Shree H. V. P. Mandal's

Degree College of Physical Education, Amravati.

(Multi-Faculty Autonomous College)

FACULTY OF SCIENCE AND TECHNOLOGY

(ENGINEERING GROUP)

CURRICULUM OF ALL SEMESTERS
AND
SYLLABUS OF MCA FIRST YEAR SEMESTER II
(Aligned As Per NEP-2020 Guidelines)

MASTER IN COMPUTER APPLICATION
Programme Code: MCA2025

Introduced From the Academic Year

(2025-2026)

Programme Structure for
(MASTER IN COMPUTER APPLICATION)

1. **Programme Name (in Complete): Master in Computer Application**
2. **Programme Name (in Short): MCA**
3. **Nature of the Programme: Post graduate Degree**
4. **Objectives:**
   The Programme Educational Objectives (PEOs) of MCA are:

   The MCA program aims to provide comprehensive training in computer applications, with a strong focus on meeting industry demands and equipping students with the latest technological skills. With specialized knowledge in areas like Artificial Intelligence (AI), Machine Learning, Deep Learning, Data Science, and Cyber Security, students will be prepared to tackle real-world problems and contribute to innovative IT solutions.

5. **Duration of the Programme:** Two Years; Full-Time
6. **Examination Pattern:** Semester
7. **Number of Semesters:** Four Semesters
8. **Marking Scheme:** Credit-Based
9. **Total Working Days:** Per Semester:100Days
10. **Teaching and Examination Scheme:**
    As prescribed in the curriculum design and approved by the Subject Board and Academic Board from time to time.

Programme Outcomes (POs)

PO(Program Outcomes) of MCA2025 (Master in Computer Application) Curriculum are overall outcomes covering different aspects of program objectives of the entire 2 year PG Program of Engineering group of Faculty of Science & Technology of Autonomous college Degree college of Physical Education .These are as given below:

PO1: Apply advanced knowledge of computer science and emerging technologies to solve real-world problems ethically and efficiently.

PO2: Design, develop, and deploy secure software solutions using modern tools and frameworks.

PO3: Communicate effectively, work collaboratively in diverse teams, and manage projects with leadership and professionalism.

PO4: Engage in lifelong learning, innovation, and entrepreneurship to adapt to evolving technology landscapes.

PO5: Demonstrate awareness of societal, environmental, and ethical responsibilities in the IT profession.

Programme Specific Outcomes(PSOs):

PSO (Program Specific Outcomes) of MCA2025 (Master in Computer Application) Curriculum focuses on specific skills and abilities related to field of computer applications, that student should acquire during and after the completion of the program. These are as given below:

PSO1: Develop efficient, scalable software systems and applications using programming, data structures, and algorithms.

PSO2: Build secure web, mobile, and cloud-based solutions leveraging databases and computing platforms.

PSO3: Integrate AI, ML, IOT, and cyber security principles into real-time applications and research projects.

PSO4: Apply software engineering and project management practices throughout the software development life cycle.

PSO5: Contribute to innovation, research, and entrepreneurship with effective technical communication and teamwork.

PSO6: Student should be able to design, develop and manage databases using various database management systems

PSO7: Students should be proficient in using current programming languages, software development tools and other advanced computing platforms to build software solutions.

PSO8: Students should be able to work effectively in teams, communicate technical information clearly and collaborate with others.

SPECIAL NOTE FOR THE STUDENTS

1) This is notified for general information and guidance of all concerned for admission and examination to Master of Science in Computer Science.

2) All the students desirous to take examinations for which this prospectus has been prescribed should if found necessary for any other information regarding examinations etc. refer the examination rules of this autonomous college.

Pattern of Question Papers for Semester/Final Examinations of MCA in Choice Based Credit System

For Theory Examination (CBCS Curriculum)

1. Under the CBCS curriculum, the semester/final theory examinations shall be conducted for each course (subject) as per the schedule declared by the Examination Section.
2. The question papers shall be of maximum of 70 marks, containing ten questions—two questions for each unit — and students are required to attempt **any one of the two**.
3. No objective- type multiple- choice questions are allowed.
4. Every question will be of fourteen marks (14) and may contain sub-questions. Distribution of marks shall be given on the right of each question.
5. The questions' numbering will be as follows: Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
6. The questions shall be targeted to evaluate **knowledge, skill, thinking ability,** and **application**.

For Practical Examination

1. External Practical examination of MCA will be based on practical experiment performance(s) of significance of 15 Marks and 10 Marks for viva.
2. Internal practical examination of 25 Marks will be based on attendance, Completion of practical performance in the laboratory.

Examination Leading to the Degree of Master In Computer Application

(Bi-annual Pattern)(Two Year Course)

Whereas, it is expedient to prepare a new rule for Examination leading to the Degree of Master In Computer Application (Bi-annual) (Two Year Course)under CBCS for the purposes here in after appearing in the Academic Council and Governing Body.

Examination Rules for Master in Computer Application (Bi-Annual)–Two Year Course(CBCS)

1. This rule may be called **"Examination of Master in Computer Application (Bi-Annual)(Two Year Course) CBCS."**
2. This rule shall come into force **with effect from the session 2023–24** for the degree of **Master in Computer Application** (Bi-Annual Pattern) (Two Year Course) under CBCS.
3. Subject to the incompliance with the provisions/rules in force from time to time.
4. The eligibility for the first and second year is mentioned in the table below.
5. The P. G. Diploma /P.G. Degree **Master in Computer Application** shall be awarded to an examinee who, in accordance with the provisions of this rule, qualifies for the degree.
6. Duration of the programe shall be **two academic years**.
    - The First Year MCA is divided into two semesters, called **Semester I** and **Semester II**.
    - The Second Year MCA is also divided into two semesters, called **Semester III** and **Semester IV**.
    - The college shall hold examinations in **Winter** and **Summer** every year for both the even and odd semesters.
7. The regular examination of **Semester I** and **Semester III** shall be conducted in **Winter**, and the regular examination of **Semester II** and **Semester IV** shall be conducted in **Summer** every year.
    - **Supplementary Examination** for Semester I and Semester III shall be held in **Summer**, and the supplementary examination for Semester II and Semester IV shall be held in **Winter** every year.
8. For the purpose of **instruction sand examinations**, the students shall study **sequentially**.
9. The period of the academic session/term shall be such as may be **notified by this Autonomous College**.
10. The examinations, as given in Para 7 above, shall be held on such dates as may be **notified by this Autonomous College**.

11. **Subject to his/her compliance with the provisions of this rule and other rules pertaining to examinations in force from time to time, the applicant for admission at the end of the course of study of a particular term shall be eligible to appear for the examination if:**

(i) He/ She has satisfied the conditions mentioned in the table and the provisions there under.
(ii) He/ She has pursued a regular course of study in this college.
(iii) He/ She has, in the opinion of the Head of the Department/Principal, shown satisfactory progress in his/her studies.

Semester wise Admission, Eligibility and NCRF Level

Sr. No.	Semester and NCRF Level	Type of Admission	Eligibility
1	M.C.A. Semester-I NCRF Level 6.5	Direct Admission	A person who has passed the three year degree of Bachelor of Science of any stream with CET of MH-State for that academic year.
2	M.C.A. Semester-II NCRF Level 6.5	Natural Growth	---
3	M.C.A. Semester-III NCRF Level7.0	Natural Growth	Completed minimum 50% of total credits of major course plus 50% of total credits from remaining course categories of MCA Semester I and Semester II. OR Having four year UG honors degree or UG honors with research degree in similar Major from any Statutory University. OR Having PG Diploma in Major from any Statutory University.
4	M.C.A. Semester-IV NCRF Level 7.0	Natural Growth	---

General Examination Regulations for Master in Computer Application

12. The papers and practical's in which an examine is to be examined, the maximum marks for these, and the minimum passing marks that an examinee must obtain in order to passing the subject and the examination shall be **as per the curriculum**.
13. (i) The scope of the subjects is as indicated in the syllabus.
    (ii) The medium of instruction and examination shall be **English**.
14. There shall be **no classification** of examinee successful in **MCA Semester–I**, **MCA Semester–II**, **MCA Semester–III**, and **MCA Semester–IV** examinations separately.
15. Examinees who are successful as mentioned below:
    a. Clearly passed in MCA Sem I, MCA Sem II, MCA Sem III, and MCA Sem IV.
    b. Acquired UG Honors or UG Honors with Research Degree in Major and clearly passed in MCA Sem III and MCA Sem IV.
    c. Acquired P. G. Diploma in Major and clearly passed in MCA Sem III and MCA Sem IV.
    — shall be declared passed in MCA, and CGPA and programme grade will be computed as per the provisions and rules of examinations under CBCS for this autonomous college.
16. An examine who does not pass or who fails to present himself/ herself for the examination shall be eligible for **re-admission** to the same examination, on payment of fresh fees and such other fees as may be prescribed.
17. As soon as possible after the examinations, the **Examination Committee** shall publish the **results** Of the examinees.
    The result of the final MCA examination shall be declared as mentioned in Para-15 above, and the **merit list** shall be notified as per the rules.
18. Not with standing anything to the contrary in this rule, **no one shall be admitted to an examination** under this rule, if he/she has already passed the same examination or an **equivalent examination** of any statutory university.
19. (i) The examinees that have passed in all the subjects prescribed for all the examinations shall be eligible for the **award of the Degree of Master in Computer Application** by **S.G.B. Amravati University, Amravati**.
    (ii)The **degree certificate** in the prescribed form will be signed by the **Honorable Vice- Chancellor** of **S.G.B. Amravati University, Amravati**.

Curriculum for **First Year MCA** (Programme Code MCA2025) Aligned As Per NEP2020 w.e.f. AY 2025-2026

Sr. No	Course Category	Course Code	Course Name	Short Name	Credits	Teaching Scheme			Hours/Week	Examination Scheme											
										Theory					Practical						
						LECTURES	TUTORIAL	PRACTICAL		Duration of Exam (Hrs)	Max Marks Theory Papers	Max Marks Sessional	Total	Min Pass Marks	Duration of Exam (Hrs)	External Marks	Sessional Marks	Total	Min Pass Marks	Grand Total
Semester-I (NCRF Level 6.5)																					
1	Major	25MCA1F500	Problem Solving & Programming in Java	PSPJ	3	3			3	3	70	30	100	40						
2	Major	25MCA1F501	Data Structures & Algorithms	DSA	3	3			3	3	70	30	100	40						
3	Major	25MCA1F502	Database Management Systems	DBMS	3	3			3	3	70	30	100	40						
4	Major	25MCA1F503	Web Technologies	WT	3	3			3	3	70	30	100	40						
5	Major	25MCA1F504	Elective - I	EL I	3	3			3	3	70	30	100	40						
6	Major	25MCA1F505	Lab - 1: Based on PSPJ & DSA	LAB1	2			2	4						3	25	25	50	20	
7	Major	25MCA1F506	Lab - 2: Based on DBMS & WT	LAB2	2			2	4						3	25	25	50	20	
8	Major	25MCA1F507	Mini Project-1	PRJ1	2			2	4						3	25	25	50	20	
9	SEC	25SEC I	Skill Enhancement Course -I	SEC I	1	1			1								50	50	20	
			Total		**22**	**16**		**6**	**28**		**350**	**150**	**500**			**75**	**125**	**200**		**700**
Semester-II (NCRF Level 6.5)																					
1	Major	25MCA2F508	Programing in Python	PP	3	3			3	3	70	30	100	40						
2	Major	25MCA2F509	Artificial Intelligence & Machine Learning	AIML	3	3			3	3	70	30	100	40						
3	Major	25MCA2F510	PHP and MySql Programming	PHP	3	3			3	3	70	30	100	40						
4	Major	25MCA2F511	Cloud Computing	CC	3	3			3	3	70	30	100	40						
5	Major	25MCA2F512	Elective - II	EL II	3	3			3	3	70	30	100	40						
6	Major	25MCA2F513	Lab - 3: Based on PP & AIML	LAB3	2			2	4						3	25	25	50	20	
7	Major	25MCA2F514	Lab - 4: Based on PHP & EL II	LAB4	2			2	4						3	25	25	50	20	
8	Major	25MCA2F515	Mini Project-2	PRJ2	2			2	4						3	25	25	50	20	
9	SEC	25SEC II	Skill Enhancement Course -II	SEC II	1	1			1								50	50	20	
			Total		**22**	**16**		**6**	**28**		**350**	**150**	**500**			**75**	**125**	**200**		**700**

SEMESTER-I	
Elective Course- I	
25MCA1F504	Basics of Linux and Shell Scripting (BLS)
25MCA1F504	Software Engineering(SE)
25MCA1F504	Computer Networks and Communication(CNC)

SEMESTER-II	
Elective Course -II	
25MCA2F512	Cyber Security (CS)
25MCA2F512	Sports Data Modeling and Analytics (SDMA)
25MCA2F512	Natural Language Processing (NLP)

Note 1: 50% theory syllabus may be completed by subject teacher in the classroom teaching, 30% theory syllabus may be completed through online mode by the subject teacher and 20% syllabus may be completed with the help of professional outside experts from academia/industry/professional body through online/classroom teaching mode.

Note 2: 60% practical course may be completed by subject teacher in the laboratory or, 10% practical course may be completed through online mode using Virtual Labs and 30% using case study approach.

Note 3: Project report submission through online mode on college library portal with due approval of supervisor and Head of the Department, Project evaluation by presentation through online system/face-to-face interview method by the examiners.

Note 4: Courses to be learn through online mode shall be learn through UGC/AICTE recognized portals for online courses, and treated as completed on successful completion and submission of certificate to the college. The course shall be selected in consultation with nodal officer and approved by the committee. The evaluation shall be done by conducting examination by the external examiner through presentation/face-to-face interview/viva-voce.

Note 5: Students shall be divided into three groups depending on their percentage of marks in previous examination, Group 1: percentage more than 70%, Group 2: Percentage more than 55% and less than 70% and Group 3: Percentage less than 55%. These students shall be assessed internally using three different methods. Group 1: Based on online test and advanced study, Group 2: Based on written Class test and online test, Group 3: Based on Written Unit Test and assignments.

Note 6: Students should include similarity index report(Plagiarism Report) in project and/or seminar report of each semester.

Curriculum for **Second Year MCA** (Programme Code MCA2025) Aligned As Per NEP2020 w.e.f AY 2026-2027

Sr. No	Course Category	Cour	Course Name	Short Na	Credit	Teaching Scheme				Examination Scheme										
										Theory					Practical					
						LECTURES	TUTORIALS	PRACTICALS	Hours/Week	Duration of Exam (Hrs)	Max Marks Theory Papers	Max Marks Sessional	Total	Min Pass Marks	Duration of Exam (Hrs)	External Marks	Sessional Marks	Total	Min Pass Marks	Grand Total
Semester-III(NCRF Level 7.0)																				
1	Major	25MCA3S600	Mobile Application Development	MAD	3	3			3	3	70	30	100	40						
2	Major	25MCA3S601	Internet of Things	IOT	3	3			3	3	70	30	100	40						
3	Major	25MCA3S602	Digital marketing	DM	3	3			3	3	70	30	100	40						
4	Major	25MCA3S603	Research Methodology	RM	2	2			2								50	50		
5	Major	25MCA3S604	Elective - III	EL III	3	3			3	3	70	30	100	40						
6	Major	25MCA3S605	Lab-5: Based on MAD (Using Flutter / React Native	LAB5	2			2	4						3	25	25	50	20	
7	Major	25MCA3S606	Lab-6: Based on IOT (Arduino/Raspberry Pi)	LAB6	2			2	4						3	25	25	50	20	
8	Major	25MCA3S607	Lab-7:Based on DM and EL III	LAB7	2			2	4						3	25	25	50	20	
9	Major	25MCA3S608	Major Project	PRJ3	2			2	4						3	25	25	50	20	
			Total		**22**	**14**		**8**	**30**		**280**	**120**	**400**			**100**	**150**	**250**		**650**
Semester-IV(NCRF Level 7.0)																				
1	Major	25MCA4S609	Internship	PRJ4	16				32						3	100	50	150	60	
2	Major	25MCA4S610	Seminar (Based On Online Technical course(S)	SEM	6				12						3	50	50	100	40	
			Total		**22**				**44**		**0**	**0**	**0**			**150**	**100**			**250**

SEMESTER-III
Elective Course - III
25MCA3S604 : Deep Learning (DL)
25MCA3S604 : Microsoft Azure (MA)
25MCA3S604 : Software Testing Techniques & Tools (STT)

*** During 4th semester students shall complete one online course approved by the department and should submit completion certificate issued by competent authority**
*** External Marks of internship will be assessed on cumulative or monthly performance report of student submitted by industry/ company mentor to college internship mentor.**

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Degree College of Physical Education
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Amravati
Basket for SEC Courses

Skill Enhancement Course (SEC) Basket

SEM – I

SR. NO.	COURSE CODE	SKILL ENHANCEMENT COURSE (SEC) - I	SHORT NAME	PROGRAMME
1	25SEC I	Business Communication & Organizational Behavior	BCOB	MCA
2	25SEC I	Blockchain Technology	BT	MCA
3	25SEC I	Prompt Engineering	PE	MCA

SEM – II

SR. NO.	COURSE CODE	SKILL ENHANCEMENT COURSE (SEC) - II	SHORT NAME	PROGRAMME
1	25SEC II	Innovation & Entrepreneurship Development	IDE	MCA
2	25SEC II	Devops and CI-CD Automation	DOP	MCA

Semester- I

Course Category	**Major**	
Course Code	**25MCA1F500**	
Course Name	**Problem Solving & Programming in JAVA**	
Course Short Name	**PSPJ**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Basic knowledge of computers and operating systems
2. Understanding of fundamental programming concepts.

Course Objectives:

1. To learn basic features of JAVA and working of JVM.
2. To understand the concept of control statements.
3. To learn concepts of OOP
4. To learn event Handling and exception Handling
5. To learn creating packages in java and working of Applets.

Mapping of Programme Outcomes:	**Mapping of Programme Specific Outcomes:**
PO1, PO2	PSO1, PSO2

Course Outcomes: After completing this course, The students will be able to:

CO 1. Student will be able to understand Java basics and how to write and run a simple Java program.
CO 2. Student will be able to apply OOP concepts in class design.
CO 3. Student will be able to write reusable and modular Java code using inheritance and interfaces.
CO 4. Understand JDBC architecture and will be able to create applications to communicate with SQL databases like oracle, mysql, etc.
CO 5. Can develop server side applications and enterprise web applications using Java Servlet.

Units	**Contents**	**Total Lectures**
I	**Introduction to Java:** Data types, types of variable(local, static, instance)**Control statements:** if, if-else, Nested if, Switch-case Statement, **Looping Statement:** for loop, for-each loop, while loop, do-while loop, break statement, continue statement, type casting, Array, Creating, Initializing, and Accessing an Arrays, static and dynamic binding**,** Access modifier.	9
	Mapping of COs: CO1	
II	**OOP's Concept:** class, object, inheritance, encapsulation, abstraction, polymorphism, method, method overloading, Argument passing, static keyword, final keyword, super keyword. **Inheritance**: types of inheritance, polymorphism, Run time polymorphism, method overriding, abstract, abstract method and classes, and interface. String functions.	9
	Mapping of COs: CO2	
III	**Exception Handling:** Introduction, pre-defined Exceptions, Try-Catch-Finally, throws, throw, User Defined Exceptions, creating packages, Socket and Server Socket classes, URL class, displaying data of a web page, Inet Address class, Datagram Socket and Datagram Packet, Two way communications, Creating client server chat application using TCP Sockets, Creating client server chat application using UDP Sockets.	9
	Mapping of COs: CO3	
IV	**JDBC** Drivers, Steps to connect to the database, Connectivity with Oracle, Connectivity with MySQL, Connectivity with Access without DSN, Driver Manager, Connection interface, Statement interface, Result Set interface, Prepared Statement, ResultSet MetaData, Database MetaData, Storing image, Retrieving image, Storing file, Retrieving file, Stored procedures and functions, Transaction Management, Batch Processing, scrollable and updatable resultset.	9
	Mapping of COs: CO4	

V	**Servlets**: Introduction, Web application Architecture, HTTP Protocol & HTTP Methods, Web Server & Web Container, Servlet Interface, HTTPServlet, GenericServlet, Servlet Life Cycle, ServletConfig, Servlet Context, Servlet Communication: **Servlet-Browser Communication**-send Error, setHeader, sendRedirect, **Web-Component Communication-** Forward, Include, **JSP:**Introduction, LifeCycle, **JSP Scripting Elements:** declaratives, scriptlets, expressions, **Implicit Objects**, **JSP Directives**: page, include, taglib,**JSPStandard Actions**: use Bean tag, setProperty tag, getProperty tag	9
	Mapping of COs CO5	

Text Books:

1. Java for beginners by Shirish Chavan
2. internet and Java Programming by R. Krishna moorthy and S. Prabhu
3. Java: The Complete Reference, Seventh Edition - by Herbert Schildt ,McGraw Hill Education; 9th edition
4. JDBC API Tutorial and Reference (Java Series) -by Maydene Fisher , Jon Ellis, Jonathan Bruce, Addison Wesley; 3rd edition

Reference Books:

1. Java: The Complete Reference, Seventh Edition - by Herbert Schildt , McGraw Hill Education; 9th edition

Course Category	**Major**	
Course Code	**25MCA1F501**	
Course Name	**Data Structures & Algorithms**	
Course Short Name	**DSA**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Basic Knowledge of C Language

Course Objectives:

1. To learn linear and non-linear data structures.
2. To analyse, design and implement different data structure algorithms, sorting and searching mechanisms.
3. To understand, analyse, design and implement different file formats, file organization methods.

Mapping of Programme Outcomes:	**Mapping of Programme Specific Outcome:**
PO1, PO2	PSO1

Course Outcomes: After completing this course, The students will be able to:

CO 1. Student will be able to understand, basic concept of data structure, file and algorithms, operations.
CO 2. Student will be able to analyse, design and implement different data structure algorithms.
CO 3. Student will be able to understand, analyses, design and implement searching and sorting techniques.
CO 4. Student will be able to analyse, design and implement hierarchical data structures.
CO 5. Student will be able to understand, analyse, design and implement different file formats, file organization methods.

Units	**Contents**	**Total Lectures**
I	**Introduction**: Types of Data Structure: Linear & Nonlinear data structure, DS operations, algorithm, Complexity of algorithm, Abstract data types. **Arrays:** Linear Array, Memory Representation of linear Arrays, Operation on Linear Array, Multidimensional Arrays.	9
	Mapping of COs: CO1	
II	**Linked List:** Linked List Representation, Types of Linked List: Simple Linked List, Doubly Linked List, Circular Linked List, Operations: Insert, Delete, Traversal **Stacks:** Introduction to Stack, Stack Representation, Operation on stack, Stack implementation using arrays and linked list, Stack's applications: Infix, Postfix & prefix expressions, Infix to Postfix conversation, evaluation of postfix expressions, Recursion.	9
	Mapping of COs: CO2	
III	**Queues:** Introduction to queues, Primitive Operations on the Queues, Dqueue, Circular Queue, Priority Queues. Queue Application. **Searching:** Introduction to Searching & Sorting, linear search, binary search. **Sorting:** bubble sort, selection sort, insertion sort, Merge Sort.	9
	Mapping of COs: CO3	
IV	**Trees:** Terminology and Concepts, Binary Tree, Representation, Linked representation of binary trees, Binary Search Tree, Operation on Binary search trees: Insert, Delete. Tree Traversals: Preorder, Inorder, Postorder, AVL Search Trees, B Trees, Application of Tree. **Graphs:** Terminology and Graph Representation: Adjacency matrix, Adjacency list, Traversals: Depth first and Breadth first, Minimum spanning tree, shortest path algorithm, topological ordering, Application of Graph.	9
	Mapping of COs: CO4	
V	**File Concepts:** Files, Types of File: Master file, Transaction file, Work file, Text file, Binary file, Program file, File Processing Operation: open, close, read, write, seek. File Format: CSV, JSON, ascii text, Microsoft Excel, Audio-Video Interleave and ZIP. **File Organization:** Sequential organizations, Random organizations, Linked Organizations, Inverted files.	9
	Mapping of COs CO5	

Text Books:

1. Data structure by Seymour Lipschutz.
2. Practical approach to Data structure and algorithm by Sanjay Pahuja.
3. SartajSahani, —Data structure algorithms and Application in C++", McGrawHill

Reference Books:

1. Introduction to data structure with applications. By Tremblay &Sorenson.
2. Introduction to data structure by T.L Naps & BhagatSingh.
3. Data management & file structure by Merry E.S. Loomis
4. Tanenbaum, Langsam, Augenstein, —Data structure using C‖, PHI S.B.Kishor,
5. —Data Structures‖Maek Allan Weless,
6. —Data structure and algorithm analysis in C++", Addison Weslay

Course Category	**Major**	
Course Code	**25MCA1F502**	
Course Name	**Database Management System**	
Course Short Name	**DBMS**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Basic knowledge about database and tables.

Course Objectives:

1. Explain fundamental database concepts and different DBMS architectures
2. Master SQL data definition, manipulation, control, and transaction control commands and apply integrity constraints.
3. Develop complex query skills using DQL select command
4. Implement PL/SQL modules—functions, procedures, cursors, triggers—for encapsulated logic.
5. Normalize relational schemas through normalization to minimize redundancy.
6. Equip students with the knowledge of advanced database security mechanisms and introduce modern NoSQL database concepts for handling diverse and scalable data systems.

Mapping of Programme Outcomes:	**Mapping of Programme Specific Outcomes:**
PO1, PO2	PSO6

Course Outcomes: After completing this course, the students will be able to:

CO 1. Compare file system and DBMS and understand various database system architectures.
CO 2. Students will construct and execute SQL statements for schema and data management. Also able to apply integrity constraints.
CO 3. Students will design and execute advanced SQL queries and views to retrieve meaningful business insights.
CO 4. Students will write PL/SQL routines with proper use of cursors and triggers to enforce business rules and data integrity within the database.
CO 5. Students will apply normalization techniques to analyze dependencies and decompose schemas into normal form structures.
CO 6. Apply database security techniques and compare SQL with NoSQL systems, including the use of document-based databases like MongoDB for secure and scalable data management.

Units	**Contents**	**Total Lectures**
I	**Introduction to Database Concepts:** File System VS DBMS, Purpose of Database systems, Database system application, Three-Schema Architecture and Data Independence, Database Environment. **Database System Architectures:** RDBMS, Centralized Database system, Server System Architecture and its transaction server architecture, Parallel Database Architecture, Distributed Systems, Cloud based services. **Mapping of COs: CO1**	10
II	**SQL: Data Definition Language-** Create, Alter, Drop, Truncate, Rename. Integrity Constraints in SQL. **Data Manipulation Language-** Insert, Update, Delete. **Data Control Language:** Grant and Revoke. **Transaction Control Language-** Commit, Rollback, Savepoint. **Mapping of COs: CO2**	8
III	**Data Query Language:** Select, Distinct, All, Arithmetic operators, Comparison operators & Logical operators, Rename operation, String Operations, Pattern matching with LIKE operator, Order by Clause, Between operator, Null values, Aggregate Functions, Group By, Having Clause, Nested Sub-queries, Joined relations, Set Operations, Set Membership, Set Comparison, Views. **Mapping of COs: CO3**	9
IV	**PL/SQL:** Function, Stored Procedure, Cursor, Trigger. **Decomposition:** Lossy and Lossless Decomposition, **Normalization:** First, Second, Third, Boyce-Codd, Fourth, Fifth, Domain - Key Normal Forms	8

	Mapping of COs: CO4, CO5	
V	**Database Security:** DB Security issues, Discretionary Access, mandatory access control and role-based access control for multi-level security, SQL injection. **NoSQL database concepts:** Introduction to NOSQL systems, Benefits of NoSQL, comparison between SQL and NoSQL database systems, Categories of NoSQL systems, Document – based NoSQL systems and MongoDB.	10
	Mapping of COs : CO6	
	Text Books: 1. Abraham Silberschatz, Henry F. Korth, S. Sudharsan, ―Database System Concepts‖, Sixth Edition, McGraw-Hill , 2011 2. Ramez Elmarsi, Shamkant B. Navathe, ―Fundamentals of database System‖, Seventh Edition, Person Education 2017.	
	Reference Books: 1. ―SQL, PL/SQL: The Programming Language of Oracle‖ by Ivan Bayross – BPB Publications 2. Raghu Ramkrishnan, Johannes Gehrke, Database Management Systems, Third Edition, McGraw-Hill, 2003 3. ―Database Systems‖ by Thomas Connolly and Carolyn Begg , Fourth Edition	

Course Category	**Major**	
Course Code	**25MCA1F503**	
Course Name	**Web Technologies**	
Course Short Name	**WT**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Basics knowledge of Computer system, Internet and editing tools.

Course Objectives:

1. To learn basics of Website
2. To develop simple web pages.
3. To learn and understand the CSS and create Styles for web pages.
4. To learn and understand scripting and to write simple JavaScript.
5. To learn and understand basics of JavaScript and to write simple JavaScript

Mapping of Programme Outcomes:	**Mapping of Programme Specific Outcomes:**
PO1, PO2	PSO1, PSO2

Course Outcomes: After completing this course, the students will be able to: CO 1. To be able to develop simple web pages.
CO 2. Knowledge and skill of Website designing and scripting.
CO 3. Comfortably use CSS, JavaScript for developing advanced web sites CO 4. Understand and apply fundamental JavaScript concept and syntax CO 5. Use array, objects, and events for dynamic user interaction.
CO 6. Manipulate the DOM and perform client-side form validation

Units	**Contents**	**Total Lectures**
I	Web basics, Multitier Application Architecture, Client-Side Scripting versus Server-Side Scripting, World-Wide-Web Consortium (W3C). W3C Standards. **HTML5**: Features, Editing, HTML5 structure, Headings, Linking, Images, Lists, Tables, Forms. **HTML5 New Elements**: **Form input type element**: colors, date, time, e-mailaddress, numbers, range, search, telephone numbers, URLs, **Datalist Elements**.	9
	Mapping of COs: CO1	
II	**HTML 5 Page-Structure Elements**: header, nav, figure, fig-caption, article, summary, details, section, aside, meter, footer, Audio & Video elements. **CSS**: Introduction, **basic properties**: text, list, border font, **Selectors**: universal, element, id, class, group.**CSS types**: Inline, Internal and External Style Sheets.	9
	Mapping of COs: CO2	
III	**Introduction to JavaScript :**History and features, Client-side **VS** server-side JavaScript JavaScript placement :Inline, Internal, External,<script> tag and placement (head vs body) **Variables and Data Types :** var, let, const, Primitive types: string, number, Boolean ,null, undefined, Type conversion **Operators:** Arithmetic, assignment, comparison, logical, bitwise, ternary. **Control Statements :** if, if-- else, if-- else if and switch.	9
	Mapping of COs: CO3	
IV	**Looping Statements:** for, while, do-while, for-in loop, for-of loop, break, continue **Functions in JavaScript:** Defining and Calling Functions, Function Expression, Arrow Functions, Parameter and return values. **Events in JavaScript:** onclick, onchange, onmouseover, Event Handling and Listeners. **Recursion. JavaScript Objects:/** Math, String, Date, Number and Boolean.	9

	Mapping of COs: CO4	
V	**Document Object Model (DOM):** What is DOM. getElementByID, getElementsByClassName, querySelector, innerHTML. Modifying attributes, text, styles dynamically. **Browser Object model (BOM):** window, navigator, location, history, screen. Alert, Confirm, Prompt boxes. **Form Validation:** Accessing form elements. Validating form fields: email, number, required. Preventing form submission. **JavaScript Arrays:** Creating arrays, Methods: push, pop, shift, unshift, splice, slice. Iterating arrays using for and forEach(). **JavaScript Error Handling.**	9
	Mapping of Cos: CO5,CO6	

Text Books:

1. Paul Deitel, Harvey Deitel and Abbey Deitel, ―Internet & World Wide Web:How to program‖, Fifth Edition Pearson ISBN 978-0-13-215100-9
2. Thomas A. Powell, ―HTML & CSS: The Complete Reference‖ , Fifth Edition,McGraw-Hill, ISBN: 978-0-07-174170-5

Reference Books:

1. Complete JavaScript Reference ,Thomas powell , MC Graw Hills

Course Category	**Major**	
Course Code	**25MCA1F504**	
Course Name	**Basics of Linux and Shell Scripting**	
Course Short Name	**EL I**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Basic knowledge of computer fundamentals
2. Familiarity with any programming language (preferably C or Python)
3. Understanding of operating system concepts

Course Objectives:

1. Introduce students to the Linux operating system and its environment
2. Develop proficiency in using Linux commands and utilities
3. Enable students to automate tasks using shell scripting
4. Provide hands-on experience in writing, debugging, and executing shell scripts
5. Prepare students for real-world problem-solving using Linux and shell scripting tools

Mapping of Programme Outcomes:	**Mapping of Programme Specific Outcomes:**
PO1	PSO7

Course Outcomes: After completing this course, The students will be able to:

CO 1. Understand and navigate the Linux file system and environment.
CO 2. Execute and manage Linux commands for daily tasks
CO 3. Write, debug, and optimize shell scripts for process automation
CO 4. Utilize advanced shell scripting features such as loops, conditionals, and functions
CO 5. Develop project-based solutions using Linux and shell scripting

Units	**Contents**	**Total Lectures**
I	Introduction to Operating Sysytem, Introduction to Linux , History and features of Linux, Overview of Linux distributions, Linux system architecture,Kernel, Shell, and File System, Logging in and basic navigation, Understanding the Linux desktop and terminal	9
	Mapping of COs:CO1	
II	Working with the Linux File System, Linux file system structure (directories and files),Basic file and directory commands: ls, cd, pwd, mkdir, rmdir, File operations: cp, mv, rm, cat, more, less, Understanding file permissions and ownership, Viewing and changing permissions with chmod and chown	9
	Mapping of COs: CO2	
III	Users, Processes, and Editors, User and group concepts, Switching users and managing passwords, Introduction to processes: viewing (ps, top), killing (kill) Introduction to text editors: nano and vi, Creating and editing files	9
	Mapping of COs: CO2	
IV	Introduction to Shell, Types of Shells (e.g., Bash, Zsh, etc.), Shell Environment and Variables, Shell Configuration Files (.bashrc, .bash_profile) , Writing and Executing Shell Scripts, Variables and Data Types, Input/Output Redirection, Positional Parameters and Command-Line Arguments, Arithmetic Operations ,Conditional Statements: if, if-else, elif, case, Loops: for, while, until,Break and Continue Statements	9
	Mapping of COs: CO3	
V	Defining and Calling Functions , Function Parameters and Return Values, File Handling in Shell Scripts, Regular Expressions and Pattern Matching ,Scheduling Jobs: cron and at, Debugging Shell Scripts (set -x, set -e),Linux system call	9
	Mapping of Cos: CO4, CO5	
	Text Books: 1. Richard Petersen Linux The Complete Reference McGraw Hill, 6th edition 2. Richard Blum Linux command line and shell scripting Wiley India 3. Linux System Programming, Robert Love, O'Reilly, SPD.	
	Reference Books: 1. "A Practical Guide to Linux Commands, Editors, and Shell Programming": by Mark G. Sobell. 2. "Linux for Beginners": by Jason Cannon.	

Course Category	**Major**	
Course Code	**25MCA1F504**	
Course Name	**Software Engineering**	
Course Short Name	**EL I**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Basic concept of software program.
2. Basic project management concepts.
3. Logical and analytical thinking.

Course Objectives:

1. To understand the software development life cycle and various process models.
2. To analyze and gather software requirements using standard methodologies.
3. To design software solutions applying architectural and design principles.
4. To introduce testing strategies, quality assurance, and maintenance techniques.
5. To emphasize project management techniques in software development.

Mapping of Programme Outcomes:	**Mapping of Programme Specific Outcomes:**
PO1, PO2, PO3	PSO1, PSO4, PSO5

Course Outcomes: After completing this course, The students will be able to:

CO 1. Understand and compare software process models.
CO 2. Apply requirements engineering techniques for software systems.
CO 3. Design software architecture and apply modeling techniques.
CO 4. Implement effective software testing and maintenance practices.
CO 5. Apply project management practices to software development projects.

Units	Contents	Total Lectures
I	**Introduction to Software Engineering** System, Characteristics of system, Types of system, Types of information system, Software, Software characteristics, Software process, Software development process, Definition and need of software engineering, SDLC, History and development of software development models, Waterfall model, Spiral model, V-model, Agile model and other models. RAD model incremental model, Iterative model, Prototype model. **Mapping of COs: CO1**	9
II	Requirement in software process, Requirement analysis, Types of requirements, Steps in requirements analysis, Techniques for knowing user requirements, Requirements specification, Structure of software requirements specification (SRS) documents, Characteristics of good SRS, Role of system analysis, Requirement validation. **Mapping of COs: CO2**	9
III	Process of software design, Top-down approach, Bottom-up approach, High level design entity, ER diagram, Data flow diagram, Data dictionary, Decision Tree and Decision Table, Flowchart, Pseudocode, UI design, I/O Design, UML Diagram, Software modularity, Coupling and Cohesion, Structure charts, Quality of design, Principles of Good Design.. **Mapping of COs: CO3**	9
IV	Coding: Programming Practices: Top-down and Bottom-up, Structured programming, Programming style, Code inspection and review, Unit testing. Metrics of coding: Size, Complexity, Style. Testing Fundamentals: Error, Failure and Bugs, Bug Lifecycle, Functional testing and Non-functional testing, Verification techniques, Validation Techniques: Levels of testing: Unit testing, Integration testing, System testing, Test cases, Automated testing.. **Mapping of COs: CO4**	9
V	Software maintenance, Types, Models, Techniques for software maintenance, Software Configuration management tools for software maintenance, Software Planning and scheduling, Responsibilities of project management, Risk management, Project plan, Project scheduling, Project staffing , Project cost estimation, Software Quality metrics **Mapping of COs CO5**	9

Text Books:

1. Software Engineering Principles and Practices, 5th Ed., Rohit
2. Software Engineering: Concepts and Cases, Ashwini Renavikar

Reference Books:

1. *An Integrated Approach to Software Engineering*, Pankaj Jalote, Narosa Publishing.

Course Category	**Major**	
Course Code	**25MCA1F504**	
Course Name	**Computer Networks And Communication**	
Course Short Name	**EL I**	
Total Lectures	**45**	
Total Credits	**03**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:
1. Basic understanding of computer systems and operating systems.

Course Objectives:
1. To introduce fundamental concepts and types of computer networks and communication protocols.
2. To analyse data link control, error detection, and flow control mechanisms.
3. To study IP addressing, routing algorithms, and network layer functionalities.
4. To understand the transport layer protocols and their role in reliable communication.
5. To explore application layer protocols and network security fundamentals.

Mapping of Programe Outcome:	**Mapping of Programme Specific Outcomes:**
PO1, PO2	PSO7

Course Outcomes: After completing this course, The students will be able to:
CO 1. To introduce fundamental concepts and types of computer networks and communication protocols.
CO 2. Analyse data link layer functions including framing, error detection, and MAC protocols
CO 3. To study IP addressing, routing algorithms and network layer functionalities.
CO 4. To understands the transport layer protocols and their role in reliable communication.
CO 5. To explore application layer protocols and network security fundamentals

Units	Contents	Total Lectures
I	**Introduction to Computer Networks**: Data communication components and types, Network types: LAN, MAN, WAN, Network topologies, Reference models: OSI and TCP/IP, Network devices: Hub, Switch, Router, Bridge, Gateway	9
	Mapping of COs: CO1	
II	**Data Link Layer:** Framing, error detection and correction (Parity, CRC, Hamming Code)**,**Flow control mechanisms**,** Data link layer protocols: Stop-and-Wait, Go-Back-N, Selective Repeat**,** MAC protocols: ALOHA, CSMA/CD, CSMA/CA**,** Ethernet and IEEE 802.3	9
	Mapping of COs: CO2	
III	**Network Layer:** Network layer design issues and functions**,** IPv4 and IPv6 addressing**,** Subnetting and Supernetting**,** Routing algorithms: Distance Vector, Link State, Path Vector**,** ICMP, ARP, RARP protocols	9
	Mapping of COs: CO3	
IV	**Transport Layer:** Transport layer services**,** Multiplexing and DE multiplexing**,** TCP vs UDP**,** TCP flow control, error control, congestion control**,** Port addressing, sockets.	9
	Mapping of COs: CO4	
V	**Application Layer and Network Security:** Application protocols: DNS, FTP, HTTP, SMTP, SNMP**,** Basic network management concepts**,** Network security fundamentals**,** Cryptography: Symmetric and Asymmetric encryption**,** Secure communication protocols: SSL/TLS, IPsec**,** Firewalls and VPNs	9
	Mapping of Cos: CO5	
	Text Books: 1. Behrouz A. Forouzan, *Data Communications and Networking*, McGraw Hill **2.** Andrew S. Tanenbaum, *Computer Networks*, Pearson	
	Reference Books: 1. James F. Kurose & Keith W. Ross, Computer Networking: A Top-Down Approach, Pearson 2. William Stallings, Data and Computer Communications, Pearson 3. William Stallings, Cryptography and Network Security, Pearson	

Course Category	**Major**	
Course Code	**25MCA1F505**	
Course Name	**LAB 1 : Based on PSPJ & DSA**	
Course Short Name	**LAB 1**	
Total Lectures	**60**	
Total Credits	**2**	
Marks	**External: 25**	**Internal: 25**
Note: Practical List will be freshly prepared by the course teacher in every session. So the list is not mentioned.		

Course Category	**Major**	
Course Code	**25MCA1F506**	
Course Name	**LAB 2 : Based on DBMS & WT**	
Course Short Name	**LAB 2**	
Total Lectures	**60**	
Total Credits	**2**	
Marks	**External: 25**	**Internal: 25**
Note: Practical List will be freshly prepared by the course teacher in every session. So the list is not mentioned.		

Course Category	**Major**	
Course Code	**25MCA1F507**	
Course Name	**Mini Project -1**	
Course Short Name	**PRJ1**	
Total Lectures	**60**	
Total Credits	**2**	
Marks	**External: 25**	**Internal: 25**

Prerequisites

1. Preliminary knowledge of software development process.
2. Knowledge about technology and application domain in which project will be developed.
3. Good knowledge of subject domain and Software Engineering.

Course Objectives

1. Enable students to identify real-life problems or research-based issues in the domain of computer applications and translate them into well-defined project objectives.
2. Develop students' ability to apply theoretical and technical knowledge gained during the MCA programme to design, develop, and deploy a software-based solution.
3. Foster skills in project management, teamwork, requirement analysis, software engineering, and development methodologies.
4. Encourage documentation and communication skills through structured reports, presentations, and user manuals.
5. Prepare students for professional roles by simulating a real-world software development environment involving problem-solving, innovation, and ethical practices.

Mapping of Programme Outcomes:	**Mapping of Programme Specific Outcomes:**
PO1, PO2	PSO4, PSO5

Course Outcomes

CO1: Identify and define real-world problems or research areas relevant to computer applications, and propose suitable solutions using appropriate software engineering principles.
CO2: Apply theoretical knowledge and technical skills gained in the coursework to design, develop, and implement a software-based solution or prototype.
CO3: Demonstrate effective use of programming tools, platforms, databases, and other technologies required for development.
CO4: Practice collaborative teamwork, project planning, and time management through systematic execution of project phases.
CO5: Develop professional documentation, including Software Requirements Specifications (SRS), system design, and user manuals, adhering to industry standards.
CO6: Communicate technical information clearly and effectively through oral presentations and demonstrations of the project.

Rules for Project Work:

A student will be examined in the course ―Project Work‖ as given below:

1. Project work may be done individually or in groups. However if project is done in groups, each student must be given are possibility for a distinct task and care should be taken to see the progress of individual.
2. Students should take guidance from a guide and prepare Project Report on ―Project Work‖ in 2 copies to be submitted to the Head of the Department. A soft copy of project report along with source-code and data should also be submitted.
3. The Project Synopsis should contain an Introduction to Project, which should clearly explain the project scope in detail. Also, Data Dictionary, DFDs, ERDs, Navigation Diagrams, File designs, experimental setup and methodology.
4. The project report will be duly accessed by the guide of the project and marks will be communicated by the Head of the Department to the Examination Department.
5. The project report should be prepared in format prescribed by the College, which also specifies the contents and methods of presentation.

Format of Project Synopsis:

Topic
Introduction
Technology Usage
Name of students and their signatures
Name of Guide and signature

Note: Synopsis should be hand written

General Instruction Regarding Preparation of Project Report:

TYPING:

(a) The typing shall be standard 12 pts in double spacing using only
(b) Margins must be Left 1.5 inches Right 1 inches Top 1 inches Bottom 1 inches
(c) Paper: A4 size Paper

COPIES:

Two hard-bind copies (As per format displayed here with) One original and one clean Xerox Copy.

FORMAT FOR TITLE PAGE AND FOR COVERPAGE:

PROJECT REPORT ON
NAME OF THE PROJECT BY
NAME OF STUDENT

GUIDED BY
NAME OF THE GUIDE

P.G. Department of Computer Science & Technology,
Degree College of Physical Education,
Shree H.V. P. Mandal, Amravati.

ACADEMIC SESSION

Report format for Application Development Projects:

1. Blank Page at beginning
2. Title Page
3. Certificate from Guide Acknowledgement
4. Index with printed Page Numbers

CHAPTER1 : INTRODUCTION

1.1 Existing System and Need for Software
1.2 Proposed System
1.3 Scope of Work
1.4 Operating Environment– Hardware and Software

CHAPTER2 :ANALYSIS &DESIGN

2.1 User Requirements
2.2 Software Requirements
2.3 System Flow
2.4 Module Flow
2.5 Module Document
2.6 Input Document
2.7 Computational Method Document(If methods are used)
2.8 Output Document
2.9 Navigation Diagram (if website)
2.10 Data Flow Diagram(DFD) (if desktop application)
2.11 Functional Decomposition Diagram(FDD) (if desktop application)
2.12 Entity Relationship Diagram(ERD) (if desktop application)
2.13 Data Dictionary
2.14 Table Design
2.15 Menu Tree
2.16 Menu Screens
2.17 Input Screens
2.18 Report Formats
2.19 Pseudo codes(optional)
2.20 Test Procedures(optional)

CHAPTER 3:IMPLEMENTATION&RESULTS

3.1 Input Forms with Data
3.2 Output Reports with Data
3.3 Sample Code

CHAPTER4:CONCLUSION ANDFUTURESCOPE

4.1. Drawbacks and Limitations
4.2. Conclusion
4.3.Proposed Enhancements

REFERENCES

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Course Category	**Skill Enhancement Course I**	
Course Code	**25SEC I**	
Course Name	**Business Communication and Organizational Behavior**	
Course Short Name	**BCOB**	
Total Lectures	**15**	
Total Credits	**1**	
Marks	**External: -**	**Internal: 50**

Prerequisites:

1. Basic English Communication Skills.
2. Computer Literacy
3. Interpersonal Interaction Experience
4. Fundamentals of Human Behaviour (Desirable)

Course Objectives:

1. To develop effective business communication skills, both verbal and non-verbal.
2. To understand individual and group behavior within organizational settings.
3. To analyse organizational structures and dynamics.

Mapping of Programme Outcomes:	**Mapping of Programme Specific Outcomes:**
PO3, PO5	PSO8

Course Outcomes: After completing this course, The students will be able to:

CO 1. Demonstrate effective business communication skills in various formats.
CO 2. Analyse individual behavior and its impact on organizational performance.
CO 3. Evaluate group dynamics and apply team-building strategies.

Units	Contents	Total Lectures
I	**Fundamentals of Business Communication: Definition** and importance of business communication. Communication process and types (verbal, non-verbal, written, oral). Barriers to effective communication and overcoming them.	3
	Mapping of COs: CO1	
II	The 7 Cs of effective communication. Listening skills and feedback mechanisms. **Organizational Behaviour –** Individual Level: Introduction to organizational behaviour (OB)**.**	3
	Mapping of COs: CO2	
III	Personality traits and their impact on behaviour. Perception and attribution in organizations. Motivation theories (Maslow, Herzberg, McGregor). Group formation, team roles, and conflict resolution.	3
	Mapping of COs: CO1	
IV	Organizational Structure and Culture: Types of organizational structures (functional, divisional, matrix). Organizational culture and its components.	3
	Mapping of COs:CO2	
V	Power and politics within organizations. Change management and organizational development. Stress management and coping strategies.	3
	Mapping of Cos: CO3	
	Text Books: 1. Behrouz A. Forouzan, *Data Communications and Networking*, McGraw Hill 2. Andrew S. Tanenbaum, *Computer Networks*, Pearson	
	Reference Books: 1. James F. Kurose & Keith W. Ross, Computer Networking: A Top-Down Approach, Pearson 2. William Stallings, Data and Computer Communications, Pearson 3. William Stallings, Cryptography and Network Security, Pearson	

Course Category	**Skill Enhancement Course I**	
Course Code	**25SEC I**	
Course Name	**Blockchain Technology**	
Course Short Name	**BT**	
Total Lectures	**15**	
Total Credits	**1**	
Marks	**External: -**	**Internal: 50**

Prerequisites:

1. Basic understanding of blockchain and network security.

Course Objectives:

1. To Understand the concept of decentralization of the block chain with different layers of Block chain
2. To understand the concept of basic cryptographic primitives with encryption standard
3. To Understand Fundamentals of Bitcoin and Decentralization
4. To understand different Consensus algorithms.
5. Acquiring skills to develop computer vision based applications

Mapping of Programme Outcomes:	**Mapping of Programme Specific Outcomes:**
PS1, PO2	PSO2

Course Outcomes: After completing this course, The students will be able to:

CO1. Understand Basic Concepts in BlockChain technology.
CO2. Understand working of BlockChain technology.
CO3. Understand the concept of Decentralization.
CO4. Understand the concept of blockchain network.
CO5. Understand application development and its application in different domains with the help of case studies.

Units	Contents	Total Lectures
I	Blockchain Fundamentals: Introduction to Blockchain, History, Centralised, Importance of Blockchain, Blockchain Architecture & Types Blocks and chains: The Structure of a blackchain and how block are linked together. **Mapping of COs: CO1**	3
II	Blockchain Uses and Use Cases. Blockchain Working: Laying the blockchain foundation, Cryptography, Symmetric key Cryptography, DES cryptography, Advanced Encryption Standard, Asymmetric key Cryptography, Blockchain Application. **Mapping of COs:CO2**	3
III	Decentralization: Decentralization using blockchain, Methods of decentralization: Disintermediation Contest-driven decentralization, Routes to decentralization, Innovative trends. Crypto currency: bitcoin, working of bitcoin, block structure, Ethereum. **Mapping of COs: CO3**	3
IV	Nodes and Miners: The different participants in blockchain network. Types of Blockchain: Public, Private, consortium, and hybrid networks. Blockchain Architecture: The underlying design and framework of blockchain system **Mapping of COs:CO4**	3
V	Blockchain Application Development: Decentralized Applications, Blockchain Application Development, Case Studies: Block chain in Financial Service, Supply Chain Management and Government Services. **Mapping of Cos: CO5**	3
	Text Books: **1.** Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda, ―Beginning Blockchain ",Apress. **2.** Imran Bashir, ―Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained‖, Packt Publishing. **3.** 3. Narayanan, Bonneau, Felten, Miller and Goldfeder, ―Bitcoin and Crypto currency Technologies – A Comprehensive Introduction‖, Princeton University Press.	

Reference Books:

1. Josh Thompson, „Blockchain: The Blockchain for Beginnings, Guide to Blockchain Technology and Blockchain Programming", Create Space Independent Publishing Platform, 2017.
2. Merunas Grincalaitis, ―Mastering Ethereum: Implement Advanced Blockchain Applications Using Ethereum-supported Tools, Services, and Protocols‖, Packt Publishing.
3. Prof. Sandip Chakraborty, Dr. Praveen Jayachandran, ―Blockchain Architecture Design And Use Cases‖[MOOC], NPTEL: https://nptel.ac.in/courses/106/105/106105184/

Course Category	**SEC**	
Course Code	**25SEC I**	
Course Name	**Prompt Engineering**	
Course Short Name	**PE**	
Total Lectures	**15**	
Total Credits	**1**	
Marks	**External: -**	**Internal: 50**

Prerequisites:

- Basic knowledge of Artificial Intelligence and Machine Learning.
- Introductory Python programming.
- Awareness of general-purpose Large Language Models (LLMs) like ChatGPT, Bard, etc.

Course Objectives:

1. To introduce the fundamentals and applications of prompt engineering in LLMs.
2. To enable students to design and refine effective prompts.
3. To impart knowledge of optimization and evaluation of prompts.
4. To expose learners to practical use cases in MCA domains.
5. To create awareness of ethical, legal, and security issues in prompt usage.

Mapping of Programme Outcome:	**Mapping of Programme Specific Outcome:**

Course Outcomes: After completing this course, The students will be able to: **CO1.** Explain the concept and role of prompt engineering in generative AI. **CO2.** Apply basic and advanced prompt design techniques.

CO3. Optimize and evaluate prompts for quality outputs.

CO4. Develop domain-specific applications of prompt engineering.

CO5. Recognize ethical, legal, and security concerns in AI-generated content.

Units	**Contents**	**Total Lectures**
I	**Introduction to Prompt Engineering:** Basics of Generative AI and LLMs. Definition, Scope and significance of prompt engineering of prompt engineering. Anatomy of a prompt (instruction, context, role, constraints). Applications in education, research, and business. **Mapping of COs:CO1**	3
II	**Fundamentals of Prompt Design:** Principles of effective prompting: clarity, specificity, structure.Types of prompts: zero-shot, few-shot, role-based, iterative. **Mapping of COs: CO2**	3
III	**Advanced Prompting Techniques:** Chain-of-thought and Tree-of-thought methods. Multi-turn conversations and context preservation. Prompt templates and automation.Prompting for debugging and code generation. **Mapping of COs: CO2, CO4**	3
IV	**Structured Prompt Design and Optimization:** Prompt Patterns and Templates: Persona, interview, question–answer, brainstorming. Optimization Techniques: Iterative refinement, handling ambiguity.Evaluation of Prompts: relevance, coherence, correctness, conciseness. **Mapping of COs: CO3, CO4**	3

V	**Ethics, Security and Future Trends:** AI Risks: AI hallucinations, bias, misinformation, plagiarism.Security issues: Adversarial prompting, data leakage.Responsible use of AI tools: Academic and professional settings.Future of prompt engineering: Automation, AI agents, reinforcement learning. **Mapping of COs: CO5**	3
	Text Books: 1. Bhargava, Shubham. Prompt Engineering for Generative AI: Harnessing the Power of LLMs. BPB Publications, 2023. 2. Rao, S. & M. Shetty. Mastering Prompt Engineering: A Hands-On Guide to Crafting Effective Prompts. Apress, 2024.	
	Reference Books: 1. Russell, Stuart &Norvig, Peter. Artificial Intelligence: A Modern Approach. 4th Edition, Pearson, 2021. 2. Bommasani, R. et al. On the Opportunities and Risks of Foundation Models. Stanford, 2021. 3. Brown, T. et al. Language Models are Few-Shot Learners. NeurIPS, 2020. 4. OpenAI& Anthropic official documentation (Prompting Guides & API references). 5. Online Resource: Prompt Engineering Guide – https://www.promptingguide.ai	

SEMISTER II

Course Category	**Major**	
Course Code	**25MCA2F508**	
Course Name	**Programming in Python**	
Course Short Name	**PP**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Basic knowledge of any high level Language, Object Oriented Programing language

Course Objectives: To be familiar with basic and advanced concepts of Python.

1. Understand Python syntax, semantics, and basic programming concepts.
2. Develop efficient and readable Python code using functions, loops, and conditionals.
3. To Build basic programs using fundamental programming constructs
4. To Work with user input to create fun and interactive programs.
5. To be familiar with python modules and libraries, file system, database connectivity.
6. Foster analytical and critical thinking abilities.

Mapping of Programme Outcome: PO1	**Mapping of Programme Specific Outcome:** PSO2

Course Outcomes:

CO1: Understand the structure, syntax, and semantics of the Python language.

CO2: Understand conditional and control structures , operators and functions in python

CO3: Know in-depth about core libraries in python

CO4: Handle different files using python & operations on them.

CO5: Develop your own applications using the Python programming language using database connectivity.

Units	Contents	Total Lectures
I	**Introduction to Python:** Introduction, **python overview:** History, Features, Python installation, **getting started with python:** Program structure: Heading, declaration, comments, actions, statements. **Python tokens:** Identifier, reserved word, variables, Simple data types, **Operators:** Arithmetic, Boolean, expression, **statement;** Assignment statement, input/ output statement, control statement, branching statement, Looping statement	9
	Mapping of COs: CO1	

II	**Functions:** **Group data type:** List, tuples, dictionary, strings, operations on group data type. **Functions:** std or lib functions, user defines functions, program on both types of function, **core libraries in python:** numpy, pandas, metplot lib, nltk, sample Programs on it. Besic of data analytics: Importing andExporting data set, Data warning, dealing with missing values, categorical variables statistical summary, using groupby. **Mapping of COs: CO2**	9
III	**Classes and Objects:** **Overview of OOP's :** class definition, creating object, object as argument and return values, inheritance, polymorphism, overriding, encapsulation, abstraction, constructor, destruction and sample program on it. **Mapping of COs: CO3**	9
IV	**File and Exception:** Types of files, text file. **Operations of file:** open, write, append, update, and read, Read and write CSV and excel file, close. **File mode:** input mode, Append mode, output mode. File related methods sample program on it. **Exception:** Handling exception (try, catch, and throw). **Mapping of COs: CO4**	9
V	**Python and Database:** **Python and databases:** python MySQL, introduction to python MySQL, connect MySQL Database using python connector. **Python MySQL create database:** create table, insert into table, select query, use of where clause, order by clause, and update query, commit and rollback operation in python, drop table and sample program on it. **Mapping of COs : CO5**	9
	Text Books: 1. Introduction to computing and problem solving using python, E. Balagurusamy, 2nd Edition , McGraw Hill Education. 2. Python Programing, John. M. Zelle. PH. D., 3rd Edition, Franklin, Beedle & Associates 3. Python Book: Beginning python, Advance python and python exercises, Dave Kuhlman Version 2.0 (Often distributed as Open Source), self-published / Plateaus	
	Reference Books: 1. Python Programing, John. M. Zelle. PH. D., 3rd Edition, Franklin, Beedle & Associates 2. Python Book: Beginning python, Advance python and python exercises, Dave Kuhlman, 2.0 (Often distributed as Open Source), self-published / Plateaus	

Course Category	**Major**	
Course Code	**25MCA2F509**	
Course Name	**Artificial Intelligence & Machine Learning**	
Course Short Name	**AIML**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Basic knowledge about programming language like python.
2. Basic concept in mathematics like linear algebra, statistics & probability.
3. Understanding of data structure and algorithms.

Course Objectives:

1. To provide a foundational understanding of core AI and ML concepts.
2. To develop practical skills in implementing and evaluating ML models.
3. To foster an understanding of the data-driven problem-solving pipeline.
4. To cultivate critical thinking and ethical awareness in the application of AI.

Mapping of Programme Outcome: PO1, PO2	**Mapping of Programme Specific Outcome:** PSO3

Course Outcomes After completing this course, The students will be able to

CO1: Understand Foundational AI and ML Concepts.

CO2: Apply Data Handling and Preprocessing Techniques

CO3: Implement and Evaluate Supervised Learning Models

CO4: Utilize Unsupervised Learning for Data Analysis.

CO5: Basics of Neural Networks and Deep Learning.

Units	Contents	Total Lectures
I	**Overview of Artificial Intelligence:** Introduction, history and evolution, definition and applications of AI, types of AI. Knowledge: Introduction, Definition, type of knowledge. Knowledge organization, Manipulation & Acquisition. Knowledge representation Techniques: Propositional Logic, predicate logic, syntax and semantic, Interface rules, frame & production rule representation, procedural vs declarative representation.	9
	Mapping of COs: CO1	
II	**Expert system:** Introduction to expert system, characteristics, components. Expert system architecture. Rule base architecture, Expert system shell. Inconsistencies & uncertainties: truth maintenances system**,** default reasoning, model & temporal logic. Learning: Definition, type of learning, general learning model, classification of learning strategies.	9
	Mapping of COs: CO2	

III	**Machine Learning:** Introduction to ML**,** Types of ML**,** Machine Learning workflow**,** Basic steps of ML, Data pre-processing, Data collection and cleaning, handling missing values, data labelling, data transformation and normalization. Splitting data in to training, validation & testing sets. **Supervised Machine Learning algorithms:** Regression, simple linear regression, multiple linear regressions. Classification of supervised learning: k-Nearest neighbor‘s algo (KNN), Support Vector Machine (SVM), Decision tree, Random Forest.	9
	Mapping of COs: CO3	
IV	**Unsupervised ML:** Clustering, K-Means, mean shift algo, Association. Semi-supervised ML: AI Agent, types, PEAS, Rational agent, Uniformed search strategies, BFS, DFS, Informed search strategies, Heuristic search: Hill climbing, A* algo. **Reinforce ML:** Game theory, Operation Research, Information theory, multi-agent systems. Natural Language processing using NLTK, Tokenization, stemming, lemmatization, Model evaluation techniques: confusion matrix, precision, Recall, F1 score, ROS curve, AUC cross validation.	9
	Mapping of COs: CO4	
V	**Neural Network and Deep learning basics:** introduction to artificial neural network, perceptrons and multilayer perceptron modes, Deep learning basics, training, validation and estimation, basics of convolution neural Network (CNN) and recurrent neural network(RNN), applications.	9
	Mapping of COs : CO5	
	Text Books: 1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 4th Edition, Pearson, 2021. 2. Ethem Alpaydin, Introduction to Machine Learning, 4th Edition, MIT Press, 2020.	
	Reference Books: 1. Tom M. Mitchell, Machine Learning, McGraw-Hill, 2017. 2. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning, MIT Press, 2016. 3. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006. 4. Trevor Hastie, Robert Tibshirani, and Jerome Friedman, The Elements of Statistical Learning, Springer, 2017.	

Course Category	**Major**	
Course Code	**25MCA2F510**	
Course Name	**PHP and MySql Programming**	
Course Short Name	**PHP**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Basic programing concepts and foundation knowledge of web technology.

Course Objectives:

1. To learn basics of Server side scripting.
2. To develop dynamic web pages.
3. To learn and understand the PHP for dynamic web sites.
4. To learn and understand file handling in PHP.
5. To learn and understand working with database.

Mapping of Programme Outcome: PO1, PO2	**Mapping of Programme Specific Outcome:** PSO1, PSO2

Course Outcomes The students will be able to

CO1. To be able to understand PHP basics.
CO2. Knowledge and skill of server side scripting.
CO3. Comfortably use PHP MySql for developing advanced web sites
CO4. Use array, sessions and cookies for dynamic user interaction.
CO5. Knowledge of file handling using PHP.
CO6. Manage data by using PHP

Units	Contents	Total Lectures
I	**Introduction:** Features, PHP HTML embedding tags and syntax, simple script examples, Echo and Print, Comments, variables, operators, PHP data types. **PHP Stings**: Modify, concatenate, Slicing, Escape Characters. Casting, Math functions, Constants, PHP Date and Time functions. **Mapping of COs:CO1, CO2**	9
II	**Control Statement in PHP:** If..Else, If..Else..If, Switch Statements. PHP Looping Statements For, While, Do-While, Foreach. Break and continue statements. **PHP Functions:** Introduction to functions, declaring functions, function scope, passing arguments to function, **Mapping of COs: CO1, CO2**	9
III	**PHP Array:** Indexed Array, Associative Array, and Multidimensional Array. Create Array, update array, add items, remove items, sort arrays. **PHP Global Variables:** $GLOBALS, $_SERVER, $_REQUEST, $_POST, $_GET, $_FILES, $_ENV,$_COOKIE. Using include files and require statements, mail functions. PHP Form Handling. **Mapping of COs: CO4**	9
IV	**File handling in PHP:** Create, Open, Read, Write, PHP file Upload. **PHP Sessions, PHP Cookies:** create, modify, delete. Exception and Error handling. **Mapping of COs: CO4, CO5**	9

V	**Database operations**: Operations with PHP, connecting to Mysql with PHP, building and sending query, Insert data, update data, delete data, select data, display data using PHP Mysql functions mysqli_affected_rows(), mysqli_connect(), mysqli _close(), mysqli_query(), mysqli_select_db(), mysqli_num_rows() , mysqli_num_fields().	9
	Mapping of COs : CO5	
	Text Books: 1. Mastering PHP, WebTech Solutions Inc. Beginning PHP6, Apache, MySql Web Development, Wrox Publication	
	Reference Books: 1.Professional PHP5, Wrox Publication	

Course Category	**Major**	
Course Code	**25MCA2F511**	
Course Name	**Cloud Computing**	
Course Short Name	**CC**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

2. Basic knowledge of computer networks, operating systems, and web technologies

Course Objectives:

1. To introduce concept of cloud and its Historical development.
2. To familiarize students with virtualization. And its significance in cloud computing
3. To provide foundational knowledge of cloud computing architecture And models.
4. To provide practical experience in using popular cloud platforms Like AWS, Azure, and Google Cloud.
5. To understand security, privacy, and compliance issues in cloud Environments.

Mapping of Programme Outcome: PO1	**Mapping of Programme Specific Outcome:** PSO2

Course Outcomes

CO1: Fundamental Concepts of Cloud Computing.
CO2: Understand Virtualization and Cloud Architecture.
CO3: Analyze and Differentiate Cloud Service Models.
CO4: Apply Cloud Deployment and Orchestration Tools.
CO5: Identify and Address Cloud Security and Emerging Trends

Units	Contents	Total Lectures
I	**Introduction to Cloud Computing:** Introduction :The vision of cloud computing ,Defining a cloud, The cloud computing reference model, Characteristics and benefits , Historical developments: Distributed systems, Virtualization , Web 2.0, Service-oriented computing, Utility-oriented computing	9
	Mapping of COs: CO1	
II	**Virtualization:** Introduction, Characteristics of Virtualized environments. Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples: Xen: paravirtualization, VMware: full virtualization, Microsoft Hyper-V.	9
	Mapping of COs: CO2	
III	**Cloud Computing Architecture:** The cloud reference model, Architecture, Infrastructure-and hardware-as-a-service, Platform as a service, Software as a service. Types of clouds: Public clouds, Private clouds, Hybrid clouds, Community clouds, Economics of the cloud, Open challenges**.**	9
	Mapping of COs: CO3	

IV	**Cloud Platforms in Industry:** Amazon web services, Google App, Engine, Microsoft Azure Cloud Applications: Scientific applications, Business and consumer applications, Social networking, and Media applications. Advanced Topics in Cloud Computing: Energy efficiency in clouds, Market-based management of clouds, Federated clouds/Inter Cloud, Third-party cloud services	9
	Mapping of COs: CO4	
V	**Cloud Information Security Objectives, Cloud Computing Risk Issues:** Security, Confidentiality,Integrity, Availability. Cloud Security Services, Relevant Cloud Security Design Principles, Privacy and Compliance Risks, Threats to Infrastructure, Data, and Access control, Cloud Service Provider (CSP) Risks: Security Policy Implementation , Policy Types, CSIRT (Computer Security Incident Response Team), Identity.	9
	Mapping of COs : CO5	
	Text Books: **3.** Raj Kumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing: Foundations and Applications Programming, Morgan Kaufmann, 2013. 4. Ronald L. Krutz, Russell Dean Vines ,Cloud Security A Comprehensive Guide to Secure Cloud Computing, Wiley Publishing, Inc. 2010	
	Reference Books: 1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, McGraw-Hill. 2. Raj Kumar Buyya, James Broberg, Andrzej Goscinski. Cloud Computing Principles and Paradigms, Published by John Wiley & Sons, Inc., 3. Hoboken, New Jersey Thomas Erl, Ricardo Puttini, Zaigham Mahmood, Cloud Computing: Concepts, Technology & Architecture, Prentice Hall.	

Course Category	**Major**	
Course Code	**25MCA2F512**	
Course Name	**Cyber Security**	
Course Short Name	**EL II**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Basics software security concepts.
2. Basic knowledge of Networking Protocols and analytical skill.

Course Objectives:

1. To gain knowledge of OSI Architecture and Encryption techniques.
2. To understand Security threats, IP Security architecture and threats.
3. To get an overview of the Web Application Vulnerabilities and different types of attacks.
4. To achieve awareness about the Machine Learning for Cyber Security.
5. To know about Machine learning and AI for Cyber Security.
6. To gain knowledge about applying ML and AI in Cyber security.

Mapping of Programmer Outcome: PO1, PO2, PO5	**Mapping of Programme Specific Outcome:** PSO2, PSO3

Course Outcomes: After completing this course, The students will be able to

CO1. Understand architecture, Mechanism and different encryption algorithms.
CO2. Understand various threats in cyber security.
CO3. Understand the details of Web Application Vulnerabilities and Wireless security in IOT.
CO4. Understand the Machine learning and types of ML.
CO5. Understand Machine learning and AI for Cyber Security.
CO6. Understand the applying ML and AI in Cyber security and Cyber Crime.

Units	Contents	Total Lectures
I	**Introduction Computer and cyber Security:** Computer Security, Cyber Security, OSI Security Architecture, Security Services, Security attacks, Security Mechanism, **Cryptography and Encryption:** Encryption Techniques, Public Key Cryptography, Caesar Cipher, Mono-alphabetic Cipher, Play fair Cipher, Poly-alphabetic Ciphers, Vernam Cipher and One-time Pad.	9
	Mapping of COs:CO1	
II	**Introduction to security threats**: Virus, Worms, Trojan Horse, E-mail Spoofing, E-mail Virus, Malicious Software, Digital Signature, Digital Signature standard, Web Security, Secure Socket layer and Transport layer security, IP Security, IP Security architecture.	9
	Mapping of COs: CO2	

III	**Web Application Vulnerabilities:** Web Application Vulnerabilities, Types of web Application Vulnerabilities, SQL Injection, Types of SQL Injection, SQL Injection Techniques, Denial of Service Attacks, types of DOS. **Wireless Security in the Internet of Things (IoT):** IoT Devices and Connectivity, Security Challenges in IoT, Securing Wireless Communication in IoT	9
	Mapping of COs: CO2, CO3	
IV	**Machine Learning for Cyber Security**: Introduction of machine learning, Delving into machine learning in the cyber security world, Different types of machine learning systems, Different data preparation techniques, Machine learning architecture, statistical models and machine learning models, Model tuning to ensure model performance and accuracy, Machine learning tools.	9
	Mapping of COs: CO4, CO6	
V	**Introduction to AI for Cyber security:** Applying AI in cyber security, The evolution from expert systems to data mining and AI, The different forms of automated learning , The characteristics of algorithm training and optimization ,Introducing AI in the context of cyber security. **Cyber Crime:** Unauthorized Access and Hacking , Data Theft and Unauthorized Copying , Identity Theft and Impersonation, Cyber Stalking and Harassment	9
	Mapping of Cos: CO5,CO6	
	Text Books: 1. Cryptography and Networking Security Principles & Practice(fourth edition) Willam Stallings 2. Fundamentals of Cyber Security Principles, Theory and Practices, Mayank Bhushan, Rajkumar Singh Rathore, Aatif Jamshed	
	Reference Books: 1. The fundamentals of New Security –John F. Chavwan, Artch.House 2. EcCouncil,"EthicalHackingandCountermeasures:AttackPhases",Delmar Cengage Learning, 2009. 3. Naina Godbole, Sunil Belapure,"Cyber Security-Understanding Cybercrime,	

Course Category	**Major**	
Course Code	**25MCA2F512**	
Course Name	**SPORTS DATA MODELING AND ANALYTICS**	
Course Short Name	**EL II**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Strong foundation in statistics, probability and proficiency in programing languages like python od R.

Course Objectives:

1. To understand the fundamentals and importance of data analytics in sports.
2. To apply data modeling techniques to real-world sports scenarios.
3. To evaluate team performance, player statistics, and strategy using data-driven insights.
4. To gain hands-on experience with tools and technologies used in sports analytics.

Mapping of Programme Outcome:	**Mapping of Programme Specific Outcome:**

Course Outcomes: After completing this course, the students will be able to:

CO1. Define sports data types and their significance.

CO2. Clean and preprocess raw sports datasets.

CO3. Build predictive models using ML for sports outcomes.

CO4. Analyze player/team performance using tracking data.

CO5. Integrate analytics into fantasy sports and injury risk modeling.

Units	Contents	Total Lectures
I	**Introduction to Sports Analytics:** Overview of sports analytics: history, scope, and importance in modern sports. Types of sports data: performance data, biomechanical data, physiological data, tactical data. Data collection tools and methods: sensors, wearable devices, video tracking, GPS systems. Data formats, storage, and retrieval systems (SQL & NoSQL databases). Ethical issues in sports data analytics (data privacy, athlete consent).	9
	Mapping of COs: CO1	
II	**Data Preprocessing and Statistical Analysis:** Data cleaning: handling missing values, noise removal, Normalization. Descriptive statistics in sports: measures of central tendency and variability. Inferential statistics: hypothesis testing, correlation, regression. Time-series data in sports: trends, seasonality, and forecasting. Case studies: performance trends in are different sports and games.	9
	Mapping of COs: CO2	

III	**Sports Predictive Modeling:** Introduction to machine learning in sports. Model evaluation: accuracy, precision, recall, F1-score, ROC curves. Applications: injury prediction, player performance forecasting, match outcome prediction.	9
	Mapping of COs: CO3	
IV	**Data Visualization and Interpretation:** Principles of effective sports data visualization. Tools: Matplotlib, Seaborn, Plotly, Tableau, Power BI. Creating dashboards for coaches and analysts. Real-time visualization for live matches.	9
	Mapping of COs: CO4	
V	**Applications and Future Trends in Sports Analytics:** Team selection and talent identification using data analytics. Tactical analysis and strategy formulation. Integration of AI, IoT, and big data in sports. Future challenges and opportunities in sports data analytics. Case studies on Sports Technologies.	9
	Mapping of COs : CO5	
	Text Books: 1. Henry E. Garrett (2000), Statistics in Psychology and Education, Surjeet Publications. 2. Michael Lewis (2003) - Moneyball: The Art of Winning an Unfair Game, W. W. Norton & Company. 3. Benjamin C. Alamar (2013) - Sports Analytics: A Guide for Coaches, Managers, and Other Decision Makers, Columbia University Press.	
	Reference Books: 1. Guido B. Giunti (2023) - Data Science for Sports Performance Analytics, Springer. 2. Leonard C. MacLean & William T. Ziemba (2018) - The Data Analytics of Sports: A Practical Guide to Sports Data Analysis, World Scientific. 3. Rod Cross (2021) - Applied Sports Analytics, Routledge. 4. Wes McKinney (2022) - Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython (3rd Edition), O'Reilly Media. 5. SportRadar, Opta, and StatsBomb APIs and Documentation - Available online and updated regularly.	

Course Category	**Major**	
Course Code	**25MCA2F512**	
Course Name	**Natural Language Processing**	
Course Short Name	**EL II**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Foundation of knowledge in python programing, mathematics, probability, statistics, and basic machine learning concepts.

Course Objectives:

1. Grasp Foundational NLP Concepts and Techniques.
2. Apply Linguistic Models and Feature Engineering.
3. Implement and Evaluate Machine Learning for Text Classification.
4. Understand and Implement Deep Learning Architectures for NLP.
5. Build Real-World NLP Applications.

Mapping of Programme Outcome: PO1, PO2	**Mapping of Programme Specific Outcome:** PSO5, PSO7

Course Outcomes: After completing this course,the students will be able to:

CO1: Fundamental NLP Concepts and Text Processing.
CO2: Apply Linguistic Principles to Text Analysis.
CO3: Implement Machine Learning Models for NLP.
CO4: Understand Advanced Sequence Models and Architectures.
CO5: Explore and Apply NLP in Real-World Scenarios.

Units	Contents	Total Lectures
I	**Introduction to NLP** Overview of Natural Language Processing, history and applications, components of NLP, challenges in natural language understanding, and basic text processing tasks such as tokenization, stemming, and Lemmatization.	9
	Mapping of COs: CO1	
II	**Text Processing & Linguistic Concepts** Morphology, syntax, and semantics, n-grams and language models, stop word removal, part-of-speech Tagging, named entity recognition, and parsing techniques.	9
	Mapping of COs: CO2	
III	**Statistical & Machine Learning Approaches** Bag-of-words and TF-IDF representation, word embeddings such as Word2Vec and GloVe, text classification using naive bayes, decision trees, and support vector machines, along with evaluation metrics for NLP tasks	9
	Mapping of COs: CO3	

IV	**Sequence Models for NLP** Introduction to recurrent neural networks, long short-term memory (LSTM) networks, gated recurrent units (GRU), sequence-to-sequence models, attention mechanism, and transformer architecture basics. **Mapping of COs: CO4**	9
V	**Applications of NLP** Machine translation, sentiment analysis, text summarization, question answering systems, chatbots, and current trends in NLP research including large language models. **Mapping of COs : CO5**	9
	Text Books: 2. 1. Daniel Jurafsky and James H. Martin, Speech and Language Processing, 3rd Edition (Draft), Prentice Hall, 2023. 3. Steven Bird, Ewan Klein, and Edward Loper, Natural Language Processing with Python, O'Reilly Media, 2009.	
	Reference Books: 1. "Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze, Introduction to Information Retrieval, Cambridge University Press, 2008. 2. Jacob Eisenstein, Natural Language Processing, MIT Press, 2019. 3. Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, and Harshit Surana, Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems, O'Reilly Media, 2020. 4. James Pustejovsky and Amber Stubbs, Natural Language Annotation for Machine Learning, O'Reilly Media, 2012.	

Course Category	**Major**	
Course Code	**25MCA2F513**	
Course Name	**LAB 3 : Based on Python & AIML**	
Course Short Name	**LAB 3**	
Total Lectures	**60**	
Total Credits	**2**	
Marks	**External: 25**	**Internal: 25**
Note: Practical List will be freshly prepared by the course teacher in every session. So the list is not mentioned.		

Course Category	**Major**	
Course Code	**25MCA2F514**	
Course Name	**LAB 4 : Based on PHP & ELE II**	
Course Short Name	**LAB 4**	
Total Lectures	**60**	
Total Credits	**2**	
Marks	**External: 25**	**Internal: 25**
Note: Practical List will be freshly prepared by the course teacher in every session. So the list is not mentioned.		

Course Category	**Major**	
Course Code	**25MCA2F515**	
Course Name	**Mini Project -2**	
Course Short Name	**PRJ2**	
Total Lectures	**60**	
Total Credits	**2**	
Marks	**External: 25**	**Internal: 25**

Prerequisites

1. Preliminary knowledge of software development process.
2. Knowledge about technology and application domain in which project will be developed.
3. Good knowledge of subject domain and Software Engineering.

Course Objectives

1. Enable students to identify real-life problems or research-based issues in the domain of computer applications and translate them into well-defined project objectives.
2. Develop students' ability to apply theoretical and technical knowledge gained during the MCA programme to design, develop, and deploy a software-based solution.
3. Foster skills in project management, teamwork, requirement analysis, software engineering, and development methodologies.
4. Encourage documentation and communication skills through structured reports, presentations, and user manuals.
5. Prepare students for professional roles by simulating a real-world software development environment
6. involving problem-solving, innovation, and ethical practices.

Mapping of Programme Outcomes:	**Mapping of Programme Specific Outcomes:**
PO1, PO2	PSO4, PSO5

Course Outcomes

CO1: Identify and define real-world problems or research areas relevant to computer applications, and propose suitable solutions using appropriate software engineering principles.

CO2: Apply theoretical knowledge and technical skills gained in the coursework to design, develop, and implement a software-based solution or prototype.

CO3: Demonstrate effective use of programming tools, platforms, databases, and other technologies required for development.

CO4: Practice collaborative teamwork, project planning, and time management through systematic execution of project phases.

CO5: Develop professional documentation, including Software Requirements Specifications (SRS), system design, and user manuals, adhering to industry standards.

CO6: Communicate technical information clearly and effectively through oral presentations and demonstrations of the project.

Rules for Project Work:

A student will be examined in the course —Project Work‖ as given below:

1. Project work may be done individually or in groups. However if project is done in groups, each student must be given are possibility for a distinct task and care should be taken to see the progress of individual.
2. Students should take guidance from a guide and prepare Project Report on —Project Work‖ in 2 copies to be submitted to the Head of the Department. A soft copy of project report along with source-code and data should also be submitted.
3. The Project Synopsis should contain an Introduction to Project, which should clearly explain the project scope in detail. Also, Data Dictionary, DFDs, ERDs, Navigation Diagrams, File designs, experimental setup and methodology.
4. The project report will be duly accessed by the guide of the project and marks will be communicated by the Head of the Department to the Examination Department.
5. The project report should be prepared in format prescribed by the College, which also specifies the contents and methods of presentation.

Note: Synopsis should be hand written

General Instruction Regarding Preparation of Project Report:

TYPING:

(a) The typing shall be standard 12 pts in double spacing using only
(b) Margins must be Left 1.5 inches Right 1 inches Top 1 inches Bottom 1 inches
(c) Paper: A4 size Paper

COPIES:

Two hard-bind copies (As per format displayed here with) One original and one clean Xerox Copy.

FORMAT FOR TITLE PAGE AND FOR COVERPAGE: PROJECT REPORT ON
NAME OF THE PROJECT BY
NAME OF STUDENT

GUIDED BY
NAME OF THE GUIDE

P.G. Department of Computer Science & Technology, Degree College of Physical Education,
Shree H.V. P. Mandal, Amravati.

ACADEMIC SESSION

Course Category	**Skill Enhancement Course (SEC) - II**	
Course Code	**25SEC II**	
Course Name	**Innovation and Entrepreneurship Development**	
Course Short Name	**IED**	
Total Lectures	**15**	
Total Credits	**1**	
Marks	**External: Nil**	**Internal: 50**

Prerequisites:

1. Basic understanding of business environment and economics.
2. Familiarity with ICT tools, internet usage, and digital platforms.
3. Ability to observe societal and market problems and think creatively.
4. Interest in innovation, startups, and self-employment.

Course Objectives:

1. Understand the fundamentals of innovation and entrepreneurship and their role in economic and social development.
2. Develop entrepreneurial thinking and creativity for identifying and evaluating business opportunities.
3. Acquire practical skills in business planning, strategy formulation, and risk management.
4. Understand financial, legal, ethical, and regulatory aspects of starting and scaling a business.
5. Apply emerging digital technologies to develop innovative and sustainable entrepreneurial solutions.

Mapping of Programme Outcomes: PO4	**Mapping of Programme Specific Outcomes:** PSO5

Course Outcomes: After completing this course, the students will be able to:

CO1: Explain the concepts, processes, and types of innovation and entrepreneurship

Course Category	**Major**	
Course Code	**25SEC II**	
Course Name	**Devops and CI-CD Automation**	
Course Short Name	**DOP**	
Total Lectures	**15**	
Total Credits	**1**	
Marks	**External: Nil**	**Internal: 50**

Prerequisites:

1. Foundational knowledge like SDLC process manement, IP addresses, version control, cloud platforms, python scripting etc.

Course Objectives:

1. Understanding of the DevOps philosophy, culture, and the shift from traditional to agile methodologies.
2. Explain the mechanics of CI/CD pipelines to ensure rapid and reliable software delivery.
3. Equip students with technical proficiency in Version Control Systems (Git) and automated build processes.

Mapping of Programme Outcome: PO1, PO2	**Mapping of Programme Specific Outcome:** PSO4, PSO7

Course Outcomes: After completing this course,the students will be able to:

CO1: principles of DevOps and the cultural shift required to bridge the gap between development and operations.

CO2: Implement version control workflows and automated continuous integration processes for collaborative software development.

CO3: Deploy scalable applications using containerization tools and manage them through orchestration platforms like Kubernetes.

Units	Contents	Total Lectures
I	**Introduction to DevOps** DevOps concepts, principles, and culture. It covers the evolution from traditional software development models to DevOps, key challenges in software delivery. and the importance of collaboration between development and operations teams	3
	Mapping of COs: CO1	

II	**Version Control and Continuous Integration** Source code management and continuous integration. Repository management, branching strategies, and collaboration workflows. Continuous integration concepts, build automation, and testing using CI tools are introduced	3
	Mapping of COs: CO1	
III	**Continuous Delivery and Deployment** Continuous delivery and deployment pipelines. It includes build, test, and release automation, configuration management basics, and deployment strategies. Concepts of infrastructure as code and automated release pipelines	3
	Mapping of COs: CO2	
IV	**Containerization and Orchestration** Containerization using Docker and container orchestration concepts. Container images, registries, and basics of orchestration using Kubernetes, including pods, services, and deployments.	3
	Mapping of COs: CO3	
V	**Monitoring, Security, and DevOps in Practice** Monitoring and logging practices in DevOps environments: performance monitoring, alerting, DevSecOps concepts, and security integration in pipelines. Real-world DevOps workflows, cloud platforms overview.	3
	Mapping of COs : CO3	
	Text Books: 1. The DevOps Handbook by Gene Kim, Jez Humble, Patrick Debois, and John Willis 2. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation by Jez Humble and David Farley	
	Reference Books: 1. The DevOps Handbook by Gene Kim, Jez Humble, Patrick Debois, and John Willis 2. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation by Jez Humble and David Farley	

SEMESTER III

Course Category	**Major**	
Course Code	**25MCA3S600**	
Course Name	**Mobile Application Development**	
Course Short Name	**MAD**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. An ability to apply knowledge of SDK, Activity and Intents, Services, Location based.
2. An ability to design mobile application with functionality.

Course Objectives:

Mapping of Programme Outcome: PO1, PO2	**Mapping of Programme Specific Outcome:** PSO2

Course Outcomes:

CO 1. To learn the characteristics of mobile applications.
CO 2. To understand the intricacies of UI required by mobile applications.
CO 3. To study about the design aspects of mobile application.
CO 4. To learn Mobile application development and working of mobile applications.

Units	Contents	Total Lectures
I	**Introduction**: Mobile Application, Mobile Application development, Types of Mobile Application: Native, Hybrid and Web application, Mobile Applications – Characteristics and Benefits, Tools for Mobile apps development, Flutter Tools.	7
	Mapping of COs: CO1	
II	**Application development with Android:** Introduction, Versions, Features, Architecture, Difference of android with other mobile application development platform. **Android Required Tools introduction**: Android Studio, Android SDK, Android SDK manager, Android Development tools (ADT), Android virtual device (AVD), Android NDK.	9
	Mapping of COs: CO2	

III	**Android Studio Project Structure**: Introduction, User Interface, Tools Window, Version Control Basics, Gradle Build System, Creating First Android Application, Introduction Kotlin on Android. **Activities and Intent**: Introduction, Life cycle of Activity, Applying style and themes to an activity, displaying a Dialog window, linking activities using intent, Passing data using an intent object, Displaying Notification. **Mapping of COs: CO2, CO3**	10
IV	**User Interface**: Components of a Screen: Linear Layout, Relative Layout, Table Layout, Screen orientation, Detecting and controlling the orientation of Activity, Listening for UI notification. **User interface with Views**: Text View, Button, Image Button, Edit Text, Checkbox, List View, Spinner view, Date and Time Picker view, Image view, Menus with types. **Mapping of COs: CO2, CO3**	10
V	**Data Persistence**: Persisting data to files, saving internal and external storage, Creating and using Database, Content provider. Introduction about Sqlite database. **Messaging:** sending and receiving SMS messages, sending E-mail, **Location based services:** Displaying the map, displaying the zoom control. **Mapping of COs : CO4**	9
	Text Books: • Wei-Meng Lee," Beginning Android 4 Application development", Wrox publication. • Reto Meier "Professional Android 4 Application Development", Wrox Publication	
	Reference Books: • Mastering Android WebTech Solution Inc. Khanna Book Publication. • https://developer.android.com/guide/ • https://docs.flutter.dev/install	

Course Category	**Major**	
Course Code	**25MCA3S601**	
Course Name	**Internet OF Things**	
Course Short Name	**IOT**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Basic knowledge about computers system, it's components, and microprocessor & microcontroller architecture.
2. Knowledge of programming using at least one language preferably C or python.

Course Objectives:

1. To make students aware students about "Internet of Things"
2. To study different sensors and Actuators used in IoT
3. To study protocols and gateways used to establish IoT
4. To study wireless technology and mobile network.
5. To be familiar with Security threats, Access control, Security model.
6. To establish IOT system.

Mapping of Programme Outcome: PO1, PO2	**Mapping of Programme Specific Outcome:** PSO3, PSO7

Course Outcomes: After completing this course, the students will be able to:

CO1 . Demonstrate functioning of hardware devices and sensors used for IoT.

CO2. Understand constraints and opportunities of wireless and mobile networks for IoT.

CO3. Analyze the societal impact of IoT security events.

CO4. Develop critical thinking skills in IoT.

CO5. Analyze, design and develop IoT solutions and map it towards business model .

CO6. Evaluate ethical and potential security issues related to the IoT.

CO7. Develop IoT solutions using development platforms like Arduino, Raspberry-Pi.

Units	Contents	Total Lectures
I	**Introduction:** What is IoT, History of IoT, About IoT, Overview, Definitions, Applications. IOT Frameworks: Definitions, Components of IOT, IoT Network Architecture & Design a basic building block, Physical Design: IOT protocol, Logical Design, functional Blocks, Communication Model, IoT Frameworks.	9
	Mapping of COs: 1, 2, 5	
II	**Fundamentals of IoT mechanism & key technologies:** Identification of IoT Objects and Services, Structural aspects of IoT, Environment Characteristics, Traffic Characteristics, Scalability, Interoperability, Security and Privacy, Open Architecture, Key IoT Technologies, Device Intelligence, Communication Capabilities, Mobility Support, Device Power, Sensor Technology, RFID Technology, Satellite Technology.	9
	Mapping of COs: 2, 3, 4	
III	**Signal Conditioning Units:** Sensors: Definition, features, Resolutions, Types: Temperature Sensor, Pressurcvbne Sensor, Motion Control Sensor, Soil Moisture Sensor, Ultrasonic Range Sensor, Gateway (Raspberry PI, Arduino, Its Difference), Actuators: Different types of Actuators. **Evolving IoT standard :** Overview &Approaches, MQTT Protocol, Representational State Transfer (REST), ETSI M2M, IP in Smart Objects (IPSO).	9
	Mapping of COs: 1,4,5	
IV	**Wireless Technologies for IOT : Wireless sensor net**work: History and contents, the connecting nodes, WSN and IoT, **WPAN Technologies for IoT/M2M**: Zigbee/IEEE 802.15.4, Radio Frequency for Consumer Electronics (RF4CE), Bluetooth and it's Low-Energy Profile, Comparison of WPAN Technology. **Cellular and Mobile Network Technologies for IoT/M2M:** Overview and Motivations, Universal Mobile Telecommunications System, LTE	9
	Mapping of COs: 3,6	
V	**IOT Privacy, Security & Governance :** Vulnerabilities of IoT, Security requirements, Threat analysis, Use cases and misuse cases, IoT security tomography and layered attacker model, Identity establishment, Access control, Message integrity, Non-repudiation and availability, Security model for IoT.	9
	Mapping of COs: 3, 6, 7	

	Text Book : **1. Daniel Minoli,** "Building the internet of things with IPV6 and MIPV6: The Evolving World of M2M communications", Willy Publications 2.**Raj Kamal**, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)	
	Reference Book : 1. "Internet of Things : A Hands on Approach", by Harshadeep Bahga and Vijay Madishetti (Universities Press) 2. "The Internet of Things: Enabling Technologies, Platform and Use Cases", By Pethuru Raj and andAnupama C. Raman (CRC Press)	

Course Category	**Major**	
Course Code	**25MCA3S602**	
Course Name	**Digital marketing**	
Course Short Name	**DM**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

4. Fundamental knowledge of digital media.

Course Objectives:

1. To learn the fundamental concepts of Digital Marketing.
2. To learn the Social Media Marketing.
3. To learn Email marketing, Mobile marketing and content marketing.
4. To expose students to Search Engine Optimization, Search Engine Marketing.
5. To study Goals & objectives of Web Analytics and google analytics.

Mapping of Programme Outcome:	**Mapping of Programme Specific Outcome:**
PO1, PO2, PO3, PO4	PSO1, PSO2, PSO5, PSO8

Course Outcomes: After completing this course, The students will be able to:

CO1. Understand the Basic concepts of Digital Marketing and required skill.
CO2. Understand the concept of Social Media Marketing its types and purpose.
CO3. Understand Email marketing, Mobile marketing and content marketing.
CO4. Understand the concept of Search Engine Optimization Technique as well as Search Engine Marketing.
CO5. Understand the Goals & objectives of Web Analytics and google analytics.

Units	**Contents**	**Total Lectures**
I	**Introduction & origin of Digital Marketing**: Traditional v/s Digital Marketing. Digital Marketing Strategy, The P-O-E-M Framework, Segmenting & Customizing Messages, The Digital landscape, Digital Advertising Market in India. Skills required in Digital Marketing. Digital Marketing Plan, Paid marketing and organic marketing.	9
	Mapping of COs: CO1	

II	**Social Media Marketing**: Meaning, Purpose, types of social media websites, Social Media Engagement, Target audience, Facebook Marketing, Facebook Marketing Tools. LinkedIn Marketing, Importance of LinkedIn Marketing. Twitter Marketing: Framing content strategy, Twitter Advertising Campaigns, YouTube Marketing, YouTube Analytics.	9
	Mapping of COs: CO2	
III	**Email Marketing**: Types of Emails, Mailing List, Email Marketing tools, Email Deliverability & Email Marketing automation Mobile Marketing: Introduction, Mobile Usage, Mobile Advertising, Mobile Marketing Types, Marketing Strategy, Content creation tools and apps, Challenges of Content Marketing.	9
	Mapping of COs: CO3	
IV	**Search Engine Optimization**: Meaning, Common SEO techniques, Understanding Search Engines, basics of Keyword search. Search Engine Marketing: Introduction to SEM, Introduction to Ad Words - Google Ad Words. Buying Models: Cost per Click (CPC), Cost per Milli (CPM), Cost per Lead (CPL), Cost per Acquisition (CPA).	9
	Mapping of COs: CO4	
V	**Web Analytics**: Purpose, History, Goals & objectives, Web Analytic tools & Methods. **Google Analytics**: Basics of Google Analytics, Installing Google Analytics in website, Parameters of Google Analytics, Reporting and Analysis	9
	Mapping of COs CO5	
	Text Books: 1. "E-Commerce Strategy, Technologies and Applications", Whitley, David, Tata McGrawHill, 2017 2. Digital Marketing, Seema Gupta, McGraw Hill Education, 2nd Edition	
	Reference Books: 1. E-Commerce by S. Pankaj, A.P.H. Publication, NewDelhi 2. Fundamentals of Digital Marketing, Punit Singh Bhatia, Pearson, 2nd Edition 3. "Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation", Damian Ryan, Calvin Jone. Kogan Page, 4th Edition	

Course Category	**Major**	
Course Code	**25MCA3S603**	
Course Name	**Research Methodology**	
Course Short Name	**RM**	
Total Lectures	**30**	
Total Credits	**2**	
Marks	**External: Nil**	**Internal: 50**

Prerequisites:

1. Basic Knowledge about research.

Course Objectives:

1. To develop scientific and analytical thinking among postgraduate students
2. To understand the concept of Research Problem, Objectives, and Literature Review
3. To provide a comprehensive understanding of research processes and designs
4. To equip students with data collection, analysis, and interpretation skills
5. To inculcate ethical values and academic integrity in research

Mapping of Programme Outcome: PO4, PO5	**Mapping of Programme Specific Outcome:** PSO5

Course Outcomes: After completing this course, The students will be able to:

CO1: Explain concepts, types, and processes of scientific research

CO2: Identify research problems and conduct systematic literature reviews

CO3: Design appropriate research methodology and sampling techniques

CO4: Analyze research data using basic statistical tools and software

CO5: Prepare ethical research proposals, reports, and scientific papers

Units	Contents	Total Lectures
I	**Foundations of Research:** Concept, Nature, and Scope of Research, Scientific Method and Research Process, Types of Research: Basic, Applied, and Action Research, Quantitative, Qualitative, and Mixed Methods, Interdisciplinary and Multidisciplinary Research (NEP Perspective),Role of Research in Sustainable Development and Innovation	6
	Mapping of COs: CO1	

II	**Research Problem, Objectives, and Literature Review:-** Identification and Formulation of Research Problem, Research Questions and Objectives, Review of Literature: Sources, Techniques, and Tools, Research Gap Identification, Hypothesis: Meaning, Types, and Testing (Conceptual)	6
	Mapping of COs: CO2	
III	**Research Design and Sampling:** Meaning and Importance of Research Design, Types of Research Design: Exploratory, Descriptive, Experimental, Variables and Measurement Scales, Sampling Design: Concept and Methods, Probability and Non-Probability Sampling, Determination of Sample Size.	6
	Mapping of COs: CO3	
IV	**Data Collection and Data Analysis :-**Types and Sources of Data: Primary and Secondary, Methods of Data Collection: Observation, Interview, Questionnaire, Research Tools: Validity and Reliability, Data Processing: Editing, Coding, Classification, Tabulation, Basics of Statistical Analysis: Descriptive Statistics, Introduction to Inferential Statistics (t-test, Chi-square, ANOVA), Introduction to Statistical Software (SPSS / R / Excel)	6
	Mapping of COs: CO4	
V	Research Ethics, IPR, and Scientific Communication : Research Ethics and Academic Integrity (UGC Guidelines) .Plagiarism: Types, Detection, and Prevention, Intellectual Property Rights (IPR): Patents, Copyrights, Research Proposal Writing ,Thesis, Dissertation, and Research Report Writing. Research Paper Writing and Referencing Styles (APA / MLA).	6
	Mapping of COs CO5	
	Text Books: 1. Kothari, C.R. – *Research Methodology: Methods and Techniques.*	
	Reference Books: **1.** Creswell, J.W. – *Research Design* 2. Dawson, C. – *Practical Research Methods* 3. UGC – *Academic Integrity and Plagiarism Regulations.*	

Course Category	**Major**	
Course Code	**25MCA3S604**	
Course Name	**Deep Learning**	
Course Short Name	**EL III**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Foundational understanding of mathematics.
2. Programming skill in python.
3. Basic understanding of machine learning concept.

Course Objectives:

1. Introduce the mathematical and biological foundations of artificial neural networks.
2. Provide a deep dive into the mechanics of backpropagation and the optimization of multi-layer networks.
3. Explore specialized architectures for spatial data (CNNs) and sequential data (RNNs/LSTMs).
4. Develop practical skills in using deep learning frameworks (e.g., PyTorch or TensorFlow) to solve real-world engineering problems.

Mapping of Programme Outcomes: PO1, PO2	**Mapping of Programme Specific Outcomes:** PSO3, PSO7

Course Outcomes: After completing this course, The students will be able to:

CO 1. Analyze the mathematical components of a neuron, including activation functions and gradient descent optimization, to build basic perceptron models.

CO 2. Implement and Fine-tune multi-layer deep neural networks while mitigating issues like vanishing gradients and overfitting using regularization.

CO 3. Develop sequence-based models using RNNs, LSTMs, and GRUs to process time-series, speech, and natural language data.

CO 4. Synthesize advanced architectures, including Autoencoders, GANs, and Transformers, to address complex generative and ethical AI challenges.

Units	Contents	Total Lectures

I	**Foundations of Deep Learning** Basics of deep learning, its evolution, and key applications. Fundamental concepts of artificial neurons, perceptron model, activation functions, loss functions, and gradient-based optimization are covered along with essential mathematical background.	9
	Mapping of COs: CO1	
II	**Deep Neural Networks** Multi-layer neural networks and their training using forward and backpropagation. Issues such as overfitting, vanishing gradients, and optimization challenges are discussed along with regularization techniques and model evaluation methods. Basic implementation using deep learning frameworks is included.	9
	Mapping of COs: CO2	
III	**Convolutional Neural Networks (9 Hours)** Convolutional neural networks for image data, including convolution, pooling, and CNN architectures. Popular models and transfer learning concepts are introduced with applications in image classification and visual recognition.	9
	Mapping of COs: CO3	
IV	**Recurrent Neural Networks and Sequence Models (9 Hours)** Recurrent neural networks for sequential data. LSTM and GRU architectures are discussed to handle long-term dependencies, along with applications in natural language processing, speech processing, and time-series analysis.	9
	Mapping of COs: CO4	
V	**Advanced Deep Learning Models and Applications (9 Hours)** Advanced models such as autoencoders, GANs, and transformers. Emerging trends, real-world applications, ethical considerations, and an overview of deployment challenges are also discussed.	9
	Mapping of COs CO5	

Text Books:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville
2. Neural Networks and Deep Learning by Michael Nielsen

Reference Books:

1. Deep Learning with Python by François Chollet

Course Category	**Major**	
Course Code	**25MCA3S604**	
Course Name	**Microsoft Azure**	
Course Short Name	**EL III**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Basic Knowledge about Cloud computing.

Course Objectives:

1. Explain core cloud computing concepts, including cloud models and the shared responsibility model.
2. Describe the core architectural components of Azure (regions, availability zones, resource groups).
3. Identify and utilize fundamental Azure services for compute, networking, storage, and databases.
4. Implement security, identity, and governance features in an Azure environment.
5. Understand cost management and service level agreements (SLAs) in Azure.

Mapping of Programme Outcome: PO1, PO2	**Mapping of Programme Specific Outcome:** PSO1, PSO2, PSO7

Course Outcomes: After completing this course, The students will be able to:
CO1: Explain core cloud computing concepts and service categories (SaaS, PaaS, IaaS).
CO2: Describe Azure architectural components and management tools like the Azure Portal and Resource Manager.
CO3: Provision and manage core Azure services including Web Apps, Virtual Machines, and Storage.
CO4: Configure Virtual Networks and manage relational/NoSQL databases in Azure.
CO5: Apply identity management through Azure Active Directory and utilize governance tools.

Units	Contents	Total Lectures
I	**Introduction to Cloud Computing and Azure:** Overview of cloud computing; Public, Private, and Hybrid clouds; SaaS, PaaS, and IaaS offerings; Overview of Azure regions and datacenters	9
	Mapping of COs: CO1	
II	**Azure Management and Architecture:** The Azure Portal, Dashboard, and Hub; Azure Resource Manager (ARM) vs. Classic deployment; Resource Groups, Tags, and Role-Based Access Control (RBAC)	9
	Mapping of COs: CO2	
III	**Azure Compute and App Services:** Azure App Service and Web Apps; App Service Plans; Deployment, Monitoring, and Scaling Web Apps; Azure Virtual Machines: creation, configuration, and disks.	9
	Mapping of COs: CO3	
IV	**Azure Networking and Storage:** Virtual Networks (VNet) and Subnets; Site-to-site and Point-to-site connectivity; Azure Storage: Blobs, Files, Tables, and Queues; Storage security and Redundancy.	9
	Mapping of COs: CO4	
V	**Databases, Identity, and Governance:** Azure SQL Database vs. SQL Server on VMs; NoSQL options: DocumentDB and Table Storage; Azure Active Directory: Users, Groups, and MFA; Management tools: PowerShell, Azure CLI, and SDKs.	9
	Mapping of COs CO5	
	Text Books: 1. Collier, M., & Shahan, R. (2016). *Microsoft Azure Essentials: Fundamentals of Azure* (2nd ed.). Microsoft Press.	
	Reference Books: 1. Microsoft Azure Documentation and Quickstart Templates. 2. Azure Billing and RateCard API Documentation.	

Course Category	**Major**	
Course Code	**25MCA3S604**	
Course Name	**Software Testing techniques and Tools**	
Course Short Name	**EL III**	
Total Lectures	**45**	
Total Credits	**3**	
Marks	**External: 70**	**Internal: 30**

Prerequisites:

1. Basic knowledge of SDLC.
2. Understanding of fundamental programming concepts.

Course Objectives:

1. To understand software testing principles, processes, and methodologies.
2. To gain hands-on experience with manual and automated testing tools.
3. To familiarize students with performance, security, and defect-tracking tools.

Mapping of Programme Outcomes: PO1, PO2	**Mapping of Programme Specific Outcomes:** PSO4, PSO7

Course Outcomes: After completing this course, The students will be able to:
CO1. Understand the fundamental principles of software testing, including the distinction between errors, faults, and failures, and compare SDLC vs. STLC.
CO2. Construct a Requirements Traceability Matrix (RTM) and utilize tools like Jira or TestLink to manage test plans and defect life cycles.
CO3. Analyze the feasibility of automation for a given project and identify the appropriate Selenium components for web testing.
CO4. Design and Implement structured automation frameworks (Data-driven, Keyword, or Hybrid) using TestNG and JUnit for scalable testing.

Units	Contents	Total Lectures
I	**Introduction to Software Testing: Fundamentals** of Software Testing, Errors, faults, failures. Testing Principles. Verification & Validation, SDLC and STLC, **Test Levels**: Unit, Integration, System, Acceptance Testing. **Test Types:** Functional & Non-Functional Testing. Defect Life Cycle.	9
	Mapping of COs: CO1	
II	**Test Design Techniques: Black-Box Test Design Techniques:** Equivalence partitioning**,** Boundary value analysis**,** Decision table testing**,** State transition testing**,** Use case–based testing**. White-Box Test Design Techniques:** Code coverage (statement, branch, path)**,** Control flow & data flow testing**. Experience-Based Testing:** Error guessing**,** Exploratory tests.	9
	Mapping of COs: CO2	
III	**Requirements-Based Test Design:** Mapping requirements to test cases**,** Traceability matrices (RTM). **Static vs. dynamic testing**, Test Management Tools. Overview of Test Management. **Tools:** TestLink, qTest, Zephyr, Jira Test Management. Creating test plans, test cases, test cycles	9
	Mapping of COs: CO3	
IV	**Introduction to Automation Tools:** Need for automation, Automation vs Manual testing, **Automation frameworks overview:** Introduction to Selenium, Features, benefits, and limitations. Components of selenium.	9
	Mapping of COs: CO4	
V	TestNG basics: test execution, Overview of JUnit. Differences between JUnit and TestNG. Automation Frameworks: Data-driven framework, Keyword-driven framework, Hybrid framework concepts.	9
	Mapping of COs CO4	

Text Books:

1. Software Testing, Author: Ron Patton, Sams Publishing / Pearson.
2. Foundations of Software Testing: ISTQB Certified Tester, by Rex Black, Erik van Veenendaal, Dorothy Graham, Latest edition (2023/2024) – updated for modern testing practices

Reference Books:

1. Selenium Framework Design in Data-Driven Testing" by Carl Cocchiaro.
2. Selenium Testing Tools Cookbook" by Unmesh Gundecha

Course Category	**Major**	
Course Code	**25MCA3S605**	
Course Name	**Lab-5: Based on MAD (Using Flutter / React Native**	
Course Short Name	**LAB 5**	
Total Lectures	**60**	
Total Credits	**2**	
Marks	**External: 25**	**Internal: 25**
Note: Practical List will be freshly prepared by the course teacher in every session. So the list is not mentioned.		

Course Category	**Major**	
Course Code	**25MCA3S606**	
Course Name	**Lab-6: Based on IOT (Arduino/Raspberry Pi)**	
Course Short Name	**LAB 6**	
Total Lectures	**60**	
Total Credits	**2**	
Marks	**External: 25**	**Internal: 25**
Note: Practical List will be freshly prepared by the course teacher in every session. So the list is not mentioned.		

Course Category	**Major**	
Course Code	**25MCA3S607**	
Course Name	**Lab-7:Based on DM and EL III**	
Course Short Name	**LAB 7**	
Total Lectures	**60**	
Total Credits	**2**	
Marks	**External: 25**	**Internal: 25**
Note: Practical List will be freshly prepared by the course teacher in every session. So the list is not mentioned.		

Course Category	**Major**	
Course Code	**25MCA3S608**	
Course Name	**Major Project**	
Course Short Name	**PRJ3**	
Total Lectures	**60**	
Total Credits	**2**	
Marks	**External: 25**	**Internal: 25**
Prerequisites 4. Preliminary knowledge of software development process. 5. Knowledge about technology and application domain in which project will be developed. 6. Good knowledge of subject domain and Software Engineering.		

Course Objectives

7. Enable students to identify real-life problems or research-based issues in the domain of computer applications and translate them into well-defined project objectives.
8. Develop students' ability to apply theoretical and technical knowledge gained during the MCA programme to design, develop, and deploy a software-based solution.
9. Foster skills in project management, teamwork, requirement analysis, software engineering, and development methodologies.
10. Encourage documentation and communication skills through structured reports, presentations, and user manuals.
11. Prepare students for professional roles by simulating a real-world software development environment
12. involving problem-solving, innovation, and ethical practices.

Mapping of Programme Outcomes:	**Mapping of Programme Specific Outcomes:**
PO1, PO2	PSO4, PSO5

Course Outcomes

CO1: Identify and define real-world problems or research areas relevant to computer applications, and propose suitable solutions using appropriate software engineering principles.

CO2: Apply theoretical knowledge and technical skills gained in the coursework to design, develop, and implement a software-based solution or prototype.

CO3: Demonstrate effective use of programming tools, platforms, databases, and other technologies required for development.

CO4: Practice collaborative teamwork, project planning, and time management through systematic execution of project phases.

CO5: Develop professional documentation, including Software Requirements Specifications (SRS), system design, and user manuals, adhering to industry standards.

CO6: Communicate technical information clearly and effectively through oral presentations and demonstrations of the project.

Rules for Project Work:

A student will be examined in the course —Project Work‖ as given below:

6. Project work may be done individually or in groups. However if project is done in groups, each student must be given are possibility for a distinct task and care should be taken to see the progress of individual.
7. Students should take guidance from a guide and prepare Project Report on —Project Work‖ in 2 copies to be submitted to the Head of the Department. A soft copy of project report along with source-code and data should also be submitted.
8. The Project Synopsis should contain an Introduction to Project, which should clearly explain the project scope in detail. Also, Data Dictionary, DFDs, ERDs, Navigation Diagrams, File designs, experimental setup and methodology.
9. The project report will be duly accessed by the guide of the project and marks will be communicated by the Head of the Department to the Examination Department.
10. The project report should be prepared in format prescribed by the College, which also specifies the contents and methods of presentation.

Format of Project Synopsis:

Topic
Introduction
Technology
Usage
Name of student and their signatures
Name of Guide and signature

Note: Synopsis should be hand written

General Instruction Regarding Preparation of Project Report:

TYPING:

(d) The typing shall be standard 12 pts in double spacing using only
(e) Margins must be Left 1.5 inches Right 1 inches Top 1 inches Bottom 1 inches
(f) Paper: A4 size Paper

COPIES:

Two hard-bind copies (As per format displayed here with) One original and one clean Xerox Copy.

FORMAT FOR TITLE PAGE AND FOR
COVERPAGE: PROJECT REPORT ON
NAME OF THE PROJECT BY
NAME OF STUDENT

GUIDED BY
NAME OF THE GUIDE

P.G. Department of Computer Science &
Technology, Degree College of Physical
Education,
Shree H.V. P. Mandal, Amravati.

ACADEMIC SESSION

Report format for Application Development Projects:

5. Blank Page at beginning
6. Title Page
7. Certificate from Guide Acknowledgement
8. Index with printed Page Numbers

CHAPTER1 : INTRODUCTION

5. Existing System and Need for Software
6. Proposed System
7. Scope of Work
8. Operating Environment– Hardware and Software

CHAPTER2 :ANALYSIS &DESIGN

2.1. User Requirements
2.2. Software Requirements
2.17 System Flow
2.18 Module Document
2.19 Input Document
2.20 Computational Method Document(If methods are used then only specify)
2.21 Output Document
2.22 Navigation Diagram (if website)
2.23 Data Flow Diagram(DFD) (if desktop application)
2.24 Table Design
2.25 Menu Tree
2.26 Menu Screens
2.27 Input Screens
2.28 Report Formats
2.29 Pseudo codes(optional)
2.30 Test Procedures(optional)

SEMISTER IV

Course Category	**Major**	
Course Code	**25MCA4S609**	
Course Name	**Internship**	
Course Short Name	**PRJ4**	
Total Lectures	**32**	
Total Credits	**18**	
Marks	**External: 100**	**Internal: 50**

Prerequisites:

1. Knowledge of Software engineering.
2. Knowledge of Software Development Life Cycle.

Course Objectives:

1. To acquire industry required skills during internship and hands on experience during this tenure.
2. To acquire professional experience of IT and ITES.

Mapping of Programme Outcome:	**Mapping of Programme Specific Outcome:**

Course Outcomes: After completing this course, the students will be able to:

CO1. Students will get professional experience in the field of IT and ITES.

Students may either Industrial Project or Internship or Start-up. Following are the Guidelines for this course are given as under…..

Industrial Project: It is a software development project assigned by any registered industry/ organization to the student. Student may complete the project at industry/ organization or at other location permitted by the industry. Student shall submit the completion/ implementation certificate issued by the Industry/ organization. Students should take prior approval from the institute in this regard.

Internship: In the internship, students shall apply direct/through institute to the Industry/Organization for internship or take use of 'Intershala', an initiative of AICTE. The internship is placement of students in the industry/organization for which they are entitled to receive stipend. Students shall submit the appointment letter at the start of the internship and completion certificate at the end of the session well before the final examination.

Mapping of COs: 1

Course Category	**Major**	
Course Code	**25MCA4S610**	
Course Name	**Seminar (Based On Online Technical course(S)**	
Course Short Name	**SEM**	
Total Lectures	**12**	
Total Credits	**6**	
Marks	**External: 50**	**Internal: 50**

Prerequisites:

1. Knowledge of presentation tools and communication skill.

Course Objectives:

1. To learn cutting-edge-technologies.
2. To practice presentation skill.

Mapping of Programme Outcome:	**Mapping of Programme Specific Outcome:**

Course Outcomes: After completing this course, the students will be able to:
CO1. Students will be able to learn new technologies and skill of presentation of their work.

The Guidelines for this course are given as under…

1. Institute shall assign mentor/guide to each student.

2. Student shall prepare synopsis with the help of guide, then submit synopsis approved by the mentor/guide in the institute.

3. Institute shall approve the seminar topic.

4. Students shall prepare seminar report and presentation with the help of guide and submit seminar report and presentation approved by the guide well in advance to conduct final presentation/examination.

5. Students may take seminar topic based on new technology, case study, success story of start-up he/she has undertaken in the 'Industrial Project/Internship/Start-up activity.

Mapping of COs: 1

Internal Assessment mechanism for syllabus MCA 2025

1. Theory Courses:

Internal Marks: 30

These 30 internal assessment marks for evaluation of student performance in theory courses is based on three assessment parameters.

1. Academic Assessment (10 marks)
2. Skill Based Assessment (15 marks)
3. Composite Assessment (5 marks)

1. Academic Assessment will be carried out after completion of every 2 units. Of every theory courses / after 22-25 lectures of that theory course using following tools / methods. (10 marks)

1.1. MCQ Test: On unit 1 and 2 contents of theory courses (10 Marks).

Frequency: 1 MCQ Test

Duration: 10 Minutes.

Marks: 10 for each MCQ Test 1 & Test 2.

Mode: Online Tool like Testmoz or any other free tool

1.2. Logical Question Test: on unit 3 & 4 contents of that theory course (10 Marks).
Frequency: 1
Duration: 30 minutes each.
Marks: 10
Type: Two logical questions of 5 mark each in 4 sets A, B, C, D.
Mode: In course classroom (Offline).

1.3. Viva – Voce on All units (10 Marks) while completing 5th units.
(Subject teacher should have question bank of 1 mark each, questions should be sufficient for a batch size of course)
Frequency: 1 viva- voce
Duration: 5 Min each student
Marks: 5 Marks for Viva-voce
Mode: Offline
Total Academic Assessment marks have to be converted out of 10 from 30.

2. Skill Based Assessment (15 marks)

2.1. Technical Skill Assessment (8 Marks):
Technical skill of the students attaining in that theory course as per industry requirement should be assessed based on 5-7 min presentation on technical skill to be assessed identified in that course (minimum 2 technical skills).
Frequency: 1
Marks: 8 – Technical skill 1- 4 marks.
Technical skill 2- 4 marks.
Mode: Offline

2.2. Soft Skill Assessment (7 Marks):
From presentation based on (Technical skill) soft skills to be assessed and parameters are
a) Physical Appearance(2 Marks)
b) Presentation / Communication / Body language(2 Marks)
c) Defense/ Pressure tactics/ Negotiation skills(2 Marks)
d) Social skills(1 Marks)
Marks: 7 Marks
Mode: Offline

3. Composite Assessment (5 Marks):
To ensure that student is industry ready & to align with NEP 2020,
Overall assessment including 3 marks for attendance (for 25% attendance 1 marks each will be up to 75% attendance) and 2 marks will be reserved to evaluate overall performance of student based on peer review feedback from course teacher/ industry, based on cognitive skills of students and 100% attendance. Evaluate on project presentation, problem solving skills, creativity / innovation online course completion with certificate and interdisciplinary design thinking.

2. Practical

Internal Assessment: 25 marks
2.1. Practical Attendance and record – 5 Marks.
2.2. Performance in Laboratory – 15 Marks.
2.3. Viva-voce - 5 Marks.

3. Mini project internal Assessment:

Internal Marks: 25 Marks
3.1. Project based Learning: 5 Marks
3.2. Innovation: 5 Marks
3.3. Demo 1 + Demo 2 + Demo 3: 15 Marks (5 marks each demo)

4. Skill Enhancement Course I & II (Marks 50)

4.1. Skill attainment evaluation based on presentation by student conducted by course teacher (15 Marks)

4.2. Case Study (10 Marks)
4.3. Class Test (25 Marks)(MCQ / Subjective)

5. Internal Assessment for internship (50 Marks)

5.1. Objective: To acquire industry required skills during internship and hands on experience during this tenure.

5.2. Outcome:

- Monthly report of 10 marks each report from industry to internship mentor assigned by department (min 4 reports-max 5 reports).
- Minimum 18 weeks should be completed in IT industry. If student is not getting internship for first one and half month then he/she has to submit online technical skill acquired from online course of min 15 days each with course completion certificate to mentor. Similarity report is mandatory in the project report / AI plagiarism report

6. Seminar (Based on online technical course(s)) (50 Marks):

6.1. Online course completion certificate & presentation based on should give to seminar mentor/ guide

1. **Seminar report** – 15 Marks.
2. **Certificate:** 10 Marks
3. **Presentation to mentor:** 15 Marks
4. **Similarity report:** 10 Marks