CO1: Build an understanding of the fundamental concepts of computer networking. CO2: Understand and explain the concept of Data Communication and networks, layered architecture and their applications. CO3: Enumerate the layers of the OSI model and TCP/IP. CO4: Familiarize the student with the taxonomy and terminology of advance concepts of computer networking. CO5: Familiarity with the basic of internet and various important terms associated with it.		
Pre Requisite	:	NA		
Unit-I **Introduction to Networking:**	:	Hardware Architecture:- Topologies, Media, Devices Transmission Techniques:-Twisted Pair, Coaxial Cable, Fiber Optics, Wireless Transmission Switching: - Circuit Switching, Message Switching, Packet Switching		
Unit-II **Common Network Architecture:**	:	Connection oriented N/Ws, Connectionless N/Ws **Local Area Networks:** Components & Technology , Access Technique Transmission Protocol & Media		
Unit-III **Reference Models:**	:	**The OSI Reference Model:** Protocol Layering, TCP/IP Model, OSI vs TCP/IP		
Unit-IV **Broad Band Networks**	:	Integrated Service Digital Networks (ISDN), Broad Band ISDN, ATM, ATM Traffic Management, Introduction to very small Aperture Terminal(VSAT)		
Unit-V **Network Applications :**	:	**Hyper Text Transfer Protocol (HTTP)** **HTTP communications**: - HTTP request, Request Headers, Responses, Status Code, Error Status Code Email : Sending & Receiving Emails, Email Addressing, Message Structure MIME – Multipurpose Internet Mail Extensions SMTP – Simple Mail Transfer Protocol with Examples Mail Exchangers – Delivering a message, Mail Boxes POP – Post Office Protocol IMAP – Internet Message Access Protocol FTP – File Transfer Protocol Telnet – Remote Communication Protocol Proxy Server, Proxy Web Servers		
Text Books	:	1. Tanenbaum, Andrew, Computer Networks, PHI 2. Forouzan Behrouz A., Tata Mcgraw Hill		
Additional Reference Books	:	1. Norton Peter, Complete Guide To Networking		

Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar

MCA NEP 2020 Pattern 2024-25

MCA IIIrd Semester Research Project and Research Seminar

Research Project (4 Credits – 100 Marks)

1. Objective of the Research Project

- To provide hands-on experience in **research methodologies, problem-solving, and innovation.**
- To enable students to **apply theoretical knowledge** gained in the MCA program to real-world problems.
- To develop skills in **research writing, presentation, and data analysis.**
- To encourage contributions towards **emerging technologies** in computer applications.

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2. Nature of the Project

- The project must be **research-oriented** software development / Research paper / Avishkar Competition.
- It should involve **problem identification, literature survey, objectives, experimentation, and analysis.**
- Preferred areas include (but are not limited to):
  - Artificial Intelligence and Machine Learning
  - Natural Language Processing
  - Data Science and Big Data Analytics
  - Cloud Computing and Virtualization
  - Cyber Security and Blockchain
  - IoT and Embedded Systems
  - Software Engineering / Testing Frameworks
  - Web/Mobile Application Research (with innovative focus)
  - Human-Computer Interaction
  - Digital Transformation in Business/Healthcare/Education

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3. Selection of Topic

- Students may choose topics **individually or in small groups.**
- Topics should be **relevant, innovative, and research-focused.**
- Each topic must be **approved by the project guide.**
- A brief **one-page synopsis** (problem statement, objectives, methodology, and expected outcome) should be submitted for approval.

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4. Project Stages & Deliverables

(a) Stage 1 – Synopsis Submission (2 weeks into Semester)

- Title of Research Project
- Problem Definition / Research Question
- Objectives and Scope
- Proposed Methodology
- Expected Contribution

11/10/24

(b) **Stage 2 – Literature Survey & Methodology (by mid-semester)**

- Detailed literature review (minimum 8–10 research papers/books).
- Comparative analysis of existing approaches.
- Finalized research methodology.

(c) **Stage 3 – Research Work / Experimentation (weeks 9–12)**

- Data collection / simulation / coding experiments.
- Testing of hypothesis.
- Documentation of results.

(d) **Stage 4 – Final Report & Presentation (end of semester)**

- **Project Report** in proper format.
- **Presentation** before the evaluation panel.
- **Viva-voce** to assess understanding.

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5. Project Report Format

- Cover Page (University, College, Title, Student details, Guide details)
- Certificate from Guide & HoD
- Acknowledgement
- Abstract (300–400 words)
- Chapters:
    1. Introduction & Objectives
    2. Literature Review
    3. Research Methodology
    4. System Design / Experimental Setup
    5. Results & Discussion
    6. Conclusion & Future Scope
- References (APA / IEEE style)
- Appendices (if any)

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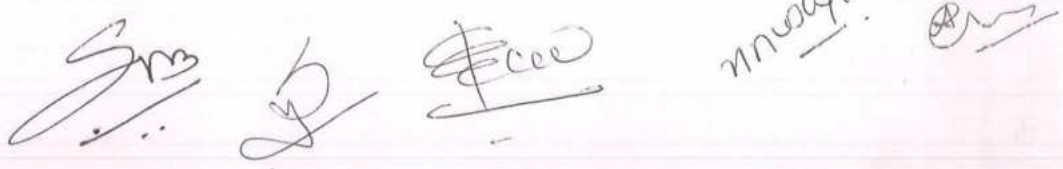
6. Evaluation Criteria

Component	Weightage
Problem Identification & Relevance	10%
Literature Review & Background Study	15%
Methodology & Research Design	20%
Implementation / Experimentation	25%
Analysis, Results & Findings	15%
Report Writing (Structure, Language, Referencing)	15%p

Evaluation Guidelines – Research Seminar 2 Credits (50 Marks)

- **Report Quality (10 Marks):** Abstract, organization, references, plagiarism check.
- **Presentation & Q&A (40 Marks):** Slide quality, delivery, communication, confidence, and ability to answer questions.



OPEN ELECTIVE - IV

Subject Title		Linux Administration and Server Config			
Subject Ref. No.		MANC521	No. of Credits		3
			Assignments / Sessional		30
			Semester End Examination		45

Course Outcomes (COs)

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

CO-1	Understanding the basic set of commands and utilities in Linux/UNIX systems.
CO-2	Learn the important Linux library functions and system calls
CO-3	Understand the inner workings of Linux operating systems
CO-4	Design Live Servers.

Pre Requisite		Operating System Concepts, Windows Platform
Unit – I		**Introduction:** Basic Linux System Concepts, GNU, Free Software, and Open Source Software, Open Source Software Licenses, Distributions of Linux O.S, Installing Ubuntu, The GNOME Desktop, Linux Commands
Unit – II		**Managing the basics:** User Administration, Linux File-System Administration, File Permissions, and Networking Management.
Unit – III		**Software Installation**: The Package Management, Vi/Vim Editor, Regular Expressions. Open SSH Server, VNC Server, Installation of Python.
Unit – IV		**Server Configuration**: FTP Server, NFS Server, Samba Server, HTTP/Apache Server, DNS Server, DHCP Server, Mail Server, And Database Server: MySQL.
Unit – V		**Maintenance** : Backing Up and Restoring Files, Security and Firewall, Monitoring
Text Books		1. "Ubuntu Server Guide" by UBUNTU LTD. 2. "Introduction to Linux", A Hands on Guide by Machtelt Garrels 3. "GNU/Linux Advanced Administration", by Josep Jorba Esteve and Remo Suppi Boldrito
Additional Reference Books		1. Managing Linux® Systems with WebminTM System Administration and Module Development by Jamie Cameron
Web Reference		https://www.ubuntupit.com/27-best-linux-tutorial-books-need-download-now/

Subject Title		Linux Admin & Server Config. Lab			
Subject Ref. No.		MANC555	No. of Credits		1
			External		25

Course Outcomes (COs)

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

CO-1	Understanding the basic set of commands and utilities in Linux/UNIX systems.
CO-2	Learn the important Linux library functions and system calls
CO-3	Understand the inner workings of Linux operating systems
CO-4	Design Live Servers.

Subject Title :	Mobile Application Development Using Android			
Subject Ref. No.	MANC522	No. of Credits	:	03
Assignments/Sessional			:	30
Semester Exam.			:	45

Course Outcomes (COs)

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

CO-1	Write code for implementing concept of Android as different layouts, Services, components, activities
CO-2	Design User interface using Menus, labels, text control, button control, toggle button, images etc.
CO-3	Write the programs using concepts of JAVA + SQLite
CO-4	Write the programs using concepts of JAVA + PHP + MYSQL.
CO-5	Write programs for handling Bluetooth, camera, GPS services.
CO-6	Design Android applications.

Prerequisite :	Experience in Object Oriented programming language, Knowledge in XML format
Unit –I :	**1) Introduction To Mobile Apps** I. Why we Need Mobile Apps II. Different Kinds of Mobile Apps III. Briefly about Android **2) Introduction Android**

	I. History Behind Android Development II. What is Android? III. Pre-requisites to learn Android IV. Brief Discussion on Java Programming **3) Android Architecture** I. Overview of Android Stack II. Android Features III. Introduction to OS layers **4) Deep Overview in Android Stack** I. Linux Kernel II. Libraries III. Android Runtime IV. Application Framework V. Dalvik VM **5) Installing Android Machine** I. Configuring Android Stack II. Setting up Android Studio III. Working with Android Studio IV. Using Older Android Tools
Unit –II :	**1) Creating First Android Application** I. Creating Android Project II. Debugging Application through DDMS III. Setting up environment IV. AVD Creation V. Executing Project on Android Screen **2) Android Components** I. Activities II. Services III. Broadcast Receivers IV. Content Providers **3) Hello World App** I. Creating your first project II. The manifest file III. Layout resource IV. Running your app on Emulator
Unit –III :	**1) Building UI with Activities** I. Activities II. Views, layouts and Common UI components III. Creating UI through code and XML IV. Activity lifecycle V. Intents VI. Communicating data among Activities **2) Advanced UI** I. Selection components (GridView, ListView, Spinner) II. Adapters, Custom Adapters III. Complex UI components IV. Building UI for performance V. Menus VI. Creating custom and compound Views **3) Notifications** I. Toast, Custom Toast

	II. Dialogs III. Status bar Notifications
Unit – IV :	**1) Working with Database** I. SQLite Introducing SQLite SQLiteOpenHelper and creating a database Opening and closing a database Working with Inserts, updates, and deletes operations II. PHP + MySql Introduction to basic PHP & MySql Connectivity Using PHP code with Android Performing insert, delete, update, view operations on MySql Database
Unit – V :	**1) Camera** I. Taking pictures II. Media Recorder III. Rendering previews **2) Bluetooth** I. Controlling local Bluetooth device II. Discovering and bonding with Bluetooth devices III. Managing Bluetooth connections IV. Communicating with Bluetooth **3)Location Based Services and Google Maps** I. Using Location Based Services II. Finding current location and listening for changes in location III. Proximity alerts IV. Working with Google Maps i. Showing google map in an Activity ii. Map Overlays iii. Itemized overlays iv. Geocoder v. Displaying route on map
Reference Books :	1. Android Application Development All-In-One for Dummies, 2ed 2015 by Barry Burd 2. Android Application Development (With Kitkat Support), Black Book 2014 by Pradeep Kothari and Kogent Learning Solutions Inc. 3. Head First Android Development: A Brain-Friendly Guide, 2nd Edition by Dawn Griffiths and David Griffiths

Subject Title	:	**Android LAB**			
Subject Ref. No.	:	**MANC556**	**No. of Credits**	:	1
			External	:	25

Course Outcomes (COs)

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

CO-1	Write code for implementing concept of Android as different layouts, Services, components, activities
CO-2	Design User interface using Menus, labels, text control, button control, toggle button, images etc.
CO-3	Write the programs using concepts of JAVA + SQLite
CO-4	Write the programs using concepts of JAVA + PHP + MYSQL.
CO-5	Design Android applications.

Content	:	Assignment based on the Android will be covered.

Subject Title	:	**Cloud Computing**			
Subject Ref. No.	:	**MANC523**	**No. of Credits**	:	3
			Assignments / Sessional	:	30
			Semester Examination	:	45

Course Outcomes (COs)

1. **CO1:** Explain the fundamentals of Cloud Computing, including its architecture, benefits, deployment models, and security challenges.
2. **CO2:** Apply virtualization concepts, including types of virtualization, hypervisors, and their role in cloud infrastructure.
3. **CO3:** Implement and manage cloud services using AWS, including EC2 instances, security groups, and Elastic IPs.
4. **CO4:** Configure and manage cloud storage solutions like AWS S3, Glacier, and lifecycle policies for efficient data handling.

Pre Requisite	:	
Unit – I	:	**Basic of Cloud Services-**Introduction to Cloud Computing,History, Why Cloud Computing? Cloud Hosting,Benefits of Cloud Computing Types of Cloud Computing Public Cloud Private Cloud Hybrid Cloud Community Cloud,Platformas a Service Providers,Evolution of Cloud computing,Characteristics,Advantages. Cloud Computing Issues Security Costing Model,Architecture of Cloud Computing,Infrastructure,Components.
Unit – II	:	**Virtualization-**Root of Cloud Computing ,Types of Virtualization,Hardware Virtualization,Types of Hardware Virtualization,Virtualization Reference Model, Benefits,Characteristics,Host Machine,Guest Machine Hypervisor Benefits, types,SOA Web Service,Grid computing,Automatic Computing.
Unit – III	:	**AWS Platform-** Introduction to AWS Elastic computing Introduction to the AWS products,Benefits.Regions and Availability Zones Signing up for AWS,Case Study,Use of AWS,Domains of AWS.AWS Free usage tier Introduction AWS management console.
Unit – IV	:	**EC2 Instance-**Understanding AMI Launching your first AWS instance On- demand Instance pricing,Reserved Instance pricing Spot instance pricing Settingup security Security groups,Choosing & Creating a new AMI Public and Private IP's,Deploying a new instance from the created AMI Key Pairs Elastic IP's
Unit – V	:	**Storage in Cloud-**Uploading Downloading S3 Permissions S3 Object Versioning S3 Lifecycle Policies Storage,S3 Transfer Acceleration Glacier storage,Gateway Import Export,Shutting down and rebooting the system Yum Command set, Installpackages by using yum.
	:	
Reference Books		• **"The Cloud Computing Book: The Future of Computing Explained"** – Douglas E. Comer • **"Cloud Computing: Principles and Paradigms"** – Rajkumar Buyya, James Broberg, Andrzej Goscinski • **Mastering Cloud Computing: Foundations and Applications**

		Programming" – Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi • **"AWS for Developers For Dummies"** – John Paul Mueller

Subject Title	:	**Cloud Computing LAB**			
Subject Ref. No.	:	**MANC557**	**No. of Credits**	:	1
			External	:	25
Course Outcomes (COs) At the end of the course, students will be able to:					
Content	:	Assignment based on the cloud computing will be covered.			

Subject Title	:	**Data Visualization using Power BI and Tableau**			
Subject Ref. No.	:	**MANC524**	**No. of Credits**	:	3
			Assignments / Sessional	:	30
			Semester Examination	:	45

Course Objective:

The course aims to equip students with the skills to use Power BI and Tableau for data visualization, including data preparation, creating visualizations, and designing interactive dashboards. Students will also learn to publish, share, and optimize visualizations for effective data-driven decision-making in real-world scenarios.

Course Outcomes (COs)

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

CO-1	Understand core concepts of data visualization and Business Intelligence tools.
CO-2	Perform data handling, cleaning, and transformation in Power BI and Tableau.
CO-3	Create basic and advanced visualizations for various data insights.
CO-4	Design interactive dashboards and data stories for effective decision-making.
CO-5	Publish, share, and optimize dashboards and visualizations using cloud platforms.

Pre Requisite	:	
Unit – I	:	**Introduction to Data Visualization & BI Tools** Definition & Importance of Data Visualization Concepts of Data Visualization History and Evolution of Visualization Role of Visualization in Data-Driven Decision Making Understanding Business Intelligence (BI) What is BI? Data Analytics vs. Business Intelligence Introduction to BI Tools Overview of Power BI Overview of Tableau Comparative Analysis of Power BI and Tableau
Unit – II	:	**Data Handling and Preparation** Data Sources & Connections Connecting to different types of data sources (databases, files, cloud storage) Data Importing & Exporting in Power BI and Tableau Data Transformation & Cleaning Data cleaning techniques in Power BI (Power Query Editor) Data transformation in Tableau (Data Interpreter, Joins, Blends) Managing Missing and Outlier Data Data Modeling Data Model in Power BI (relationships, hierarchies) Data Model in Tableau (dimensions, measures)

Unit – III	:	**Creating Basic Visualizations** Basic Charts & Visualizations Bar, Line, Pie Charts Tables and Matrix Visualizations Scatter Plots, Heat Maps, and Tree Maps Advanced Charts Waterfall Charts, Gauge Charts, and Funnel Charts in Power BI Bullet Graphs, Gantt Charts, and Sparklines in Tableau Customizing Visualizations Formatting and Labeling (Colors, Fonts, and Borders) Tooltips, Legends, and Filters
Unit – IV		**Advanced Features & Dashboards** Advanced Visualizations Time Series Visualizations (Date and Time Analysis) Geospatial Visualizations (Maps) Advanced Filters and Calculations (Slicers, Drillthrough in Power BI, LOD in Tableau) Creating Dashboards Principles of Dashboard Design Creating Interactive Dashboards Combining Multiple Visualizations in Power BI and Tableau Data Storytelling & Interactive Features Adding Interactivity (buttons, actions) Telling Stories with Data
Unit – V		**Publishing, Sharing & Collaboration** Publishing & Sharing Dashboards Power BI Service (publishing and sharing options) Tableau Server/Tableau Public for sharing dashboards Managing Access and Permissions Collaboration Features Collaborating on Reports and Dashboards Using Power BI and Tableau in Teams and Workspaces Performance Optimization Best Practices for Performance Optimization in Power BI and Tableau Reducing Load Times and Handling Large Datasets
	: :	
Books		**"Beginning Power BI: A Practical Guide to Self-Service Data Analytics"** – *Dan Clark* **"Power BI Cookbook: Creating Business Intelligence Solutions"** – *Brett Powell* **Fundamentals of Data Analytics With Tableau -** by Dr. Thiyagarajan V S, Ms. V Sudha

Subject Title		Power BI and Tableau Lab		
Subject Ref. No.		MANC558	No. of Credits	1
			External	25

Course Outcomes (COs)
At the end of the course, students will be able to:

CO-1	Demonstrate proficiency in installing, setting up, and navigating Power BI and Tableau interfaces.
CO-2	Apply data cleaning and transformation techniques using Power Query in Power BI and Data Interpreter in Tableau.
CO-3	Develop basic and advanced visualizations, including time series and geospatial visualizations, in both Power BI and Tableau.
CO-4	Design and implement interactive dashboards with filters, drill-downs, and storytelling elements.
CO-5	Publish, share, and manage permissions for visualizations on Power BI Service and Tableau Public, ensuring effective collaboration.

Prerequisites	
Unit I	**Chapter 1: Introduction to Data Visualization & BI Tools** **Lab Work 1.1: Power BI Installation & Setup** • Install Power BI Desktop. • Explore the Power BI interface (Home, Data, Model, and Report views). • Import a sample dataset (e.g., Excel or CSV file). **Lab Work 1.2: Tableau Installation & Setup** • Install Tableau Public or Tableau Desktop. • Navigate through the Tableau interface (Data, Analytics, and Worksheet panes). • Import a sample dataset (e.g., Excel or CSV file).
Unit II	**Chapter 2: Data Handling and Preparation** **Lab Work 2.1: Connecting to Data Sources in Power BI** • Connect Power BI to different data sources (Excel, SQL Server, Web Data). • Perform basic data loading and examine the data in Power BI. **Lab Work 2.2: Data Cleaning in Power BI (Power Query)** • Use Power Query Editor to clean and transform data (remove duplicates, filter data, fill missing values). • Perform data transformations like pivot/unpivot, merge, and split columns. **Lab Work 2.3: Data Import and Transformation in Tableau** • Import data from multiple sources (Excel, Google Sheets, and SQL Server). • Clean and transform data using Data Interpreter, joins, and blends in Tableau. **Lab Work 2.4: Building Data Models** • Create a data model in Power BI, establishing relationships between multiple tables. • In Tableau, work with dimensions and measures to create a basic data model.

Unit III	**Chapter 3: Creating Basic Visualizations** **Lab Work 3.1: Creating Basic Charts in Power BI** • Create bar charts, line charts, and pie charts using sample datasets. • Add filters and slicers for data interaction. **Lab Work 3.2: Creating Basic Charts in Tableau** • Use Tableau to build bar charts, line charts, and scatter plots. • Use the "Show Me" feature to experiment with different visualization types. **Lab Work 3.3: Advanced Visualizations in Power BI** • Build advanced visualizations like funnel charts, waterfall charts, and gauge charts. • Customize the appearance and interactivity of these charts. **Lab Work 3.4: Advanced Visualizations in Tableau** • Create Gantt charts, bullet graphs, and tree maps in Tableau. • Customize formatting and apply conditional color schemes.
Unit IV	**Chapter 4: Advanced Features & Dashboards** **Lab Work 4.1: Time Series and Geospatial Visualization in Power BI** • Build time series visualizations to analyze trends over time (line chart with date axis). • Create maps and apply geospatial visualizations using latitude and longitude data. **Lab Work 4.2: Time Series and Geospatial Visualization in Tableau** • Use Tableau to create time series graphs and maps to analyze trends and geographic data. • Experiment with different map types and layers. **Lab Work 4.3: Creating Dashboards in Power BI** • Build an interactive dashboard that combines multiple charts and filters. • Use slicers, drillthrough, and drill-down options to enhance interactivity. **Lab Work 4.4: Creating Dashboards in Tableau** • Design a Tableau dashboard with multiple views (charts, graphs, and maps). • Add filters and interactivity (actions between sheets). **Lab Work 4.5: Data Storytelling with Power BI** • Create a report that walks through a business story using multiple pages. • Use buttons and navigation to make the report interactive. **Lab Work 4.6: Data Storytelling with Tableau** • Build a Tableau story that walks through key insights with a step-by-step narrative. • Use actions and dashboard navigation.
Unit V	**Chapter 5: Publishing, Sharing & Collaboration** **Lab Work 5.1: Publishing Dashboards to Power BI Service** • Publish your Power BI report to Power BI Service. • Set up user permissions and explore different sharing options. **Lab Work 5.2: Publishing Dashboards to Tableau Public** • Publish a Tableau dashboard to Tableau Public or Tableau Server. • Adjust sharing and access control settings. **Lab Work 5.3: Collaboration and Team Workspaces in Power BI** • Create a workspace in Power BI for collaboration. • Add team members and manage permissions. **Lab Work 5.4: Tableau Collaboration and Permissions** • Set up permissions for Tableau dashboards. • Collaborate with team members by adding comments and sharing links. **Lab Work 5.5: Performance Optimization in Power BI** • Analyze and improve the performance of large datasets in Power BI (reduce data load times). **Lab Work 5.6: Performance Optimization in Tableau** • Explore best practices for performance tuning in Tableau (optimize extracts, reduce chart complexity).

	Final Lab Project • Build an end-to-end data visualization project using either Power BI or Tableau. • **Requirements:** o Import and clean a real-world dataset. o Create multiple visualizations to provide insights. o Design a dashboard or story. o Publish and share the dashboard, ensuring proper user permissions.

Subject Title	:	**Advances in algorithm LAB**			
Subject Ref. No.	:	**MANC551**	**No. of Credits**	:	1
			External	:	25
Course Outcomes (COs)					
		At the end of the course, students will be able to:			
Content	:	Assignment based on the advances in algorithm will be covered.			

Subject Title	:	**PHP LAB**			
Subject Ref. No.	:	**MANC552**	**No. of Credits**	:	1
			External	:	25

Course Outcomes (COs)

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

CO-1	Write code for implementing basic concept of PHP as loops, conditions, arrays, strings.
CO-2	Connect the My Sql database with PHP for performing operations such as insert, update, delete, retrieve.
CO-3	Implement the concepts of COOKIES and SESSION handling using PHP.
CO-4	Write the programs using concepts of HTML + JAVASCRIPT + PHP + MYSQL.
CO-5	Design the Web portals to fulfill the requirements.

Content	:	Assignment based on the PHP & supporting languages will be covered.

Subject Title	:	**Research Project**			
Subject Ref. No.	:	**MANC553**	**No. of Credits**	:	4
			Internal	:	40
			Externa	:	60
Content	:	Research Projects needs to be performed.			

Subject Title	:	**Research Project - Seminar**			
Subject Ref. No.	:	**MANC554**	**No. of Credits**	:	2
			Internal	:	20
			External	:	30
Content	:	Seminars based of topics given needs to be delivered.			

SEMESTER – IV

Subject Title	:	**Seminar**			
Subject Ref. No.	:	**MANC559**	**No. of Credits**	:	4
			Internal	:	40
			External		60
Content	:	Seminars will be covered.			

Subject Title	:	**Project**			
Subject Ref. No.	:	**MANC560**	**No. of Credits**	:	16
			Internal	:	160
			External	:	240
Content	:	Major Projects needs to be performed.			

***** PROJECT DOCUMENTATION SAMPLE FORMAT *******

2 Blank Pages at beginning
Title Page
Certificate from Company
Certificate from Guide
Acknowledgement
Index with printed Page Numbers

CHAPTER 1 : INTRODUCTION

1.1 Company Profile
1.2 Existing System and Need for System
1.3 Scope of Work
1.4 Operating Environment – Hardware and Software
1.5 Detail Description of Technology Used

CHAPTER 2 : PROPOSED SYSTEM

2.1 Proposed System
2.2 Objectives of System
2.3 User Requirements

CHAPTER 3 : ANALYSIS & DESIGN

NOTE – All below diagrams are not compulsory. Students can decide which diagrams needs to add in project by consulting with PROJECT GUIDE.

3.1 Class Diagram
3.2 Activity Diagram
3.3 Use Case Diagrams

3.4 Component Diagram
3.5 Deployment Diagram
3.6 Sequence Diagram
3.7 Web Site Map Diagram (in case of Web Site)
3.8 Data Flow Diagram (DFD)
3.9 Functional Decomposition Diagram (FDD)
3.10 Entity Relationship Diagram (ERD)
3.11 User Interface Design (Screens etc.)
3.12 Table specifications (in case back end is a database)
3.13 Data Dictionary
3.16 Test Procedures and Implementation

CHAPTER 4 : USER MANUAL

4.1 User Manual
4.2 Operations Manual / Menu Explanation
4.3 Program Specifications / Flow Charts
Drawbacks and Limitations
Proposed Enhancements
Conclusions
Bibliography

ANNEXURES :

ANNEXURE 1 : USER INTERFACE SCREENS
ANNEXURE 2 : OUTPUT REPORTS WITH DATA (if any)
ANNEXURE 3 : SAMPLE PROGRAM CODE (which will prove sufficient development is done by the student)
2 Blank Pages at the end

General Instruction Regarding Preparation Of Project Report

TYPING

(a) The typing shall be standard 12 pts in double spaced using black ink only
(b) Margins must be Left 2 inches Right 1.5 inches
Top 2 inches Bottom 1.5 inches
(c) Paper A4 size Bond Paper

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