Pimpri Chinchwad Education Trust's

Pimpri Chinchwad University

Sathe, Pune - 412106

PCET's Pimpri Chinchwad University

Learn | Grow | Achieve

Curriculum Structure

M.C.A.

(2025 Pattern)

School of Computer Applications

Effective from Academic Year 2025-2026

Program Curriculum

Preamble:

At Pimpri Chinchwad University, we present the Master of Computer Application (MCA), a Post Graduate Program designed to equip students with a comprehensive understanding of Computer Science and Application. As aspiring professionals in the field of computing, we acknowledge the weight of responsibility that accompanies our education. Upholding the highest standards of integrity, professionalism, and ethical conduct is fundamental to our academic pursuits and beyond. We embrace the imperative of continuous learning and adaptability in an era marked by rapid technological advancement, pledging to proactively seek new knowledge and master emerging technologies.

The MCA program curriculum is designed to provide students with a strong foundation in computer science, programming languages, software engineering, database management systems, and computer networks. The program also includes courses on business management and soft skills to prepare students for a career in the IT industry

Overall, an MCA program aims to provide students with a well-rounded education that prepares them for a successful career in the IT industry and for further academic pursuits.

Vision and Mission of Program:

Vision:
To create computer application specialists who will benefit society, industry, and all stakeholders

Mission:
To provide people in the computer application sector with valuable academic, research, and employment prospects as well as social consciousness with ethical principles.

Program Outcomes:

Here are some possible Program Outcomes (POs) for a Master of Computer Application (MCA) program:

1. Computational Knowledge: Understand and apply mathematical foundation, computing, and domain knowledge for the conceptualization of computing models from defined problems.
2. Problem Analysis: Ability to identify, critically analyze, and formulate complex computing problems using fundamentals of computer science and application domains.
3. Design and Development of Solutions: Ability to transform complex business scenarios and contemporary issues into problems, investigate, understand, and propose integrated solutions using emerging technologies.
4. Conduct Investigations of Complex Computing Problems: Ability to devise and conduct experiments, interpret data, and provide well-informed conclusions.
5. Modern Tool Usage: Ability to select modern computing tools, skills, and techniques necessary for innovative software solutions
6. Professional Ethics: Ability to apply and commit professional ethics and cyber regulations in a global economic environment.
7. Life-long Learning: Recognize the need for and develop the ability to engage in continuous learning as a Computing professional.
8. Project Management: Ability to understand management and computing principles with computing knowledge to manage projects in multidisciplinary environments.
9. Communication Efficacy: Communicate effectively with the computing community as well as society by being able to comprehend effective documentation and presentations.
10. Societal & Environmental Concern: Ability to recognize economic, environmental, social, health, legal, and ethical issues involved in the use of computer technology and other consequential responsibilities relevant to professional practice.
11. Individual & Team Work: Ability to work as a member or leader in diverse teams in a multidisciplinary environment.
12. Innovation and Entrepreneurship: Identify opportunities, entrepreneurship vision, and use of innovative ideas to create value and wealth for the betterment of the individual and society.

Program Educational Objectives:

Here are some possible Program Educational Objectives (PEOs) for a Master of Computer Applications (MCA) program:

To prepare the youth to take up positions as system analysts, system engineers, software engineers, and Programmers.

1. To aim at developing systems thinking, abstract thinking, skills to analyze and synthesize, and skills to apply knowledge through extensive problem-solving sessions, hands-on practice under various hardware and software environments, and projects developed.
2. To prepare students with social interaction skills, communication skills, life skills, entrepreneurial skills, and research skills, which are necessary for career growth and for leading a quality life.

Program Specific Outcomes:

PSO1-- Comprehend and implement mathematical and industrial principles in computing methodologies to address real-time industrial issues.

PSO2:-Utilizing the most recent computer tools and technologies, analyze, design, develop, test, and maintain software applications.

PSO3: the capacity to employ computer technology and mathematical and computer science skills to solve business difficulties

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CURRICULUM FRAMEWORK

Sr. No.	Type of course	Abbreviations
1	Major	**MAJ**
2	Elective (Minor Stream and Vocational and Program Specific)	**MIN**
3	Open Electives	**OE**
4	Ability Enhancement Courses	**AEC**
5	Skill Enhancement Courses(MOOC)	**SEC**
6	Vocational Skill Course	**VSC**
7	Summer Internship and On Job Training	**OJT**
8	Project	**PROJ**
9	Field Project	**FP**
10	Indian Knowledge System	**IKS**
11	Co-Curriculum	**CC**
12	Community Engagement Program	**CEP**
13	Value Education Course	**VEC**

Sr. No.	Type of course	No. of Courses	Total Credits	
			No	%
1	Major	**15**	**35**	**39.77**
2	Elective (Minor Stream and Vocational and Program Specific)	**3**	**9**	**10.22**
3	Ability Enhancement Courses	**4**	**2**	**2.27**
4	Skill Enhancement Courses(MOOC)	**7**	**14**	**15.9**
5	Vocational Skill Course	**1**	**3**	**2.64**
6	Summer Internship and On Job Training	**1**	**12**	**10.56**
7	Field Project	**3**	**7**	**6.16**
9	Value Education Course	**2**	**6**	**5.28**
	Total	**35**	**88**	**100**

CREDIT DISTRIBUTION: SEMESTER WISE

Sr. No.	Type of course	No. of Credits and Semester				Total
		1	2	3	4	
1	Major	11	11	10	3	**35**
2	Elective (Minor Stream and Vocational and Program Specific)	3	3	3	-	**9**
3	Ability Enhancement Courses	-	2	-	-	**2**
4	Skill Enhancement Courses(MOOC)	2	4	4	2	**12**
5	Vocational Skill Course	-	-	-	3	**3**
6	Summer Internship and On Job Training	-	-	-	12	**12**
7	Field Project	3	2	2	2	**9**
9	Value Education Course (Audit Courses)	3	-	3	-	**6**
Total		22	22	22	22	**88**

COURSE CODE NOMENCLATURE

COURSE CODE NOMENCLATURE			
Sr No.	Course Code	Course Type	Course Name
1	PMC101	Python Programming	MAJM
2	PMC102	Python Programming Lab	MAJM
3	PMC103	Data Structures and Algorithms	MAJM
4	PMC104	Data Structures and Algorithms Lab	MAJM
5	PMC105A	Software Testing Tools Using Automation	MAJE
6	PMC105B	Software Engineering & Project Management	MAJE
7	PMC105C	Introduction to Cyber Security	MAJE
8	PMC105D	Introduction to Data Science	MAJE
9	PMC106	Probability and Combinatory	BSC
10	PMC107	Advanced Database Management System	VSC
11	PMCM101	Programming Paradigm	MOOC
12	PMCM102	Introduction to Database Design & SQL Programming	MOOC
13	PMC110	Organizational Behaviour	VEC
14	PFL201A	Foreign Language-1:German	AEC
15	PFL201B	Foreign Language-2: Japanese	AEC
16	PMC111	Java Programming	MAJM
17	PMC112	Java Programming Lab	MAJM
18	PMC113	Web Design and Development	MAJM
19	PMC114	Web Design and Development Lab	MAJM

20	PMC115A	Data Communication and Computer Networks	MAJE
21	PMC115B	Introduction to IOT	MAJE
22	PMC115C	Machine Learning using Python	MAJE
23	PMC115D	Prompt Engineering	MAJE
24	PMC116	Optimization Techniques	BSC
25	PMC117	Big Data Analytics	VEC
26	PMC118	Mini Project using Python / DSA	FP
27	PMCM103	Generative AI	MOOC
28	PMCM104	Front-End Developer Tools	MOOC
29	PFL202A	Foreign Language-1: Japanese	AEC
30	PFL202B	Foreign Language-2: German	AEC
31	PMC201	Mobile Application Development	MAJM
32	PMC202	Mobile Application Development Lab	MAJM
33	PMC203	Cloud Computing	MAJM
34	PMC204	Cloud Computing Lab	MAJM
35	PMC205A	Cloud Security	MAJE
36	PMC205B	Edge Computing	MAJE
37	PMC205C	Management Information System	MAJE
38	PMC205D	Agile Development and Scrum	MAJE
39	PMC206	Design and Analysis of Algorithm	SEC
40	PMCM201	MERN Full Stack	MOOC
41	PMCM202	Logic and Critical Thinking	MOOC
42	PMC207	Research Methodology and IPR	VEC
43	PMC210	Mini Project	FP
44	PMC211	DevOps	MAJM

45	PMC212	PowerBI and Tableau	VSC
46	PMCM203	Linux and Git For Open Source Software Development	MOOC
47	PMC213	Seminar/Workshop	FP
48	PMC214	Major Project /Research Project /Internship	OJT

FIELD ABBREVIATIONS

Sr. No.	Field Name	Abbreviations
1	THEORY	TH
2	PRACTICAL	PR
3	TUTORIAL	TUT
4	ORAL	OR
5	HOURS	HR
6	CONTINUOUS INTERNAL ASSESSMENT	CIA
7	END SEMESTER ASSESSMENT	ESA

PIMPRI CHINCHWAD UNIVERSITY, PUNE, MAHARASHTRA											
SCHOOL OF COMPUTER APPLICATIONS											
PROGRAM STRUCTURE											
MASTER OF COMPUTER APPLICATIONS (M.C.A.) 2025 PATTERN											
Effective from the Academic Year (2025-2026)											
SEMESTER – I											
COURSE CODE	**COURSE TYPE**	**COURSE NAME**	**TEACHING SCHEME**					**ASSESSMENT SCHEME**			
			TH	**PR**	**TUT**	**CREDIT**	**HRS**	**CIA**	**ESA**	**PR /OR**	**TOTAL**
PMC101	MAJM	Python Programming	3	-	-	3	3	40	60	-	100
PMC102	MAJM	Python Programming Lab	-	1	-	1	2	25		25	50
PMC103	MAJM	Data Structures and Algorithms Using C	3	-	-	3	3	40	60	-	100
PMC104	MAJM	Data Structures and Algorithms Using C Lab	-	1	-	1	2	25		25	50
PMC105	MAJE	Major Elective - I	3	-	-	3	3	40	60	-	100
PMC106	BSC	Probability and Combinatory	3	-	-	3	3	40	60	-	100
PMC107	VSC	Advanced Database Management System	2	-	-	2	2	20	30	-	50
PMCM101	SEC	**Programming Paradigm (MOOC)**	2		-	2	-	25	-	25	50
PMCM102	VEC	**Introduction to Database Design & SQL Programming (MOOC)**	2	-	-	2	-	25	-	25	50
PMC108	VEC	Organizational Behaviour	2	-	-	2	2	20	30	-	50
PFL201	AEC	Foreign Language - I	2	-	-	-	2	50	-	-	50
TOTAL			**22**	**2**	**0**	**22**	**22**	**350**	**300**	**100**	**750**
PMC105 MAJOR ELECTIVE – I											
PMC105A	MAJE	Software Testing Tool Using Automation	3	-	-	3	3	40	60	-	100
PMC105B	MAJE	Software Engineering and Project Management	3	-	-	3	3	40	60	-	100
PMC105C	MAJE	Introduction To Cyber security	3	-	-	3	3	40	60	-	100
PMC105D	MAJE	Introduction to Data Science	3	-	-	3	3	40	60	-	100
PFL201 FOREIGN LANGUAGE – I											
PFL201A	AEC	Foreign Language-1: German	2	-	-	-	2	50		-	50
PFL201B	AEC	Foreign Language-2: Japanese	2	-	-	-	2	50		-	50

SEMESTER –II										
COURSE CODE	**COURSE TYPE**	**COURSE NAME**	**TEACHING SCHEME**					**ASSESSMENT SCHEME**			
			TH	**PR**	**TUT**	**CREDIT**	**HRS**	**CIA**	**ESA**	**PR/ OR**	**TOTAL**
PMC111	MAJM	Java Programming	3	-	-	3	3	40	60	-	100
PMC112	MAJM	Java Programming Lab	-	1	-	1	2	25	-	25	50
PMC113	MAJM	Web Design and Development	3	-	-	3	3	40	60	-	100
PMC114	MAJM	Web Design and Development Lab	-	1	-	1	2	25	-	25	50
PMC115	MAJE	Major Elective – II	3	-	-	3	3	40	60	-	100
PMC116	BSC	Optimization Techniques	3	-	-	3	3	40	60	-	100
PMC117	VEC	Big Data Analytics	2	-	-	2	2	20	30	-	50
PMC118	FP	Mini Project using Python/DSA	-	2	-	2	4	50	-	50	100
PMCM103	MOOC	**Generative AI Engineering**	2	-	-	2	2	25	-	25	50
PMCM104	MOOC	**Front-End Developer Tools**	2	-	-	2	2	25	-	25	50
PFL202	AEC	Foreign Language – II	2	-	-	-	2	50	-	-	50
TOTAL			**20**	**4**	**-**	**22**	**28**	**380**	**270**	**150**	**800**
PMC115 MAJOR ELECTIVE – II											
PMC115A	MAJE	Data Communication and Computer Networks	3	-	-	3	3	40	60		100
PMC115B	MAJE	Introduction to IOT	3	-	-	3	3	40	60		100
PMC115C	MAJE	Machine Learning Using Python	3	-	-	3	3	40	60		100
PMC115D	MAJE	Prompt Engineering	3	-	-	3	3	40	60		100
PFL202 FOREIGN LANGUAGE – II											
PFL202A	AEC	Foreign Language-1: Japanese	2	-	-	-	2	50			50
PFL202B	AEC	Foreign Language-2: German	2	-	-	-	2	50			50
Exit Policy: PG Diploma in MCA: Students who opt to exit after completion of the first year and have scored the required credits offered by the school in the program structure will be awarded a PG Diploma in MCA, provided they must earn additional credits during the summer vacation of the first year											

COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME					ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	Hrs	CIA	ESA	PR/ OR	TOTAL
PDIEXMC101	VSC	Information security / MOOCs	**2**	**-**	**-**	**2**	**2**	**25**		**25**	**50**
PDIEXMC102	VSC	Project	**-**	**4**	**-**	**4**	**8**	**50**	**-**	**50**	**100**

SEMESTER-III											
COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME					ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	HRS	CIA	ESA	PR / OR	TOTAL
PMC201	MAJM	Mobile Application Development	3	-	-	3	3	40	60	-	100
PMC202	MAJM	Mobile Application Development Lab	-	1	-	1	2	25		25	50
PMC203	MAJM	Cloud Computing	3	-	-	3	3	40	60	-	100
PMC204	MAJM	Cloud Computing Lab	-	1	-	1	2	25	-	25	50
PMC205	MAJE	Major Elective - III	3	-	-	3	3	40	60	-	100
PMC206	SEC	Design and Analysis of Algorithm	2	-	-	2	2	20	30	-	50
PMCM201	MOOC	**MERN Full Stack**	2	-	-	2	2	25	-	25	50
PMCM202	MOOC	**Logic and Critical Thinking**	2	-	-	2	2	25	-	25	50
PMC207	VEC	Research Methodology and IPR	3	-	-	3	3	40	60	-	100
PMC210	FP	Mini Project using Mobile comp/ML	-	2	-	2	4	50	-	50	100
TOTAL			**18**	**4**	**0**	**22**	**26**	**330**	**270**	**150**	**750**
PMC205 MAJOR ELECTIVE – III											
PMC205A	MAJE	Cloud Security	3	-	-	3	3	40	60	-	100
PMC205B	MAJE	Edge Computing	3	-	-	3	3	40	60	-	100
PMC205C	MAJE	Management Information System	3	-	-	3	3	40	60	-	100
PMC205D	MAJE	Agile Development And Scrum	3	-	-	3	3	40	60	-	100

SEMESTER-IV SCHEME A											
COURSE CODE	**COURSE TYPE**	**COURSE NAME**	**TEACHING SCHEME**					**ASSESSMENT SCHEME**			
			TH	**PR**	**TUT**	**CREDIT**	**HRS**	**CIA**	**ESA**	**PR / OR**	**TOTAL**
PMC211	MAJM	DevOps	3	-	-	3	3	40	60	-	100
PMC212	VSC	Power BI and Tableau	3	-	-	3	3	40	60	-	100
PMCM203	MOOC	Linux and Git For Open Source Software Development	2	-	-	2	2	25	-	25	50
PMC213	FP	Seminar/Work shop	-	-	-	2	2	50	-	-	50
PMC214	OJT	Major Project / Research Project / Internship	-	12	-	12	-	250	-	250	500
TOTAL			**8**	**12**	**0**	**22**	**10**	**405**	**120**	**275**	**800**

SEMESTER-IV SCHEME B											
COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME					ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	HRS	CIA	ESA	PR / OR	TOTAL
PMCM209	MOOC	IBM Data Science Professional Certificate (MOOC)	3	-	-	3	3	50	-	50	100
PMCM210	MOOC	Meta Front-End Developer Professional Certificate (MOOC)	3	-	-	3	3	50	-	50	100
PMCM203	MOOC	Linux and Git For Open Source Software Development	2	-	-	2	2	25	-	25	50
PMC213	FP	Seminar/Workshop	-	-	-	2	2	50	-	-	50
PMC214	OJT	Major Project / Research Project / Internship	-	12	-	12	-	250	-	250	500
TOTAL			**8**	**12**	**0**	**22**	**32**	**425**	**-**	**375**	**800**

Note:

1. Scheme A – Regular Students (student should maintain a minimum attendance of 75%)
2. Scheme B – Students with Pre-Placement Offer (students should follow the activity schedule and report accordingly).

MCA 2025 PATTERN

COURSE DETAILS

Semester - I

Name of the Program:	MCA	**Semester: I**	**Level: PG**
Course Name	Python Programming	**Course Code and Course Type**	**PMC101/ MAJM**
Course Pattern	**2025**	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-	-	3	3	40	60	-

Prerequisite:

Course Objectives (CO):	The Objectives of Python Programming are: 1. Understand the fundamental concepts of Python programming and its environment. 2. Illustrate data structures like lists, tuples, sets, and dictionaries for real-world applications. 3. Develop structured and modular Python programs using functions, modules, and exception handling. 4. Analyse object-oriented programming principles and GUI development in Python. 5. Design and optimize Python programs for data handling, file operations, and database integration.
Course Learning Outcomes (CLO):	Students will be able to: 1. Explain Python programming concepts, syntax, and constructs. 2. Illustrate built-in data structures for handling and processing data efficiently. 3. Apply control structures, loops, and functions to solve computational problems. 4. Develop object-oriented programs and graphical user interfaces using Python libraries. 5. Evaluate and integrate file handling and database connectivity in Python applications.

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
Introduction to Python Programming: Introduction to Python, Features, Installation, and Python IDEs**;** Basic Syntax, Variables, Data Types, and Operators; Input/Output operations and Type Conversion; Control Statements- Conditional Statements (if-else), Loops (for, while)**;** Loop manipulation using pass, continue, break and else.	**CLO 1**	**9**
UNIT II		
Data Structures in Python: Lists- Definition, Slicing, Methods, List Comprehensions**;** Tuples- Definition, Operations, and Applications; Sets- Definition, Operations, and Use Cases**;** Dictionaries- Creating, Manipulating, and Dictionary Comprehensions; Iterators and Generators.	**CLO 2**	**9**
UNIT III		
Functions, Modules, and Exception Handling: Introduction to Functions- Built-in Functions & User-defined Functions**;** Defining and Calling Functions, Function Arguments, and Recursion**;** Anonymous Functions**;** Modules and Packages- Importing and Creating Modules**;** Exception Handling- try, except, finally, raise**;** Decorator.	**CLO3**	**9**
UNIT IV		
Object-Oriented Programming (OOP) & GUI in Python: Classes and Objects, Constructors & Destructors; Inheritance, Polymorphism, and Method Overriding; Encapsulation and Data Abstraction; GUI Programming using Tkinter (Widgets, Layouts, Event Handling); Introduction to PyQt.	**CLO4**	**9**
UNIT V		
File Handling and Database Connectivity: File Handling- Reading and Writing Files (Text, CSV, JSON), File Operations: Append, Modify, Delete; Database Connectivity using SQLite & MySQL; Performing CRUD Operations.	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Mark Lutz, *Learning Python*, O'Reilly Media, 5th Edition.
2. Paul Barry, *Head First Python*, O'Reilly Media, 2nd Edition.
3. Reema Thareja, *Python Programming: Using Problem Solving Approach*, Oxford University Press.

Reference Books:

1. Allen B. Downey, *Think Python: How to Think Like a Computer Scientist*, 2nd Edition, O'Reilly Media.

2. Wesley Chun, *Core Python Applications Programming*, Pearson, 3rd Edition.
3. David Beazley & Brian K. Jones, *Python Cookbook*, O'Reilly Media.

Online & E-Learning Resources:

1. **Official Python Documentation:** https://docs.python.org/3/
2. **Python for Beginners (W3Schools):** https://www.w3schools.com/python/
3. **Python Course (GeeksforGeeks):** https://www.geeksforgeeks.org/python-programming-language/

MOOCs & Online Courses:

1. Coursera: 'Python for Everybody' by University of Michigan
2. Udemy: 'Complete Python Bootcamp: From Zero to Hero'
3. edX: 'Introduction to Python' by Microsoft

COURSE CURRICULUM

Name of the Program:	**MCA**	**Semester: I**	**Level: PG**
Course Name	**Python Programming Lab**	**Course Code/ Course Type**	**PMC102/MAJM**
Course Pattern	**2025**	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
-	1	-	1	2	25	-	25

Prerequisite: Basic Knowledge of Computers are required.	
Course Objectives (CO):	The Objectives of Python Programming are: 1. To introduce students to Python programming basics, including syntax, data types, and control structures. 2. To enable students to write modular and reusable programs using functions, recursion, and exception handling. 3. To familiarize students with Python's built-in data structures (lists, tuples, dictionaries, sets) and their applications. 4. To expose students to object-oriented programming concepts such as classes, objects, inheritance, and polymorphism using Python. 5. To provide hands-on experience in file handling, GUI development using Tkinter, and database connectivity using SQLite.
Course Learning Outcomes (CLO):	Students would be able to: 1. Demonstrate proficiency in writing Python programs using variables, data types, control structures, and loops. 2. Apply Python functions, recursion, and exception handling to develop modular and error-resilient programs. 3. Implement and manipulate Python's data structures (lists, tuples, dictionaries, sets) to solve programming problems 4. Design object-oriented solutions using Python classes, objects, inheritance, and polymorphism. 5. Develop Python applications incorporating file handling, GUI elements using Tkinter, and database operations using SQLite.

Course Contents/Syllabus: Practical Plan

Activity Number	Assignment/Practical/Activity Title	Week Number	Details	CLO	Hours
1	Introduction to Python	Week 1	• Writing basic Python scripts • Understanding variables, data types, and I/O operations	CLO1	2
2	Control Structures	Week 2	• Implementing if-else, elif, and nested conditions.	CLO1	2
3	Control Structures	Week 3	• Using loops (for, while) with break, continue, pass	CLO1	2
4	Working with Lists and Tuples	Week 4	• Performing operations on lists (slicing, sorting, list comprehension) • Implementing tuples for immutable data storage.	CLO2	2
5	Dictionaries and Sets	Week 5	• Implementing dictionaries for key-value data storage • Using sets for unique data handling and mathematical operations	CLO2	2
6	Iterators, Generators	Week 6	• Using iter() and next() for iteration • Creating generators with yield	CLO2	2
7	Functions	Week 7	• Implementing user-defined functions and recursion • Anonymous function	CLO3	2
8	Exception Handling	Week 8	• Using try-except-finally for error handling	CLO3	2
9	Modules and Packages	Week 9	• Creating custom modules and importing built-in libraries • Using standard modules like math, random, datetime • Implementing decorators to modify functions	CLO3	2
10	Object-Oriented Programming	Week 9 & 10	• Implementing classes and objects	CLO4	4

			• Using constructors, destructors, inheritance, and polymorphism		
11	GUI Development using Tkinter	Week 11	• Designing a GUI application with buttons, labels, and input fields • Handling events using Tkinter	CLO4	2
12	File Handling in Python	Week 12 & Week 13	• Reading and writing text, CSV, and JSON files • Performing file operations (append, modify, delete)	CLO5	4
13	Database Connectivity using SQLite	Week 14 & Week 15	• Connecting Python with SQLite • Performing CRUD operations on databases	CLO5	4
Total Marks					**30**

Learning resources

Textbooks:

1. Mark Lutz, Learning Python, O'Reilly Media, 5th Edition.
2. Paul Barry, Head First Python, O'Reilly Media, 2nd Edition.
3. Reema Thareja, Python Programming: Using Problem Solving Approach, Oxford University Press.

Reference Books:

1. Allen B. Downey, *Think Python: How to Think Like a Computer Scientist*, 2nd Edition, O'Reilly Media.
2. Wesley Chun, *Core Python Applications Programming*, Pearson, 3rd Edition.
3. David Beazley & Brian K. Jones, *Python Cookbook*, O'Reilly Media.

Online & E-Learning Resources:

1. **Official Python Documentation:** https://docs.python.org/3/
2. **Python for Beginners (W3Schools):** https://www.w3schools.com/python/
3. **Python Course (GeeksforGeeks):** https://www.geeksforgeeks.org/python-programming-language/

MOOCs & Online Courses:

1. Coursera: 'Python for Everybody' by University of Michigan
2. Udemy: 'Complete Python Bootcamp: From Zero to Hero'
3. edX: 'Introduction to Python' by Microsoft

Name of the Program:	**MCA**			**Semester : I**		**Level: PG**	
Course Name	**Data Structure And Algorithms Using C**			**Course Code and Course Type**		**PMC103 / MAJM**	
Course Pattern	**2025**			**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-	-	3	3	40	60	-
Prerequisite: Student should learn at least one programming language, such as C++, Java, or Python, Operating System							
Course Objectives (CO):	The objectives of (DATA STRUCTURE AND ALGORITHM USING C) are: 1. To recall basic Perform of operations on Arrays. 2. To recognize different Searching and Sorting methods. 3. To apply basic operations on Linked List. 4. To analyze operations on Stack using Array and Linked List Implementations. 5. To analyze operations on Stack using Array and Linked List Implementations. 6. To Design and create Tree And Graph to solve problems.						
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify fundamental concepts and importance of data structures in solving computational problems. 2. Explain the various searching and sorting algorithms to organize and retrieve data efficiently. 3. Apply knowledge of Design and implement linked list structures to manage dynamic data. 4. Analyze and implement stack and queue operations and explore their use in real-world scenarios. 5. Evaluate the utilize tree and graph structures to represent hierarchical and networked data.						

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
Introduction to Data Structures 1.1 Introduction: Concept and Need of Data Structure, Definition, Abstract Data Type 1.2 Types of Data Structures: (i) Linear Data Structures (ii) Non-Linear Data Structures 1.3 Operations on Data Structures: (i) Traversing (ii) Insertion (iii) Deletion	**CLO 1**	**9**
UNIT II		
Searching and Sorting :- 2.1 Searching: Searching for an item in a data set using the following methods: (i) Linear Search (ii) Binary Search 2.2 Sorting: Sorting of data set in an order using the following methods: (i) Bubble Sort (ii) Selection Sort (iii) Insertion Sort (iv) Quick Sort (v) Merge Sort	**CLO 2**	**9**
UNIT III		
Linked List:-3.1 Difference between Static and Dynamic Memory Allocation. 3.2 Introduction to Linked List, Terminologies: Node, Address, Pointer, Information field /Data field, Next pointer, Null Pointer, Empty List. 3.3 Type of Lists: Linear List, Circular List, Representation of Doubly Linked List. 3.4 Operations on a Singly Linked List: Creating a Linked List, Inserting a new node in a Linked List, Deleting a node from a Linked List, Searching a key in Linked List, Traversing a Singly Linked List. 3.5 Applications of Linked List.	**CLO3**	**9**
UNIT IV		
Stack:-Introduction to Stack: 4.1 Introduction to Stack: Definition, Stack as an ADT, Operations on Stack-(Push, Pop), Stack Operation Conditions – Stack Full / Stack Overflow, Stack Empty /Stack Underflow. 4.2 Stack Implementation using Array and representation using Linked List. 4.3 Applications of Stack: Reversing a List, Polish Notations, Conversion of Infix to Postfix Expression, Evaluation of Postfix Expression. 4.4 Recursion: Definition and Applications. **Queue:** Introduction to Queue: Queue as an ADT, Queue representation in memory using Array and representation using a Linked List. 4.5 Types of Queues: Linear Queue, Circular Queue, Concept of Priority Queue, Double-Ended Queue. 4.6 Queue Operations: INSERT, DELETE, Queue Operation Conditions: Queue Full, Queue Empty. 4.7 Applications of Queue.	**COL4**	**9**
UNIT V		
Tree- 5.1 Introduction to Trees Terminologies: Tree, Degree of a Node, Degree of a Tree, Level of a node, Leaf Node, Depth / Height of a Tree, In-Degree and OutDegree, Path, Ancestor and Descendant Nodes. 5.2 Tree Types and Traversal methods, Types of Trees: General Tree, Binary Tree, Binary Search Tree (BST). Binary Tree Traversal: In-Order Traversal, Preorder Traversal, Post-Order Traversal. 5.3 Expression Tree **Graph:**-Introduction to graph Terminology :- Graph Node, Vertices, edges, indegree/outdegree graph,, directed graph ,undirected graph, adjecent, successor, predecessor, Adjacency List, Adjacency Matrix of directed and undirected graph.	**COL5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Mark Allen Weiss, Data Structure and Algorithm Analysis in C++, 2014, 4th Edition, Pearson Education Limited.
2. An Introduction to Data Structures with Applications. by Jean-Paul Tremblay & Paul G. Sorenson Publisher-Tata McGraw Hill.
3. Data Structures using C & C++ -By Ten Baum Publisher – Prenctice-Hall International.

Reference Books:

1. AnanyLevitin, Introduction to design and analysis of algorithm, 2012, 3rd Edition, Addison Wesley.
2. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms,PaperBack, 2010, 3rd Edition, MIT Press.

Online Resources and E-Learning Resources

1. https://www.audisankara.ac.in/has/pdf/DATA%20STRUCTURE.pdf
2. https://github.com/Rustam-Z/data-structures-and-algorithms/tree/master/lecture%20notes
3. https://www.programiz.com/dsa/linked-list

COURSE CURRICULUM:

<table>
<tr><td colspan="2">Name of the Program:</td><td colspan="2">MCA</td><td colspan="2">Semester : I</td><td colspan="2">Level: PG</td></tr>
<tr><td colspan="2">Course Name</td><td colspan="2">Data Structure And Algorithm Lab Using C</td><td colspan="2">Course Code and Course Type</td><td colspan="2">PMC104 /MAJM</td></tr>
<tr><td colspan="2">Course Pattern</td><td colspan="2">2025</td><td colspan="2">Version</td><td colspan="2">1.0</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td colspan="4">Assessment Scheme</td></tr>
<tr><td>Theory</td><td>Practical</td><td>Tutorial</td><td>Total Credits</td><td>Hours</td><td>CIA (Continuous Internal Assessment)</td><td>ESA (End Semester Assessment)</td><td>Practical and Oral</td></tr>
<tr><td></td><td>1</td><td>-</td><td>1</td><td>2</td><td>25</td><td>-</td><td>25</td></tr>
<tr><td colspan="8">Prerequisite: Student should learn at least one programming language, such as C++, Java, or Python</td></tr>
<tr><td colspan="3">Course Objectives (CO):</td><td colspan="5">The objectives of (Name of course) are:
1. To Comprehend Perform basic operations on Arrays
2. To identify and apply different Searching and</td></tr>
</table>

	Sorting methods. 3. To apply the different algorithms for sorting and searching techniques. 4. To Demonstrate and Implement basic operations on Linked List, stack, queue. 5. To develop and evaluate the Tree to solve problems.
Course Learning Outcomes (CLO):	Students will be able to: 1. Identify the concepts like array, matrix, traversing, and indexing using sorting and searching techniques. 2. Explain the appropriate data structures like stack, queue as applied to the specified problem definition. 3. Apply the concepts of Linked Lists and it's applications on given data 4. Implement the knowledge of handle operations like searching, insertion, deletion, and traversing mechanisms on various data structures 5. Evaluate the non-linear data structures through Tree.

Course Contents and Syllabus:
Practical Plan

Practical No.	Practical Title	Week No. and Turn 1	Details	CLO	Hours
1	Write a C program to implement the following Searching operations	Week 1	1. Selection Search 2. Binary Search	CLO1	2
2	Write a C program to implement the following Sorting operations	Week1	1. Selection Sort 2. Bubble Sort	CLO1	2
3	Write a C program that Explain the STACK operations on Given Data.	Week 3 and 4	1. Push() 2. pop()	CLO 2	4
4	Write program that implement all the operations on Queue with array representation	Week 5 and 6	1. Insert 2. Delete 3. Display	CLO2	4
5	Write programs to implement the following using an array representation.	Week7 and 8	1. Ascending Priority Queue 2. Descending Priority Queue	CLO2	4
6	Practical 1: Write C program	Week	1. Insert	CLO4	4

	that implement the Single Linked list applications	9 and 10 Turn 1	2. Delete 3. Search 4. count 5. reverser 6. sorted linked list 7. Display		
7	Write C program that implement the Double Linked list applications	Week 11 and 12	1. Insert 2. Delete 3. Search 4. Display	CLO4	4
8	Write a C program to implement the following operations on Binary Tree	Week 13 and 14	1. Insert 2. Display	CLO5	4
9.	Write a 'C' Program to Implement BST (Binary Search Tree) and Traverse in In-Order.	Week 15		CLO5	2
Total Hours					30

Learning resources

Textbooks:

1. Mark Allen Weiss, Data Structure and Algorithm Analysis in C++, 2014, 4th Edition, Pearson Education Limited.
2. An Introduction to Data Structures with Applications. by Jean-Paul Tremblay & Paul G. Sorenson Publisher-Tata McGraw Hill.
3. Data Structures using C & C++ -By Ten Baum Publisher – Prenctice-Hall International.

Reference Books:

1. AnanyLevitin, Introduction to design and analysis of algorithm, 2012, 3rd Edition, Addison Wesley.
2. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms,PaperBack, 2010, 3rd Edition, MIT Press.

Online Resources and E-Learning Resources

1. https: and and www.audisankara.ac.in and has and pdf and DATA%20STRUCTURE.pdf

2. https: and and github.com and Rustam-Z and data-structures-and-algorithms and tree and master and lecture%20notes

3. https: and and www.programiz.com and dsa and linked-list

Name of the Program:	MCA	Semester: I	Level: PG
Course Name	**Major Elective-I** Software Testing Tool Using Automation	Course Code and Course Type	PMC105A/MAJE
Course Pattern	2025	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical and Oral
3	-	-	3	3	40	60	-

Prerequisite:

Course Objectives (CO):	**The objectives of:** 1. Understand the fundamentals of software testing and automation. 2. Learn different testing techniques, test case design, and defect tracking. 3. Explore automation tools such as Selenium, JUnit, and TestNG. 4. Apply automation frameworks for efficient software testing. 5. Analyze real-world case studies and applications of test automation.
Course Learning Outcomes (CLO):	**Students will be able to:** 1. Explain the fundamental concepts of software testing and its importance. 2. Compare and analyze various manual and automated testing techniques. 3. Demonstrate proficiency in using automation tools like Selenium, JUnit, and TestNG. 4. Design and implement automation testing frameworks. 5. Evaluate case studies to apply automation testing strategies in real-world scenarios.

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I : Fundamentals of Software Testing		
Introduction to Software Testing: Objectives, principles, and challenges, Software Development Life Cycle (SDLC) and Software Testing Life Cycle (STLC), Testing Levels: Unit, Integration, System, and Acceptance Testing, Types of Testing: Black-box, White-box, and Grey-box Testing, Functional vs. Non-functional Testing, Test case design techniques: Equivalence Partitioning, Boundary Value Analysis, Defect life cycle and test management tools (JIRA, Bugzilla), Introduction to Automated	**CLO 1**	9

Testing: When to Automate?, Overview of Software Testing Tools and Trends.		
UNIT II : Test Automation and Scripting		
Introduction to Test Automation: Benefits and Limitations, Selecting a Test Automation Framework, Overview of Test Automation Tools: Selenium, Appium, JUnit, TestNG, Writing test scripts using Selenium WebDriver, Working with TestNG: Annotations, Assertions, and Reports, Test automation best practices, Challenges in Test Automation and Solutions, Continuous Integration (CI) with Automated Testing, Introduction to Behavior-Driven Development (BDD) using Cucumber.	**CLO 2**	9
UNIT III : Advanced Test Automation Frameworks		
Understanding Test Automation Frameworks: Data-driven, Keyword-driven, and Hybrid, Setting up Selenium with Java/Python, Automating Web Applications with Selenium WebDriver, Working with Page Object Model (POM) for efficient testing, Handling Dynamic Elements and Web Tables, Handling Alerts, Pop-ups, and Multiple Windows, Introduction to API Testing with Postman and Rest Assured, Mobile App Automation using Appium, Parallel Test Execution and Cross-Browser Testing.	**CLO3**	9
UNIT IV : Performance and Security Testing		
Introduction to Performance Testing: Load, Stress, and Scalability Testing, Tools for Performance Testing: JMeter and LoadRunner, Writing and executing performance test cases, Security Testing: Importance and Techniques, Tools for Security Testing: OWASP ZAP and Burp Suite, Penetration Testing and Ethical Hacking Basics, Automating Security Testing in CI/CD Pipelines, Risk-based testing strategies, Real-world case studies in security and performance testing.	**CLO4**	9
UNIT V : Advanced Test Automation Frameworks		
Understanding Test Automation Frameworks: Data-driven, Keyword-driven, and Hybrid, Setting up Selenium with Java/Python, Automating Web Applications with Selenium WebDriver, Working with Page Object Model (POM) for efficient testing, Handling Dynamic Elements and Web Tables, Handling Alerts, Pop-ups, and Multiple Windows, Introduction to API Testing with Postman and Rest Assured, Mobile App Automation using Appium, Parallel Test Execution and Cross-Browser Testing.	**CLO5**	9
Total Hours		45

Learning resources

Textbooks:

1. **Paul C. Jorgensen**, *Software Testing: A Craftsman's Approach*, 4th Edition, CRC Press, 2018.
2. **Gaurav Gupta and Pallavi Sharma**, *Selenium WebDriver 3 Practical Guide*, Packt Publishing, 2018.
3. **Rex Black**, *Advanced Software Testing – Vol. 2: Guide to the ISTQB Advanced Certification as an Advanced Test Manager*, Rocky Nook, 2014.
4. **William Perry**, *Effective Methods for Software Testing*, 3rd Edition, Wiley, 2006.

Reference Books:

1. **Gerard Meszaros**, *xUnit Test Patterns: Refactoring Test Code*, Addison-Wesley, 2007.
2. **Michael Bolton and James Bach**, *Rapid Software Testing*, Context Driven Testing Press, 2015.
3. **Elfriede Dustin**, *Implementing Automated Software Testing: How to Save Time and Lower Costs While Raising Quality*, Addison-Wesley, 2009.

4. **Mark Fewster and Dorothy Graham**, *Software Test Automation: Effective Use of Test Execution Tools*, Addison-Wesley, 1999.

Online Resources and E-Learning Resources:

Online Resources:

1. **Selenium Official Documentation**
   https://www.selenium.dev/documentation/
2. **JUnit Official Guide**
   https://junit.org/
3. **OWASP Security Testing Guide**
   https://owasp.org/www-project-web-security-testing-guide/
4. **Google Testing Blog**
   https://testing.googleblog.com/

E-Learning Resources:

1. **Coursera – Software Testing and Automation** (University of Minnesota)
   - https://www.coursera.org/learn/software-testing
2. **Udemy – Selenium WebDriver with Java**
   - https://www.udemy.com/course/selenium-webdriver-with-java-basics-to-advanced/
3. **edX – Software Testing Fundamentals**
   - https://www.edx.org/course/software-testing
4. **NPTEL – Software Testing**
   - https://nptel.ac.in/courses/106/105/106105150/

Name of the Program:	MCA			**Semester: I**		**Level: PG**	
Course Name	**Major Elective I-** Software Engineering & Project Management			**Course Code and Course Type**		**PMC105B/MAJE**	
Course Pattern	**2025**			**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-	-	3	3	40	60	-
Prerequisite: Basic software engineering concepts							
Course Objectives (CO):				The objectives of the Course are: - 1. To understand fundamental principles and concepts of software engineering. 2. To learn requirement analysis and system design principles. 3. To study the process of Software Project Management for effective project planning. 4. To acquire knowledge of Agile Project Management Framework. 5. To apply Agile tools for software development			

Course Learning Outcomes (CLO):	Students will be able to: 1. Apply concepts, principles of software engineering to develop comprehensive Software Requirement Specification. 2. Use software engineering analysis and design modelling technique to represent systems. 3. Illustrate Software Project Management models for effective plan, manage and enhance projects. 4. Implement Agile methodologies to enhance project adaptability and responsiveness to changing requirements. 5. Employ Agile tools effectively to manage, navigate and facilitate collaboration and streamline project workflows in software development

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I		
Overview of Software Engineering: SDLC models, Requirement Engineering, Types of Requirements: -Functional and Non-functional, Four Phases of Requirement Engineering, Software requirement Specification (SRS), Structure and contents of SRS, IEEE SRS Format Case studies : based on SRS	**CLO 1**	**9**
UNIT II		
System Analysis and Modeling: Object modelling using UML , Use case Model , Class diagrams , Interaction diagrams , Activity diagrams , State chart diagrams , Functional modelling , Data Flow Diagram- CASE TOOLS. Case studies based on diagrams	**CLO 2**	**9**
UNIT III		
Fundamentals of Project Management: Overview of project Management, Project management life cycle-IEEE Life Cycle, Quality Metrics, Risk Management Process, Linear Software Project Cost Estimation, COCOMO-I (Problem Statement), Function Point Analysis (Problem Statement), The SEI Capability Maturity Model CMM, Software Configuration management. Case studies/Numerical Problems based on Risk management, COCOMO-I and FPA	**CLO3**	**9**
UNIT IV:		
Agile Project Management Framework: Introduction and Definition Agile, Agile Project Life Cycle, Agile Manifesto: History of Agile and Agile Principle, Team and roles of an Agile Team: Scrum Master Product Owner, Development Team, Key Agile Concepts: User stories, Story points, Techniques for estimating Story Points, Product Backlog, Sprint Backlog	**CLO4**	**9**
UNIT V		
Implementation with Agile Tools: MS Project Tool, Agile Tools: Open Source, Hands on GitHub, Create Project using Kanban, Project Repositories, Continuous Integration, Project Backlog, Team Management	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Software Engineering by Roger Pressman (6th edition)
2. Object-Oriented Software Engineering: A Use Case Driven Approach by Ivan Jacobson
3. Software Engineering by Sommerville, Pearson,8th Ed
4. Coaching Agile Teams: A Comparison for ScrumMasters, Agile Coaches, and Project Managers in Transition, Lyssa Adkins
5. Agile Project Management: Creating Innovative Products (2nd Edition) by Jim Highsmith, Addison-Wesley Professional

Reference Books:

1. Object Oriented Modeling and Design with UML by James Rumbaugh, MichaelBlaha
2. The Unified Modeling Language user guide by Grady Booch, James Rumbaugh,Ivar Jacobson Mark C. Layton, Steven J. Ostermiller
3. Agile Estimating and Planning by Mike Cohn Robert C Martin Series
4. Agile Project Management with Kanban By Eric Brechner

Online & E-Learning Resources:

1. https://www.mooc-list.com/course/object-oriented-design-coursera
2. https://nptel.ac.in/courses/106101061/
3. https://www.agilealliance.org
4. http://www.pmi.org
5. https://github.com/topics/kanban
6. https://www.opensourcescrum.com/
7. https://www.scrum.org/resources
8. https://www.atlassian.com/agile

Name of the Program:	MCA	**Semester: I**	**Level: PG**
Course Name	**Major Elective I –** Introduction to Cyber Security	**Course Code and Course Type**	**PMC105C/MAJE**
Course Pattern	**2025**	**Version**	1.0

Teaching Scheme				**Assessment Scheme**			
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-	-	3	3	40	60	-

Prerequisite:	
Course Objectives (CO):	The objectives of: 1. To introduce students to the fundamental principles of cyber security and its need in modern computing environments. 2. To provide insights into threats, vulnerabilities, attacks, and mitigation strategies in cyberspace. 3. To explore key security technologies, protocols, and best practices in system and network security. 4. To familiarize students with legal, ethical, and regulatory aspects of cyber security. 5. To equip students with foundational knowledge for pursuing advanced topics or certifications in cyber security.
Course Learning Outcomes (CLO):	Students will be able to: 1. Define and explain core concepts of cyber security, threat models, and security principles. 2. Identify and analyze various types of cyber-attacks and vulnerabilities. 3. Demonstrate understanding of system, application, and network security practices. 4. Explain cyber laws, ethical issues, privacy concerns, and compliance standards. 5. Apply basic cyber security tools and frameworks to secure systems and networks.

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I		
Introduction to Cyber Security: Cyber security concepts and principles, Goals of cyber security (CIA Triad), Types of threats: malware, phishing, social engineering,	**CLO 1**	9

ransomware, Cyber security vs. information security vs. network security, Introduction to security frameworks (NIST, ISO 27001) , Case studies of major cyber attacks		
UNIT II		
Cyber Attacks, Threats and Vulnerabilities: Types of attackers: hackers, insiders, hacktivists, APTs, Attack vectors: email, web, USB, Wi-Fi, cloud, Common vulnerabilities: software bugs, misconfiguration, zero-day, OWASP Top 10, Vulnerability assessment and penetration testing basics, Threat modeling techniques	**CLO 2**	9
UNIT III		
Network, System, and Application Security: Network security fundamentals: firewalls, IDS/IPS, VPN, Secure system configuration and hardening, Patch management, Web and application security: SQL Injection, XSS, Introduction to endpoint and mobile security, Cloud and IoT security challenges	**CLO3**	9
UNIT IV		
Cyber Laws, Ethics, and Compliance: Overview of IT Act 2000 (India) and amendments, Global regulations: GDPR, HIPAA, PCI-DSS, Digital forensics basics, Ethical hacking and responsible disclosure, Cyber-crime investigation procedures, Privacy vs. security debate	**CLO4**	9
UNIT		
Security Tools, Techniques and Best Practices: Security policy and access control, Password policies and multifactor authentication, Antivirus, anti-malware, and endpoint security tools, Basics of cryptography (symmetric/asymmetric, hashing), Incident response and disaster recovery, Introduction to security operations center (SOC)	**CLO5**	9
Total Hours		45

Learning resources

Textbooks:

1. **William Stallings**, *"Computer Security: Principles and Practice"*, Pearson Education.
2. **Mark Ciampa**, *"Security+ Guide to Network Security Fundamentals"*, Cengage Learning.

Reference Books:

1. **Chuck Easttom**, *"Computer Security Fundamentals"*, Pearson.
2. **Dieter Gollmann**, *"Computer Security"*, Wiley.
3. **Michael E. Whitman & Herbert J. Mattord**, *"Principles of Information Security"*, Cengage.

Online Resources and E-Learning Resources

1. **Cybrary** – https://www.cybrary.it
   (Free/paid cyber security courses and labs)
2. **Cisco Networking Academy** – https://www.netacad.com
   (Offers cyber security fundamentals with hands-on practice)
3. **NPTEL Online Course – Introduction to Cyber Security**
   https://nptel.ac.in/courses/106105031
4. **Coursera – Introduction to Cyber Security Specialization (NYU)**
   https://www.coursera.org/specializations/intro-cyber-security

Name of the Program:		MCA		**Semester: I**		**Level: PG**	
Course Name		**Major Elective-I:** Introduction to Data Science		**Course Code and Course Type**		**PMC105D/MAJE**	
Course Pattern		**2025**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-	-	3	3	40	60	
Prerequisite:							
Course Objectives (CO):		The objectives of: 1. To understand need of Data Science 2. To Know role of Statistics in Data Science 3. To know Data Science Models and Tasks 4. To Define Data Science Tasks and Models and Lifecycle 5. To Apply Prep-processing and visualization Techniques					
Course Learning Outcomes (CLO):		Students will be able to: **1**: Understand the foundational concepts of Data Science, including its significance, data types, lifecycle, applications, and the role of data scientists and data sources. **2**: Apply statistical methods to analyze data, including understanding data attributes, measuring central tendency, dispersion, and interpreting various statistical descriptors. **3**: Identify and implement core data science tasks such as classification, prediction, association, and clustering using tools like Python. **4**: Demonstrate data pre-processing techniques including data cleaning, transformation, reduction, and discretization to improve data quality and usability. **5**: Perform exploratory data analysis and utilize basic data visualization tools to communicate insights effectively using graphical representations such as histograms, scatter plots, and box plots.				

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
Introduction:- What and why, Why learn Data Science?, Types of Data -structured, semi-structured, unstructured Data Applications of Data Science, The Data Science Lifecycle, Role of Data Scientists Data sources-Open Data, Social Media Data, Multimodal Data, standard datasets.	**CLO 1**	6
UNIT II		
Statistics for Data Science;- Data Objects and Attributes, Attribute Types: Nominal, Binary, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes, Role of statistics in Data Science Descriptive statistics - Measuring the Frequency, Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion: Range, Standard deviation, Variance, Inter quartile Range	**CLO 2**	6
UNIT III		
Data science Models and Tasks:- Predictive and Descriptive Models, Introduction to Data Science Tasks – Classification, Prediction, Association, Clustering, Performing simple Data Science Tasks using WEKA / R	**CLO3**	6
UNIT IV		
Data Quality and Pre-processing;- Data Quality: Why Preprocess the Data?, Data munging/wrangling operations Data Cleaning - Missing Values, Noisy Data Data Transformation – Rescaling, Normalizing, Data reduction and Data discretization	**CLO4**	6
UNIT V		
Data Visualization:- Introduction to Exploratory Data Analysis (EDA), Data visualization, Basic data visualization tools –Box Plots, Histograms, Bar charts/graphs, Scatter plots, Line charts, Area plots, Pie charts	**CLO5**	6
Total Hours		30

Learning resources

Textbooks:

1. Data Science from Scratch: First Principles with Python By O"Reilly Media, 20153.
2. Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining by Glenn J. Myatt John Wiley Publishers, 2007

Reference Books:

1. Data Science Fundamentals and Practical Approaches, Gypsy Nandi, Rupam Sharma, BPB Publications, 2020. 34
2. Data Mining Concepts and Techniques, Third Edition, Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann, 2012.
3. A Hands-On Introduction to Data Science, Chirag Shah, University of Washington Cambridge University Press

Online Resources and E-Learning Resources

SATISTICS_FOR_DATA_SCIENCE.pdf

1. https://www.programmer-books.com/introducing-data-science-pdf/

2 . https://www.cs.uky.edu/~keen/115/Haltermanpythonbook.pdf
http://math.ecnu.edu.cn/~lfzhou/seminar/[Joel_Grus]_Data_Science_from_Scratch_Fi rst_Princ.pdf

3. . https://www.pdfdrive.com/doing-data-science-d58735039.html

<table>
<tr><td colspan="2">Name of the Program:</td><td colspan="2">MCA</td><td colspan="2">Semester: I</td><td colspan="2">Level: PG</td></tr>
<tr><td colspan="2">Course Name</td><td colspan="2">Probability and Combinatory</td><td colspan="2">Course Code and Course Type</td><td colspan="2">PMC106/BSC</td></tr>
<tr><td colspan="2">Course Pattern</td><td colspan="2">2025</td><td colspan="2">Version</td><td colspan="2">1.0</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td colspan="4">Assessment Scheme</td></tr>
<tr><td>Theory</td><td>Practical</td><td>Tutorial</td><td>Total Credits</td><td>Hours</td><td>CIA (Continuous Internal Assessment)</td><td>ESA (End Semester Assessment)</td><td>Practical and Oral</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>40</td><td>60</td><td>-</td></tr>
<tr><td colspan="8">Prerequisite:</td></tr>
<tr><td colspan="3">Course Objectives (CO):</td><td colspan="5">The objectives of:
1. To introduce students to the fundamental concepts of probability theory and combinatorics.
2. To equip students with the tools needed for solving problems in counting and probability.
3. To develop the understanding of discrete probability distributions and their applications.
4. To enable students to apply combinatorial techniques for counting and problem-solving in various fields.
5. To strengthen the analytical and problem-solving abilities of students in competitive and real-world scenarios.</td></tr>
<tr><td colspan="3">Course Learning Outcomes (CLO):</td><td colspan="5">Students will be able to:
1. Understand the foundational concepts of probability and combinatorics.
2. Apply combinatorial techniques like permutations, combinations, and the pigeonhole principle.
3. Solve problems related to probability, including conditional probability and Bayes' theorem.
4. Work with discrete probability distributions and apply them to real-world problems.
5. Solve complex problems using advanced combinatorial techniques and probability theories.</td></tr>
</table>

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
Fundamentals of Probability: Introduction to probability: Sample space, events, and probabilities, Classical, empirical, and subjective probability, Axioms of probability and basic properties, Conditional probability and independence, Bayes' Theorem and its applications.	**CLO 1**	**9**
UNIT II		
Combinatorial Principles: Permutations and combinations: Basic formulas and applications, The Pigeonhole Principle, Principle of inclusion and exclusion, Binomial coefficients and identities, Counting techniques: Multiplication rule, addition rule, and partitioning.	**CLO 2**	**9**
UNIT III		
Discrete Probability Distributions: Random variables: Discrete vs. continuous random variables, Probability mass function (PMF) and cumulative distribution function (CDF), Discrete distributions: Binomial, Poisson, and geometric distributions, Expectation, variance, and standard deviation of discrete random variables, Applications of discrete distributions.	**CLO3**	**9**
UNIT IV		
Advanced Combinatorics: Advanced counting techniques: Multinomial coefficients and Stirling numbers, Recursion and recurrence relations, Generating functions: Ordinary generating functions and exponential generating functions, Applications in counting paths, graphs, and networks.	**CLO4**	**9**
UNIT V		
Applications of Probability and Combinatorics : Applications of probability in decision-making, games, and risk assessment, Combinatorial optimization problems and their solutions, Probability in queuing theory, reliability, and reliability networks, Case studies: Real-world applications of probability and combinatorics in engineering, computer science, and economics.	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. **Sheldon Ross**, *A First Course in Probability*, 10th Edition, Pearson, 2019.
2. **Ronald Graham, Donald Knuth, and Oren Patashnik**, *Concrete Mathematics: A Foundation for Computer Science*, 2nd Edition, Addison-Wesley, 1994.
3. **Richard Johnsonbaugh**, *Discrete Mathematics*, 8th Edition, Pearson, 2017.
4. **Morris H. DeGroot and Mark J. Schervish**, *Probability and Statistics*, 4th Edition, Pearson, 2012.

Reference Books:

1. **William Feller**, An Introduction to Probability Theory and Its Applications, Vol. 1, 3rd Edition, Wiley, 1968.
2. **Kenneth H. Rosen**, Discrete Mathematics and Its Applications, 7th Edition, McGraw-Hill, 2012.

3. **Michael Mitzenmacher and Eli Upfal**, Probability and Computing: Randomized Algorithms and Probabilistic Analysis, 2nd Edition, Cambridge University Press, 2017.

Online Resources and E-Learning Resources

Online Resources

1. **MIT OpenCourseWare – Probability and Statistics**
   - https://ocw.mit.edu/courses/mathematics/18-05-introduction-to-probability-and-statistics-spring-2014/
2. **Stanford Online – Introduction to Probability and Statistics**
   - https://online.stanford.edu/courses/sohs-ystats-statistics
3. **Khan Academy – Probability and Statistics**
   - https://www.khanacademy.org/math/statistics-probability

E-Learning Resources

1. **Coursera – Probability and Combinatorics Courses**
   - https://www.coursera.org/courses?query=probability%20and%20combinatorics
2. **edX – Probability for Data Science**
   - https://www.edx.org/course/probability

3. **NPTEL (National Programme on Technology Enhanced Learning) – Probability and Combinatorics**
   - https://nptel.ac.in/courses/111/106/111106112/

<table>
<tr><td colspan="8">COURSE CURRICULUM</td></tr>
<tr><td colspan="2">Name of the Program:</td><td colspan="2">MCA</td><td colspan="2">Semester: I</td><td colspan="2">Level: PG</td></tr>
<tr><td colspan="2">Course Name</td><td colspan="2">Advanced Database Management System</td><td colspan="2">Course Code and Course Type</td><td colspan="2">PMC107</td></tr>
<tr><td colspan="2">Course Pattern</td><td colspan="2">2025</td><td colspan="2">Version</td><td colspan="2">1.0</td></tr>
<tr><td colspan="5">Teaching Scheme</td><td colspan="3">Assessment Scheme</td></tr>
<tr><td>Theory</td><td>Practical</td><td>Tutorial</td><td>Total Credits</td><td>Hours</td><td>CIA (Continuous Internal Assessment)</td><td>ESA (End Semester Assessment)</td><td>Practical and Oral</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>2</td><td>2</td><td>20</td><td>30</td><td>-</td></tr>
<tr><td colspan="8">Prerequisite: Fundamentals of Database.</td></tr>
<tr><td colspan="3">Course Objectives (CO):</td><td colspan="5">The objectives of Advanced Database Management System: -
1. To introduce the fundamentals of database systems and explore their purpose, architecture, and essential components.
2. To provide in-depth understanding of the Entity-Relationship (ER) Model and its role in designing robust and efficient databases.
3. To enable students to construct, query, and manage databases using SQL and its diverse features for real-world applications.
4. To educate students on transaction management and concurrency control techniques to ensure database integrity and performance.
5. To familiarize students with data mining concepts and techniques, including the Knowledge Discovery in Databases (KDD) process and decision-making models.</td></tr>
<tr><td colspan="3">Course Learning Outcomes (CLO):</td><td colspan="5">Students will be able to:
1. Explain database architecture, components, and data modelling concepts to solve database-related challenges.
2. Design and reduce complex ER diagrams into relational schemas, incorporating specialized database modelling techniques.
3. Create, manage, and query databases while applying constraints and optimization techniques.
4. Evaluate and implement transaction management and concurrency control techniques to ensure reliable database operations.
5. Apply fundamental data mining algorithms, such as Apriori and Decision Tree, to analyze datasets and extract valuable insights.</td></tr>
</table>

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
INTRODUCTION: Database system applications, Purpose of Database Systems, Database System Concepts (Data Models, Schema, instances, views), Approaches to building a database systems, Database System architecture and its components, data independence, classification of DBMS, Challenges in building a DBMS, Role of DBA.	**CLO1**	**6**
UNIT II		
DATABASE MODELS: Entity Relationship Model (ER Model): Basic concepts, Entities (Entity types, Entity sets, attributes, keys), Relations(Relationship types, relationship set, roles, structural constraints), Design process, ER diagrams, Design issues, weak entity sets, extended ER features –generalization, specialization, inheritance, aggregation, design of ER Database schema, reduction of ER database schema to tables, Object oriented data models. Introduction to Relational Algebra, Case based on ER.	**CLO 2**	**6**
UNIT III		
SQL QUERY: Basics of SQL, DDL, DML, DCL, structure creation, alteration, defining constraints, Primary key, foreign key, unique, not null, check, IN operator, Functions -aggregate functions, Built-in functions numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, View and its types. Transaction control commands, Commit, Rollback, Save point.	**CLO3**	**6**
UNIT IV		
TRANSACTION MANAGEMENT & CONCURRENCY CONTROL: Transaction: Transaction processing concepts, schedule, properties of transactions, serializability, characterizing schedules based on recoverability and serializability, Concurrency control: Problems of Concurrent transactions execution and need of concurrency control, Lock based protocols, Deadlock Handling(Deadlock prevention, Detection and Recovery)	**CLO4**	**6**
UNIT V		
DATA MINING: Introduction to data mining, Knowledge discovery- KDD process, Association rule mining: support and confidence and frequent item sets, market basket analysis, Apriori algorithm, Associative classification - Rule Mining, Decision Tree-based algorithms	**CLO5**	**6**
Total Hours		**30**

Learning Resources

TEXT BOOKS:

1. Raghurama Krishnan, Johannes Gehrke ,Data base Management Systems, 3rd Edition, 2014, Mc Graw Hill Education,
2. A.Silberschatz, H.F. Korth, S.Sudarshan, Data base System Concepts, VI edition, 2006, McGraw Hill,
3. Ivan Bayross "SQL, PL/SQL : The programming language of Oracle", BPB Publications.

REFERENCE BOOKS:

1. Peter Rob, Carlos Coronel, Database System Concepts, 5th Edition, 2015, Cengage Learning

2. Ashima Bhatnagar Bhatia, Vaibhav Bansal, Database Management System, First Edition 2015, Narosa Publishing House Pvt. Ltd
3. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, 2018, Pearson India Education Services Pvt. Ltd.

Online Resources

https://www.scaler.com/topics/course/dbms/

https://www.coursera.org/courses?query=database%20management

https://www.placementpreparation.io/blog/best-websites-to-learn-dbms/

E-Learning Resources

https://db.grussell.org/section002.html

https://www.youtube.com/watch?v=4cWkVbC2bNE

Name of the Program:	**MCA**			**Semester:** I		**Level: PG**	
Course Name	**Organizational Behaviour**			**Course Code and Course Type**		PMC108	
Course Pattern	**2025**			**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
2	-		2	30	20	30	-
Prerequisite: Basic understanding of management principles and human psychology in workplace settings.							
Course Objectives (CO):	The objectives of organizational behaviour are: 1. To recall the fundamental concepts and theories of organizational behaviour. 2. To recognize the knowledge of organizational behaviour to analyse real-world organizational challenges. 3. To apply critical thinking and problem-solving skills to address organizational behaviour issues. 4. To Enhance communication and interpersonal skills for effective organizational interactions 5. To analyse and recognize the importance of ethics and social responsibility in organizational behaviour.						

Course Learning Outcomes (CLO):	Students will be able to: 1. Identify the different levels of analysis in organizational behaviour. 2. Apply the different factors that influence organizational climate and culture. 3. Understand the use of different concepts of organizational behaviour to solve problems in organizations. 4. Analyse the different factors that contribute to organizational effectiveness. 5. Create a new organizational culture that is more supportive of employee engagement to evaluate the effectiveness of different organizational behaviour interventions

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I		
Introduction to Organizational Behaviour: Definition, Importance, and Scope of Organizational Behaviour, Role of OB in IT organizations, Evolution of Organizational Behaviour, Multidisciplinary nature of OB (psychology, sociology, anthropology, etc. Challenges in OB - Globalization, workforce diversity, Ethical issues and managing change in IT organizations, Role of Managers in OB	**CLO 1**	6
UNIT II		
Individual Behaviour and Motivation: Personality and Attitude - Personality traits and their influence on work performance, Attitudes and Job Satisfaction, Learning Theories: Classical and Operant Conditioning, Motivation Theories and Applications - Content theories: Maslow, Herzberg, McClelland, Process theories: Vroom's Expectancy Theory, Equity Theory	**CLO 2**	6
UNIT III		
Group Dynamics and Teamwork: Groups in Organizations - Definition, types, and stages of group formation (Tuckman's model), Groupthink and group decision-making, Team Dynamics - Characteristics of high-performing teams, Role of teams in agile and scrum methodologies in IT project, Conflict and Negotiation - Conflict types, sources, and resolution strategies, Negotiation skills for IT professionals	**CLO3**	6
UNIT IV		
Leadership and Organizational Communication: Leadership Theories - Trait theory, Behavioural theory, and Contingency theories (Fiedler's model, Situational Leadership), Transformational vs. Transactional Leadership, Leadership in IT organizations - Role of leadership in managing tech teams and fostering innovation, Organizational Communication - Types: Formal and informal communication, Barriers to effective communication and how to overcome them	**CLO4**	6
UNIT V		
Organizational Culture, Change, and Development: Organizational Culture: Definition, Elements, and Importance, Role of culture in IT companies: Innovation,	**CLO5**	6

collaboration, and adaptability, Organizational Change: Process, Resistance, and Change Management Strategies managing resistance to change in IT environments, Emerging Trends in OB - Role of AI and data analytics in organizational behaviour, Remote work dynamics and managing hybrid teams		
Total Hours		30

Learning resources

Textbooks:

1. Stephen P. Robbins and Timothy A. Judge - Organizational Behaviour
2. Fred Luthans - Organizational Behaviour: An Evidence-Based Approach
3. L.M. Prasad (2020), Principles and Practice of Management, 20th Edition, Sultan Chand & Sons, New Delhi.

Reference Books:

1. .Harold Koontz, Heinz Weihrich, Mark V. Camnice (2020), Essentials of Management - An International, Innovation and Leadership Perspective, 11th Edition.
2. Udai Pareek and Sushama Khanna (2018), Understanding Organizational Behaviour (4th Edition), Oxford Publishing,

Online Resources and E-Learning Resources

1. https://www.slideshare.net/slideshow/organisational-behavior-15668552/15668552
2. 2. https: and and www.geektonight.com and organisational-behaviour-notes-pdf and - Search
3. MBA Study Notes | MBA FAQs | Career Counsellor & MBA Articles

COURSE CURRICULUM:-

Name of the Program:		**Foreign Language**		**Semester : I**		**Level: PG**	
Course Name		**German A1.1**		**Course Code and Course Type**		PFL201A /AEC	
Course Pattern		**2025**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
2	-	-	-	2	20	30	-
Prerequisite:							
Course Objectives (CO):		The objectives of (German A1.1) are: 1. To remember new words and their spellings. 2. To understand the new concepts. 3. To apply the basic vocab and grammar concepts. 4. To understand the German text. 5. To create basic sentences in German.					
Course Learning Outcomes (CLO):		Students will be able to: 1. Spell simple words in German 2. Can understand everyday expressions. 3. Able to frame simple sentences in German language. 4. Can introduce themselves and others. 5. Can answer questions about themselves.					

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I		
Guten Tag : Speak about yourself and others, Speak about Countries and Languages, Grammar – Sentence formation and verbs usage	**CLO 1**	**6**
UNIT II		
Freunde, Kollegen und Ich :-Speak about your Hobbys, To fix a meeting, Speak about work and Profession, To creat a profile on Internet Grammar – How to use 'The' in german, Singular and plural forms of Nouns	**CLO 2**	**6**
UNIT III		
In der Stadt:-To get to know about Cities and Places, how to find way and	**CLO3**	**6**

understand directions, learn international words Grammar – Negations (how to use NO in german), Definite articles, indefinite articles		
UNIT IV		
Guten Appetit:- To speak about food and food habits, to have a discussion about shopping Grammar – introduction of cases	**CLO4**	**6**
UNIT V		
Tag für Tag & Zeit mit Freunden Clock timings, To speak about family and friends, Daily routine To speak about free time activity, to understand the specific information from the text, to order and to pay in a restaurant , Grammar – Possessivarticle, Modalverbs, use of on,at,from…till, Seprable verbs and past tence	**CLO5**	**6**
Total Hours		**30**

Learning resources

Textbooks:

1. Netzwerk A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.
2. Studio d A1, Cornelesen Verlag & Goyal Publishers & Distributors Pvt. Ltd.
3. Netzwerk Neu A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd

Reference Books:

1. Hallo Deutsch A1,Ernst Klett Verlag, Goyal Publishers & Distributors Pvt. Ltd
2. Themen Aktuell 1, Hueber verlag
3. Maximal Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.

Online Resources and E-Learning Resources:

1. https: and and youtube.com and @LearnGermanwithAnja?si=BkJYDPi7TS0fT4lr
2. https: and and youtube.com and @deutschlernenmitheidi?si=TkICIabzioaU0roZ
3. instagram.com and learngermanwithanja

COURSE CURRICULUM:-

Name of the Program:	**MCA**			**Semester : I**		**Level: PG**	
Course Name	Basic Japanese language skill			**Course Code and Course Type**		**PFL201B/ AEC**	
Course Pattern	**2025**			**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
2	--	--	2	30	50	--	--
Prerequisite: Desire to get acquainted with the Japanese language.							
Course Objectives (CO):	The objectives of Basic Japanese language skill are: 1. To meet the needs of an ever growing industry, with respect to language support. 2. To get introduced to Japanese society and culture through language. 3. To acquire a competitive edge in career choices. 4. To participate effectively & responsibly in a multicultural world. 5. To enable learners to communicate effectively in the Japanese language.						
Course Learning Outcomes (CLO):	After learning the course, the to: 1. Read and Write Hiragana script. 2. Write and Speak basic sentences. 3. Comprehend and speak about time, hobbies, likes and dislikes. 4. Write basic kanji. 5. Use the Hiragana script in discussion.						

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I		
Introduction to Japanese Language – Introduction of script, culture, History of script ,Speaking : Self introduction, listening : short video skit on self-introduction	**CLO 1**	**6**
UNIT II		
Introduction of Hiragana Script - Writing : Hiragana script, Speak : Basic sentences, General vocabulary : Months , Days of the week ,Basic numbers, colours	**CLO 2**	**6**

UNIT III		
Basic Sentence formation -Basic sentence structure : Affirmative and Negative , General vocabulary: about family,	**CLO 3**	**6**
UNIT IV		
Time and verbs – Speaking : Talking about routine, Writing: routine using verbs and time, reading : A clock	**CLO 4**	**6**
UNIT V		
Introduction of Katakana and basic kanji –Reading : English words, country names Writing : Basic Kanji	**CLO 5**	**6**
Total Hours		**30**

Learning resources

Textbook:

1. Minna no Nihongo , " Japanese for everyone" ,Elementary Main Textbook , Goyal Publishers & Distributors Pvt. Ltd.

Reference books:

1. **Shyoho Volume 1.**
2. **Genki Japan**
3. **Haru Vol. 1 & 2**

Online Resources and E-Learning Resources:

https: and and www.youtube.com and watch?v=shdlEapDsP4

https: and and youtu.be and K-nw5EUxDz0?feature=shared

https: and and youtu.be and o9sP-vaCEa0?si=l8yOvVKaItBQWXNu

https: and and youtu.be and JnoZE51WZg4?si=9uq68USOz5plBk2n

https: and and youtu.be and shdlEapDsP4?si=tC6RGaMtwDJgVu2d

https: and and youtu.be and 9paXgC2U8L0?si=btS1G4mvrkG5C9zi

1. **Apps**

A) **Learn Japanese - Hiragana APP available on Google play.**
Hiragana Pro

MCA 2025 PATTERN

COURSE DETAILS

Semester - II

COURSE CURRICULUM

<table>
<tr><td colspan="2">Name of the Program:</td><td colspan="2">MCA</td><td colspan="2">Semester: II</td><td colspan="2">Level: PG</td></tr>
<tr><td colspan="2">Course Name</td><td colspan="2">Java Programming</td><td colspan="2">Course Code and Course Type</td><td colspan="2">PMC111/ MAJM</td></tr>
<tr><td colspan="2">Course Pattern</td><td colspan="2">2025</td><td colspan="2">Version</td><td colspan="2">1.0</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td colspan="4">Assessment Scheme</td></tr>
<tr><td>Theory</td><td>Practical</td><td>Tutorial</td><td>Total Credits</td><td>Hours</td><td>CIA
(Continuous Internal Assessment)</td><td>ESA (End Semester Assessment)</td><td>Practical and Oral</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>40</td><td>60</td><td>-</td></tr>
<tr><td colspan="8">Prerequisite: Principles of object-oriented programming and its concepts.</td></tr>
<tr><td colspan="3">Course Objectives (CO):</td><td colspan="5">The objectives of Java Programming are:
1. To Understand Core Concepts of Object-Oriented Programming (OOP)
2. To Gain Proficiency in Java Syntax and Semantics
3. To Develop Application-Oriented Skills Using Java APIs
4. To Enhance Problem-Solving and Debugging Skills
5. To Promote Software Development Best Practices</td></tr>
<tr><td colspan="3">Course Learning Outcomes (CLO):</td><td colspan="5">Students will be able to:
1. Describe the fundamental principles of object-oriented programming and core Java syntax. Apply object-oriented concepts such as encapsulation, inheritance, and polymorphism to solve real-world problems in Java.
2. Develop Java applications using classes, interfaces, exception handling, and basic input/output operations.
3. Implement multithreaded programs and perform file handling and database connectivity using JDBC.
4. Analyze and debug Java programs to improve functionality and performance using appropriate tools and techniques.</td></tr>
</table>

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
Introduction to Java and OOP Concepts: History and features of Java, Java platform and Java Virtual Machine (JVM), Structure of a Java program, Data types, variables, operators, and control structures, Object-Oriented Programming concepts: Class, Object, Encapsulation, Abstraction, Inheritance, and Polymorphism	**CLO 1**	**9**
UNIT II		
Java Classes, Methods, and Constructors: Defining classes and creating objects, Constructors and method overloading, Static members, `this` keyword, Access specifiers and packages, Wrapper classes and autoboxing	**CLO 2**	**9**
UNIT III		
Inheritance, Interfaces, and Exception Handling: Single and multilevel inheritance, `super` and `final` keywords, Abstract classes and interfaces, Exception types, Try-catch-finally blocks, throw, throws, Custom exceptions	**CLO 3**	**9**
UNIT IV		
Multithreading and File Handling: Creating and managing threads, Thread lifecycle and synchronization, Inter-thread communication, Java I/O classes (FileInputStream, FileOutputStream, BufferedReader, etc.) , Reading and writing files, Serialization and deserialization	**CLO 4**	**9**
UNIT V		
Java Collections Framework and JDBC: Collection interfaces: List, Set, Map Classes: ArrayList, HashSet, TreeSet, HashMap, etc. Iterators and Generics, JDBC architecture Connecting to databases Executing queries and handling results.	**CLO 5**	**9**
Total Hours		**45**

Learning resources

TEXT BOOKS:

1. Herbert Schildt, "Java the complete reference", 9th edition, McGraw Hill, Education, 2014.
2. T. Budd, "Understanding Object-Oriented Programming with Java", updated edition, Pearson Education, 2000.

REFERENCE BOOKS:

1. J. Nino and F.A. Hosch,"An Introduction to programming and OO design using Java", 3rd edition, John Wiley & sons, 2008
2. P. Radha Krishna,"Object Oriented Programming through Java", 1st edition, Universities Press, 2007.
3. R. A. Johnson,"Java Programming and Object oriented Application Development", 1st edition, Cengage Learning, 2006.

Online Resources and E-Learning Resources

1.https: and and www.freecodecamp.org and news and object-oriented-programming-concepts-java and

2.https: and and www.w3schools.com and java and java_oop.asp

3.https: and and www.minds.co.za and wp-content and uploads and 2019 and 06 and object-oriented-programming-using-java.pdf

COURSE CURRICULUM

Name of the Program	**MCA**	**Semester : II**	**Level: PG**
Course Name	**Java Programming Lab**	**Course Code and Course Type**	**PMC112/MAJM**
Course Pattern	**2025**	**Version**	1.0

Teaching Scheme				**Assessment Scheme**			
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
-	1	-	1	2	25	-	25

Prerequisite: Student should learn at least one programming language, such as C++, Java, or Python

Course Objectives (CO):	The objectives of JAVA Programming are: 1. To recall and monitor object-oriented concepts such as data abstraction, encapsulation, inheritance, dynamic binding, and polymorphism. 2. To recognize inheritance and packages in program design. 3. To analyse programming insight using OOP constructs. 4. To explain advanced programming by using a collection framework. 5. To demonstrate Database connectivity.
Course Learning Outcomes (CLO):	Students will be able to: 1. Define different concepts of oops and java 2. Apply the knowledge of design, develop, test, document and debug Java programs using object-oriented principles 3. Define understand inheritance with developing interfaces and packages 4. Implement exception handling and multithreading and their applications in real-world problems. 5. Develop a connection framework and develop GUI programs using swing.

Practical Plan

Practical No.	Practical Title	Week No and Turn 1	Details	CLO	Hours
1	Program to define a structure of a basic JAVA program	Week 1 and Turn 1	Write a Java program to demonstrate input, output, conditional statements, and loops.	CLO1, CLO2	2
5	Program to define class and constructors. Demonstrate constructors	Week2 and 3	Create a class Student with fields and methods. Instantiate objects and access methods. And similar type of examples	CLO 2	2
6	Constructors and Method Overloading	Week4	Implement constructor overloading and method overloading in a custom class.	CLO2	2
7	Static Members and Wrapper Classes	Week5	Demonstrate static variables, static methods, and wrapper classes with autoboxing/unboxing.	CLO1, CLO 3	2
8	Inheritance and super Keyword	Week6	Develop a Java program that uses multilevel inheritance and the super keyword.	CLO3	2
9	Abstract Classes and Interfaces	Week 7	Write programs to implement an abstract class Shape and interface Drawable.	CLO3	2
			Example on interfaces	CLO3	2
10	Exception Handling	Week8	Implement a Java program using try-catch-finally, throw, and throws.	CLO2	2
			Examples on the same		
11	Multithreading	Week9	Create multiple threads using Thread class and Runnable interface.	CLO3	2
12	File Handling	Week10	Read from and write to text files using FileReader, BufferedReader, FileWriter.	CLO4	2

13	Serialization and Deserialization	Week 11and 12	Serialize an object to a file and deserialize it back.	CLO4	4
14	Java Collections Framework	Week 13 and 14	Demonstrate the use of ArrayList, HashSet, HashMap, and iterators.	CLO5	3
15	Connecting Java with MySQL	Week 15 and 16	Connecting Java with MySQL	CLO5	3
Total Hours					**30**

Learning resources

TEXTBOOKS:

1. Herbert Schildt, "Java the complete reference", 9th edition, McGraw Hill, Education, 2014.
2. T. Budd, "Understanding Object-Oriented Programming with Java", updated edition, Pearson Education, 2000.

REFERENCE BOOKS:

1. J. Nino and F.A. Hosch,"An Introduction to programming and OO design using Java", 3rd edition, John Wiley & sons, 2008
2. P. Radha Krishna,"Object Oriented Programming through Java", 1st edition, Universities Press, 2007.
3. R. A. Johnson,"Java Programming and Object oriented Application Development", 1st edition, Cengage Learning, 2006.

Online Resources and E-Learning Resources

1.https: and and www.freecodecamp.org and news and object-oriented-programming-concepts-java and

2.https: and and www.w3schools.com and java and java_oop.asp

3.https: and and www.minds.co.za and wp-content and uploads and 2019 and 06 and object-oriented-programming-using-java.pdf

Name of the Program:	MCA	**Semester: II**	**Level: PG**
Course Name	Web Design & Development	**Course Code and Course Type**	**PMC113/MAJM**
Course Pattern	**2025**	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-	-	3	3	40	60	-

Prerequisite: Basic Knowledge of the Internet & Web Technologies

Course Objectives (CO):	The objectives of: 1. Understand web technologies and web development fundamentals. 2. Design responsive web pages using HTML, CSS, and Bootstrap. 3. Implement interactive features using JavaScript and jQuery. 4. Develop dynamic websites using server-side scripting and databases. 5. Apply web security, optimization, and deployment techniques.
Course Learning Outcomes (CLO):	Students will be able to: 1. Understand the core concepts of web development, including web technologies, client-server architecture, and web hosting. 2. Design and develop structured, responsive, and visually appealing web pages using HTML, CSS, and Bootstrap. 3. Implement interactive and dynamic features in web applications using JavaScript, jQuery, and AJAX. 4. Develop full-stack web applications with server-side scripting, database integration, and authentication mechanisms. 5. Apply security best practices, optimize website performance, and deploy web applications using modern hosting services.

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
Basics of Web Development: Introduction to the Internet and Web Development, Web Browsers, Servers, and HTTP Protocol, Client-Server Architecture and Types of Websites, Overview of Frontend and Backend Development, Web Hosting, Domain Names, and Hosting Platforms, Introduction to Web Development Tools (VS Code, GitHub, DevTools), Understanding APIs and RESTful Services, Basics of UI/UX Design for Websites, Hands-on: Creating a Basic Web Page	**CLO 1**	**9**
UNIT II		
HTML, CSS, and Bootstrap: HTML5 Basics: Elements, Forms, Tables, and Media, CSS3 Basics: Selectors, Box Model, Colors, and Fonts,CSS Layout: Flexbox and Grid System, Introduction to Responsive Design with Media Queries, Introduction to Bootstrap and Its Components, Forms and Validation Using Bootstrap,Creating Navigation Bars and Layouts with Bootstrap, Hands-on: Designing a Portfolio Website, Assignment: Build a Responsive Web Page	**CLO 2**	**9**
UNIT III		
JavaScript & Front-End Development: JavaScript Basics: Variables, Data Types, and Functions, DOM Manipulation and Event Handling, JavaScript Form Validation and Local Storage, Introduction to jQuery and AJAX for Dynamic Updates, Introduction to ES6: Arrow Functions, Promises, and Modules, Basics of Frontend Frameworks (React.js Overview), Hands-on: Creating an Interactive Web Page, Hands-on: Implementing AJAX in a Web Page, Assignment: Build a Simple Interactive Website	**CLO3**	
UNIT IV		
Server-Side Scripting & Database: Introduction to Server-Side Scripting (PHP & Node.js), Handling Form Data with PHP (React.js)and Express.js, Introduction to Databases: MySQL and MongoDB, CRUD Operations with MySQL & MongoDB, Session Management and Cookies in Web Applications, Authentication & Authorization (Login System), Hands-on: Creating a Dynamic Blog with a Database, RESTful API Development with Node.js, Assignment: Build a Web Application with Database Integration	**CLO4**	**9**
UNIT V		
Web Security, Optimization & Deployment: Web Security Basics: SQL Injection, XSS, CSRF Protection, Secure Authentication and Data Encryption Techniques, Performance Optimization: Minification, Caching, Lazy Loading, Introduction to Web Hosting and Deployment, Deploying Websites Using GitHub Pages, Netlify, and Firebase, Introduction to Docker and Cloud Hosting, Hands-on: Deploying a Web Application, Case Study: Common Web Attacks and Prevention, Assignment: Secure and Deploy a Web Project	**CLO5**	**9**
Total Hours		**45**

Learning resources
Textbooks:

Text Books:

1. "HTML & CSS: Design and Build Websites" – Jon Duckett, ISBN-9781118008188.
2. "JavaScript and jQuery: Interactive Front-End Web Development" – Jon Duckett, ISBN-9781118531648.

Reference Books:

1. "Eloquent JavaScript" – Marijn Haverbeke, ISBN-9781593279509.
2. "Learning PHP, MySQL & JavaScript" – Robin Nixon, ISBN-9781491918661.

Online Resources/E-Learning Resources:

1. https://developer.mozilla.org
2. https://www.w3schools.com
3. https://javascript.info
4. https://www.php.net
5. https://owasp.org

Name of the Program:	MCA			**Semester: II**		**Level: PG**	
Course Name	Web Design & Development Lab			**Course Code and Course Type**		**PMC114/MAJM**	
Course Pattern	**2025**			**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
-	1	-	2	2	25	-	25
Prerequisite: Basic knowledge of HTML, CSS, and programming logic.							
Course Objectives (CO):				The objectives of: 1. To introduce fundamental concepts of web design and development. 2. To apply front-end development techniques for creating structured and responsive web pages. 3. To implement interactive web features using JavaScript and AJAX. 4. To understand backend development using PHP/Node.js and databases. 5. To apply security measures and optimize web applications.			

Course Learning Outcomes (CLO):	Students will be able to: 1. Develop structured and well-designed web pages using HTML and CSS. 2. Implement dynamic and interactive content using JavaScript and jQuery. 3. Build database-driven web applications using PHP/Node.js and MySQL/MongoDB. 4. Apply best practices for security, performance optimization, and deployment. 5. Develop a full-stack web application integrating front-end and back-end technologies.

Practical No	Practical Title	Week	Details	CLO	Hours
1	Introduction to Web Technologies & Development Setup	Week 1	Install VS Code, GitHub, XAMPP/Node.js, and create a basic HTML page.	CLO1	2
2	Creating a Simple Web Page using HTML5	Week 2	Design a personal portfolio page with HTML elements.	CLO1	2
3	Styling Web Pages with CSS (Flexbox & Grid)	Week 3	Create a responsive blog layout using CSS.	CLO1	2
4	Implementing Bootstrap for Responsive Design	Week 4	Develop a landing page using Bootstrap framework.	CLO1	2
5	Implementing Forms & Validations using JavaScript	Week 5	Create a form with JavaScript-based validation (email, phone, etc.).	CLO2	2
6	JavaScript DOM Manipulation & Event Handling	Week 6	Develop a to-do list with add/remove functionality.	CLO2	2

7	AJAX & jQuery for Dynamic Content Update	Week 7	Fetch API data and dynamically display it on a webpage.	CLO2	2
8	Introduction to Backend (PHP/Node.js)	Week 8	Create a simple dynamic webpage using PHP or Node.js.	CLO3	2
9	Database Connectivity with MySQL/MongoDB	Week 9	Develop a contact form storing submissions in a database.	CLO3	2
10	User Authentication System (Login & Registration)	Week 10	Implement login/register functionality using PHP/Node.js.	CLO3	2
11	RESTful API Development	Week 11	Build an API for a simple blog application.	CLO3	2
12	Web Security Implementation	Week 12	Implement measures against SQL Injection & XSS attacks.	CLO4	2
13	Website Performance Optimization	Week 13	Optimize web assets like images, CSS, and JavaScript.	CLO4	2
14	Web Application Deployment	Week 14	Deploy a project on GitHub Pages, Netlify, or Firebase.	CLO4	2
15	Capstone Project - Full-Stack Web Development	Week 15	Build a complete web application integrating all concepts.	CLO5	2

Learning Resources

Text Books:

1. "HTML & CSS: Design and Build Websites" – Jon Duckett, ISBN-9781118008188.
2. "JavaScript and jQuery: Interactive Front-End Web Development" – Jon Duckett, ISBN-9781118531648.

Reference Books:

1. "Eloquent JavaScript" – Marijn Haverbeke, ISBN-9781593279509.
2. "Learning PHP, MySQL & JavaScript" – Robin Nixon, ISBN-9781491918661.

Online Resources/E-Learning Resources:

1. MDN Web Docs – https://developer.mozilla.org
2. W3Schools – https://www.w3schools.com
3. JavaScript.info – https://javascript.info
4. PHP Official Documentation – https://www.php.net
5. Node.js Official Docs – https://nodejs.org/en/docs/

Name of the Program:	**MCA**			**Semester: II**		**Level: PG**	
Course Name	**Major Elective II-** Data Communication and Computer Networks			**Course Code and Course Type**		**PMC115A/MAJE**	
Course Pattern	**2025**			**Version**		**1.0**	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	**-**	**-**	**3**	**3**	**40**	**60**	**-**
Prerequisite: Fundamental knowledge of Networking							

Course Objectives (CO):	The objectives of Data Communication and Networks are: 1. To Understand the Fundamentals of Networking and Communication Systems. 2. To Analyze Link Layer Communication Mechanisms. 3. To Explain the Principles of Protocol Layering and Network Models. 4. To Apply IP Addressing and Routing Concepts in Networking. 5. To Evaluate Network Applications and Security Mechanisms.
Course Learning Outcomes (CLO):	Students will be able to: 1. The basic concepts of computer communication signal types, transmission media. 2. Describe and evaluate link layer functionalities including framing, error detection and correction techniques. 3. Understand and differentiate between the OSI and TCP/IP models, and identify the protocols functioning at various layers. 4. Analyze IP addressing schemes, sub-netting, and

	routing protocols such as RIP, OSPF. 5. Describe the working of network applications like HTTP, FTP, DNS, email protocols, and understand network security fundamentals including cryptographic technique.

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
Data Communication and Networking: What is a computer communication, Signal and Data, Network Criteria, Transmission Media: a) Guided Media: Twisted Pair, Coaxial & Fiber-optic, Cables b) Unguided Media: Radio, VHF, Micro Waves and Satellite, Various types of Networks-LAN, MAN, WAN, Various Topologies: Bus, Star, Ring, Mesh, Multiplexing: FDM, TDM, CDM and WDM, Network Devices, Connection Oriented N/Ws Vs Connectionless N/Ws, Ethernet- Ethernet standards ZigBee, WiFi	**CLO 1**	**9**
UNIT II		
Link Layer Communication: Data Link Layer: Design Issues - Error Detection and Correction. Access Techniques-CSMA/CD, CSMA/ CA, Error detection and correction techniques, 2 Framing and its types, Flow Control: Stop & wait, sliding window concept, Error control, HDLC protocol, P2P Protocol, MAC addressing frame format.	**CLO 2**	**9**
UNIT III		
Principle of Layering Concept: Protocol layering, Need for layering, ISO/OSI Reference Model, Protocols in OSI Layer, TCP/IP Model, TCP/IP Protocols, OSI Vs TCP/IP Comparative Study	**CLO3**	**9**
UNIT IV		
IP Addressing & Routing: Design issues in Network Layer, Internet Protocol, IP packet format, Addressing, Physical Addresses, Logical Addresses, Port Addresses, Specific Addresses, IP addresses – Network Part and Host Part, Network Masks, Network Addresses, Broadcast addresses, Address Classes, Loop back Address, DHCP, Routing: Types of routing protocol, Border Gateway Protocol (BGP), Routing Information Protocol (RIP), Open Shortest Path First (OSPF), IP Routing Concepts, Routing Tables, Port Numbers, IPV6: The next generation Protocol, IPv4 Vs IPv6	**CLO4**	**9**
UNIT V		
Network Applications and Security: Hyper Text Transfer Protocol (HTTP), HTTP Request, Request Headers, Responses, Status Code, Error Status Code, Email-Addressing, Message Structure, MIME–Multipurpose Internet Mail Extensions, SMTP–Simple Mail Transfer Protocol, POP3 – Post Office Protocol, IMAP – Internet Message Access Protocol, FTP – File Transfer Protocol, DNS-Domain Name Server, Proxy Server, Static and Dynamic web pages, Introduction to Security, Threat: Active attack, Passive Attack, Cryptography, Symmetric and Asymmetric key Cryptography, Digital Signature, IPSec, SSL, TLS.	**CLO5**	**9**

Total Hours		**45**

Learning resources

Textbooks:

1. A. S. Tanenbaum, "Computer Networks", Prentice-Hall of India 2008, 4th Edition3.

Reference Books:

1. RENCE BOOKS: 1. Stallings, "Data and Computer Communications", Pearson Education 2012, 7th Edition.
2. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill 2007, 4th Edition.
3. F. Halsall, "Data Communications, Computer Networks and Open Systems", Pearson Education 2008.

Online Resources and E-Learning Resources

1. https: nptel.ac.in and courses and 106106091
2. https: www.geeksforgeeks.org and last-minute-notes-computer-network and
3. https: kanchiuniv.ac.in

Name of the Program:	MCA	**Semester: I**	**Level: PG**
Course Name	**Major Elective II-** Introduction to IOT	**Course Code and Course Type**	**PMC115B/MAJE**
Course Pattern	**2025**	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-	-	3	3	40	60	-

Prerequisite: Basic Electronics Engineering is essential

Course Objectives (CO):	The objectives of the Course are: - 1. To study fundamental concepts of IoT 2. To study roles of sensors, actuators and development boards in IoT 3. To Learn commonly used IoT Simulation Hardware platforms 4. To Understand different Communication Technologies used in IoT 5. To Understand IoT applications in different domains
Course Learning Outcomes (CLO):	Students will be able to: 1. EXPLAIN the Applications/Devices, Protocols and Communication Models of IoT 2. DEMONSTARTE small Mechanical Engineering IoT oriented applications using Sensors, Actuators, Microcontrollers and Cloud 3. SELECT commonly used IoT Simulation Hardware platforms. 4. APPLICATION of Interfacing and Communication Technologies for IoT. 5. EVALUATE Present and Future Domain specific Applications of IoT Ecosystem

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I :		
Introduction to the Internet of Things (IoT): Overview, History, Definition and Characteristics, Connectivity Terminologies, Building blocks, Types of technologies used in IoT System, Baseline Technologies (Machine-to-Machine (M2M) communications, Cyber-Physical-Systems (CPS)), IoT Vs M2M, IoT enabled Technologies, IoT Levels and Templates, Design Methodology, The Physical Design Vs Logical Design of IoT, Functional blocks of IoT and Communication Models/Technologies, Development Tools used in IoT, IoT Architecture and Protocols, Various Platforms for IoT, Real time Examples of IoT, Challenges in IoT, The process flow of an IoT application, Evolution of Connected Devices, Applications of IoT, IoT Enablers, Overview of Governance, Privacy and Security Issues	**CLO 1**	**9**
UNIT II:		
Sensors, Actuators and Microcontrollers: Measuring physical and virtual quantities in digital world, Overview of Sensors working, Analog Vs Digital Sensors, Wired Vs Wireless Sensors, Types of Sensors, Types of Converters Types of Transducers and Actuator, Controlling Hardware, Types of Controller, Role of microcontroller as gateway to interfacing sensors and actuators, Microcontroller Vs Microprocessor, Type of microcontrollers in embedded System	**CLO 2**	**9**
UNIT III:		
IoT Simulation Environment Hardware platforms: IoT supported Hardware platforms: Introduction to IoT Simulation Environment and Devices (Raspberry Pi, Arduino), Architecture, Setup, IDE, Installation, Interfaces (serial, SPI, I2C), Basics of Embedded C programming. Interfacing: Interfacing Input, Intermediate, Output and Display Sensors, Converters, Actuators, Controlling Hardware, Controllers and Network Devices, IoT Architecture: Building architecture and Open source architecture (OIC), Main design principles and needed capabilities, An IoT architecture outline, Standards Considerations	**CLO3**	**9**
UNIT IV:		
Interfacing and Communication for Building IoT Applications: Communication: Overview and Working of Controlled Systems, Connectivity models - TCP/IP Vs OSI model, IoT Communication Models, IoT Communication APIs, Serial Vs Parallel Communication, Wires Vs Wireless Communication, their Technologies and Hardware IoT Communication Protocols: Protocol Standardization for IoT, Role of M2M in IoT, M2M Value Chains, IoT Value Chains, M2M and WSN Protocols (SCADA and RFID)	**CLO4**	**9**
UNIT V:		

Present and Future Domain specific Applications of IoT Ecosystem: IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, Business, Manufacturing, Smart Homes/Home automation, Surveillance applications, Connected Vehicles, Agriculture, Healthcare, Activity Monitoring, Retail, Logistics, Security, Health and Lifestyle, Legal challenges, IoT in Environmental Protection Modern Day IoT Applications, Smart Grid, Smart Cities - Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities Future: Future IoT ecosystem, Need of powerful core for building secure algorithms, Examples for new trends (AI, ML penetration to IoT)	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Raj Kamal , " Internet of Things: Architecture and Design", McGraw Hill.2nd edition June 2022.
2. Bahga, A. and Madisetti, V., (2015), "Internet of Things - A Hands-on Approach," Universities Press, ISBN: 9788173719547
3. Misra, Sudip., Mukherjee, Anandarup., Roy, Arijit. "Introduction to IoT". India: Cambridge University Press, 2021.
4. Raj, P. and Raman, A. C., (2017), "The Internet of Things: Enabling Technologies, Platforms, and Use Cases," Auerbach Publications

Reference Books:

1. Pethuru Raj, Anupama C. Raman ," The Internet of Things Enabling Technologies, Platforms, and Use Cases", Taylor and Francis group. February 2017
2. Peter Waher, "Mastering Internet of Things: Design and create your own IoT applications using Raspberry Pi 3", First Edition, Packt Publishing, 2018 Agile Estimating and Planning by Mike Cohn Robert C Martin Series
3. Waher, P., (2015), "Learning Internet of Things," Packt Publishing,

Online & E-Learning Resources:

1. https://nptel.ac.in/courses/106105166
2. https://www.udemy.com/internet-of-things-iot-for-beginners-getting-started/
3. http://playground.arduino.cc/Projects/Ideas
4. http://www.megunolink.com/articles/arduino-garage-door-opener
5. http://www.willward1.com/arduino-wifi-tutorial
6. http://www.toptechboy.com/arduino-lessons
7. https://www.eprolabs.com

Name of the Program:	MCA	**Semester: II**	**Level: PG**
Course Name	**Major Elective II-** Machine Learning Using Python	**Course Code and Course Type**	**PMC115C/MAJE**
Course Pattern	**2025**	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-	3	3	3	40	60	

Prerequisite: Introductory Knowledge Of Data Science and Statistics

Course Objectives (CO):	The objectives of: 1. To understand and learn regression models, interpret estimates and diagnostic statistics 2. To understand and learn different classification models and its algorithms 3. To understand and learn clustering methods 4. To generate an ability to build neural networks for solving real life problems. 5. To acquire knowledge of Convolution Artificial Neural Networks , Recurrent network and learn how to apply analytics concept on text data.
Course Learning Outcomes (CLO):	Students will be able to: 1. Apply, build and fit regression models for real time problems. 2. Apply and build classification models using SVM and random forest classifiers. 3. Apply and build clustering models using clustering methods and its corresponding algorithms. 4. Design and development of certain scientific and commercial application using computational neural network models, 5. Apply text classification and topic modelling methods to solve given problem

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
Introduction to machine learning:- What is Machine Learning? Well posed learning problems, Designing a Learning system,Machine Learning types-Supervised learning, Unsupervised learning, and Reinforcement Learning, Applications of machine learning, Perspective and Issues in Machine Learning	**CLO 1**	**9**
Regression Models:- Overview of statistical linear models, residuals, regression inference, Generalized linear models, logistic regression, Interpretation of odds and odds ratios, Maximum likelihood estimation in logistic regression, Poisson regression, Examples, Interpreting logistic regression, Visualizing fitting logistic regression curves	**CLO 2**	**9**
UNIT II		
Classification Methods:- Decision tree representation, Constructing Decision Trees, Classification and Regression Trees, hypothesis space search in decision tree learning Bayes' Theorem, Working of Naïve Bayes' Classifier, Types of Naïve Bayes Model, Advantages, Disadvantages and Application of Naïve Bayes Mode	**CLO3**	**9**
UNIT III		
Clustering Methods:- Overview of clustering and unsupervised learning, Introduction to clustering methods :Partitioning methods K-Means algorithm, assessing quality and choose number of clusters, KNN (1 NN, K NN) techniques, K-Medians, Density based method: Density-Based Spatial Clustering. Hierarchical clustering methods: Agglomerative Hierarchical clustering technique, Roles of dendrograms and Choosing number clusters in Hierarchical clustering, Divisive clustering techniques.	**CLO4**	**9**
UNIT IV		
Artificial Neural Network:- Biological neuron, models of a neuron, Introduction to Neural networks, network architectures (feedforward, feedback etc.), Activation Functions Perceptron, Training a Perceptron, Multilayer Perceptrons, Back propagation Algorithm, Generalized Delta Learning Rule, Limitations of MLP **Convolutional Neural Network:-** Recursive Neural Network, Recurrent Neural Network, Long-short Term Memory, Gradient descent optimization	**CLO5**	**9**
Total Hours		**45**

<u>Learning resources</u>
Textbooks:

1. Machine Learning by Tom M. Mitchell
2. Douglas Montgomery, Elizabeth A. Peck, and G. Geoffrey Vining, "Introduction to Linear Regression Analysis", 5th edition, Wiley publication.
3. Data Clustering Algorithms and Applications By Charu C. Aggarwal, Chandan K. Reddy
4. EthemAlpaydin: Introduction to Machine Learning, PHI 2nd Edition-2013

Reference Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems 2nd Edition
2. B Yegnanarayana : Artificial Neural Networks for pattern recognition ,PHI Learning Pvt. Ltd., 14-Jan-2009
3. Jack Zurada: Introduction to Artificial Neural Systems, PWS Publishing Co. Boston, 2002.
4. Feldman, Ronen, and James Sanger, eds. The text mining handbook: advanced approaches in analyzing unstructured data. Cambridge University Press, 2007.

Online Resources and E-Learning Resources

1. https://anuradhasrinivas.files.wordpress.com/2013/08/29721562-zurada-introduction-toartificial-neural-systems-wpc-1992.pdf
2. https://www.academia.edu/35741465/Introduction_to_Machine_Learning_2e_Ethem_Alpaydin
3. Support Vector Machines for Classification and Regression by Steve R. Gunn (https://meandmyheart.files.wordpress.com/2009/02/svm_gunn1.pdf)

MOOC/ Video Lectures available at:

1. https://nptel.ac.in/courses/117/105/117105084/
2. https://nptel.ac.in/courses/106/106/106106184/

<table>
<tr><td colspan="8">COURSE CURRICULUM</td></tr>
<tr><td colspan="2">Name of the Program:</td><td colspan="2">MCA</td><td colspan="2">Semester: II</td><td colspan="2">Level: PG</td></tr>
<tr><td colspan="2">Course Name</td><td colspan="2">Major Elective II- Prompt Engineering</td><td colspan="2">Course Code and Course Type</td><td colspan="2">PMC115D/MAJE</td></tr>
<tr><td colspan="2">Course Pattern</td><td colspan="2">2025</td><td colspan="2">Version</td><td colspan="2">1.0</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td colspan="4">Assessment Scheme</td></tr>
<tr><td>Theory</td><td>Practical</td><td>Tutorial</td><td>Total Credits</td><td>Hours</td><td>CIA (Continuous Internal Assessment)</td><td>ESA (End Semester Assessment)</td><td>Practical and Oral</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>40</td><td>60</td><td>-</td></tr>
<tr><td colspan="8">Prerequisite: Proficiency in Python.</td></tr>
<tr><td colspan="3">Course Objectives (CO):</td><td colspan="5">The objectives of Prompt Engineering: -
1. To Understand the fundamentals of Prompt Engineering and its role in AI-driven communication..
2. To Analyze the structure and effectiveness of prompts in generating accurate AI responses.
3. To Apply techniques like Few-shot, Zero-shot, and Chain-of-thought prompting to optimize AI interactions.
4. To Evaluate ethical considerations in AI communication, including bias and responsible usage.
5. To Develop practical applications of Prompt Engineering for business, coding, and creative content generation.</td></tr>
<tr><td colspan="3">Course Learning Outcomes (CLO):</td><td colspan="5">Students will be able to:
1. Design and implement structured prompts that enhance AI-generated outputs.
2. Refine AI responses through iterative prompt modifications.
3. Utilize advanced prompting techniques for better AI reasoning and accuracy.
4. Identify and mitigate biases in AI-generated content.
5. Develop AI-powered applications using prompt optimization strategies.</td></tr>
</table>

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
Introduction to Prompt Engineering Definition and significance in AI-driven interactions,The role of prompts in guiding AI responses,Evolution of AI models and how they process prompts,Overview of Large Language Models (LLMs) like GPT, Bard, Claude,How AI models interpret user inputs,Fundamentals of Natural Language Processing (NLP) and tokenization,Direct prompts vs. Indirect prompts – How instruction style affects output,Open-ended vs. Closed-ended prompts ,When to use each type, Instruction-based prompts for task automation and complex reasoning,Common Mistakes in Prompt Engineering.	**CLO1**	**9**
UNIT II		
Fundamentals of Prompt Design:- How well-structured prompts influence AI-generated responses, The impact of word choice, phrasing, and specificity on AI outputs, Comparison of structured vs. unstructured prompts, Direct prompts vs. Indirect prompts Controlling AI behaviour, Open-ended vs. Closed-ended prompts, When to use each type, Instruction-based prompts for complex tasks (e.g., coding, analysis),Case study, Analyzing real-world AI interactions with different prompt styles, Setting constraints and conditions within prompts, How to guide AI toward logical, relevant answers, Experimenting with repetition and rephrasing, Understanding AI confidence levels and response variability, Writing effective prompts for different applications (writing, coding, Q&A),Testing prompts with AI models and analyzing response patterns.	**CLO 2**	**9**
UNIT III		
Structuring Effective Prompts:- Ensuring precise and unambiguous instructions for AI, Providing relevant background information to enhance response accuracy, Avoiding vague language to reduce misinterpretation,Using structured language (bullet points, lists, separators), Effects of synonyms, phrasing, and tone on AI-generated content, Case study: Comparing responses to different wording styles, Using keywords strategically to refine AI understanding, Prompting AI for concise vs. detailed answers, Setting response constraints: word count, summary instructions, elaboration requests, AI's behavior with short, medium, and long prompts	**CLO3**	**9**
UNIT IV		
Iterative Refinement Techniques:- Understanding Iterative Refinement in Prompt Engineering, Definition and significance of iterative refinement in AI interactions, How refining prompts enhances response accuracy, clarity, and relevance, Case study, Evolution of prompt refinement in AI model training, Identifying Errors & Weaknesses in Prompts, Common mistakes in initial prompt design, Recognizing ambiguity, bias, and irrelevant outputs, Strategies to diagnose ineffective AI responses, Techniques for Iterative Refinement, Testing and debugging prompts, How to assess AI outputs for improvement, Rephrasing, Restructuring, and simplifying prompts, Adjusting prompt complexity vs. specificity for better results.	**CLO4**	**9**
UNIT V		

Advanced Prompting Strategies:- Understanding Advanced Prompting Techniques, How advanced prompting improves AI-generated responses, Comparing basic prompts vs. optimized advanced prompts, The role of context, specificity, and iterative refinement in advanced strategies, Few-Shot Prompting, Definition and concept, Teaching AI with minimal examples, How few-shot prompting enhances learning efficiency, Case study: Using few-shot examples in text completion and classification tasks, Hands-on exercise: Optimizing AI responses using minimal examples	**CLO5**	**9**
Total Hours		**45**

Learning Resources

Text Books:-

The Art of Prompt Engineering with ChatGPT: A Hands-on Guide by Nathan Hunter

Prompt Engineering for AI: A Hands-On Guide by Emily Fox

Reference Books:-

Designing Bots: Creating Conversational Experiences by Amir Shevat,O'Reilly Media, 2017

The Art of Prompt Engineering: Designing Effective AI Queries by Kiran Jonnalagadda,2024

E-Learning Resources

https://prompt-engineer.com/top-10-resources-for-learning-prompt-engineering/

https://www.coursera.org/specializations/prompt-engineering

COURSE CURRICULUM

<table>
<tr><td colspan="2">Name of the Program:</td><td colspan="2">MCA</td><td colspan="2">Semester : II</td><td colspan="2">Level: PG</td></tr>
<tr><td colspan="2">Course Name</td><td colspan="2">Optimization Techniques</td><td colspan="2">Course Code and Course Type</td><td colspan="2">PMC116 / BSC</td></tr>
<tr><td colspan="2">Course Pattern</td><td colspan="2">2025</td><td colspan="2">Version</td><td colspan="2">1.0</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td colspan="4">Assessment Scheme</td></tr>
<tr><td>Theory</td><td>Practical</td><td>Tutorial</td><td>Total Credits</td><td>Hours</td><td>CIA (Continuous Internal Assessment)</td><td>ESA (End Semester Assessment)</td><td>Practical and Oral</td></tr>
<tr><td>2</td><td>-</td><td>1</td><td>3</td><td>3</td><td>40</td><td>60</td><td>-</td></tr>
<tr><td colspan="8">Prerequisite: Linear Algebra and Univariate Calculus is essential</td></tr>
<tr><td colspan="3">Course Objectives (CO):</td><td colspan="5">The objectives of Optimization Techniques are:
1. To Understand the role and principles of optimization techniques in business world (Understand)
2. To Demonstrate specific optimization technique for effective decision making (Apply)
3. To Apply the optimization techniques in business environments (Apply)
4. To Illustrate and infer for the business scenario (Analyze)
5. To Analyze the optimization techniques in strategic planning for optimal gain. (Analyze)</td></tr>
<tr><td colspan="3">Course Learning Outcomes (CLO):</td><td colspan="5">Students will be able to :
1. Understand the role and principles of optimization techniques in business world.
2. Demonstrate specific optimization technique for effective decision making
3. Apply the optimization techniques in business environments
4. Illustrate and infer for the business scenario
5. Analyze the optimization techniques in strategic planning for optimal gain.</td></tr>
</table>

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
Introduction of operation research: 1.1. Various definitions, statements of basic theorems and properties, Advantages and Limitations, 1.2. Application areas of Linear programming 1.3. Linear Programming – Concept 1.4. Simplex Method and Problems 1.5. Two Phase Simplex Method and problems	**CLO 1**	**9**
UNIT II		
Sequential model and Duality:- 2.1 Processing n jobs through 2 machines 2.2 Processing n jobs through 3 machines 2.3 Processing n jobs through m machine Extra Readings: Processing of n jobs through m machines 2.4 Definition of the dual problem 2.5 Primal dual relationship	**CLO 2**	**9**
UNIT III		
Project Management: PERT and CPM :3.1 Basic differences between PERT and CPM. 3.2 Network diagram 3.3 Time estimates (Forward Pass Computation, Backward Pass Computation 3.4 Critical Path 3.5 Probability of meeting scheduled date of completion, 3.6 Calculation on CPM network. 3.7 Various floats for activities 3.8 Event Slack 3.9 Calculation on PERT network. 3.10 Application of schedule based on cost analysis and crashing	**CLO3**	**9**
UNIT IV		
Transportation Model : 4.1 Definition of the Transportation model 4.2 The Transportation algorithm The Assignment Model :4.3 The Hungarian method 4.4 Simplex explanation of the Hungarian method	**CLO4**	**9**
UNIT V		
Sequencing Problems **1.** Processing n Jobs Through 2 Machines Problem 2. Processing n Jobs Through 3 Machines Problem 3. Processing n Jobs Through m Machines Problem 4. Processing 2 Jobs Through m Machines Problem	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Gillet B.E. Introduction to Operation Research, Computer Oriented Algorithmic approach - Tata McGraw Hill Publising Co. Ltd. New Delhi
2. P.K. Gupta & D.S. Hira, "Operations Research", S.Chand & Co.
3. B S Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers.

Reference Books:

1. J.K. Sharma, "Operations Research: Theory and Applications", Mac Millan. .
2. Tata Hamdy, A "Operations Research - An Introduction", Fifth Edition, Prentice Hall of India Pvt. Ltd., New Delhi.
3. Taha H.A. "Operations Research an Introduction" McMillan Publication.

Online Resources and E,Learning Resources:

1. https: and and www.ieor.iitb.ac.in and files and optimization-notes.pdf
2. https: and and people.eecs.berkeley.edu and ~varaiya and Download and Varaiya-Optimization.pdf
3. https: and and sites.google.com and thapar.edu and meenakshirana and Current-Semester-2020 and optimization-techniques_

COURSE CURRICULUM							
Name of the Program:	**MCA**			**Semester: II**		**Level: PG**	
Course Name	Big Data Analytics			**Course Code and Course Type**		PMC117/VEC	
Course Pattern	**2025**			**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
2	-	-	2	2	20	30	
Prerequisite: Fundamentals of Database.							

Course Objectives (CO):	The objectives of Big Data Analytics: - 1. To Gain an understanding of its definition, features, value, evolution, and the challenges it presents. 2. To Examine the connections between Big Data, Cloud Computing, IoT, and Data Centres. 3. To Develop knowledge of Hadoop's architecture, ecosystem, and tools such as PIG and HIVE. 4. To Analyze data sources like enterprise systems, IoT, and biomedical fields, along with techniques for data collection and storage. 5. To Learn about HDFS components like Namenodes and Datanodes, and perform operations using its interfaces.
Course Learning Outcomes (CLO):	Students will be able to: 1. Define Big Data, identify its features and applications, and explain its development and challenges. 2. Articulate how Big Data integrates with Cloud Computing, IoT, and other systems. 3. Apply Hadoop, PIG, and HIVE for data analysis and management tasks. 4. Employ methods for data collection, transportation, pre-processing, and storage across various fields. 5. Execute file system operations using command-line tools and APIs for efficient Big Data management

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
BIG DATA INTRODUCTION:- Introduction: Dawn of the Big Data Era, Definition and Features of Big Data, Big Data Value, The Development of Big Data, Challenges of Big Data, Cloud Computing Cloud Computing Preliminaries, Relationship Between Cloud Computing and Big Data, IoT - IoT Preliminaries, Relationship Between IoT and Big Data, Data Center, Hadoop - Hadoop Preliminaries, Relationship between Hadoop and Big Data.	**CLO1**	**6**
UNIT II		
HADOOP ECOSYSTEM: - Hadoop Architecture, Hadoop ecosystem components - Schedulers - Fair and Capacity, Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. HIVE : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases	**CLO 2**	**6**
UNIT III		
BIG DATA GENERATION AND ACQUISITION: Big Data Generation-Enterprise Data, IoT Data, Internet Data, Bio medical Data, Data Generation from Other Fields, Big Data Acquisition, Data Collection, Data Transportation, Data Pre-processing, Storage Mechanism for Big Data, Design Factors, Database Programming Model. Big Data Technology.	**CLO3**	**6**
UNIT IV		

MEET HADOOP: Data, Data Storage and Analysis, Comparison with Other Systems, RDBMS, Grid Computing, Volunteer Computing, A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem Hadoop Releases Response.	**CLO4**	**6**
UNIT V		
THE HADOOP DISTRIBUTED FILE SYSTEM: The Design of HDFS, HDFS Concepts, Blocks, Namenodes and Datanodes, HDFS Federation, HDFS High-Availability, The Command-Line Interface, Basic Filesystem Operations, Hadoop Filesystems Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the FileSystem API, Writing Data, Directories, Querying the Filesystem, Deleting Data.	**CLO5**	**6**
Total Hours		**30**

Learning Resources

TEXT BOOKS:

1. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications" Wiley.
2. Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", 1st Edition, Michael Minelli, Michele Chambers, AmbigaDhiraj, Wiley CIO Series, 2013.
3. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.

REFERENCE BOOKS:

1. Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
2. Chris Eaton, Dirk deroos et al., "Understanding Big data", McGraw Hill, 2012.
3. Vignesh Prajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013.
4. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.

Online Resources

https://jbonneau.com/doc/2012-04-27-big_data_lecture_1.pdf

https://public.dhe.ibm.com/software/pdf/ch/SWP10/Harness_the_Power_of_Big_Data.pdf

E-Learning Resources

https://www.mltut.com/how-to-learn-big-data-step-by-step/

https://www.skillsoft.com/course/big-data-concepts-getting-to-know-big-data-94ad6ad2-43dd-463a-8080-09103e628e0f

COURSE CURRICULUM

Name of the Program:	**Foreign Language**	**Semester : II**	**Level: PG**
Course Name	**German A1.2**	**Course Code and Course Type**	PFL 202 A/ AEC
Course Pattern	**2025**	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
2	-	-	-	2	20	30	-

Prerequisite: Can understand and use familiar, everyday expressions and very simple sentences aimed at satisfying specific needs.

Course Objectives (CO):	The objectives of (German A1.2) are: 1. To get along with a basic vocab. 2. To understand German day to day culture. 3. Can communicate in routine situations. 4. To be able to have a direct exchange of information about familiar matters. 5. To describe own surroundings.
Course Learning Outcomes (CLO):	Students will be able to: 1. Communicate in the areas of immediate importance. 2. Able to frame simple sentences in formal conversation. **3.** Translate simple sentences from English to the German language and vice-versa**.** 4. Construct a dialogue, in the German language, for basic human interactions in a social context. 5. Take part in an interaction relating to basic conversation

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
Kontakte planning of letter writing, ramification of Letter, ,writing and understanding, discussion about language learning, find information from texts, understand conversations on various topics, texts related to office life Grammar – Usage of Articles and Prepositions	**CLO 1**	**6**
UNIT II		
MeineWohnung Understand home advertisements, describe house, how to reply invitations, how to express 'likes and dislikes', speak about different forms of living, how to write a text on house Grammar – Adjectives	**CLO 2**	**6**
UNIT III		
AllesArbeit? Talk about daily routine, talk about past, understand job advertisements, understand blogs on jobs, express opinions about jobs, prepare telephonic dialogues, speak about jobs Grammar – Past tense, Sentence connectors	**CLO3**	**6**
UNIT IV		
Kleidung und Mode Speak about cloths and shopping, lead a discussion during cloths shopping, discussion in departmental store, understand and research information about Berlin Grammar – Separable and non-separable verbs	**CLO4**	**6**
UNITV		
Gesund und munter&Ab in den Urlaub Learn body parts, Health related dialogue, City orientation, Travel reports, discussion regarding different travel destinations and weather Grammar – Imperative, Time adverbs	**CLO5**	**6**
Total Hours		**30**

Learning resources

Textbooks:

1. Netzwerk A1, Ernst klettVerlag&Goyal Publishers & Distributors Pvt. Ltd.
2. Studio d A1, CornelesenVerlag&Goyal Publishers & Distributors Pvt. Ltd.
3. NetzwerkNeu A1, Ernst klettVerlag&Goyal Publishers & Distributors Pvt. Ltd

Reference Books:

1. Hallo Deutsch A1,ErnstKlettVerlag, Goyal Publishers & Distributors Pvt. Ltd
2. ThemenAktuell 1, Hueberverlag
3. Maximal Ernst klettVerlag&Goyal Publishers & Distributors Pvt. Ltd.

COURSE CURRICULUM:-

<table>
<tr><td colspan="2">Name of the Program:</td><td colspan="2">MCA</td><td colspan="2">Semester : II</td><td colspan="2">Level: PG</td></tr>
<tr><td colspan="2">Course Name</td><td colspan="2">Japanese language skill - L2</td><td colspan="2">Course Code and Course Type</td><td colspan="2">PFL201B/ AEC</td></tr>
<tr><td colspan="2">Course Pattern</td><td colspan="2">2025</td><td colspan="2">Version</td><td colspan="2">1.0</td></tr>
<tr><td colspan="4">Teaching Scheme</td><td colspan="4">Assessment Scheme</td></tr>
<tr><td>Theory</td><td>Practical</td><td>Tutorial</td><td>Total Credits</td><td>Hours</td><td>CIA
(Continuous Internal Assessment)</td><td>ESA (End Semester Assessment)</td><td>Practical and Oral</td></tr>
<tr><td>2</td><td>--</td><td>--</td><td>2</td><td>2</td><td>20</td><td>30</td><td>--</td></tr>
<tr><td colspan="8">Prerequisite: Desire to get acquainted with the Japanese language. Basic knowledge of Hiragana and Katakana.</td></tr>
<tr><td colspan="3">Course Objectives (CO):</td><td colspan="5">The objectives of Basic Japanese language skill are:
1. To meet the needs of ever growing industry, with respect to language support.
2. To get introduced to Japanese society and culture through language.
3. To promote multilingualism in exposing students to different cultures
4. Fostering respect for linguistic diversity.
5. Learning additional language to develop a better memory, talent for problem solving, ability to concentrate.</td></tr>
<tr><td colspan="3">Course Learning Outcomes (CLO):</td><td colspan="5">After learning the course:
1. Read & write words that have been borrowed from other language.
2. Comprehend and speak basic conversation with basic particles
3. Speak and write about Routine
4. Basic sentence patterns incorporated into short dialogues indicating how they are used in actual conversation.
5. To understand grammatical structure, and improve communication abilities</td></tr>
</table>

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
Katakana Script: Katakana Script and Writing Kanji	**CLO 1**	**6**
UNIT II		
System of demonstrative words : Minna no Nihongo lesson no. 1,2 & 3	**CLO 2**	**6**
UNIT III		
Minna no Nihongo lesson no 4 (Write and Speak basic sentences in correct tenses)	**CLO 3**	**6**
UNIT IV		
Reading : Basic conversation using particles Listening : conversation related to particles Speaking : Sentences about give, lend, teach, receive	**CLO 4**	**6**
UNIT V		
Tenses : Writing : Affirmative present ,past & future Negative present ,past,& future sentences Writing : About Routine	**CLO 5**	**6**
Total Hours		**30**

Learning resources

Textbooks:

1. Minna no Nihongo , " Japanese for everyone" ,Elementary Main Textbook , Goyal Publishers & Distributors Pvt. Ltd.

Reference books:

1. Shyoho Volume 1
2. Genki Japan
3. Haru Vol. 1 & 2

Online Resources and E-Learning Resources:

YouTube links

1. https: and and youtu.be and 1JephUxTHxg?si=ouCwTXZc_fYgY9Kh
2. https: and and youtu.be and 9EfbkBkF2ag?si=rLNzc55_REacMoGu
3. https: and and youtu.be and DpEolYasgyg?si=dya9ue-YMSHO3VOG
4. https: and and youtu.be and itccOS1_LSk?si=hvPqILKlviuncMvA

COURSE CURRICULUM:-

Name of the Program:	**MCA**	**Semester : II**	**Level: PG**
Course Name	**Information Security**	**Course Code and Course Type**	**PDIEXMC101 / VSC**
Course Pattern	**2025**	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
2	--	--	2	2	50	-	--

Prerequisite: Basic computer Knowledge, Introduction to Computer Information Systems

Course Objectives (CO):	The objectives of Basic Information Security are: 1. To Understand the concepts of Information Security, cryptography and its applications 2. To Familiarize various authentication and integrity techniques available 3. To Understand firewalls and intrusion detection systems. 4. To Familiarize relevant security parameters in the web, internet, database and operating systems 5. To appreciate the difficulties that arise when valuable information needs to be shared
Course Learning Outcomes (CLO):	After learning the course: 1. Discuss the requirement of information security , private and public key algorithms and to examine the mathematics of cryptography Understanding 2. Analyze authentication and integrity techniques available Analysing 3. Interpret the importance of firewalls and intrusion detection systems and signatures. Understanding 4. Relate to the security issues and technologies used in the web, internet, database and operating system 5. Examine and apply the fundamental techniques of computer security.

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
Introduction : Introduction to Information Security, principles, services and attacks, functional requirements of security, current trends in security, Need for security, Security approaches **Database and OS Security**: Introduction to database, Security requirements of database, sensitive data, Database access control, inference, Security in operating systems	**CLO 1**	**6**
UNIT II		
Cryptography and Authentication: Cryptography: Concept: Symmetric and Asymmetric Cryptography. Mathematics of cryptography: Modular Arithmetic Additive Inverse, Multiplicative Inverse, Euclidean Algorithm and Extended Euclidean Algorithm. Stream Cipher and Block Cipher, Concept of Confusion and Diffusion. Modes of Operation of Block Cipher: ECB, CBC, OFB, CFB , DES, RSA, Numerical on RSA Authentication: Types of authentication, Biometric Authentication and Third Party Authentication using KDC and Kerberos Version 5, Mutual authentication ,reflection attack	**CLO 2**	**6**
UNIT III		
Digital certificates and integrity Digital Signature: Concept, Compare Digital Signature with Public Key Cryptography, Digital Signature Schema. Public Key Infrastructure (PKI): Private key management, Public Key Cryptography Standards (PKCS). Digital Certificate Creation Steps, X.509 Certificate, Certificate Revocation **Integrity:** Message Integrity, Hash functions Properties Algorithm: MDC, MAC, HMAC, MD5, SHA -512	**CLO 3**	**6**
UNIT IV		
Internet and web security: SSL, IPSec, Email Security- PGP, Email attacks Web services Security: web app versus web service concept, WS-Security, SOAP web service, SAML assertion, Browser attacks, web attacks targeting users, obtaining user or website data.	**CLO 4**	**6**

UNIT V		
Firewall and IDS Firewall: Introduction, Characteristic ,Types :Packet Filter, Stateful and Stateless Packet Filter, Attacks of Packet Filter, Circuit Level and Application Level Firewall, Bastion Host, Firewall Configurations. **Intrusion:** What is Intrusion, Intruders, Intrusion Detection, Behaviour of Authorized user and Intruder, Approaches for Intrusion Detection: Statistical Anomaly Detection and Rule based Detection. Audit Record and Audit Record Analysis.	**CLO 5**	**6**
Total Hours		**30**

Learning resources

Reference books:

1. AtulKahate, "Cryptography and Network Security", McGraw Hill
2. Kaufman C., Perlman R., and Speciner, "Network Security", Private Communication in a public world, 2nd ed., Prentice Hall PTR.,2002
3. Cryptography and Network Security, Behrouz A Forouzan

Online Resources and E-Learning Resources:

1. https://link.springer.com/content/pdf/10.1007%2F978-1-4302-6383-8_16.pdf
2. docs.oracle.com/cd/B19306_01/server.102/b14220/security.htm 3
3. https://www.w3.org/Security/security-resource 4
4. https://www.sophos.com/en-us/labs/security-threat-report.aspx 5
5. https://www.tutorialspoint.com/cryptography/data_integrity_in_cryptography.htm 6
6. https://www.unf.edu/public/cop4610/ree/Notes/PPT/PPT8E/CH15-OS8e.pdf