KONGU ENGINEERING COLLEGE

(Autonomous Institution Affiliated to Anna University, Chennai)

PERUNDURAI ERODE – 638 060

TAMILNADU INDIA

REGULATIONS, CURRICULUM & SYLLABI – 2024

(CHOICE BASED CREDIT SYSTEM AND OUTCOME BASED EDUCATION)

(For the students admitted from the academic year 2024 - 2025)

MASTER OF COMPUTER APPLICATION

KONGU
Assuring the Best

MASTER OF COMPUTER APPLICATIONS CURRICULUM–R2024
(For the students admitted from the academic year 2024-25 onwards)

SEMESTER – 1

Course Code	Course Title	Hours/Week				Credit	Maximum Marks			Category
		L	T	P	MP		CA	ESE	Total	
Theory/Theory with Practical										
24MCT11	Applied Mathematics	3	1	0	NE	4	40	60	100	FC
24MCC11	Problem solving using C Programming	3	0	2	ES	4	100	0	100	PC
24MCT12	Data Structures and Algorithms	3	0	0	ES	3	40	60	100	PC
24MCT13	Database Technologies	3	0	0	NE	3	40	60	100	PC
24MCT14	Software Engineering	3	1	0	ES	4	40	60	100	PC
24MCB01	Operating Systems	3	0	0	NE	0	100	0	100	BC
24MCB02	Computer Organization and Design	3	0	0	NE	0	100	0	100	BC
Practical/Employability Enhancement										
24MCL11	Data Structures and Algorithms Laboratory	0	0	4	NE	2	60	40	100	PC
24MCL12	Database Technologies Laboratory	0	0	4	NE	2	60	40	100	PC
24MCP11	Mini Project – I	0	0	4	NE	2	50	50	100	EC
Total Credits to be earned						**24**				

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SEMESTER – 2										
Course Code	Course Title	Hours/Week				Credit	Maximum Marks			Category
		L	T	P	MP		CA	ESE	Total	
Theory/Theory with Practical										
24MCT21	Advanced Java Programming	3	0	0	ES	3	40	60	100	PC
24MCC21	Machine Learning	3	0	2	ES	4	50	50	100	PC
24MCT22	Cloud Computing Technologies	3	0	0	NE	3	40	60	100	PC
	Professional Elective – I	3	0	0	ES	3	40	60	100	PE
	Professional Elective – II	3	1	0	NE	4	40	60	100	PE
24MCB03	C++ Programming	3	0	0	NE	0	100	0	100	BC
24MCB04	Computer Networks	3	0	0	NE	0	100	0	100	BC
Practical/Employability Enhancement										
24MCL21	Advanced Java Programming Laboratory	0	0	4	NE	2	60	40	100	PC
24MCL22	Cloud Computing Technologies Laboratory	0	0	4	NE	2	60	40	100	PC
24GCL21	Professional Skills Training	0	0	4	NE	2	100	0	100	PC
24MCP21	Mini Project – II	0	0	4	NE	2	50	50	100	EC
Total Credits to be earned						**25**				

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MASTER OF COMPUTER APPLICATIONS CURRICULUM - R2024
(For the students admitted from the academic year 2024-25)

SEMESTER – III

Course Code	Course Title	Hours / Week				Credit	Maximum Marks			Category
		L	T	P	MP		CA	ESE	Total	
Theory/Theory with Practical										
24MCT31	Full Stack Framework	3	0	0	ES	3	40	60	100	PC
24MCT32	C# and .NET	3	0	0	NE	3	40	60	100	PC
24MCT33	Data Science	3	1	0	ES	4	40	60	100	PC
	Professional Elective – III	3	0	2	ES	4	50	50	100	PE
	Professional Elective – IV	3	0	0	NE	3	40	60	100	PE
Practical / Employability Enhancement										
24MCL31	Full Stack Framework Laboratory	0	0	4	NE	2	60	40	100	PC
24MCL32	C# and .NET Laboratory	0	0	4	NE	2	60	40	100	PC
24MCL33	UI / UX Design Laboratory	0	0	4	NE	2	60	40	100	PC
Total Credits to be earned						**23**				

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MASTER OF COMPUTER APPLICATIONS CURRICULUM - R2024
(For the students admitted from the academic year 2024-25)

SEMESTER – IV										
Course Code	Course Title	Hours / Week				Credit	Maximum Marks			Category
		L	T	P	MP		CA	ESE	Total	
Practical / Employability Enhancement										
24MCP41	Project Work	0	0	24	NE	12	50	50	100	EC
Total Credits to be earned						12				

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LIST OF PROFESSIONAL ELECTIVES (PEs)								
S. No.	Course Code	Course Name	L	T	P	MP	C	Category
	Semester –II							
Elective – I								
1.	24MCE01	Software Project Management	3	0	0	ES	3	PE
2.	24MCE02	Cryptography and Network Security	3	0	0	ES	3	PE
3.	24MCE03	Web Application Development	3	0	0	ES	3	PE
4.	24MCE04	Natural Language Processing	3	0	0	ES	3	PE
5.	24MCE05	Business Intelligence	3	0	0	ES	3	PE
6	24MCF01	Devops	2	0	2	ES	3	PE
Elective – II								
7.	24MCE06	Python Programming	3	1	0	NE	4	PE
8.	24MCE07	Artificial Intelligence	3	1	0	NE	4	PE
9.	24MCE08	Information Security	3	1	0	NE	4	PE
10.	24MCE09	Mobile Application Development	3	1	0	NE	4	PE
11.	24MCE10	Social Network Analysis	3	1	0	NE	4	PE
12.	24MCE11	Design Thinking	3	1	0	NE	4	PE
Semester – III								
Elective – III								
13.	24MCF02	Internet of Things	3	0	2	ES	4	PE
14.	24MCF03	PHP and MYSQL	3	0	2	ES	4	PE
15.	24MCF04	Data Visualization Techniques	3	0	2	ES	4	PE
16.	24MCF05	Digital Marketing	3	0	2	ES	4	PE
17.	24MCF06	Accounting and Financial Management	3	0	2	ES	4	PE
18	24MCF07	Deep Learning	3	0	2	ES	4	PE
Elective – IV								
19.	24MCE12	Affective Computing	3	0	0	NE	3	PE
20.	24MCE13	Software Testing	3	0	0	NE	3	PE
21.	24MCE14	Blockchain Technologies	3	0	0	NE	3	PE
22.	24MCE15	Virtual and Augmented Reality	3	0	0	NE	3	PE
23	24GET11	Introduction to Research	3	0	0	NE	3	PE
24.	24GET14	Innovation, Entrepreneurship and Venture Development	3	0	0	NE	3	PE

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24MCT11 – APPLIED MATHEMATICS								
Programme & Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**1**	**FC**	**3**	**1**	**0**	**NE**	**4**

Preamble	To demonstrate the basic knowledge of Mathematics and statistics used to solve computational problems	
Unit – I	**Propositional Calculus:**	**9+3**
Propositions – Truth Table – Logical Operators – Tautologies and Contradiction – Logical Equivalences and Implications – Laws of Logic – PDNF and PCNF– Proofs in Propositional Calculus – Direct Proof– Conditional Conclusion – Indirect Proof– Inconsistent Set of Premises.		
Unit – II	**Predicate Calculus:**	**9+3**
Predicates – Statement Function – Variables and Quantifiers – Predicate Formulae – Free and Bound variables – The Universe of discourse – Logical implications and equivalence for Quantified statements – Theory of inference of predicate calculus		
Unit – III	**Number Theory:**	**9+3**
Divisibility - Prime numbers - Fundamental theorem of arithmetic – Fermat's Little theorem - GCD – Euclid's algorithm - Congruence - Solution of Congruences - Chinese remainder theorem		
Unit – IV	**Probability:**	**9+3**
Probability - Axioms of Probability – Mutually exclusive events – Independent events - Conditional Probability - Addition and multiplication laws of Probability - Total Probability -Baye's theorem.		
Unit – V	**Statistics:**	**9+3**
Measures of central tendency: Mean, Median, Mode. Measures of dispersion: Range - Quartile deviation - Mean deviation - Standard deviation. Correlation and Regression: Karl Pearson's Coefficient of Correlation, Regression Line of Y on X - Regression Line of X on Y.		
Lecture:45, Tutorial:15, Total: 60		

REFERENCES:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 8th Edition, McGraw-Hill Education, India, 2019.
2. Veerarajan T., "Discrete Mathematics with Graph Theory and Combinatorics", 18th Reprint, Tata McGraw Hill, New Delhi, 2017.
3. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2016.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	use propositional logic in AI for knowledge representation and reasoning	Applying (K3)
CO2	derive the inferences from proposition and predicate that will be helpful in solving Artificial Intelligence problems	Applying (K3)
CO3	solve network security related problems using number theory concepts	Applying (K3)
CO4	apply the concept of probability and predicting outcomes in various scenarios, making them valuable tools in decision-making and problem-solving	Applying (K3)
CO5	analyze the relationship between two variables using regression to predict how much a dependent variable changes based on adjustments to an independent variable to make objective on data-driven decisions	Analyzing (K4)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	2				1
CO2	3	2	2	2				1
CO3	3	2	2	2			3	1
CO4	3	2	2	2				1
CO5	3	2	2	2				1

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	30	70	-	-	-	100
CAT2	-	30	70	-	-	-	100
CAT3	-	20	40	40	-	-	
ESE	-	20	60	20	-	-	100

* ±3% may be varied, CAT1, 2, 3 – 50 marks, ESE – 100 marks

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24MCC11 - PROBLEM SOLVING USING C PROGRAMMING								
Programme & Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**1**	**PC**	**3**	**0**	**2**	**ES**	**4**

Preamble	Empowering students to develop and execute C programs tailored to real-world challenges, fostering practical problem-solving skills essential for professional success.	
Unit – I	**Fundamentals and Control Statements in C:**	**9**
Structure of 'C' program, - Keywords, Identifiers, Data Types, Variables, and Constants - Input and Output Statements – Operators in C – Type Conversion and Typecasting Decision Control Statements – Conditional Branching Statements.		
Unit – II	**Looping and Functions In C:**	**9**
Iterative Statements – Nested Loops – Break and Continue Statements – Goto Statements - Function: Declaration, Definition – Function Call - Return statement- Passing Parameters to function- Types of Function - Storage classes – Recursive Function.		
Unit – III	**Arrays and Strings in C:**	**8**
Arrays: Initialization – Accessing Elements of Array - One dimensional, Two dimensional, and Multi-dimensional arrays - String: String operations, Manipulating Strings - Passing arrays and strings as arguments - Command Line Arguments.		
Unit – IV	**Pointers in C:**	**10**
Pointers – void pointer – Null Pointer – Array and pointers – Pointers and Strings – Pointer Arithmetic – Pointers to Pointers – Array of Pointers – Pointer to Array – Two Dimensional Array and Pointers – Pointers to function – Dynamic Memory Allocation.		
Unit – V	**Structures, Unions and File Handling in C:**	**9**
Structure: Declaration, Definition-Array of Structures –Structures and Functions - Pointer to Structure - Structure within a Structure-Bit fields in Structure - Union – Enumerated Data Types – Files – Reading Data from files – Writing Data to files – Functions for - selecting a Record Randomly – Preprocessor Directives .		

LIST OF EXPERIMENTS / EXERCISES:

1.	Construct a C program using I/O statements, operators, expressions
2.	Build the C program for decision-making constructs: if-else, goto, switch-case, break-continue
3.	Experiment with Loops in C program: for, while, do-while
4.	Develop a C program for Functions: call, return, passing parameters by (value, reference), passing arrays to Function.
5.	Apply Recursion using Function
6.	Make use of Arrays to perform 1D and 2D, Multi-dimensional arrays, traversal
7.	Construct a C program that performs various string manipulation operations. Your program should provide a menu-driven interface to allow users to choose from the following options: 1. Concatenate Strings 2. Compare Strings 3. Reverse String 4. Find Length of String 5. Exit
8.	Experiment with various Pointer Concepts : Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
9.	Construct a C program using Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
10.	Make use of File operations, perform reading and writing in files , File pointers, random access and processor directives

Lecture:45, Practical:30, Total:75

REFERENCES:

1.	Reema Thareja ,"Computer Fundamentals and Programming in C" , 3rd Edition Paperback,2023.
2.	Yashavant P. Kanetkar, "Let Us C : Authentic guide to C programming language", 18th Edition, BPB Publications, 2021.
3.	Pradip Dey, Manas Ghosh , "Computer Fundamentals and Programming in C" , 2nd Edition Paperback 2013

MICRO PROJECT:

1	Develop a system for any one of the given applications: student database management system/library management system/Inventory Management System/Employee Payroll system/ Phone book application/ Bank Management system / School Management System / bus reservation/hospital management/ online voting system using structures and file handling.
2	Create any one of the tool: A syntax checker which can check the syntax if it is correct in C or not / typing tutor/ Quiz game.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	solve simple problems using C and control statements.	Applying (K3) Manipulation (S2)
CO2	ability to develop and implement various decision making statements, Operators , expression and functions	Applying (K3) Manipulation (S2)
CO3	store and manipulate homogeneous data using arrays and strings	Applying (K3) Manipulation (S2)
CO4	develop programs using dynamic memory allocation	Applying (K3) Manipulation (S2)
CO5	store and manipulate heterogeneous data using structures and files	Applying (K3) Manipulation (S2)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	2	3	2	3	2	3
CO2	2	2	2	2	2	2	2	2
CO3	3	3	3	2	3	3	3	3
CO4	3	2	2	3	2	2	2	2
CO5	3	3	3	2	3	3	3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	40	60	-	-	-	100
CAT2	-	45	55	-	-	-	100
CAT3	-	40	60	-	-	-	100
ESE	-	45	55	-	-	-	100

* ±3% may be varied, CAT1, 2, 3 – 50 marks, ESE – 100 marks

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(K. CHITRA) (Dr. L. Rakkiyappan)

ACADEMIC CELL ★ KONGU ENGINEERING COLLEGE ★

24MCT12 – DATA STRUCTURES AND ALGORITHMS								
Programme & Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**1**	**PC**	**3**	**0**	**0**	**ES**	**3**
Preamble	To focus on a variety of ideas, methods, and algorithmic implementations relevant to linear and Non-linear data structures.							
Unit –I	**Stacks, Queues and Linked Lists:**							**9**
Introduction –Stacks: Stack ADT – Applications - Implementation – Queues: Queue ADT – Applications – Implementation – Linked Lists: Linear Linked List - Doubly Linked List – Circular Linked List – Polynomial Addition.								
Unit –II	**Trees:**							**9**
Introduction – Glossary – Binary trees – Types of binary trees – Properties of binary trees - Binary tree traversals - Threaded binary tree traversals - Expression trees - Binary search trees – AVL Trees.								
Unit –III	**Graphs:**							**9**
Introduction – Glossary – Applications of Graphs – Graph representation – Graph traversals – Topological sort – Shortest path algorithms - Minimum Spanning Tree – Graph Algorithms: Problems & Solutions.								
Unit –IV	**Sorting and Searching:**							**9**
Introduction to sorting – Bubble sort – Selection sort – Insertion Sort – Merge Sort – Heap Sort - Quick Sort – Tree sort - Searching: Linear Search – Binary Search.								
Unit –V	**Hashing and String Algorithms:**							**9**
Hashing – Components of hashing – Hashing Problems & Solutions – String Algorithms: Introduction –String matching algorithm – Brute Force method – KMP algorithm – Boyer-Moore algorithm – Data structures for storing strings.								
								Total:45

REFERENCES:

1. Narasimha Karumanchi, "Data Structures and Algorithms Made Easy", 5th Edition, CareerMonk Publications, IIT Mumbai, 2023.
2. R.S.Salaria, "Data structures & Algorithms Using C", 5th Edition, Khanna Book Publishing Co. Pvt. Ltd., SRS Enterprises, New Delhi, 2022.
3. Reema Thareja.,"Data Structures using C", 2nd Edition, Oxford University Press, New Delhi, 2018.

MICRO PROJECT:

1. Design an application for online shopping system using appropriate data structures.
2. Implement game applications using graph data structures.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	applying linear data structures to solve the problems.	Applying (K3)
CO2	construct various types of tree and perform the operations on a tree along with implementation	Applying (K3)
CO3	examine the solution for solving various computing problems using graph data structure.	Analyzing(K4)
CO4	perform sorting and searching of input elements.	Applying (K3)
CO5	utilize hashing and string algorithms to solve the problems.	Applying (K3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	2	2			2
CO2	3	2	2	2	2			2
CO3	3	3	2	2	2			2
CO4	3	2	2	2	2			2
CO5	3	2	3	3	3			2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	40	60	-	-	-	100
CAT2	-	30	55	15	-	-	100
CAT3	-	40	60	-	-	-	100
ESE	-	30	55	15	-	-	100

* ±3% may be varied, CAT1, 2, 3 – 50 marks, ESE – 100 marks

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(K. CHITRA) (Dr. P. VIJAYAKUMAR)

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24MCT13 - DATABASE TECHNOLOGIES								
Programme & Branch	**MCA & Computer Applications**	**Sem**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**1**	**PC**	**3**	**0**	**0**	**NE**	**3**

Preamble	To understand the designing, modeling and manipulating the information from relational database systems.

Unit – I	**Data Models:**	9

Introduction – Database System Applications – Purpose of database systems – View of data – Database Languages –Database Design and Engine – Database Architecture – Database Users and administrators – Relational Model : Structure of Relational Databases – Database Schema – Keys – Schema Diagrams – Relational Query Languages – Relational Algebra- Database Design and E-R model : E-R model- Constraints – ER diagrams – Reduction to Relational Schema – ER design issues.

Unit – II	**Structured Query Language:**	9

Overview – SQL data definition – Basic structure – Basic Operations – SET Operations and Aggregate Functions –Nested Sub queries – Modification of the database – Intermediate SQL : Joins – views- Integrity Constraints– SQL data types and schemas – Authorization – Functions and procedures – Triggers.

Unit – III	**Normalization, Indexing and Query Processing:**	9

Relational Database Design: Features of good relational designs- Decomposition using functional dependencies: Normal Forms : 1NF, 2NF, 3NF, BCNF – Decomposition using Multivalued Dependencies- 4NF, 5NF - Indexing – Single-level ordered Indexes – Hash Indices - Query Processing: Overview – Measures of Query Cost -Query optimization – Overview – Transformation of Relational Expressions – Choice of Evaluation Plan.

Unit – IV	**Transaction Processing and Management:**	9

Transaction Concept – Properties - Transaction States – Serializability – Lock-Based Protocols- Multiple Granularity – Timestamp Based Protocols – Validation-Based Protocols – Recovery System – Failure Classification – Storage – Recovery and Atomicity.

Unit – V	**Parallel and Distributed Databases:**	9

Database System Architectures: centralized database systems – server system architectures – Parallel Systems – Distributed Systems – Transaction Processing in Parallel and Distributed Systems – Parallel and Distributed Storage : Data Partitioning – Dealing with Skew in partitioning – Replication – Parallel Indexing – Distributed File Systems.

Total:45

REFERENCES:

1. Abraham Silberschatz, Henry F. Korth and Sudharshan S., "Database System Concepts", 7th Edition, Tata McGraw Hill, New York, 2024 .
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson, 2024.
3. Lee Chao, "Database Development and Management", Auerbach Publications, 2015.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	build ER model for various applications	Applying (K3)
CO2	apply relational query language and algebra for various scenario	Applying (K3)
CO3	utilize the normalization techniques to build a good design of database and to outline the order of storing data	Applying (K3)
CO4	solve the transaction processing and concurrency control problems	Applying (K3)
CO5	analyze the parallel and distributed databases	Analyzing (K4)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	2			2	
CO2	3	2	2	2			2	
CO3	3	2	2	2			2	
CO4	3	2	2	2			2	
CO5	3	2	2	2			2	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	40	60	-	-	-	100
CAT2	-	40	60	-	-	-	100
CAT3	-	40	50	10	-	-	100
ESE	-	40	50	10	-	-	100

* ±3% may be varied, CAT1, 2, 3 – 50 marks, ESE – 100 marks

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Board of Studies - MCA

Dr. K. CHITRA

S. HEMALATHA

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24MCT14 – SOFTWARE ENGINEERING								
Programme & Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**1**	**PC**	**3**	**1**	**0**	**ES**	**4**

Preamble	To understand the formal method to analyze the requirement, design and develop a software project	
Unit – I	**Formal and Agile Methodologies:**	9+3
The Nature of software- The Software Process – Prescriptive process models– Agility and Process: Agile Process -The Politics of Agile Development – Scrum-Other Agile Framework: The XP Framework- Kanban- DevOps-Recommended process model.		
Unit – II	**Requirements Analysis and Modeling:**	9+3
Understanding Requirements: Requirements engineering -Establishing the groundwork Requirements- Modeling: Requirements Analysis- Scenario Based Modeling-Class Based modeling – Functional modeling -Behavior modeling,		
Unit – III	**Software Design:**	9+3
Design Concepts: design concepts - Architectural Design: architectural styles - Component Level Design - Design for Mobility-pattern-based Design.		
Unit – IV	**Software quality and security:**	9+3
Review metrics and their use-informal reviews-formal technical reviews-Software security Engineering - Risk management - Software Evolution.		
Unit – V	**Advances in software Engineering:**	9+3
SPI-SPI process-CMMI-people CMM-SPI Frameworks- Technology Evolution-Observing software Engineering trends- identifying soft trends-Technology directions-Tools related trends- Software engineer's responsibility.		
Lecture:45, Tutorial:15, Total: 60		

REFERENCES:

1.	RogerS.Pressman,BruceR.Maxim, "Software Engineering -A Practitioner's Approach", 9th Edition, Tata McGraw Hill, NewYork, 2020.
2.	PankajJalote, "An Integrated Approach to Software Engineering", 3rd Edition, Narosa publications, 2011.
3.	Somerville Ian, "Software Engineering", 9th Edition, Pearson Education Asia, Singapore, 2011.

MICRO PROJECT:

1	To gather the requirements, analyze, design and develop a software project for the grocessory / pharmacy shop using appropriate software development model.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest level)
CO1	apply the various formal and agility process models of for develop software	Applying (K3)
CO2	develop the various features of requirement analysis and modeling of software	Applying (K3)
CO3	apply architectural and mobility design of the software	Applying (K3)
CO4	Identify an idea about risk management and software maintenance	Applying (K3)
CO5	apply the software trends and tools used in software process	Applying (K3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	2	3	2	3	2	3	2
CO2	2	2	2	3	2	2	2	3
CO3	2	3	2	2	3	3	2	2
CO4	2	2	3	2	2	2	2	2
CO5	3	3	2	2	2	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1)	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	55	45	-	-	-	100
CAT2	-	50	50	-	-	-	100
CAT3	-	40	60	-	-	-	100
ESE	-	45	55	-	-	-	100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

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Board of Studies - MCA

(R. CHITRA) (Dr. P.A. Selvaraj)

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24MCB01 - OPERATING SYSTEMS								
Programme & Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**1**	**BC**	**3**	**0**	**0**	**NE**	**0**

Preamble	To get an understanding of the internal processes that a computer performs	
Unit – I	**Operating Systems Overview:**	**9**
Introduction: Computer System Organization – Architecture – Operations – OS Structures: OS Services – System Calls: – Process Control – File – Device Management – Information Maintenance – Communication – Protection - OS functionality and security mechanisms.		
Unit – II	**Process Management:**	**9**
Processes: Process concepts – Scheduling - Operations on Process – Inter-Process Communication - Threads Multithreading Models – Synchronization: Peterson"s Solution – Semaphores–CPU Scheduling: Scheduling Criteria – Algorithms: FCFS – SJF – Priority –Round Robin.		
Unit – III	**Deadlock:**	**9**
Characterization: Conditions – Resource Allocation Graph – Methods for Handling Deadlocks: Deadlock Prevention – Deadlock Avoidance: Banker"s Algorithm – Deadlock Detection – Recovery from Deadlock.		
Unit – IV	**Memory Management:**	**9**
Main Memory: Contiguous Memory Allocation – Segmentation - Paging – Structure of Page Table – Swapping –Virtual Memory:Demand Paging - Page Replacement Algorithms: FIFO, Optimal and LRU .		
Unit – V	**Storage Management:**	**9**
Overview of Mass Storage Structure: Disk Structure – Attachment – Scheduling Algorithms: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK– Management - File System: Concepts – Access Methods – Directory Structure, Advanced Topics: Virtual Machines, Network and Distributed Systems.		
		Total:45

REFERENCES:

1. Abraham Silberschatz, Greg Gagne, Peter B. Galvin, "Operating System Concepts", 10th Edition, John Wiley & Sons Inc., USA, 2018.
2. Andrew S. Tanenbaum, Herbert Bos, "Modern Operating Systems", 8th Edition, Pearson Education India, 2022.
3. William Stallings, "Operating Systems: Internals and Design Principles", 9th Edition, Pearson Education India, 2017.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	understand the fundamental architecture, operations, and structures of operating systems, including their services and security mechanisms.	Understanding (K2)
CO2	apply process management techniques, including scheduling, inter-process communication, multithreading models, and synchronization mechanisms, to manage concurrent processes effectively..	Applying (K3)
CO3	analyze deadlock conditions and methods for handling deadlocks, including prevention, avoidance, detection, and recovery strategies..	Analyzing (K4)
CO4	analyze memory management techniques, including paging, segmentation, and page replacement algorithms in the context of both main memory and virtual memory..	Applying (K3)
CO5	analyze storage management techniques, including disk scheduling algorithms and file system concepts, and understand advanced topics such as virtual machines and networked/distributed systems.	Analyzing (K4)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1						1
CO2	1	2	2					1
CO3	1	2	2					
CO4	2	2	2					
CO5	1	2	2					

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	30	40	30	-	-	100
CAT2	-	20	40	40	-	-	100
ESE	-	-	-	-	-	-	NA

* ±3% may be varied (CAT 1 & 2 – 50 marks & ESE – NA)

Signature of the Chairman
Board of Studies - MCA

(K. CHITRA) Dr. D. Sivabalaselvamani

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24MCB02 - COMPUTER ORGANIZATION AND DESIGN								
Programme & Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**1**	**BC**	**3**	**0**	**0**	**NE**	**0**

Preamble	To understand the hardware behind the code and its execution at physical level by interacting with existing memory and I/O structure.
Unit – I	**Digital Logic Circuits and Digital Components:** **9**
Digital Computers–Logic Gates–Boolean Algebra–Map Simplification–Combinational Circuits–Flip-Flops–Sequential Circuits – Decoders – Multiplexers – Registers and Counters.	
Unit – II	**Data Representation, Register Transfer and Micro Operations:** **9**
DataTypes and Number Conversion–Complements–Fixed Point Representation–Floating point Representation-Register Transfer Language – Register Transfer - Bus and Memory Transfer – Arithmetic, Logic and Shift Micro operations.	
Unit – III	**Basic Computer Organization and Design, Programming the Basic Computers:** **9**
Instruction Codes–Computer Registers–Computer Instructions-Timing and Control–Machine and Assembly Language–Programming Arithmetic and Logic Operations.	
Unit – IV	**Central Processing Unit:** **9**
General Register Organization – Stack Organization – Instruction Formats - Addressing Modes - Data Transfer and Manipulation..	
Unit – V	**Input-Output and Memory Organization:** **9**
Input-Output Organization: Peripheral Devices – Asynchronous Data Transfer -Modes of Transfer - Direct Memory Access. Memory Organization: Memory Hierarchy - Main Memory - Auxiliary - Associative - Cache - Virtual Memory-Characteristics of MultiProcessors-Interconnection Structures.	
	Total:45

REFERENCES:

1.	Morris Mano M., "Computer System Architecture", 3rdEdition, Pearson India Education Services Pvt.Ltd.,NewDelhi, 2017..
2.	Morris Mano M., Michael D.Ciletti, "Digital Design", 5thEdition, Pearson Education, Delhi, 2013.
3.	William Stallings, "Computer Organization and Architecture – Designing for Performance", 9thEdition, Pearson Education, 2012.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	apply the design of arithmetic & logic unit and compute the fixed point and floating point arithmetic operation	Applying (K3)
CO2	demonstrate an understanding of the design of the functional units of a digital computer system.	Understanding (K2)
CO3	identify the fundamental designing of elementary computer	Applying (K3)
CO4	design a simple CPU with applying the theory concepts	Applying (K3)
CO5	manipulate representations of numbers stored in digital computers	Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	3	3	2			
CO2	3	2		2	3	3	3	
CO3	2	2	3		3	3		3
CO4	2	2	2	3	3			
CO5	2	2		2	2		3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	60	40	-	-	-	100
CAT2	-	45	55	-	-	-	100
ESE	-	-	-	-	-	-	NA

* ±3% may be varied (CAT 1 & 2 – 50 marks & ESE – NA)

Signature of the Chairman
Board of Studies - MCA

(Dr. K. CHITRA)

(Dr. M. JAGADEESAN)

24MCL11- DATA STRUCTURES AND ALGORITHMS LABORATORY								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**1**	**PC**	**0**	**0**	**4**	**NE**	**2**

Preamble	To provide the set of problems covering the basic algorithms as well as numerous computing problems demonstrating the applicability of various data structures and related algorithms Implementation.

LISTOF EXPERIMENTS / EXERCISES:

1.	Design a data structure to represent a stack in an array name d, elements of size n. Also write a functions for demonstrating push (), pop () and peep () operations on stack i, where the stack is initially empty.
2.	Design an application to demonstrate the use of stack data structure in checking whether the arithmetic expression is properly parenthesized.
3.	Design a Queue data structure and to perform various operations using linked list along with its size n, where n=10.
4.	Compute the Polynomial Addition d=a+b using singly linked list where a and b be the pointers to two polynomials.
5.	Program to illustrate the implementation of Insert, Delete and Searching operations on a binary search tree.
6.	Write a function to implement pre-order, in-order and post-order traversals of a binary tree.
7.	Consider an undirected graph G= (V, E). Assume that the vertices V are numbered 1, 2, 3 ...and perform traversal of graph using iterative DFS Technique. The DFS starts from first node.
8.	Write a Program to sort an array of integers in ascending order using selection sort.
9.	Develop a program to sort an array of integers in ascending order using divide and conquer techniques.
10.	Write a program to find an element among the list of elements in an array using Linear search Techniques.
11.	Implement a program to find an element among the list of elements in an array using Divide and Conquer Technique.

Total:60

REFERENCES/MANUAL /SOFTWARE:

1.	Front End :Windows/Linux OS
2.	Software:Turbo/Borland/GCC compilers
3.	Laboratory Manual

COURSEOUTCOMES: On completion of the course, the students will be able to		**BT Mapped (HighestLevel)**
CO1	make use of linear data structures to perform various operations.	Applying (K3) Manipulation(S2)
CO2	implement a program using Non-Linear Data Structures	Applying (K3) Manipulation(S2)
CO3	applyvarious sortingtechniques to sort the number of elements in a list	Applying (K3) Manipulation(S2)
CO4	perform searching operations in a given number of input elements	Applying (K3) Manipulation(S2)

Mapping of COs with POs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	2	3			3
CO2	3	3	2	2	3			3
CO3	3	3	2	2	3			3
CO4	3	3	2	2	3			3

1–Slight,2–Moderate,3–Substantial,BT-Bloom'sTaxonomy

Signature of the Chairman
Board of Studies - MCA

K. Ch (Ch. CHITRA)

P. Vijayakumar (P. VIJAYAKUMAR)

KONGU ENGINEERING COLLEGE * ACADEMIC CELL *

24MCL12 - DATABASE TECHNOLOGIES LABORATORY

Programme& Branch	MCA & Computer Applications	Sem.	Category	L	T	P	MP	Credit
Prerequisites	Nil	1	PC	0	0	4	NE	2

Preamble	To deliver students the elementary concepts of a data base management system and equips them to design and implement a database applications built over those concepts.

LIST OF EXPERIMENTS / EXERCISES:

1.	Consider a University Database and use necessary schema (Student, Department, Faculty, Courses...etc), Make use of DDL operations to perform creation of table, alter, modify, drop and truncate. Additionally apply DML transactions over the schema and use appropriate Integrity constraints like Primary Key, Unique key, Foreign Key, Check, Default, Null and Not Null.
2.	Construct the University database and schema to perform the controlling privileges operations with TCL –Commit, Save point and Rollback the transactions. To deal with the rights, permissions, and other controls of the database system use DCL that includes commands such as GRANT and REVOKE.
3.	Build the essential DB objects using view, sequences, indexes and synonyms for University Database.
4.	Make use of Employee Database and perform SQL Statements on Single row General functions, Case Conversion functions, Character functions, Date functions, Number functions. Aggregate functions AVG, COUNT, MAX, MIN, SUM. Set operations Union, Union All, Intersect, Minus.
5.	Experiment with Employee Database and Perform various Joins & Sub queries for displaying data from multiple tables using SQL operators, GROUPBY, HAVING and ORDERBY clause.
6.	Construct a basic block to combine database language and procedural programming language using PL/SQL programs.
7.	Generate a payroll process for employee tables by stored functions and stored procedures using PL/SQL programs.
8.	Iterate number of employees using Cursors in PL/SQL programs and perform Implicit, Explicit Cursor Operations for the table.
9.	Create Triggers for DML Statement, DDL Statement, System and User event. Make Use of PL/SQL block to call multiple functions, procedures, cursors using package.
10.	Write PL/SQL programs to Handle Exceptions with inbuilt libraries and customized way to raise an exceptions.
	Total:60

REFERENCES/ MANUAL /SOFTWARES:

1.	Front End: Microsoft Visual Studio 6.0, Microsoft .NET Framework SDK v2.0, Java Eclipse.
2.	Back End : ORACLE / MYSQL
3.	Laboratory Manual

COURSE OUTCOMES: **On completion of the course, the students will be able to**		**BT Mapped (Highest Level)**
CO1	make use of SQL commands to create and manipulate databases	Applying (K3), Manipulation(S2)
CO2	building db objects and make use of predefined functions	Applying (K3) Manipulation(S2)
CO3	design complex queries using SQL	Applying (K3) Manipulation(S2)
CO4	create applications using PL/SQL	Applying (K3) Manipulation(S2)

Mapping of Cos with POs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3				
CO2	3	3	3	3				
CO3	3	3	3	3				
CO4	3	3	3	3				

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

24MCP11 - MINI PROJECT I								
Programme & Branch	MCA & Computer Applications	Sem	Category	L	T	P	MP	Credit
Prerequisites	Nil	1	EC	0	0	4	NE	2
							Total:60	

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	identify the problem by applying acquired knowledge	Applying (K3) Precision (S3)
CO2	analyze and categorize executable project modules after considering risks	Analyzing (K4) Precision (S3)
CO3	analyze efficient tools for designing project modules	Analyzing (K4) Precision (S3)
CO4	integrate all the modules through effective teamwork after efficient testing and validation	Evaluating (K5) Precision (S3)
CO5	elaborate the completed work and compile the project documentation	Creating (K6) Precision (S3)

Mapping of COs with POs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	3	3	3	2
CO2	3	3	3	3	3	3	3	2
CO3	3	3	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

Signature of the Chairman
Board of Studies - MCA

K.Chitra
(K.CHITRA)

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POS

24MCT21 - ADVANCED JAVA PROGRAMMING								
Programme & Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**2**	**PC**	**3**	**0**	**0**	**ES**	**3**

Preamble	To develop general purpose applications using object-oriented design principles with database connectivity in java language.	
Unit – I	**Basics of Java, Classes and Objects:**	**9**
The Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Introducing Classes– Methods and Classes: Overloading Methods – Passing and returning Objects – Recursion – Access control – static –final – Nested and Inner classes.		
Unit – II	**Inheritance, Packages and Interfaces:**	**9**
Inheritance: Basics – Using super – Method Overriding – Dynamic Method dispatch – Abstract classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access – importing Packages – Interfaces.		
Unit – III	**Exception Handling, Multithreading and Collection Frameworks:**	**9**
Fundamentals – Types – Uncaught Exceptions – try and catch – Multiple catch – Nested try – throw – throws – finally – Built-in Exceptions – Multithreaded: Java Thread Model – Main Thread – Creating a Thread and Multiple threads – is Alive() and join()- Collection Frameworks: Collection Interfaces - Collection Classes: ArrayList - LinkedList - HashSet - TreeSet - PriorityQueue - Iterator - Map: Map Interfaces - Map Classes: HashMap – TreeMap - Comparators.		
Unit – IV	**Servlets and Java server Pages:**	**9**
Working with Servlets: Features–Servlet API–Servlet Lifecycle–Creating a Sample Servlet-Java Server Pages: Architecture of JSP pages – Life Cycle of JSP – Working with JSP Basic Tags and implicit objects – Exploring Action Tags.		
Unit – V	**JDBC, Hibernate and Spring:**	**9**
Working with JDBC: Introduction -JDBC Drivers – Features of JDBC – JDBC API – Major Classes and Interfaces – Process with java.sql package –Working with Hibernate: Architecture – Downloading hibernate -Exploring HQL – Hibernate O/R mapping – Working with Hibernate. Introduction to Spring: Overview–DependencyInjection–SpringLibraries–SpringToolSuite–Developing a simple Spring Application.		
		Total:45

REFERENCES:

1.	Herbert Schild,"Java: The Complete Reference", 12th Edition, McGraw Hill, 2021
2.	CDAC, "Core and Advanced Java - Black Book", 1stEdition, Dreamtech Press, 2018
3.	Cay Horstmann, "Core Java -Volume 1:Fundamentals", 12thEdition , Oracle Press, 2021

MICRO PROJECT:

1	Develop a Library management system with basic modules and users like Database module: This has two functions – Insertion of data and extraction of data. Report module: For the borrowed books list to display. Availability module: To view the availability of books. Search Module: search facility for books and members. Users in the system: Librarian, student user functions: Librarian: Add, view, delete the book details and user details, issue and return books. Student: view and requesting books, returning books.
2	Design an employee payroll management system with basic modules and its processes as Admin: Admin can Add/Edit/delete the employees. Admin can Add/Edit/delete the schedule the work of the employees. Admin can Add and calculate/Edit/Delete the Salary of the employee. Employee: Employees can view his/her schedule set by Admin. Employees can check his/her attendance. Employees can update his/her details. Employees can View their salary details.

3	Design a Hospital Management with basic modules and its processes as Three main actors of the system who are going to manage or run the complete application are Admin, Doctor and Receptionist. Admin Module: Admin can ADD/DELETE/UPDATE a doctor. Admin can VIEW the list of doctors. Admin can ADD/DELETE/UPDATE a receptionist. Admin can VIEW the list of receptionists. Admin can ADD/DELETE/UPDATE a patient. Admin can ADD/DELETE/UPDATE an appointment. Doctor Module: The doctor can VIEW the appointments. The doctor can VIEW the patient list. Receptionist Module: The receptionists can ADD/EDIT/VIEW appointments. The receptionists can ADD/EDIT/VIEW the patient.
4	Design an Electricity bill management system with basic modules and its processes as follows Login registration: Admin(Electricity board user), and User(Customer) can log in and register in the application. Admin can add a new user in the application as well as a new customer also can log in by itself by using its consumer number. Billing: Admin can add details about the consumer details according to the consumed electricity units consumed by the consumer. Users can view the bill
5	Design an online Quiz system with basic modules and its processes as follows Users of the System Teacher Student Functional Requirements Teacher: Can create quiz after getting logged in. Can enter subjects and enter question with its options and answer at the time of creating quiz. 10 Question for each quiz required to be completed. Student: Can search quiz according to their interest. select the id of quiz and ready to start it. After completing all questions, result will be displayed automatically. Can view the description about each and every question in the respective quiz.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	apply object- oriented programming concepts for solving problems	Applying(K3)
CO2	construct reusable classes using inheritance, packages and interfaces	Applying (K3)
CO3	apply the concepts of Multithreading, Exception handling and Collection frameworks to develop efficient and error free codes.	Applying (K3)
CO4	develop Server side java applications using Servlet and JSP concepts	Applying (K3)
CO5	Construct applications to interact with relational database systems using JDBC and hibernate	Applying (K3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	2	2			
CO2	3	2	2	2	2			
CO3	3	2	2	2	2			
CO4	3	2	2	2	2			
CO5	3	2	2	2	2			

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Rememberin g (K1)%	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	45	55	-	-	-	100
CAT2	-	45	55	-	-	-	100
CAT3	-	50	50	-	-	-	100
ESE	-	40	60	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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TMS

24MCC21 – MACHINE LEARNING								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**2**	**PC**	**3**	**0**	**2**	**ES**	**4**

Preamble	The course focuses on finding patterns from empirical data and also explores techniques on supervised, unsupervised learning algorithms.	
Unit – I	**Machine Learning Essentials:**	**9**
Types of Machine Learning – Applications – Tools – Preparing to model: Exploring structure of data – Data quality and remediation – Data Pre-processing – Modeling and Evaluation: Selecting – Training – Model Representation and Interpretability – Evaluating Performance of a model.		
Unit – II	**Feature Engineering:**	**9**
Feature Engineering: Feature transformation – Feature subset selection – Bayesian concept learning: Bayes' theorem – Bayes' theorem and Concept learning – Bayesian Belief Network.		
Unit – III	**Supervised Learning:**	**9**
Classification: Model – Learning steps – Common Algorithms: KNN – Decision Tree – Random Forest – Support Vector Machines – Regression: Common Algorithms: SLR – MLR – Assumptions – Problems in Regression Analysis – Improving accuracy – Polynomial regression model – Logistic regression – Maximum Likelihood Estimation.		
Unit – IV	**Unsupervised Learning:**	**9**
Unsupervised Learning: Comparison – Application – Clustering: tasks – types – Partitioning methods – k-means – k-medoids – Hierarchical clustering – Density-based methods – Finding Pattern using Association Rule: Association rule – Apriori algorithm.		
Unit – V	**Neural Network:**	**9**
Neural Network: Biological neuron – Artificial Neuron- Types of activation functions – Architectures of Neural Network – Learning Process in ANN: Back Propagation.		

LIST OF EXPERIMENTS / EXERCISES:	
1.	Exploration of a Data Set in the IDE to perform various Numpy and Pandas operations.
2.	Write a python program to calculate mean, median, variance, standard deviation of the given numerical data.
3.	Implement various data preprocessing techniques on real time dataset using python.
4.	Build a python code to perform different visualization for the given data set.
5.	Develop a python code to perform dimensionality reduction using PCA.
6.	Construct a python program to find the attribute with maximum information gain and gain ratio and construct the decision tree for the given data.
7.	Develop a python program to implement K-NN algorithm for the given data.
8.	Construct a python program to implement Support Vector Machines learning algorithm for the given data.
9.	Build a python code to implement k-means clustering algorithm.
10.	Implement Multi-Layer Artificial Neural Network analysis for the given dataset using python code.

Lecture:45, Practical:30, Total:75

REFERENCES:	
1.	SaikatDutt, Subramanian Chandramouli and Amit Kumar Das, Machine Learning, 1st Edition, Pearson Education, India, 2023.
2.	Nageswara Rao R., "Core Python Programming", 3rd Edition, Dreamtech Press, Wiley India Private Ltd., New Delhi, 2022.
3.	Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning Using Python", 1st Edition, Wiley India, 2022.

MICRO PROJECT(ANY ONE):	
1.	Make use of classification or regression algorithm and develop any one of the given applications: Iris Flower Classification, titanic survival prediction, spam mail detection, diabetes prediction, sentiment analysis on movie reviews, predicting stock sales, predicting housing prices.
2.	Develop an unsupervised model for anyone of the given applications: Movie recommendation system based on user ratings, image clustering, and market basket analysis to Identify frequent itemsets, social media analysis to identify communities or user segments, credit card fraud detection, tect document clustering to cluster the similar documents together, customer segmentation for E-Commerce.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	articulate the perspectives of machine learning and formulate the hypothesis.	Applying (K3) Manipulation (S2)
CO2	make use of feature engineering process and Bayesian concept learning.	Applying (K3) Manipulation (S2)
CO3	utilize the concepts of classification and regression for solving a given problem.	Applying (K3) Manipulation (S2)
CO4	employ the principles of unsupervised learning algorithm for optimization.	Applying (K3) Manipulation (S2)
CO5	apply artificial neural networks for real world problems.	Applying (K3) Manipulation (S2)

Mapping of COs with POs

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2						
CO2	3	2	2	2				
CO3	3	3	2	2				
CO4	3	3	2	2				
CO5	3	3	2	2				

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	40	60	-	-	-	100
CAT2	-	40	60	-	-	-	100
CAT3	-	40	60	-	-	-	100
ESE	-	40	60	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCT22 – CLOUD COMPUTING TECHNOLOGIES								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**2**	**PC**	**3**	**0**	**0**	**NE**	**3**
Preamble	It allows computer users to conveniently rent access to fully featured applications, to software development and deployment environments							
Unit – I	**Cloud Computing Fundamentals, Architecture:**							**9**
Define Cloud Computing– Cloud Types–Examining the Characteristics – Benefits, Disadvantages –Cloud Computing Architecture-Exploring the Cloud Computing Stack – Connecting to the Cloud.								
Unit – II	**Understanding Services and Virtualization:**							**9**
Infrastructure as a Services-Platform as a Service- Software as a Service-Identity as a Service –Compliance as a Service – Virtualization Technologies –Load Balancing and Virtualization-Understanding Hypervisors								
Unit – III	**Cloud Platform:**							**9**
Google Web Services–Amazon Web Services-Components–Working with the Elastic Compute Cloud–Amazon Storage Systems-Amazon Database Services – Microsoft Cloud Services. Case study: AWS Cloud services to build a scalable and intelligent alerting system.								
Unit – IV	**Cloud Security and Web Mail Services:**							**9**
Securing the Cloud – Securing Data – Establishing Identity and Presence Services – Working with Productivity Software-Web Mail Services: Exploring the Cloud Mail Services – Exploring Instant Messages.								
Unit – V	**Advanced Technologies in Cloud Computing:**							**9**
Cloud Computing trends-Cloud Tools-Cloud with Diverse look-Media clouds-Security clouds-App-specific clouds-Groupware clouds-Mobile cloud computing-Cloud computing Environment-Selection of cloud Applications-Cloud Descriptor language-Green computing—workload pattern for clouds-Third party technology-Inter cloud-Azure cloud services case study: Modernizing payments via cloud migration								
								Total:45

REFERENCES:

1.	Barrie Sosinsky, "Cloud Computing", 1st Edition, Wiley Publishing inc, Canada, 2018.
2.	ShailendraSingh,"Cloud Computing"1st Edition, Oxford University Press
3.	RajkumarBuyya,ChristianVecchiola.,ThamaraiSelvi.S, "Mastering Cloud Computing", 1stEdition, McGraw hill , 2015

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.	Applying (K3)
CO2	analyze various cloud programming models and apply them to solve problems on the cloud	Analyzing (K4)
CO3	demonstrate a critical understanding of how applications are deployed and costed in the cloud and take advantage of elastic resources	Applying (K3)
CO4	analyse the issues in Resource provisioning and Security governance in clouds	Analyzing (K4)
CO5	design& develop backup strategies for cloud data based on features.	Applying (K3)

Mapping of COs with POs

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	2			2	2	2	
CO2		2	3	2		2		
CO3			2		3		2	
CO4	3	2	2	2		2		
CO5	2		3	2	2			

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	50	40	10	-	-	100
CAT2	-	40	40	20	-	-	100
CAT3	-	45	35	20	-	-	100
ESE	-	40	40	20	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCE01 - SOFTWARE PROJECT MANAGEMENT								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Software Engineering**	**2**	**PE**	**3**	**0**	**0**	**ES**	**3**

Preamble	To perform various activities for successful completion of a project in spite of all the risks.	
Unit – I	**Software Project Management and Project Evaluation:**	**9**
Software Project Definition - Software Projects Versus Other Types of Projects – Contract Management and Technical Project Management - Plans, Methods and Methodologies – Categorizing Software Projects -Stakeholders - Setting Objectives – Business Case - Project Success and Failure - Management Control – Project Management Life Cycle-Project Portfolio Management – Evaluation of Individual Projects –Cost-benefit Evaluation Techniques – Risk Evaluation – Programme Management-Managing the Allocation of Resources within Programmes.		
Unit – II	**Project Planning and Software Effort Estimation:**	**9**
Step Wise Project Planning –Selection of Appropriate Project Approach- Where are the Estimates Done - Problem with Over and Under Estimates - The Basis for Software Estimating - Software Effort Estimation Techniques - Bottom up Estimating - The Top Down Approach and Parametric Models -Expert Judgment - Estimating by Analogy - Function Points – COCOMO – Cost Estimation – Staffing Pattern-Effect of Schedule Compression.		
Unit – III	**Activity Planning and Risk Management:**	**9**
Objectives-Project Schedules-Sequencing and Scheduling Activities-Network Planning Models-Formulation of a Network Model - Forward Pass - Backward Pass - Critical Path - Activity Float -Risk Management Approaches - Risk Identification, Assessment, Planning and Management – Evaluating the Risks – PERT Technique-Applying PERT Technique.		
Unit – IV	**Resource Allocation, Monitoring and Managing Contracts:**	**9**
Nature of Resources, Identifying Resource Requirements, Scheduling, Creating Critical Paths –Counting the Cost- Creating the Framework, Collecting the Data, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring-Change Control – Managing Contracts – Types of Contracts – Stages in Contract Placement –Contract Management-Stress Management-Working in Teams .		
Unit – V	**Software Quality and Project Closure:**	**9**
The Place of Software Quality in Project Planning – Importance – Definition –Software Quality Models- Product versus Process Quality Management – Quality Management Systems – Process Capability Models – Techniques to Help Enhance Software Quality – Reasons for Project Closure, Project Closure Process, Performing a Financial Closure-Project Closeout Report.		
		Total:45

REFERENCES:

1.	Bob Hughes, Mike Cotterell&Rajib Mall, "Software Project Management", 6th Edition, McGraw Hill, New Delhi, 2022.
2.	S. A. Kelkar, "Software Project Management", 3rd Edition, PHI, New Delhi, 2023.
3.	Adolfo Villafiorita , "Introduction to Software Project Management", 1st Edition, CRC Press, 2014.

MICRO PROJECT:

1	Create a "Mobile Application Development for Healthcare" which manage the development of a mobile application aimed at facilitating communication between patients and healthcare providers, ensuring compliance with healthcare regulations and security standards and quality measures using GANTT chart
2	Develop a "E-Commerce Platform Development" by including features such as inventory management, payment processing and customer relationship management with project objective, project planning steps ,Cost Estimation Methods using PERT ,and recall the risk they faced while developing the project, infer how resources are allocated for project with quality measures.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (HighestLevel)
CO1	describe the modern project management and risks evaluation for different applications.	Understanding (K2)
CO2	apply the concept of the effective project planning and software effort estimation	Applying(K3)
CO3	apply adequate knowledge about cost and effort estimation of the software development.	Applying (K3)
CO4	apply and identify the various resource allocation, monitoring, and managing contracts.	Applying(K3)
CO5	analyze the quality of software and project closures.	Analyzing(K4)

Mapping of COs with POs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	2	3	2	3	2	2	2
CO2	2	2	2	2	3	2	2	2
CO3	3	3	2	2	2	3	2	2
CO4	2	2	2	2	3	2	2	3
CO5	2	2	2	2	2	2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	45	35	20	-	-	100
CAT2	-	45	35	20	-	-	100
CAT3	-	45	35	20	-	-	100
ESE	-	40	40	20	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCE02 - CRYPTOGRAPHY AND NETWORK SECURITY								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Computer Networks**	**2**	**PE**	**3**	**0**	**0**	**ES**	**3**
Preamble	To explore a growth in computer systems and their interconnections via networks, has increased the dependence of both organizations and individuals on the information stored and communication be secure using cryptography techniques.							
Unit – I	**Information and Network Security Concepts:**							**9**
Computer Security Concepts—The OSI Security Architecture–Security Attacks–Services and Mechanisms–Cryptography-Model for Network Security – Introduction to Number Theory: Divisibility and the Division Algorithm-The Euclidean Algorithm-Modular Arithmetic-Euler's Theorem-The Chinese Remainder Algorithm-Discrete Algorithm.								
Unit – II	**Symmetric Ciphers:**							**9**
Classical Encryption Techniques: Symmetric Cipher Model–Substitution Techniques–Transposition Techniques–Rotor machines–Steganography–Block Cipher and Data Encryption Standard –DES Standard-Advanced Encryption Standard.								
Unit – III	**Asymmetric Ciphers:**							**9**
Public key cryptography and RSA: Principles-RSA Algorithm-The Diffie–Hellman Problem–Elgamal Cryptographic Systems-An Introduction to Elliptic curve Arithmetic –Elliptic curve Cryptography.								
Unit – IV	**Cryptographic Data Integrity Algorithms:**							**9**
Cryptographic Hash Functions: Applications - Two simple hash functions - Secure Hash Algorithm (SHA) –SHA-3- Message Authentication codes(MAC): Requirements – Functions – Security of MAC-Hash function based MAC – DAA and CMAC – Digital Signatures-Light Weight cryptography and Post-Quantum Cryptography-Symmetric Key Distribution using Symmetric and Asymmetric Encryption – Distribution of public keys – X.509 Certificates – Public-Key Infrastructures-User Authentication.								
Unit – V	**Network and Internet Security:**							**9**
Transport-Level Security-Wireless Network Security-Electronic Mail Security-IP Security-Network Endpoint Security-Cloud Security-Internet of Things (IoT) Security.								
								Total:45

REFERENCES:

1.	William Stalllings, "Cryptography and Network Security: Principles and Practice", 8th Edition, Pearson India Education Services Pvt., Ltd., 2023.
2.	AtulKahate, "Cryptography and Network Security", 4th Edition, TataMcGraw Hill Education, 2023.
3.	Bernard L.Menezes,Ravinder Kumar"Cryptography,Network Security and Cyber Laws," 2nd Edition, Cengage Publication, 2023.

MICRO PROJECT:

1.	Design a "Digital Signature Verification " which generates and verifies digital signatures to authenticate the integrity and origin of documents and messages
2.	Develop a "Secure Chat Application" that encrypts messages using modern cryptographic algorithms to ensure confidentiality and integrity of communication

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Apply various Cryptographic Techniques and symmetric key cryptography algorithms to solve real world problems.	Applying (K3)
CO2	design various encryption techniques with symmetric cipher measures to solve real case scenarios	Applying (K3)
CO3	interpret Public and Private key cryptosystems and authentication to ensure confidentiality	Evaluating (K5)
CO4	evaluate Hash functions and Digital Signature with quantum cryptography to ensure the data Integrity	Evaluating (K5)
CO5	Implement the security challenges in Wireless networks and describe the system security.	Evaluating (K5)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	2	3	3	3	3
CO2	2	2	3	2	2	3	2	3
CO3	2	3	3	2	3	3	3	3
CO4	2	3	3	2	2	2	2	2
CO5	3	3	2	2	2	3	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5)%	Creating (K6) %	Total %
CAT1	-	35	40	15	10	-	100
CAT2	-	35	40	15	10	-	100
CAT2	-	35	40	15	10	-	100
ESE	-	30	30	20	20	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCE03 - WEB APPLICATION DEVELOPMENT								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**HTML, CSS and Javascript**	**2**	**PE**	**3**	**0**	**0**	**ES**	**3**

Preamble	To utilize contemporary web technologies and frameworks to construct dynamic online applications, fostering real-time interaction and enriching user experiences.	
Unit – I	**WebEssentials:**	**9**
Clients, Servers and Communication: The Internet - Basic Internet Protocols - The World Wide Web - HTTP Request Message - Response Message -Web Clients - Web Servers - Markup Languages: HTML – History and Versions - Basic XHTML Syntax And Semantics-HTML Elements-Relative URLs–Lists–Tables–Frames –Forms- XML –Creating HTML Documents.		
Unit – II	**StyleSheets:**	**9**
CSS – Features - Core Syntax - Style Sheets and HTML - Style Rule Cascading and Inheritance - Text Properties - Box Model – Normal Flow Box Layout - Client-Side Programming: The JavaScript Language- JavaScript in Perspective – Syntax - Variables and Data Types-Statements-Operators– Literals– Functions– Objects– Arrays -Built-in Objects-JavaScript Debuggers.		
Unit – III	**DOM:**	**9**
DOM - DOM History and Levels - Intrinsic Event Handling - Modifying Element Style -The Document Tree - DOM Event Handling - Accommodating Noncompliant Browsers - Properties of Window.		
Unit – IV	**XML:**	**9**
The Fundamentals of XML - XML Document Structure - Rules of XML Structure - Namespaces in XML - Validating XML with the Document Type Definition - Creating XML Schemas - The X-Files: XPath, XPointer, and Xlink - Transforming XML with XSL : XSLT for Document Publishing , XSL Formatting Objects.		
Unit – V	**Angular JS:**	**9**
Introduction to Angular JS- MVC Architecture - Directives, Expressions, Controllers, Filters, Module, Events, Forms, Validations, Examples.		
		Total:45

REFERENCES:

1.	Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", 1st Edition, Pearson Education, 2015
2.	Krishna Rungta,"Learn AngularJS in 1 Day" Independent Publication, 2018
3.	Schmelzer Ron , "XML and Web Services Unleashed", 1e Paperback – 1 January 2008

MICRO PROJECT:

1.Create an interactive to-do list application using HTML, CSS, and DOM manipulation with JavaScript, and XML for data storage. The application should meet the following requirements:

1. **HTML**: Create a basic structure with a form to add new to-do items, including an input field and a submit button. Include a section to display the to-do list.
2. **CSS**: Style the form, to-do list, and buttons for a visually appealing and responsive layout. Highlight completed items differently.
3. **JavaScript**: Implement functionality to:
   - Add new to-do items when the form is submitted.
   - Mark items as completed.
   - Edit existing to-do items.
   - Delete items from the list.
   - Save the to-do list in an XML format and store it in local storage.
   - Load the to-do list from the XML stored in local storage when the page loads.

Ensure that the to-do list data persists across page reloads by utilizing XML for storage.

2.Case Study: Interactive Employee Management System

1. HTML (within JSP) Structure:
   - Create a JSP page that serves the HTML structure.
   - Include a form to add new employee details (name, position, department).
   - Include a section where the employee list will be displayed.
2. CSS Styling:
   - Style the form and employee list for a visually appealing layout.
   - Ensure the layout is responsive.
3. XML for Data Storage:
   - Use XML to store employee data.
   - Provide functionality to read and write to the XML file on the server side.
4. AngularJS for Frontend Interactivity:
   - Implement AngularJS to handle dynamic data binding and interaction.
   - Allow users to add, edit, and delete employee records.

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24MCE04 – NATURAL LANGUAGE PROCESSING								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	Mathematics	**2**	**PE**	**3**	**0**	**0**	**ES**	**3**

Preamble	To develop the different modules of natural language processing like lexical analysis, error checking, part-of-speech tagging, syntax checking.	
Unit – I	**Regular Expressions:**	**9**
Concept and Use of Natural Language Processing, Ambiguity and uncertainty in language, The Turing test, Models and Algorithms-Basic Regular Expression Patterns, Disjunction, Grouping, and Precedence, Advanced Operators, Regular Expression Substitution, Using FSA to Recognize Sheeptalk, Formal Languages		
Unit – II	**Automata:**	**9**
FSAs, Using an NFSA to accept strings, Recognition as Search, Relating Deterministic and Nondeterministic Automata, Regular Languages and FSAs, Survey of (Mostly)English Morphology, Inflectional Morphology, Derivational Morphology, The Lexicon and Morphotactics, Morphological Parsing with Finite-State		
Unit – III	**Finite-State Transducers:**	**9**
Transducers, Orthographic Rules and Finite-State Transducers, Human Morphological Processing, N-gram Language Models, Words, Corpora, Text Normalization, Minimum Edit Distance, N-Grams, Evaluating LanguageModels, Generalization and Zeros, Smoothing, Kneser-Ney Smoothing		
Unit – IV	**Word Classes and Part-of-Speech Tagging:**	**9**
English Word Classes, Tagsets for English, Part of Speech Tagging, Rule-based Part-of-speech Tagging, Stochastic Part-of-speech Tagging, The Actual Algorithm for HMM tagging, Transformation-Based Tagging, How TBL rules are applied, How TBL Rules are Learned, Multiple tags and multiple words, Unknown words, Class-based N-grams.		
Unit – V	**Context-Free Grammars:**	**9**
Constituency, Context-Free Rules and Trees, Sentence-Level Constructions, The Noun Phrase, The Verb Phrase and Subcategorization, Auxiliaries, Spoken Language Syntax, Grammar Equivalence & Normal Form, Finite State & Context-Free Grammars, Grammars & Human Processing		
		Total:45

REFERENCES:

1.	Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition by Daniel Jurafsky& James H. Martin ,Pearson, 2023
2.	Speech and Language Processing by Daniel Jurafsky and James H. Martin Second edition, Prentice Hall,2023
3.	Statistical Language Learning by Charniack Eugene MIT Press, 2018

MICRO PROJECT:

1	Develop regular expressions for the following languages. By "word", it mean an alphabetic string separated from other words by whitespace, any relevant punctuation, line breaks, and so forth. 1. the set of all strings with two consecutive repeated words (e.g., "HumbertHumbert" and "the the" but not "the bug" or "the big bug"); 2. all strings that start at the beginning of the line with an integer and that end at the end of the line with a word; 3. all strings that have both the word grotto and the word raven in them (but not, e.g., words like grottos that merely contain the word grotto); 4. write a pattern that places the first word of an English sentence in a register. Deal with punctuation.
2	Develop a Restaurant Project by using following ✓ User tell about any good cantonese restaurants close by ✓ mid pricedthai food is what user looking for ✓ tell about chez panisse ✓ can user give me a listing of the kinds of food that are available ✓ user looking for a good place to eat breakfast ✓ when is caffevenezia open during the day

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Understand fundamental mathematical models and algorithms in the field of natural language processing.	Understanding (K2)
CO2	provide solutions of a problems by make use of finite state automata	Applying (K3)
CO3	Make use of N-gram model and its principle to solve a real world problems	Applying (K3)
CO4	apply concepts of processing the natural language on real world problems of speech recognition, automated question answering, text classification	Applying (K3)
CO5	Identify the syntactic structure of a sentence	Applying (K3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	2	2	2	2	3	2	2
CO2	2	2	2	2	3	2		2
CO3	3	2	3	2	2	2	2	2
CO4	2	2	2	2	2	3	2	2
CO5	2	2	2	2	2	3	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1)%	Understanding (K2)%	Applying (K3)%	Analyzing (K4)%	Evaluating (K5)%	Creating (K6)%	Total %
CAT1	-	60	40	-	-	-	100
CAT2	-	40	60	-	-	-	100
CAT3	-	40	60	-	-	-	100
ESE	-	40	60	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCE05-BUSINESSINTELLIGENCE								
Programme&Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**2**	**PE**	**3**	**0**	**0**	**ES**	**3**

Preamble	To recognize the Business Intelligence as expert information, knowledge and technologies, forth emanagement of organizational and individual business in an efficient manner.	
Unit–I	**Overview of Business Intelligence, Analytics and Decision Support:**	**9**
Changing Business Environments and Computerized Decision Support - A Framework for Business Intelligence - Intelligence Creation, Use, and BI Governance - Transaction Processing Versus Analytic Processing - Successful BI Implementation - Analytics Overview-Brief Introduction to Big Data Analytics.		
Unit–II	**Business Reporting, Visual Analytics and Business Performance Management:**	**9**
Business Reporting-Definitions and Concepts-Data and Information Visualization–Different Types of Charts and Graphs-The Emergence of Data Visualization and Visual Analytics - Performance Dashboards - Business Performance Management - PerformanceMeasurement-BalancedScorecards–SixSigmaasaPerformanceMeasurementSystem.		
Unit–III	**Data Mining:**	**9**
Data Mining Concepts and Applications-Data Mining Applications-Data Mining Process-Data Mining Methods-Data Mining Software Tools-Data Mining Privacy Issues, Myths and Blunders.		
Unit–IV	**Text and Web Analytics:**	**9**
Text Analytics and Text Mining Overview-Natural Language Processing-Text Mining Applications-Text Mining Process-Sentiment Analysis-Web Mining Overview –Search Engines-Web Usage Mining-Social Analytics.		
Unit–V	**Business Analytics: Emerging Trends and Future Impacts:**	**9**
Location Based Analytics for Organizations - Analytics Applications for Consumers - Recommendation Engines - The Web 2.0 Revolution and Online Social Networking - Cloud Computing and BI - Impacts of Analytics in Organizations -Issues of Legality, Privacy and Ethics.		
		Total:45

REFERENCES:

1. RameshSharda,DursunDelenandEfraimTurban"BusinessIntelligence—A Managerial Perspective on Analytics", 3rd Edition, Pearson Education,India,2020.
2. EfraimTurban,RameshShardaandDursunDelen,"Decision Support and Business Intelligence Systems",9thEdition,PearsonEducation, India,2018.
3. DavidLoshin,"Business Intelligence—TheSavvyManager'sGuide",2nd Edition,MorganKaufmannPublishers,USA,2013.

MICRO PROJECT:

1	Predicting sales of a supermarket chain of various products and their approach towards inventory management
2	Classification of loan eligibility prediction and the probability of successful repayment

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Understand fundamental mathematical models and algorithms in the field of natural language processing.	Understanding (K2)
CO2	provide solutions of a problems by make use of finite state automata	Applying (K3)
CO3	Make use of N-gram model and its principle to solve a real world problems	Applying (K3)
CO4	apply concepts of processing the natural language on real world problems of speech recognition, automated question answering, text classification	Applying (K3)
CO5	Identify the syntactic structure of a sentence	Applying (K3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	2	2	2	2	3	2	2
CO2	2	2	2	2	3	2		2
CO3	3	2	3	2	2	2	2	2
CO4	2	2	2	2	2	3	2	2
CO5	2	2	2	2	2	3	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1)%	Understanding (K2)%	Applying (K3)%	Analyzing (K4)%	Evaluating (K5)%	Creating (K6)%	Total %
CAT1	-	60	40	-	-	-	100
CAT2	-	40	60	-	-	-	100
CAT3	-	40	60	-	-	-	100
ESE	-	40	60	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCF01 - DEVOPS								
Programme & Branch	**Master of Computer Applications**	**Sem**	**Category**	**L**	**T**	**P**	**MP**	**Credits**
Prerequisites	**Nil**	**2**	**PE**	**2**	**0**	**2**	**ES**	**3**

Preamble	This course covers the new paradigm of combined development and operations in SDLC. It covers concepts like virtualization, containerization, continuous integration and development and cluster / cloud integration.	
Unit – I	**Introduction to DevOps, SDLC, Agile and Virtualization**	**6**
Definition of DevOps –The need for DevOps – Key concepts and principles of DevOps – Overview of SDLC – Phases of SDLC (Planning,Analysis,Design,Development,Testing,Deployment,Maintenance) – Overview of Agile methodology – Agile principles and values– Agile practices (Scrum, Kanban, Lean) – Role of DevOps in SDLC – Continuous Integration and Continuous Deployment (CI/CD) –Virtualization vs containerization –Overview of virtualization technologies (VMware, VirtualBox).Setting up virtualization software (e.g., VirtualBox, VMware) and creating a virtual machine. Installing and configuring a Linux distribution on the virtual machine. Setting up a web application development environment with the LAMP stack (Linux, Apache, MySQL, PHP). Setting up version control with Git and creating a simple Git repository. Implementing Agile methodology with a team-based project using Scrum, Kanban or Lean methodologies		
Unit – II	**Containerization and Docker**	**6**
Overview of containerization - Introduction to Docker - Docker architecture and components - Docker images and containers - Docker CLI commands – Docker file for building custom images - Docker Compose for multi-container applications. Installing and setting up Docker on a Linux machine. Building a Docker image using a Docker file. Running a Docker container and accessing its shell. Creating and running a multi-container application with Docker Compose. Deploying a Docker container to a remote server		
Unit – III	**CI/CD with Jenkins Pipeline**	**6**
Introduction to Jenkins - Understanding Continuous Integration and Continuous Delivery/Deployment - Jenkins architecture and components - Setting up Jenkins and Creating jobs - Jenkins Pipeline as code - Jenkins Master-Slave setup - Jenkins security and User Management - Integrating Jenkins with other DevOps tools. Installing and setting up Jenkins on a Linux machine. Setting up a Jenkins pipeline job. Configuring the pipeline job to build and test a sample application from a Git Hub repository. Integrating the pipeline job with a Docker registry to store and deploy the Docker image. Adding notifications and alerts to the pipeline job using Slack or email		
Unit – IV	**Kubernetes**	**6**
Introduction to Kubernetes - Kubernetes architecture and components - Kubernetes cluster setup and configuration - Kubernetes objects (Pods, Services, Deployments, etc.) - Kubernetes CLI commands - Kubernetes Networking and Service Discovery - Scaling and self-healing with Kubernetes. Creating and managing applications with Kubernetes. Installing and setting up Kubernetes on a local machine or a cloud provider. Deploying a sample application to Kubernetes using Kubernetes CLI commands. Creating and managing Kubernetes objects (Pods, Services, Deployments, etc.). Scaling the application by creating replicas and load balancing with Kubernetes. Upgrading and rolling back the application with Kubernetes		
Unit – V	**Terraform, Prometheus, and Grafana**	**6**
Introduction to Infrastructure as Code (IaC) - Overview of Terraform - Terraform Configuration file - Terraform Providers and State Management - Terraform Modules and Variables - Provisioning Resources with Terraform - Overview of monitoring and alerting - Introduction to Prometheus and Grafana - Setting up Prometheus and Grafana - Creating and visualizing metrics with Prometheus and Grafana. Installing and setting up Terraform on a Linux machine. Creating and managing infrastructure using Terraform. Creating and configuring a Prometheus server to monitor a sample application. Setting up alert rules and notifications with Prometheus and Alert manager. Creating and visualizing metrics with Grafana		

LIST OF EXPERIMENTS / PROJECTS (using different case studies):

1.	Dockerized Web Application Deployment Tools: Docker
2.	Jenkins-Driven CI/CD Pipeline Tools: Jenkins, Docker
3.	Docker Deployment with Integrated Monitoring Tools: Docker, Prometheus & Grafana
4.	Kubernetes-Based E-Commerce Application Tools: Kubernetes Docker
5.	Maven-Powered Java Application Deployment Tools: Maven, Jenkins, Kubernetes

Lecture:30, Practical:30, Total:60

TEXT BOOK:	
1.	Gene Kim, Patrick Debois, John Willis, and Jez Humble , "The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations", 2016
REFERENCES:	
1.	Docker - https://www.docker.com/use-cases/devops
2.	Kubernetes - https://kubernetes.io/docs/concepts/overview/what-is-kubernetes
3.	Jenkins - https://www.jenkins.io/doc/book/
4.	Prometheus - https://prometheus.io/docs/introduction/overview/

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	select and setup a virtualization software and create a virtual machine for web application development using WAMP/LAMP	Applying (K3) Precision(S3)
CO2	experiment with containerization by installing and setting up Docker and Docker Compose	Applying (K3) Precision(S3)
CO3	demonstrate Continuous Development (CD) / Continuous Integration (CI) using Jenkins integrated with other DevOps tools	Applying (K3) Precision(S3)
CO4	make use of Kubernetes to build scalable applications on clusters to achieve load balancing	Applying (K3) Precision(S3)
CO5	build and deploy cloud-based scalable solutions using Terraforms, Prometheus, and Grafana for effective monitoring and provisioning of resources	Applying (K3) Precision(S3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	1	1	3	3	3	3
CO2	3	2	1	1	3	3	3	3
CO3	3	2	1	1	3	3	3	3
CO4	3	2	1	1	3	3	3	3
CO5	3	2	1	1	3	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy3

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	50	50				100
CAT2	-	30	70				100
CAT3	-	30	70				100
ESE	-	0	100				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

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24MCE06 - PYTHON PROGRAMMING								
Programme & Branch	**MCA& Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**2**	**PE**	**3**	**1**	**0**	**NE**	**4**

Preamble	To make the students to be able to create and run scripts using python for real time applications.	
Unit –I	**Python Basics:**	**9+3**
Introduction to Python – Writing our First Python Program – Data types in python- operators in python -Input and Output-Control Statements:if..else-if..elif-while—for-infiniteloops-nestedloops-elsesuite—break—continue–pass—assert—return-command line arguments.		
Unit –II	**Sequential and Non Sequential Collection Operations:**	**9+3**
Arrays in Python: creating Arrays-Mathematical operations on Arrays- Comparing-Aliasing- Slicing and Indexing-Strings and Characters - Functions: defining —calling - returning results - Formal and Actual arguments- Types of actual arguments-Local and Global variables - Recursive function - Anonymous function - List and Tuples - Dictionaries.		
Unit –III	**Object Oriented Programming in Python:**	**9+3**
Introduction to Oops :Features ofOOPs-ClassesandObjects:creatingaclass–selfvariable–constructor–typesofvariables and methods – passing members – inner classes - Inheritance and Polymorphism - Abstract classes and Interfaces - Exceptions.		
Unit –IV	**Python Advances:**	**9+3**
Files: Types-open, close and working file-Binary files-with statement—seek () and tell() methods-Access binary files-zipping and unzipping files – Working with directories - Regular Expressions in Python-Date and Time: combining -formatting - comparing – sorting –Working with Calendar module.		
Unit –V	**Graphical User Interface:**	**9+3**
GUI in Python-Root Window-Fonts and Colors-Working with Containers-Canvas-Frame-Types of Widget: button-label—message—text—scrollbar-checkbutton—radiobutton—entry—spinbox-listbox-menu-CreatingTables-PythonsDatabase Connectivity - CRUD operations.		
		Lecture:45, Tutorial:15,Total:60

REFERENCES/MANUAL/SOFTWARE:

1. NageswaraRaoR.,"Core Python Programming",2nd Edition, Dream tech Press,NewDelhi,2021.
2. KennethA.Lambert,"Fundamentals of Python–FirstPrograms",2nd Edition,Cengage Publication,New Delhi,2019.
3. PaulBarry,"HeadFirstPython",2nd Edition,O'ReillyMedia, Beijing,2017.

COURSE OUTCOMES: On completion of the course,the students will be able to		BT Mapped (Highest Level)
CO1	Apply the fundamental concepts of python programming on real time applications	Applying (K3)
CO2	Implement python code to perform various operations using sequential and non-sequential collections	Applying (K3)
CO3	Develop python applications using object oriented programming concepts	Applying (K3)
CO4	apply operations on files, search the patterns using regular expression and working with date and time modules	Applying (K3)
CO5	Develop real-time applications to know about the interaction between front-backend.	Applying(K3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2						
CO2	3	2						
CO3	3	2	3	2	2			2
CO4	3	2	2	2				
CO5	3	2	3	2	3			2

1–Slight,2–Moderate,3–Substantial, BT-Bloom's Taxonomy

ASSESSMENTPATTERN– THEORY

Test/Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	40	60	-	-	-	100
CAT2	-	40	60	-	-	-	100
CAT3	-	40	60	-	-	-	100
ESE	-	40	60	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCE07 - ARTIFICIAL INTELLIGENCE								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Data Structures**	**2**	**PE**	**3**	**1**	**0**	**NE**	**4**

Preamble	To provide an introduction to the basic principles and applications of Artificial Intelligence.	
Unit – I	**Intelligent Agents and Blind search:**	**9+3**
Definition – History – Agents and Environments – Good behaviour and the concepts of rationality – Nature of environments – Structure of intelligent agents. State space search: Generate and Test – Simple search – Depth First Search (DFS) – Breadth First Search (BFS) – Comparison of DFS and BFS – Depth Bounded DFS.		
Unit – II	**Informed Search Methods:**	**9+3**
Informed Search Methods: Heuristic Search: Heuristic functions – Best First Search – Hill Climbing – Local maxima – Solution state space – Variable neighbourhood descent – Beam search – Tabu search. Peak to Peak Methods. Brute force – Branch and Bound – Refinement search.		
Unit – III	**A* and Randomized Search Methods:**	**9+3**
Algorithm A* - Admissibility of A*– Recursive Best First Search. Escaping local maxima: Iterated hill climbing – Simulated annealing – Genetic algorithms (GA) – Travelling Salesman Problem (TSP) – GA based methods for TSP.		
Unit – IV	**Game playing, Planning and Constraint Satisfaction:**	**9+3**
Board games – Game playing algorithms: Algorithm Minimax – Algorithm AlphaBeta – B* Search – Limitations of search. The STRIPS domain – Forward state space planning – Backward state space planning – Goal stack planning – Plan space planning.		
Unit – V	**Prepositional Logic, First Order Logic and Inferencing:**	**9+3**
Formal logic – Propositional logic – Resolution in propositional logic – First Order Logic (FOL) – Incompleteness of forward chaining – Resolution refutation in FOL – Horn clauses and SLD resolution – Backward chaining Formal logic – Propositional logic – Resolution in propositional logic – First Order Logic (FOL) – Incompleteness of forward chaining – Resolution refutation in FOL – Horn clauses and SLD resolution – Backward chaining.		
		Lecture:45, Tutorial:15,Total:60

REFERENCES:

1.	Khemani D., "A First Course in Artificial Intelligence", 1st Edition, 9th reprint, McGraw Hill Education (India) Private Limited, 2019.
2.	S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", 4th Edition, Pearson Education, 2022.
3.	Elaine Rich, Kelvin Knight &Shivashankar B Nair, "Artificial Intelligence", 3rdEdition, McGraw Hill Education, India, 2017.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Make use of the concepts of Intelligence agent and blind searching techniques to solve the given problem	Applying (K3)
CO2	organize the effectiveness of heuristics in informed search methods.	Applying (K3)
CO3	identify optimal solutions using A* and randomized search methods.	Applying (K3)
CO4	apply game playing and planning in problem solving.	Applying (K3)
CO5	utilize propositional logic and first order logic in knowledge-based reasoning.	Applying (K3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2					
CO2	3	2	2					
CO3	3	2	2					
CO4	3	2	2					
CO5	3	2	2					

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	40	60	-	-	-	100
CAT2	-	40	60	-	-	-	100
CAT3	-	40	60	-	-	-	100
ESE	-	40	60	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCE08 – INFORMATION SECURITY								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Computer Networks**	**2**	**PE**	**3**	**1**	**0**	**NE**	**4**

Preamble	This course focuses on wide spectrum of topics from legal and ethical issue, risk management, and implementation in the context of information security
Unit – I	**Information Security and The Need for Security**: **9+3**
The history of Information Security – CNSS Security model-Components of an Information System – Security in the system life cycle – Security professionals and the organization – Communities of interest – Information Security: Threat and Attacks – Compromises to intellectual property – Deviations in Quality of Service-Espionage – Force of nature – Human Error – Information Extortion – Sabotage-Software attacks – Technical hardware failures – Technical software failures.	
Unit – II	**Issues in Information Security and Planning for Security:** **9+3**
Law and ethics in information Security – Relevant U.S. Laws-International laws and legal bodies – Ethics and Information security – Codes of ethics of professional organizations – Key U.S. Federal agencies – Planning for Security: Information security policy, standards, and practices – The Information security blueprint – Security education, training, and awareness program.	
Unit – III	**Risk Management** **9+3**
Risk Identification: Planning and organizing the process – Identifying, inventorying and categorizing assets- Classifying and prioritizing threats – Specifying asset vulnerabilities; Risk assessment : Planning and organizing risk assessment- Determining the loss frequency – Calculating risk – Assessing risk acceptability – The FAIR approach to risk assessment – Risk control Quantitative versus qualitative risk management practices-Recommended risk control practices.	
Unit – IV	**Security Technology:** **9+3**
Access Control: Access control mechanisms – Biometrics – Access control architecture models – Firewalls: Firewall processing modes – Firewall architecture – Selecting the right firewalls – Configuring and managing firewalls – Content filters – Protecting remote connections – Intrusion detection and prevention systems –Honeypots, Honeynets, and padded cell systems – Scanning and analysis tools.	
Unit – V	**Implementing Information Security and Security & Personnel**: **9+3**
Information security project management – Technical aspects of implementation-Nontechnical aspect of implementation Information security certification and accreditation-Credentials for information security professionals-Employment policies and practices-Security considerations for temporary employees, consultants, and other workers-Internal control strategies – Privacy and the security of personnel data.	
Lecture:45, Tutorial:15,Total:60	

REFERENCES:

1.	Michael E. Whitman and Herbert J. Mattord, "Principles of Information Security", 6th Edition, Cengage Learning, India, 2018.
2.	Charles P. Pfleeger and Shari Lawrence Pfleeger, "Security in Computing", 5th Edition, Prentice Hall, 2018
3.	Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", Vol. 6, 6th Edition, CRC Press, 2012.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	elucidate fundamental principles within information security and ascertain the nature of attacks present in a security breach	understanding (K2)
CO2	identify challenges within information security and implement security policies, standards, and practices accordingly	Applying (K3)
CO3	recognize the potential hazards within information security and conduct evaluations to assess risks.	Applying (K3)
CO4	apply various security technologies for protecting information	Applying (K3)
CO5	utilizing diverse elements in information security implementation, rephrasing the challenges and considerations associated with staffing the information security team	Applying (K3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2		**2**			
CO2	3	2	2				**2**	
CO3	3	2	2					
CO4	3	2	2					
CO5	3	2	2		**2**			

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	70	30	-	-	-	100
CAT2	-	40	60	-	-	-	100
CAT3	-	40	60	-	-	-	100
ESE	-	40	60	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCE09 – MOBILE APPLICATION DEVELOPMENT								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Java**	**2**	**PE**	**3**	**1**	**0**	**NE**	**4**
Preamble	This course provides knowledge on developing mobile applications using Android							
Unit – I	**Introduction to Android:**							**9+3**
Introduction to Kotlin– Android Architecture – Environmental setup – Develop simple Hello World application – AppFolder structure - Android virtual device - Application Components –Toast message - Activity – Activity Life cycle - App Manifest file – Permissions - Log messages.								
Unit – II	**Layout and UI:**							**9+3**
Intent –types - Intent filters - Views - Layouts – Fragments - UI components: TextView,EditText, Button, ToggleButton,RadioGroup,CheckBox,AutoCompleteTextView,ProgressBar,TimePicker,DatePicker,RatingBar – Array adapters - Spinner -Event Listeners and Handlers.								
Unit – III	**Resources and Alerts:**							**9+3**
Resources overview – Styles and Themes - Menu: Option menu, Context menu –Alert dialog - Notification – Tool tip –Broadcast receivers - WebView - Phone call.								
Unit – IV	**Storage:**							**9+3**
Introduction to Storages - Bundle - SQL Lite: CRUD operations - Content providers – Shared preferences – Firebase: CRUD operations– Dependency injection.								
Unit – V	**Services and Sensors:**							**9+3**
Services –Send and receive SMS –Sensors: Motion and Position -Camera – Accessing GEO location – JSON parsing - Basic Animations: rotate, fade, zoom, slide and move–Google map integration – Best practices.								
								Lecture:45, Tutorial:15,Total:60
REFERENCES:								
1.	Dawn Griffiths and David Griffiths, "Head First Android Development", 3rd Edition, OReilly, 2021.							
2.	Bill Phillips, Chris Stewart and Kristin Marsicano, "Android Programming", 4th Edition, BigNerd Ranch Guides, 2017.							
3.	https://developer.android.com/.							

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Illustrate the steps to create android application and discuss its activity life cycle	Applying (K3)
CO2	develop an Android application using Layouts, Fragments, UI components with event handling	Applying (K3)
CO3	design styles, themes, alerts and menu	Applying (K3)
CO4	perform CRUD operations on SQLite and firebase.	Applying (K3)
CO5	create applications using services and access data from sensors.	Applying (K3)

Mapping of COs with POs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	2				
CO2	3	3	2	2				
CO3	3	3	2	2				
CO4	3	3	2	2				
CO5	3	3	2	2				

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	50	50	-	-	-	100
CAT2	-	50	50	-	-	-	100
CAT3	-	50	50	-	-	-	100
ESE	-	50	50	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCE10 - SOCIAL NETWORK ANALYSIS								
Programme&Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Probability and Statistics, Machine Learning**	**2**	**PE**	**3**	**1**	**0**	**NE**	**4**

Preamble	To provide a core knowledge of Social network analysis along with real world data by using various graph models with clustering algorithm techniques	
Unit – I	**Social Network Data Analytics:**	**9+3**
Introduction - Statistical Properties of Social Networks: Preliminaries – Static Properties - Dynamic Properties – Random Walks onGraphs: Background – Random Walk based Proximity Measures - Other Graph-based Proximity Measures – Graph theoreticMeasures for Semi-Supervised Learning - Clustering with Random Walk based Measures - Related Work:Algorithms-Applications-Evaluation and datasets.		
Unit – II	**Community Discovery and Node Classification in Social Networks:**	**9+3**
CommunitiesinContext-CoreMethods:QualityFunctions-TheKernighanLin(KL)Algorithm–Agglomerative/DivisiveAlgorithms - Spectral Algorithms - Multi-Level Graph Partitioning - Markov Clustering – Emerging Fields and Problems - NodeClassification in Social Networks: Problem Formulation - Methods using Local Classifiers - Random Walk based Methods - ApplyingNode Classification to Large Social Networks –Inference using Graphical Models-Metric labeling-Spectral labeling-Variations on Node Classification.		
Unit – III	**A Survey of Social Influence Analysis, Expert Location and Link Prediction in SocialNetworks:**	**9+3**
Influence Related Statistics - Social Similarity and Influence - Influence Maximization in Viral Marketing - Expert Location in SocialNetworks: Expert Location without Graph Constraints - Expert Location with Score Propagation – Expert Team Formation-Related Approaches:Agent based Approach-Influenced Maximization– Link Prediction in Social Networks: Feature based Link Prediction - Bayesian Probabilistic Models - Probabilistic Relational Models-Linear Algebraic Methods.		
Unit – IV	**Visualizing, Mining and Multimedia Information Networks in Social Media:**	**9+3**
Introduction – Taxonomy of Visualizations – Data Mining Methods for Social Media - Text Mining in Social Networks: KeywordSearch - Classification Algorithms - Clustering Algorithms-Transfer Learning in Heterogeneous Networks – Multimedia Information Networks: ontology based Learning- Link fromcommunity media – Network of Personal Photo Albums – Network of Geographical Information-Inference methods.		
Unit – V	**Social Tagging and Applications:**	**9+3**
Introduction–Tags–Tag Generation Models–Tagging System Design–TagAnalysis–Visualization of Tags–Tag Recommendations – Applications of Tags– Integration -Tagging Problems:Spamming -canonicalization and ambiquities.		
		Lecture:45, Tutorial:15,Total:60

REFERENCES:

1.	Charu C. Aggarwal, "Social Network Data Analytics", 1st Edition, Springer, US, 2020.
2.	Peter Mika. "Social Networks and the Semantic Web", 1st Edition, Springer, New York, 2023
3.	BorkoFurht. "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, US, 2014

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	understand the Statistical properties and various measures with algorithms of the social network data analytics.	Understanding (K2)
CO2	utilize various methods and algorithms in social networks to predict interaction among the different network communities.	Applying (K3)
CO3	get a survey of Social Influence Analysis along with Expert location and Link Prediction in Social Networks with different models.	Analyzing (K4)
CO4	apply visualization, Mining and Multimedia Techniques in Social networks.	Applying (K3)
CO5	examine the tag generation models and applications of tags in Social Networks	Analyzing (K4)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	2	2	3	3	2	2	3
CO2	3	2	2	3	2	3	2	2
CO3	3	3	2	2	2	2	2	2
CO4	3	2	2	3	2	3	2	3
CO5	3	3	2	2	2	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	45	35	20	-	-	100
CAT2	-	45	35	20	-	-	100
CAT3	-	45	35	20	-	-	100
ESE	-	40	30	30	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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MP

24MCE11 – Design Thinking								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Software Engineering**	**2**	**PE**	**3**	**1**	**0**	**NE**	**4**

Preamble	Design Thinking is human-centered problem solving tool which emphasize on empathy, collaboration, concretion and stakeholder feedback to unlock creativity and innovation, to devises feasible and viable idea/solutions.	
Unit – I	**Design Thinking and Explore:**	**9+3**
Design Thinking: Key Principles and Mindset – Five Phases, Methods and Tools of Design Thinking – User Guide – Foundation Building for Design Thinking – Explore: Methods & Tools – STEEP Analysis – Strategic Priorities – Activity System – Stakeholder Mapping – Opportunity Framing.		
Unit – II	**Empathize:**	**9+3**
Empathize: Methods & Tools – Field Observation – Deep User Interview – Empathy Map – User Journey Map - Need Finding – User Insights - User Persona Development..		
Unit – III	**Experiment:**	**9+3**
Experiment: Methods & Tools – Ideation – SCAMPER – Analogous Inspiration – Deconstruct & Reconstruct – User Experience Journey – Prototyping– Idea Refinement..		
Unit – IV	**Engage:**	**9+3**
Engage: Methods & Tools – Story Telling – Art of Story Telling – Storyboarding – Co-Creation with Users – Collect Feedback from Users.		
Unit – V	**Evolve:**	**9+3**
Evolve: Methods & Tools – Concept Synthesis – Strategic Requirements –Evolved Activity Systems – Activity System Integration– Viability Analysis – Innovation Tools using User Needs, CAP, 4S – Change Management - Quick Wins.		
Lecture:45, Tutorial:15,Total:60		

REFERENCES:

1.	Lee Chong Hwa, "Design Thinking The Guidebook", Design Thinking Master Trainers of Bhutan, 2017. (E-Book)
2.	Jeanne Liedtka and Tim Ogilvie, "Designing for Growth: A Design Thinking Tool Kit for Managers", Columbia University Press, 1st Edition, 2011.
3.	Jeanne Liedtka, Tim Ogilvie, and Rachel Brozenske, "The Designing for Growth Field Book: A Step-by-Step Project Guide", Columbia University Press, 1st Edition, 2014.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	construct design challenge and reframe the design challenge into design opportunity.	Applying (K3)
CO2	interview the user, and know the feelings of users to foster deep user understanding and be able to uncover the deep user insights and needs.	Applying (K3)
CO3	develop ideas and prototypes by brain storming using the ideation tools.	Applying (K3)
CO4	organize the user walkthrough experience using ideal user experience journey..	Applying (K3)
CO5	develop smart strategies & implementation plan that will deliver/achieve the idea/solution deduced from earlier phases.	Applying (K3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	2				
CO2	3	3	3	2				
CO3	3	3	3	2				
CO4	3	3	3	2				
CO5	3	3	3	2				

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	50	50	-	-	-	100
CAT2	-	50	50	-	-	-	100
CAT3	-	50	50	-	-	-	100
ESE	-	50	50	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCB03 - C++ PROGRAMMING								
Programme & Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**2**	**BC**	**3**	**0**	**0**	**NE**	**0**

Preamble	To learn and apply the object oriented concepts in problem solving	
Unit–I	**Perspective on C++:**	**9**
Principles of Object Oriented Programming — Beginning with C++ - Tokens, Expressions and Control structures. Functions: Main Function, Function Prototyping, Callby Value, Callby Reference, Inline Functions, Default Arguments, Const Arguments, Recursion, Function Overloading - Scope and Storage Class.		
Unit–II	**Classes and Objects:**	**9**
Classes and Objects : Specifying a Class – Defining member functions – Making an Outside Function Inline - Nesting of Member Functions – Private Member Functions - Constructors and Destructors – Arrays of Objects – Objects as Function Arguments – Returning Objects		
Unit–III	**Operator Overloading and Inheritance:**	**9**
Operator Overloading: Overloading Unary and Binary Operators– Overloading Binary Operator using Friend Function– Inheritance: Single – Multilevel – Multiple – Hierarchical – Hybrid - Virtual Base Classes - Constructors in Derived Classes - Case Studies.		
Unit–IV	**Runtime Polymorphism and Console I/O Operations:**	9
Runtime Polymorphism: Pointers – Pointers to Objects – this Pointer - Dynamic Memory Allocation - Virtual Functions C++ Streams: C++ Stream Classes – Unformatted I/O Operations – Formatted Console I/O Operations – Managing Output with Manipulators - Case Studies		
Unit–V	**Templates , Exception Handling and STL:**	9
Templates : Class Templates – Function Templates – Overloading of Template Functions – Exception Handling: Basics - Exception Handling Mechanisms – Throwing, Catching and Rethrowing an Exception – Standard Template Library		
		Total:45

REFERENCES/MANUAL/SOFTWARE:

1. BalagurusamyE.,"Object-Oriented Programming with C++",8th Edition, McGraw Hill Education Pvt. Ltd., 2023
2. Herbert Schildt, "C++:The Complete Reference", 4th Edition,McGraw Hill Education Pvt. Ltd., 2023
3. Harvey M. Deitel and Paul J.Deitel, "C++ How to Program",10th Edition, Pearson Education, 2022.

COURSEOUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	construct the problems to explore the fundamentals of the Object Oriented concepts and C++features	Applying (K3)
CO2	make use of Constructor, Destructor, Friend function and Operator overloading to solve problems	Applying (K3)
CO3	solve various scenarios using Operator Overloading and Inheritance	Applying (K3)
CO4	model the applications to demonstrate Runtime Polymorphism and I/O Streams	Applying (K3)
CO5	experiment the concepts of Templates, Exception Handling under various circumstances	Applying (K3)

Mapping of Cos with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	3	2	2	3	2	2
CO2	3	2	3	2	2	3	2	2
CO3	3	2	3	2	2	3	2	2
CO4	3	3	3	2	2	3	2	2
CO5	3	3	3	2	2	3	2	2

1–Slight,2–Moderate,3– Substantial, BT-Bloom's Taxonomy

ASSESSMENTPATTERN– THEORY

Test / Bloom's Category*	Remembering (K1)%	Understanding (K2)%	Applying(K3)%	Analyzing (K4)%	Evaluating(K5)%	Creating (K6)%	Total %
CAT1	-	30	70	-	-	-	100
CAT2	-	20	80	-	-	-	100
ESE	-	-	-	-	-	-	NA

*±3% may be varied CAT1&2–50marks , ESE–NA

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24MCB04 – COMPUTER NETWORKS								
Programme & Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**2**	**BC**	**3**	**0**	**0**	**NE**	**0**

Preamble	A comprehensive understanding of networking principles, including network models, transmission media, error correction, logical addressing, wireless communication, and mobile telecommunication systems, preparing students for network design and management.	
Unit – I	**Network Fundamentals:**	**9**
Introduction -Network Models: OSI Model, TCP/ IP Protocol suite, Addressing – Data and Signals: Analog and Digital - Transmission Impairment.		
Unit – II	**Transmission Media and Switching:**	**9**
Guided and Unguided Media - Circuit Switched Networks - Datagram Networks - Virtual Circuit Networks. Error Detection and Correction: Introduction – Block Coding – Linear Block Codes – Cyclic Codes – CheckSum. Multiple Access: Random Access – Controlled Access – Channelization.		
Unit – III	**Logical Addressing:**	**9**
IPv4 - IPv6 Addresses. Process to Process Delivery: UDP - TCP - Congestion Control – Quality of Service (QoS) – Techniques to Improve QoS.		
Unit – IV	**Wireless Communication:**	**9**
Introduction. Spread Spectrum: Transmission - Multiplexing. Medium Access Control: Motivational for a Specialized MAC – Space Division Multiple Access (SDMA) - Frequency Division Multiple Access (FDMA) - Time Division Multiple Access (TDMA) - Code Division Multiple Access (CDMA).		
Unit – V	**Mobile Telecommunication Systems:**	**9**
GSM Architecture, Services and Protocols - Localization and Calling – Handover – Mobile IP – DHCP. Vehicular Ad Hoc Networks (VANET): Overview – Applications.		
		Total:45

REFERENCES:

1.	ForouzanBehrouz A., "Data Communication and Networking", 5th Edition, Tata McGraw Hill Publishing Company, NewDelhi, 2017.
2.	Schiller Jochen, "Mobile Communications", 2nd Edition, Pearson Education, New Delhi, 2014.
3.	William Stallings, "Data and Computer Communication", Pearson Education, 10th Edition, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	understand the OSI and TCP/IP models, addressing schemes, characteristics of data and signals, and their role in network systems.	Understanding (K2)
CO2	apply error detection and correction methods, along with various switching techniques, to optimize data transmission in network environments.	Applying (K3)
CO3	analyze the principles of IPv4 and IPv6 addressing, and evaluate their effectiveness in ensuring efficient process-to-process delivery and Quality of Service (QoS).	Analyzing (K4)
CO4	understand the fundamentals of wireless communication and assess the suitability of different medium access control methods in wireless network scenarios.	Understanding (K2)
CO5	analyze techniques for localization, handover, Mobile IP, and DHCP in mobile communication scenarios, considering the architecture and protocols of mobile telecommunication systems like GSM.	Analyzing (K4)

Mapping of COs with POs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1						
CO2	2	2	2				2	2
CO3	1	2	2					
CO4	2	1						
CO5	2	2	2				2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6)%	Total %
CAT1	-	30	40	30	-	-	100
CAT2	-	20	30	50	-	-	100
ESE	-	-	-	-	-	-	NA

* ±3% may be varied CAT 1 & 2 – 50 marks , ESE – NA)

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POs

24MCL21 - ADVANCED JAVA PROGRAMMING LABORATORY								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**2**	**PC**	**0**	**0**	**4**	**NE**	**2**
Preamble	To develop General purpose and web based applications							

LIST OF EXPERIMENTS / EXERCISES:

1.	Design a Class which consists of instance variables and methods .Create an object for the class to access all the members of the class and create more than one objects and store the reference of all objects in a single variable.
2.	Construct a class with more than one methods having same name but with different signature. Also test the static methods with same name, with different input parameters.
3.	Design a java classes which acquire the properties of the parent class and also design a subclass which provides the specific implementation of the method that has been declared by one of its parent class and create an object which should bound its functionality at runtime. Design another class that implements two or more interfaces and all the implemented interfaces contain default methods with the same name and signature.
4.	Develop an application with a custom-container that should bundle related types like classes and interfaces in to a single group with proper access protection and namespace management.
5.	Design error events in java that occurs during the execution of a program and disrupts the normal execution of the program's code.
6.	Write a java program with Light-weight sub-processes that should be executed concurrently to maximize the utilization of CPU.
7.	Design a dynamic array using collection class ArrayList and implement the Linked list data structure using Linked List collection class.
8.	Implement a Java Servlet Program to implement a dynamic HTML using Servlet and JSP.
9.	Design a java application that should establish the connection from Java Client to any relational database systems using JDBC API and Hibernate.
10.	Create a simple application using Spring Framework.

Total:60

REFERENCES/ MANUAL /SOFTWARE:

1.	JDK / IDEs:Eclipse / Netbeans
2.	Database system: MYSQL
3.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	Solve basic logics using arrays, class and objects and to implement reusable concepts using inheritance, packages and interfaces.	Applying (K3) Manipulation(S2)
CO2	Make use of the exception handling to develop error free codes, multithreading to implement multiprocessing and collection classes in java program.	Applying (K3) Manipulation(S2)
CO3	Develop real-time applications using Servlets,JSP,JDBC, and hibernate	Applying (K3) Manipulation(S2)
C04	Develop real time applications using Spring framework	Applying (K3) Manipulation(S2)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	2	2			
CO2	3	2	2	2	2			
CO3	3	3	3	3	3			
CO4	3	3	3	3	3			

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

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24MCL22 - CLOUD COMPUTING TECHNOLOGIES LABORATORY								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**2**	**PC**	**0**	**0**	**4**	**NE**	**2**

Preamble	To equip students with the knowledge and abilities needed for practical applications of cloud computing and the internet of things.

LIST OF EXPERIMENTS / EXERCISES:

1.	Demonstrate the procedure for creating AWS instance and install compiler and run program
2.	Create S3 bucket and upload a file using AWS S3 bucket.
3.	Demonstrate the procedure for creating AWS RDS instance and execute sample SQL statement
4.	Host a web application in AWS instance
5.	Develop and deploy an application using Microsoft Azure
6.	Create a Customer Relationship Management System (CRM) using salesforce.com portal.
7.	Create and use a repository using github
8.	Create visually appealing data visualizations and insightful dashboards using Zoho
9.	Demonstrate the steps for web application deployment using azure devops
10.	Create a web application and deployment in 000webhost cloud platform

Total:60

REFERENCES/ MANUAL /SOFTWARE:

1.	Operating System : Windows/Linux
2.	Software: open source
3.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	use and investigate various cloud computing services	Applying (K3) Precision(S3)
CO2	utilize productivity software, create and develop cloud apps.	Applying (K3) Precision(S3)
CO3	install a program on cloud platform.	Applying (K3) Precision(S3)
CO4	identify suitable business models of cloud computing	Applying (K3) Precision(S3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3		2	3		2
CO2	3	2	2	2	2	3	2	2
CO3	3	2	2	2	3	3		2
CO4	2	3	3	2	3	3	2	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

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24GCL21–PROFESSIONAL SKILLS TRAINING								
Programme& Branch	**Master of Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**2**	**PC**	**0**	**0**	**80**	**NE**	**2**

Preamble	This subject is to enhance the employability skills and to develop career competency.	
Unit –I	**Soft Skills:**	**20**

Soft skills and its importance: Pleasure and pains of transition from an academic environment to work —environment-Need for change- Fears, stress and competition in the professional world-Importance of positive attitude- Self motivation and continuous knowledge up gradation-Self-confidence. **Professional grooming and practices:** Basics of corporate culture-Key pillars of business etiquette- Basics of etiquette-Introductions and greetings-Rules of the handshake, earning respect, business manners-Telephone etiquette-Body Language. **Group discussions:** Advantages of group discussions-Structured GD- **Teamwork:** Value of team work in organizations- Definition of a team, why team-Elements of leadership, disadvantages of a team, stages of team formation-Group development activities. **Facing an interview:** Foundation in core subject-industry orientation / knowledge about the company-professional personality-Communication skills-Activities before Interview, upon entering interview room, during the interview and at the end Mock interviews.

Unit –II	**Quantitative Aptitude & Logical Reasoning**	**30**

Problem solving level: Number System- Percentage- Profit and Loss- Average- Ratio and Proportion- Time and Work- Time Speed Distance- Trains- Probability- Permutation and Combination- Ages- Chain Rule- Blood Relations- Calendars- Coding-Decoding- Logical connectives- Binary logic Linear arrangements- Data Sufficiency- Puzzles- Seating Arrangements Mixtures and Allegations-Simple interest and Compound interest- Geometry - Mensuration -Data Interpretation-Number Series-Logical Deductions-Syllogism-Clocks-Analytical Puzzles- Comparison and Distributions-order and Ranking-Venn Diagrams

Unit –III	**Grammar, Vocabulary, Listening, Speaking, Reading and Writing:**	**30**

Grammar: Tenses - Articles and Prepositions - Direct & Indirect Speeches -Active & Passive voice -Vocabulary: Analogies - Syllogism - Spelling test -Cloze test- Concord -Spotting Errors - Unscrambling words - Assertion and Reason - Verbal puzzle - Pair words - Logical sequence of words –Listening :Listening to TED talks, ESL & ESOL Videos - Podcasts -Speaking: Mock Interviews - Personality traits -Better pronunciation -Extempore talk -Telephonic conversations - Technical project presentations Role Play - Negotiation skills- Mock Interview -Life skills -Team Management -Leadership skills -Group Discussion - Reading: Reading with stress, pauses, slurs and fillers -Soft skills - Stress & Intonation - Effective reading strategies - Notices & book reviews - GATE type reading comprehension-Writing: Job application letter & resume - Video resume - Jumbled sentences Professionale-mail writing - Business letters - One page essay -Report writing - Editing & proofreading - Writing skills for IELTS - Summary Writing - Review of real time interviews/Competitive examinations.

Total:80

REFERENCES:

1.	R.S.Aggarwal,"QuantitativeAptitude",7th Edition,S.ChandPublication,2022.
2.	R.S.Aggarwal,"AModernApproachtoLogicalReasoning",S.ChandPublication,2022 edition.
3.	EdgarThorpeandShowickThorpe,"Objective English for Competitive Examination", 6thEdition,PearsonIndiaEducation Services Pvt Ltd, 2017.
4.	StephenBailey,"AcademicWriting:Apracticalguideforstudents"Routledge,NewYork, 2011.
5.	MeenakshiRamanandSangeetaSharma."Technical Communication – PrinciplesandPractice".4thEdition,Oxford University Press, New Delhi, 2022.
6.	ArunaKoneru,"Professional Speaking Skills,"OxfordUniversityPressIndia,2015.
7.	EdgarThorpeandShowickThorpe,"Winning at Interviews," 5thEdition,PearsonEducation,India,2013.

COURSEOUTCOMES: On completion of the course,the students will be able to		BT Mapped (HighestLevel)
CO1	develop the soft skills of learners to support them work efficiently in an organization as an individual and as a team	Applying(K3), Precision(S3)
CO2	solve real time problems using numerical ability	Applying(K3), Precision(S3)
CO3	solve real time problems using logical reasoning	Applying(K3), Precision(S3)
CO4	apply english language skills for various academic and professional purposes	Applying(K3), Precision(S3)

Mapping of Cos with POs

COs/PO s	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2				3	3	
CO2	3	2				3	3	
CO3	3	2				3	3	
CO4		2					3	3

1–Slight,2–Moderate,3–Substantial,BT-Bloom'sTaxonomy

ASSESSMENT PATTERN-THEORY

Test/Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5)%	Creating (K6) %	Total %
CAT1	-	50	50	-	-	-	100
CAT2	-	50	50	-	-	-	100
CAT 3	-	50	50	-	-	-	100

*±3% may be varied, CAT1&2–60marks , Assessment Test–100marks

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Board of Studies - MCA

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24MCP21 - MINI PROJECT II								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**2**	**EC**	**0**	**0**	**4**	**NE**	**2**
							Total:60	

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (HighestLevel)**
CO1	Identify the problem by applying acquired knowledge	Applying(K3) Precision(S3)
CO2	Analyze and categorize executable project modules after considering risks	Analyzing(K4) Precision(S3)
CO3	Analyze efficient tools for designing project modules	Analyzing(K4) Precision(S3)
CO4	Integrate all the modules through effective teamwork after efficient testing and validation	Evaluating(K5) Precision(S3)
CO5	Elaborate the completed work and compile the project documentation	Creating(K6) Precision(S3)

Mapping of COs with POs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	3	3	3	2
CO2	3	3	3	3	3	3	3	2
CO3	3	3	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

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MCA III Sem & IV Sem

24MCT31 & FULL STACK FRAMEWORK								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**3**	**PC**	**3**	**0**	**0**	**ES**	**3**

Preamble	To understand the development procedure for full stack application development	
Unit –I	**Full-Stack Development Overview**	**9**
Introducing Full-Stack Development : The Web Server/platform – Express Framework –MongoDB Database – Angular Front-end Framework : jQuery Vs Angular – Two-Way Data Binding – Load New Pages – Developing in TypeScript - Supporting Cast: TwitterBootstrap – Git for Source Control – Hosting – Mean Stack Components Work Together.		
Unit –II	**MEAN Stack Architecture and Building a Node Web Application**	**9**
MEAN Stack Architecture – Beyond SPAs – Flexible MEAN Architecture –Planning a Real Application – Development into stages –Hardware Architecture – Creating and Setting up a MEAN Project : Look at Express, Node and npm – Creating an Express Project– Modifying Express for MVC – Importing Bootstrap – Making it Live.		
Unit –III	**Node, Express, MongoDB and Mongoose**	**9**
Building a Static Site: Defining the routes in Express – Building Basic controllers – Views – Adding the rest of the Views – Taking the Data Out of the Views – Building a Datamodel with MongoDB and Mongoose: Connecting the Express Application to MongoDB–Model the Data - Mongoose Schemas – MongoDB Shell – Database Live.		
Unit –IV	**REST API**	**9**
Writing a REST API: The Rules of a REST API – Setting up the API in Express - Reading Data from MongoDB – Adding Data to MongoDB – Updating Data in MongoDB – Delete Method – Consuming a REST API: Call an API from Express – Lists of Data from an API – Single Documents from an API – Adding Data to the Database via the API.		
Unit –V	**Dynamic Front End with Angular**	**9**
Angular Application with TypeScript: Getting up and Running with Angular – Angular Components – Getting Data from an API – Angular Application into Production – Building a Single-age Application with Angular:Foundations – Adding Navigation – Multiple Nested Components – Adding Geolocation– Binding HTML Content -Building a Single-Page Application with Angular: The Next Level – Authenticating Users, Managing Sessions and Securing APIs – Authentication API in Angular Applications.		
		Total:45

REFERENCES:

1.	SmonHolmoes, Clive Harber, "Getting MEAN with Mongo,Express, Angular and Node", Manning Publications, 2nd Edition, 2019
2.	Colin Ihrig, Adam Bretz, "Full Stack Javascript Development with Mean: MongoDB, Express, AngularJS, and Node.JS", 1st Edition, SitePoint,2015
3.	Ravi Kant Soni, "Full Stack AngularJS for Java Developers", Apress, 1st Edition, 2018

MICRO PROJECT:

1.	develop a task manager application using React, node js with express and mongodb
2.	develop a web app application using React, node js with express and mongodb

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	understand the fundamentals of full stack development	Understanding(K2)
CO2	interpret the components of mean architecture and development environment.	Applying (K3)
CO3	employ the various techniques of node, express and mongoDB	Applying (K3)
CO4	prioritize the different forms of REST API in the web application development	Applying (K3)
CO5	make use of the advanced techniques to develop dynamic front end with angular.	Applying (K3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	2		2			
CO2	3	3	3					
CO3	3	3	3	2	2	2	2	
CO4	3	3	3	3	2		2	2
CO5	3	3	3	2		2	2	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN– THEORY

Test/Bloom's Category*	Remembering (K1)%	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	30	70	-	-	-	100
CAT2	-	40	60	-	-	-	100
CAT3	-	30	50	20	-	-	100
ESE	-	30	50	20	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCT32 - C# AND .NET								
Programme&Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Knowledge of Visual Studio and Object-Oriented Programming**	**3**	**PC**	**3**	**0**	**0**	**NE**	**3**

Preamble	To make the student to understand the object oriented feature of C# under the .NET framework and to develop Web based applications on ASP.NET.	
Unit – I	**Object Oriented Concepts and Advanced C# Features:**	**9**
Inheritance and Polymorphism- Interfaces - Exception Handling- Collections and Generics – Boxing and UnBoxing, ListT: QueueT,StackT, SortedSetT, Delegates, Multicast Delegates, Events, and Lambda Expressions, Anonymous Method, - Advanced C#Language Features: Indexer Method.		
Unit – II	**Language-Integrated Query:**	**9**
LINQ to Objects: An Introduction to LINQ, Types of LINQ, LINQ Queries to Primitive Arrays: Deferred Execution, Immediate Execution,– LINQ and Generic Collections– LINQ and Non Generic Collections- Investigating the C# LINQ Query Operators- Introducing LINQ to XML: XElement and XDocument- Programming with LINQ to DataSet - Programming with LINQ to SQL- Manipulating XML Documents Using LINQ to XML.		
Unit – III	**Windows Workflow Foundation and WPF:**	**9**
Introducing Windows Workflow Foundation: Defining a Business Process, building a Simple Workflow- Examining Workflow Activities - Building a Flowchart Workflow - Introducing Windows Presentation Foundation and XAML: Building a WPF Application Without XAML and using only XAML- Programming with WPF Controls: Controlling Content Layout using Panels, building a Window`s Frame using Nested Panels.		
Unit – IV	**ADO.NET:**	**9**
ADO.NET: Introduction - ADO.NET Architecture - The Connected Layer: DataProviders, DataReader, DataAdapter, ExecuteNonQuery method, ExecuteReader method, Connected Oriented Architecture - The Disconnected Layer: Understanding the Disconnected Layer of ADO.NET - Role of the DataSet - Working with DataColumns , DataRows, DataTables - Binding DataTable Objects to User Interfaces - Filling DataSet/DataTable Objects Using Data Adapters, Difference between DataReader and DataSet..		
Unit – V	**ASP.NET WEB FORMS:**	**9**
Introducing ASP.NET webforms: The Role of HTTP, The Role of HTML, The Role of Client Side Scripting, Posting Back to the Web Server, Interacting with the Incoming HTTP Request, Interacting with the Outgoing HTTP Response, The Life Cycle of anASP.NET Web Page, ASP.NET Web Controls, Master Pages, and Themes: Understanding the Nature of Web Controls, Building the ASP.NET Cars Web Site, The Role of the Validation Controls, Working with Themes.		
		Total:45

REFERENCES:

1.	Andrew Troelsen, Philip Japikse, "C# 6.0 and the .NET 4.6 Framework", 7th Edition, Apress, 2015.
2.	Herbert Schildt, "The Complete Reference: C# 4.0", 1st Edition, Tata McGraw Hill, 2012.
3.	Ben Albahari, Peter Drayton and Brad Merrill, "C# Essentials", 2nd Edition, O'Reilly, 2002

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	build an application using advanced concepts of C#.	Applying (K3)
CO2	become familiar with LINQ	Applying (K3)
CO3	gain knowledge in the concepts of the work flow and Windows Presentation Foundations	Applying (K3)
CO4	create windows applications with database access using ADO.NET.	Applying (K3)
CO5	construct web forms using ASP.NET	Applying (K3)

Mapping of COs with POs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	3	2	2	2	2
CO2	2	3	2	2	2	3	2	2
CO3	3	2	2	2	2	2	3	2
CO4	2	3	2	3	3	2	2	3
CO5	3	2	3	3	2	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	45	55	-	-	-	100
CAT2	-	40	60	-	-	-	100
CAT3	-	45	55	-	-	-	100
ESE	-	40	60	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCT33 – DATA SCIENCE								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Applied Mathematics**	**3**	**PC**	**3**	**1**	**0**	**ES**	**4**

Preamble	To apply the knowledge for exploratory data analysis (EDA) in data science.	
Unit – I	**Data Operation:**	**9 + 3**
Toolboxes for Data Scientists: Python – fundamental libraries for data Scientists – Integrated development environment (IDE). Data operations: Reading, selecting, filtering, manipulating, sorting, grouping, rearranging, ranking, and plotting.		
Unit – II	**Data Exploration:**	**9 + 3**
Descriptive statistics: data preparation – exploratory data analysis: data summarization – data distributions – outlier treatment – measuring asymmetry – estimation – Statistical Inference: frequency approach – measuring the variability in estimates – hypothesis testing.		
Unit – III	**Classification and Regression:**	**9 + 3**
Supervised Learning: First step – learning curves – training – validation and test – two learning models – ending the learning process – Regression analysis: linear regression – logistic regression.		
Unit – IV	**Clustering and Networks:**	**9 + 3**
Unsupervised learning: Clustering: similarity and distances, quality measures of clustering – taxonomy – case study – Network analysis: graphs, social network analysis, Centrality: drawing centrality of Graphs – Page Rank – Ego-Networks – community Detection.		
Unit – V	**Recommender Systems:**	**9 + 3**
Recommender systems: Content-based filtering – collaborative filtering – hybrid recommenders – evaluating recommenders – SNLP for sentiment analysis: Data cleaning – text representation – practical cases.		
		Lecture:45, Tutorial:15, Total: 60

REFERENCES:

1.	Introduction to Data Science a Python approach to concepts, Techniques and Applications, Laura Igual, SantiSeghi', Springer, 2017, ISBN:978-3-319-50016-4(eBook).
2.	Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.
3.	David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016.
4.	Python / R / Tableau tools.

MICRO PROJECT:

1.	Develop a project on the recognition of traffic signals to avoid accidents using data science tools.
2.	Implement a project on speech recognition through the emotions from multiple files involving sound that comprises the human speech.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	make use of python to perform various data operations.	Applying (K3)
CO2	Determine the relationship between data dependencies using statistics	Applying (K3)
CO3	examine the models and the basics of machine learning techniques.	Applying (K3)
CO4	explore the clustering techniques, networks and page rank.	Applying (K3)
CO5	utilize the concept of recommender systems to handle text.	Applying (K3)

Mapping of COs with POs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3							
CO2	3	2	2	2				
CO3	3	2	2	2				
CO4	3	2	2	2				
CO5	3	2	2	2				

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	40	60	-	-	-	100
CAT2	-	40	60	-	-	-	100
CAT3	-	40	60	-	-	-	100
ESE	-	40	60	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCF02–INTERNET OF THINGS								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	Computer Networks	**3**	**PE**	**3**	**0**	**2**	**ES**	**4**

Preamble	This course provides an introduction to Internet of Things and its technologies that enable the students to develop real world applications using IOT Technologies	
Unit –I	Introduction to Internet of Things	**9**
Introduction to Internet of Things: Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT Communication Models - IoT Communication APIs – IoT enabled Technologies – Wireless Sensor Networks - Cloud Computing – Big data analytics – Communication Protocols- Embedded Systems – IoT Levels and Templates.		
Unit –II	Design Methodology and Endpoints	**9**
M2M – Difference between M2M &IoT – Software defined networks – Network function Virtualization – IoT Platform design Methodologies – Domain Specific IoT – Home Automation – Smart Agriculture.Endpoints: Introduction to Raspberry PI – Interfaces: serial- SPI- 12C- Programming –Interfacing with external gadgets – controlling output – reading input from pins – Modern IoT controllers		
Unit –III	IoT Protocols	**9**
IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4,802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, ConstrainedNodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing overLow Power and Lossy Networks – Application Transport Methods: Supervisory Control and DataAcquisition – Application Layer Protocols: CoAP and MQTT.		
Unit –IV	Data Analytics and Supporting Services	**9**
Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning –No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analyticsand Network Analytics – Xively Cloud for IoT, Python Web Application Framework – Django –AWS for IoT – System Management with NETCONF-YANG.		
Unit –V	IoT Seurity and Case Studies	**9**
Attacks and Countermeasures – Authentication and Authorization at IoT Layers – Other security features and related issues – Middleware – Cross Layer security – Privacy and Risk Mitigations – Blockchain – 5G – Fog and Edge Computing. IoT USECASES: Asset Management The Smart Grid Commercial Building Automation Smart Cities.		

LISTOF EXPERIMENTS / EXERCISES:

1.	Familiarization with concept of IoT, Arduino/Raspberry-Pi and perform necessary software installation.
2.	Study of connectivity and configuration of Raspberry-Pi with basic peripherals, LED ON / OFF using Push Button, understanding GPIO and its use in program
3.	Understanding and connectivity of Raspberry-Pi with Distance measuring using Ultrasonic Sensor. Write an application to measure the distance of the obstacle using Ultrasonic Sensor.
4.	Understanding and connectivity of Raspberry-Pi with Temperature and Humidity Sensor. Write an application to read an environment temperature and Humidity value. If a temperature crosses a threshold value, the application indicated user using LEDs
5.	Create simple security alarm system using Raspberry Pi
6.	Understanding and connectivity of Raspberry-Pi with camera. Write an application to detect the color of the object or obstruction detection.
7.	Write an application using Raspberry-Pi based health monitoring using heartbeat and Pulse Sensor
8.	Write an application using Raspberry-Pi based Eye blinking/closeness detection sensor.
9.	Write an application using Raspberry-Pi based Rain fall detection using Rain Sensor
10.	Push IoT sensor data for cloud storage and apply simple data analytics

MICRO PROJECT:

1.	Develop a mini-project using Raspberry pi
2.	Web page integration with Raspberry Pi

Lecture:45,Practical:30,Total:75

REFERENCES/MANUAL/SOFTWARE:

1.	Arshdeep Bahga and Vijay Madisetti, "Internet of Things – A Hands-on Approach", 1st Edition, University Press, 2015. (For Units I, II, V)
2.	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things", Cisco Press, 2017. (For Units III, IV)
3.	Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", 1st Edition, CRC Press, 2012

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	familiarize the use of IoT architecture, infrastructure and constraints of Internet of Things	Understanding(K2) Manipulation(S2)
CO2	utilize the design methodologies for IoT applications and experiment with simple applications using Raspberry Pi	Applying (K3) Precision (S3)
CO3	apply the IoT protocols for local and global connectivity	Applying (K3) Precision (S3)
CO4	develop IoT products with the use of data analytics and supporting services	Applying (K3) Precision (S3)
CO5	identify the security challenges and opportunities in the different domains of Internet of Things	Applying (K3) Precision (S3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	3	2	2		2	
CO2	3	3	3	3	2		2	
CO3	3	2	3	3	2		2	
CO4	3	2	3	3	2		3	
CO5	3	2	3	3	2		3	

1–Slight,2–Moderate,3–Substantial, BT-Bloom's Taxonomy

ASSESSMENT PATTERN– THEORY

Test/Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	40	60	-	-	-	100
CAT2	-	30	70	-	-	-	100
CAT3	-	30	70	-	-	-	100
ESE	-	30	70	-	-	-	100

* ±3% may be varied, CAT 1,2,3 – 50 marks , ESE – 100 marks)

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24MCF03 & PHP and MYSQL								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**3**	**PE**	**3**	**0**	**2**	**ES**	**4**

Preamble	To understand the development procedure for full stack application development	
Unit – I	**Dynamic Web Content:**	**9**
Dynamic Web Content: HTTP and HTML- Request/ Response Procedure-Benefits-Setting up a Development Server – Introduction to PHP – Structure of PHP		
Unit – II	**PHP Essentials :**	**9**
Expressions – Operators - Conditional – Looping – PHP Functions – Files – Version compatibility – PHP Arrays: Basic Access – Using Array Functions		
Unit – III	**PHP Objects and Practical PHP:**	**9**
Class –Objects – Methods – Properties – Constructor – Destructors – Inheritance – Practical PHP: printf – Date and Time – File Handling		
Unit – IV	**MYSQL:**	**9**
MYSQL Basics: Command Line interface – MYSQL Commands – Data Types – Indexes – Querying – Joining Tables – MYSQL Functions- Accessing MySQL Using PHP		
Unit – V	**Web Application Development:**	**9**
Form Handling; Building Forms - Retrieving Submitted Data - Default Values - Input Types - HTML5 Enhancements - Cookies, Sessions, and Authentication - JavaScript and PHP Validation and Error Handling - Using Asynchronous Communication		

LIST OF EXPERIMENTS / EXERCISES:	
1.	Write a PHP to evaluate expressions using different kind of operators
2.	Write a PHP program to demonstrate decision-making control structures using a. If statement b. If-else statement c. Switch statement
3.	Write a PHP program to demonstrate looping structures using- a. While statement b. Do-while statement c. For statement d. Foreach statement
4.	Develop a PHP code to perform various tasks using user-defined functions
5.	Write a PHP code to perform string handling operations with and without using built-in functions.
6.	Write a PHP program for creating and manipulating- a. Indexed array b. Associative array c. Multidimensional array
7.	Write a PHP program to a. Inherit members of super class in a subclass. b. Create a constructor to initialize the object of class by using object-oriented concepts
8.	Design a PHP Form and use a regular expression to validate the fields.
9.	Write a PHP program to manage sessions of the web applications using session and cookies
10.	Develop a Web Application to perform CURD Operations using MYSQL Operations
MICRO PROJECT:	
1.	Design a PHP applications to display the bio data of a person by reading the personal details from the mysql database and provide the option to convert into pdf file.
2.	Develop a PHP application for the ecommerce site and perform the following operations 1.Display the product 2. Showcase the offers and discount of the product 3. customize the search options 4. user can add the product to the cart(using session/cookies) 5. deploy the application in the cloud platform

Lecture:45, Practical:30, Total:75

REFERENCES/ MANUAL / SOFTWARE:

1.	Robin Nixon, " Learning PHP, MySQL & JavaScript With jQuery, CSS & HTML5 ", O'Reilly Media, 5th Edition, 2018
2.	Larry E. Ullman, "PHP and MySQL for Dynamic Websites: Visual QuickPro Guide", 4th Edition, Peachpit Press, CA, 2014.
3.	Marty Matthews, "PHP And Mysql Web Development: A Beginner's Guide", Indian Edition, McGraw Hill, India, 2015.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	understand the fundamentals of dynamic web content.	Understanding (K2) Imitations(S1)
CO2	learn PHP essential concepts of PHP Programming	Applying (K3) Precision (S3)
CO3	employ object-oriented programming and built-in functions	Applying (K4) Precision (S3)
CO4	explore MYSQL commands to manipulate tables in the database.	Applying (K3) Precision (S3)
CO5	design dynamic web applications for real-world problems	Applying (K3) Precision (S3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	2				
CO2	3	3	3	2				
CO3	3	3	3	2				
CO4	3	3	3	2				
CO5	3	3	3	2				

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	60	40	-	-	-	100
CAT2	-	30	70	-	-	-	100
CAT3	-	30	70	-	-	-	100
ESE	-	30	70	-	-	-	100

* ±3% may be varied ,C AT 1,2,3 – 50 marks , ESE – 100 marks)

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24MCF04 - DATA VISUALIZATION TECHNIQUES								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**3**	**PE**	**3**	**0**	**2**	**ES**	**4**

Preamble	To understand the various types of data, apply and evaluate the principles of data visualization.	
Unit –I	**Data Visualization Fundamentals:**	**9**
Visualization Basics–Visualization Process–Role of Cognition–Pseudo code Conventions–Scatter plot-Data foundation: Types of data- Structure within and between Records - Data Preprocessing – Human Perceptions and Information Processing – Visualization Foundations.		
Unit –II	**Tree, Graph, Networks, Text and Document:**	**9**
Displaying Hierarchical Structure – Displaying Arbitrary Graphs/Networks – Other Issues - Levels of Text Representation – Vector Space Model – Single Document Visualization – Document Collection Visualization- Extended Text Visualizations.		
Unit –III	**Spatial and Geospatial Data:**	**9**
Visualization Techniques for Spatial Data: One, Two, and Three Dimensional Data —Dynamic Data- Combining Techniques - Visualization Techniques for Geospatial Data: Visualizing Spatial Data - Visualization of Point Data - Visualization of Line Data - Visualization of Area Data - Other Issues in Geospatial Data Visualization.		
Unit –IV	**Time-Oriented and Multivariate Data:**	**9**
Visualization Techniques for Time-Oriented: Introduction - Characterizing Time-Oriented Data- Visualizing Time-Oriented Data – Time Bench: A Data Model and Software Library for Visual Analytics of Time-Oriented Data- Visualization Techniques for Multivariate Data: Point-Based Techniques —Line-Based Techniques - Region-Based Techniques - Combinations of Techniques.		
Unit –V	**Visualizing Distributions:**	**9**
Empirical Cumulative Distribution Functions and Q-QPlots - Visualizing many Distribution at once–Visualizing Proportions– Nested Proportions – Association among Two or More Quantitative Variables – Trends – Uncertainty.		

LISTOF EXPERIMENTS / EXERCISES:

1.	Acquiring and plotting data using various plotting techniques.
2.	Use statistical analysis –such as Multivariate Analysis, PCA, LDA, Correlation regression and analysis of variance for visualizing the data
3.	Visualize an analysis the financial dataset using Histogram, density plots andHeatMap
4.	Use Time-series and stock market datasets to visualize the data using nested proportions
5.	Visualization of various massive dataset – Finance – Healthcare – Census - Geospatial
6.	Design a Visualization on Streaming dataset(Stock market dataset, weather forecasting)
7.	Using Visualization proportions techniques for Market-Basket Data analysis - visualization
8.	Show the text visualization using web analytics
9.	Visualizing a Single Distribution
10.	Visualizing Multiple Distributions at the Same Time

MICRO PROJECT:

1.	Conduct data exploration with live visual analytics using the Tableau tool, from data preparation to consumption. Also, perform building and iteration on visualizations with a drag-and-drop experience and dynamic previews. Ask new questions, spot trends, identify opportunities, and make data-driven decisions with confidence.
2.	Performing data analysis and visualization tasks with the Power BI tool enables sorting, comparing, and analyzing data very easily and quickly. Power BI is also compatible with multiple sources, including Excel, SQL Server, and cloud-based data repositories

Lecture:45,Practical:30,Total:75

REFERENCES/MANUAL/SOFTWARE:

1.	Matthew O.Ward, Georges Grinstein Daniel Keim" Interactive Data Visualization:Foundations, Techniques, and Applications", 2nd Edition, CRC Press, United States, 2015
2.	Claus O.Wilke,"Fundamentals of Data Visualization",1st Edition, O'Reilly, 2019
3.	David Baldwin,"Mastering Tableau",1st Edition, Packt Publishing, Mumbai, 2016

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	describe the principles of visual perception.	Understanding (K2) Imitations(S1)
CO2	apply visualization techniques for various data analysis tasks.	Applying (K3) Precision (S3)
CO3	design effective visualization techniques for Spatial and Geospatial Data.	Applying (K3) Precision (S3)
CO4	manage the visualization techniques for Time-Oriented and Multivariate Data.	Evaluating (K5) Manipulation (S2)
CO5	discriminate the designing Visualization techniques for various data distribution.	Analyzing (K4) Manipulation (S2)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	2				
CO2	3	3	3	2	2			
CO3	3	3	3	2	2			
CO4	3	3	3	2	3			
CO5	3	3	3	3	3	3	3	

1–Slight,2–Moderate,3– Substantial,BT-Bloom's Taxonomy

ASSESSMENT PATTERN– THEORY

Test/Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	60	40	-	-	-	100
CAT2	-	40	60	-	-	-	100
CAT3	-	30	50	10	10	-	100
ESE	-	30	50	10	10	-	100

* ±3% may be varied , CAT 1,2,3 – 50 marks , ESE – 100 marks)

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24MCF05- DIGITAL MARKETING								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**3**	**PE**	**3**	**0**	**2**	**ES**	**4**

Preamble	To understand the basic concepts of Digital marketing and the roadmap for successful Digital marketing strategies and implementation.	
Unit – I	**Introduction to Digital Marketing:**	**9**
Fundamentals of Digital Marketing, Orgin and development of Digital Marketing, Internet Users, Digital Marketing Strategy, Digital Advertising Market in India, Digital Marketing Plan, Ethical and Legal Framework, Skills required in Digital Marketing. Displaying Advertising: Concept, Digital Metrics, Types of display Ads, Pillars of paid marketing, and Targeting in Digital Marketing.		
Unit – II	**Search Engine Advertising:**	**9**
Pay for search advertising, Understanding Ad Placement and Ad Ranks, Google Ads Account, Best practices for creating effective Ads, Enhance Ads campaign, Performance reports, Trends in Search Engine Advertising, E-Commerce.		
Unit – III	**Social Media Marketing:**	**9**
Fundamentals of Social Media Marketing, Listen , Goal setting, Strtegy, Implementation, Measures, Improve, Different forms of Social Entertainment, Gamification, Brand Community, Best practices, Metrics to measure success of Brand Community.		
Unit – IV	**Search Engine Optimization:**	**9**
Introduction to SEO, How Search engine works, SEO Phases, On-page Optimization, Off-page Optimization, Social Media Reach, Maintenance, Google Search Engine, Local Search SEO, Google My Business, SEO Visual Search.		
Unit – V	**Facebook and Twitter Marketing:**	**9**
Organic Marketing, Paid Marketing, Facebook insights, other Marketing tolls, Marketing with 3D posts, other Essentials. Budilding a content strategy, Twitter usage, Twitter for business, Twitter Ads, Twitter Tools and Tips for Marketers.		

LIST OF EXPERIMENTS / EXERCISES:	
1	Digital Marketing Implementation in Business Scenario
2	Create the Digital Marketing Webpage
3	Conducting the Search Engine Optimization and Search Engine Marketing
4	Using Google Analytics to analyze website performance
5	Creating Promotional banner through Canva
6	Facebook Promotion using banners
7	Creating YouTube Channel for Marketing
8	Twitter Marketing
9	Instagram Marketing
10	Email Marketing
MICRO PROJECT:	
11.	Create a digital marketing for a product in a social media.
12.	Create an advertisement for an admission of education institution and promote it in a specific platform.

Lecture:45, Practical:30, Total:75

REFERENCES/ MANUAL / SOFTWARE:

1. Seema Gupta, "Digital Marketing",3rdEdition,McGraw Hill Education(India)Pvt. Ltd., 2023
2. NitinKamat and ChinmeyNitinKamat , "Digital Marketing" , 2nd Revised Edition, Himalaya Publishing House Pvt.Ltd.,, 2023.
3. Puneet Singh Bhatia, "Fundamentals of digital Marketing", 1st Edition, Pearson Education, 2023.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	learn basic principles of digital marketing	Understanding(K2) Imitation (S1)
CO2	learn digital marketing tools like search engine optimization	Understanding(K2) Imitation (S1)
CO3	apply digital marketing tools to a) improve websites' rankings and optimize it inthe process. b) Improve the brand's visibility c) Improve brands reach which physically is relatively difficult and less effective	Applying (K3) Manipulation (S2)
CO4	design search engine optimization and search engine marketing campaigns	Applying (K3) Manipulation (S2)
CO5	familiar with social media marketing	Applying (K3) Manipulation (S2)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2							
CO2		2						
CO3			3	2	2		3	2
CO4			3	2	2		3	2
CO5			3	2	2		3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	80	20	-	-	-	100
CAT2	-	50	50	-	-	-	100
CAT3	-	50	50	-	-	-	100
ESE	-	50	50	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCF06 - ACCOUNTING AND FINANCIAL MANAGEMENT								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**3**	**PE**	**3**	**0**	**2**	**ES**	**4**

Preamble	To deal with managing the monetary transactions in an organization that enables in taking useful financial and costing related decisions by accounting tools and techniques.	
Unit – I	**Financial Accounting:**	**9**
Meaning and Scope of Accounting – Accounting Principles: Concept – Conventions - Standards - Classifications of Accounts – Accounting Cycle, Golden Rule - Preparation of Journal – Ledger - Trial Balance – Trading, Profit and Loss Account - Balance Sheet.		
Unit – II	**Ratio Analysis:**	**9**
Introduction to Financial Statement Analysis – Advantages, Limitations of Ratio Analysis– Classification of Ratios: Profitability and Liquidity Ratio.		
Unit – III	**Cost Accounting:**	**9**
Meaning and Objectives – Classification of Cost – Elements of Costs – Preparation and Interpretation of Cost Sheet.		
Unit – IV	**Budgetary Control:**	**9**
Introduction – Types of Budgets – Preparation and Interpretation of Functional Budgets: Sales Budget, Production Budget, Cash Budget - Flexible Budget.		
Unit – V	**Financial Management:**	**9**
Objectives and Functions of Financial Management – Time Value of Money Concepts – Capital Budgeting: Discounting and Compounding Techniques.		

LIST OF EXPERIMENTS / EXERCISES:

1.	Creation of Company using tally.
2.	Creation of Voucher using tally.
3.	Voucher Alteration, Delete and Printing reports
4.	Creation of Journal to record transactions
5.	Creation of Ledger, Trial Balance and Balance Sheet
6.	Creation of Group and Stock
7.	Report Generation with inventory
8.	Creation of payroll including generation of pay slip, pay head, employee group and salary details
9.	Creation of Payroll voucher
10.	Report generation of payroll

MICRO PROJECT:

1.	Create a balance sheet for a company and evaluate using the ratio.
2.	Create and implement a cost sheet for a company to prepare a financial budget.

Lecture:45, Practical:30, Total:75

REFERENCES:

1.	Maheshwari SN, MaheshwariSuneel K, MaheshwariSharad K (CA), "Financial and Management Accounting", 6th Revised Edition, Sulthan Chand & Sons, 2022.
2.	I.M.Pandey, "Financial Management", 12th Edition, Pearson India Education Services Pvt. Ltd., 2021.
3.	M.N.Arora, "A Textbook of Cost and Management Accounting", 11th Edition, Vikas Publishing House Pvt. Ltd., 2021.
4.	Tally Software.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	make use of journal, ledgers and trail balance, trading account and balance sheet for various transactions	Applying (K3) Manipulation (S2)
CO2	apply ratio analysis for financial statement	Applying (K3) Manipulation (S2)
CO3	demonstrate the concepts of cost accounting in preparing cost sheet	Applying (K3) imitation (S1)
CO4	implement the various budgets using budgetary control	Applying (K3) Manipulation (S2)
CO5	utilize the various functions and techniques in financial management and financial accounting statements in tally	Applying (K3) Manipulation (S2)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2		2				
CO2	3	2		2				
CO3	3	2		2				
CO4	3	2		2				
CO5	2	2		2				

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	40	60	-	-	-	100
CAT2	-	40	60	-	-	-	100
CAT3	-	40	60	-	-	-	100
ESE	-	40	60	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCF07 - DEEP LEARNING

Programme&Branch	MCA & Computer Applications	Sem.	Category	L	T	P	MP	Credit
Prerequisites	Artificial Intelligence, Machine Learning	3	PE	3	0	2	ES	4

Preamble	Explores the knowledge in fundamental concepts of deep learning and popular architectures of deep neural network to build the effective models.	
Unit – I	**Deep Networks:**	9
Overview of neural networks- Loss functions- Hyperparameters-Defining Deep Learning - Common Architectural Principles of Deep Networks: Core Components - Building Blocks of Deep Networks: RBMs.		
Unit – II	**Mathematical Building Blocks of Neural Networks:**	**9**
Data Representation for neural networks – The gears of neural networks: Tensors operations-The engine of Neural networks: gradient based optimization-Introduction to Keras and TensorFlow - Setting up a deep learning work station – First steps with TensorFlow-Understanding core KerasAPI .		
Unit – III	**Deep Learning for Computer Vision:**	**9**
Introduction to convents – Training a convent from scratch on a small dataset – Leveraging a pretrained model – Computer vision tasks – Image segmentation – Modern convent architecture patterns – Interpreting with convents.		
Unit – IV	**Deep Learning for Timeseries and Text:**	**9**
Different kinds of time series tasks – A Temperature forecasting – Understanding recurrent neural networks – Advances in RNN – Natural Language Processing – Preparing text data- Approaches for representing groups of words: Sets and sequences – Transformer Architecture.		
Unit – V	**Generative Deep Learning:**	**9**
Text generation – DeepDream – Neural style transfer – Generating images with variation autoencoders – Genearative Adversarial Networks.		

LIST OF EXPERIMENTS / EXERCISES:

1.	Implement simple perceptron learning.
2.	Construct a multilayer perceptron with a hyperparameter tuning.
3.	Generate synthetic images using traditional data augmentation function.
4.	Demonstrate the role of ImageDataGenerator class in data augmentation.
5.	Implement a CNN process for image classification.
6.	Demonstrate the RNN architecture for time series data.
7.	Construct the steps to deal with text analysis using NLP.
8.	Experiment with AI generator such as Deep Dream and New Style Transfer
9.	Generate synthetic images using variational autoencoders
10.	Generate synthetic images using Generative Adversarial Network.

MICRO PROJECT:

1	Implement the CNN architecture to classify the multiclass dataset with proper preprocessing, augmenting and Hyper parameter tuning.
2	Implement the RNN architecture for time series data or text data with proper preprocessing, augmenting and hyper parameter tuning.

Lecture:45, Practical:30, Total:75

REFERENCES/ MANUAL / SOFTWARE:

1.	Josh Patterson & Adam Gibson, "Deep Learning - A Practitioner's Approach", 4th Indian Reprint, O'Reilly Media, CA, 2021.
2.	Francois Chollet, "Deep Learning with Python", 2nd Edition, Manning Publications, New York, 2021.
3.	John D. Kelleher, "DEEP LEARNING", 1st Edition, MIT Press, 2019 .

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	describe the fundamentals, architectural principles and building blocks of neural networks	Understanding(K2) Imitate(S2)
CO2	understand the mathematical building blocks of Neural Networks	Applying (K3) Manipulation(S2)
CO3	apply CNN architecture for image classification	Applying (K3) Manipulation(S2)
CO4	apply RNN architecture for time series and text data	Applying (K3) Manipulation(S2)
CO5	generate synthetic images using traditional and AI generator	Applying (K3) Manipulation(S2)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2							
CO2	3	3						
CO3			3	3	3		2	2
CO4			3	3	3		2	2
CO5			3	3	3		2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – HEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	80	20	-	-	-	100
CAT2	-	50	50	-	-	-	100
CAT3	-	40	60	-	-	-	100
ESE	-	40	60	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCE12 – AFFECTIVE COMPUTING								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**AI, Machine Learning**	**3**	**PE**	**3**	**0**	**0**	**NE**	**3**

Preamble	To focus on enabling the machines with emotion recognition and adaptive interaction. It also discuss about social implications of affective computing particularly in relation to Human-Machine Interaction.	
Unit –I	**Affective Computing and Information Representation:**	**9**
Introduction – Affective Computing: Emotion – Role of emotions in decision making – Challenges in Affective Computing – Affective Computing in Practice – Introduction to Information Representation: Affective Computing and Emotion – Human-Computer Interaction – Human Emotion Expression and Perception – Recognition of Facial Emotion – Fundamentals – Techniques for Classifying Facial Expressions.		
Unit –II	**Models, Theory of Emotion and Information Extraction and Processing:**	**9**
Introduction – Emotion Theory – Categorical Approach – Evolutionary Theory of Emotion by Darwin – Cognitive Appraisal and Physiological Theory of Emotions – Dimensional Approaches to Emotions – Information Extraction and Processing: Information Extraction from Audio, Video and Physiological Signals – Studies on Affective Information Processing – Evaluation		
Unit –III	**Multimodal Affective Information Fusion:**	**9**
Introduction –Early Fusion – Intermediate Fusion – Late Fusion – Levels of Information Fusion: Sensor or Data-level Fusion – Feature Level Fusion – Decision-Level Fusion – Challenges in Information Fusion		
Unit –IV	**Multimodal Fusion Framework and Multi resolution:**	**9**
Introduction – Benefits of Multimodal Features – Noise In Sensed Data – Non-Universality – Feature Level Fusion – Multimodal Feature-Level Fusion: Feature Normalization – Feature Selection – Multimodal Fusion Framework – Analysis		
Unit –V	**Emotion Recognition from Facial Expression:**	**9**
Introduction – Facial Emotion Recognition: Challenges – Noise and Dynamic range in digital images – Characteristics Source of Digital Image Noise – Experiments with the Proposed Framework		
		Total:45

REFERENCES:

1.	Multimodal Affective Computing: Affective Information Representation, Modelling, and Analysis, Gyanendra k. Verma, Bentham Science Publishers Pte. Ltd. Singapore, 2023.
2.	Affective Computing Focus on Emotion Expression, Synthesis and Recognition, Jimmy Or, I-Tech Education and Publication, 2008.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Understand the emotional needs of the user and able to identify the gap between the humans and technology	Understanding(K2)
CO2	apply various approaches to identify the human emotion	Applying (K3)
CO3	To recognize the human facial expressions.	Applying (K3)
CO4	Identify the emotions from large number of channels	Applying (K3)
CO5	analyze facial expressions from images and videos	Analyzing (K4)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	2				
CO2	3	3	2	2				
CO3	3	3	2	2				
CO4	3	3	2	2				
CO5	3	3	2	2				

1–Slight,2–Moderate,3–Substantial, BT-Bloom's Taxonomy

ASSESSMENTPATTERN– THEORY

Test/Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	60	40	-	-	-	100
CAT2	-	40	60	-	-	-	100
CAT3	-	40	50	10	-	-	100
ESE	-	40	50	10	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCE13–SOFTWARE TESTING								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Software Engineering Methodologies**	**3**	**PE**	**3**	**0**	**0**	**NE**	**3**

Preamble	To learn the ways to improve software testing and quality assurance through planning, establishing a productive work environment to deliver the customer expected product.	
Unit – I	**Fundamentals of Software Testing:**	**9**
Principles of Testing – Phases of Software Project – Quality Assurance and Control – Verification and Validation - White Box Testing: Static Testing – Structural Testing – Challenges.		
Unit – II	**Black Box Testing and Levels of Testing:**	**9**
Black Box Testing: Requirements based Testing – Positive and Negative Testing – Boundary Value Analysis – Decision Tables – Equivalence Class Partitioning – State Based Testing – Compatibility Testing – User Documentation Testing – Domain Testing. Levels of Testing: System and Acceptance Testing.		
Unit – III	**Performance, Regression and Ad-hoc Testing:**	**9**
Factors – Methodology – Tools – Challenges. Regression Testing: Types – Methods. Internationalization Testing – Ad-hoc Testing: Buddy and Pair Testing – Exploratory Testing – Iterative Testing – Agile and Extreme Testing. Usability and Accessibility Testing.		
Unit – IV	**Life Cycle Based Testing:**	**9**
Life Cycle Based Traditional Waterfall Testing, Testing in Iterative Life Cycles, Agile Testing, Agile Model–Driven Development - Model-Based testing: Testing Based on Models - Integration Testing: Decomposition-Based Integration, Call Graph–Based Integration, Path-Based Integration.		
Unit – V	**Test-Driven Development:**	**9**
Object-Oriented Testing: Issues in Testing Object-Oriented Software, Object-Oriented Unit Testing, Object-Oriented Integration Testing, Object-Oriented System Testing - Software Complexity: Unit-Level Complexity, Integration-Level Complexity, System Level Complexity - Model-Based Testing for Systems of Systems: Characteristics, Sample Systems of Systems Software Engineering for Systems of Systems.		
		Total:45

REFERENCES:

1.	Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing Principles and Practices", 1st Edition, Pearson Education, New Delhi, 2016. (Unit I - III)
2.	Paul C. Jorgensen, "Software Testing: A Craftsman's Approach", 4th Edition, CRC Press (Auerbach) Publications, New York, 2017. (Unit IV - V)
3.	William E. Perry, "Effective Methods for Software Testing", 3 rd Edition, Wiley India, New Delhi, 2017

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Understand the importance of software testing in software development.	Understanding (K2)
CO2	Apply testing operations, manage software defects, and generate a testing report using testing techniques.	Applying (K3)
CO3	Implement the various software testing techniques like performance testing, regression testing, and ad-hoc testing.	Applying (K3)
CO4	Understand the concepts of software testing and appraise the most appropriate life cycle based testing and model based testing approaches for a given situation.	Understanding (K2)
CO5	Use the test driven development approaches and identify the complexity of the project by developing the necessary test cases and testing methods based on the implementation of various problems.	Understanding (K2)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	3	3	2	2	2
CO2	3	2	3	2	3	2	2	2
CO3	3	2	3	2	3	2	2	3
CO4	3	3	2	3	2	2	2	3
CO5	3	3	2	3	3	2	2	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	40	60	-	-	-	100
CAT2	-	40	60	-	-	-	100
CAT3	-	40	60	-	-	-	100
ESE	-	40	60	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCE14 - BLOCKCHAIN TECHNOLOGIES								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Cryptography and Network Security, Cyber Security**	**3**	**PE**	**3**	**0**	**0**	**NE**	**3**
Preamble	To provide a comprehensive understanding and practical application of blockchain technology concepts and their real-world implications.							
Unit – I	**Introduction to Blockchain Technology:**							**9**
Basics of Blockchain - Decentralized System - Overview of Distributed Ledger Technology (DLT) - Blockchain structure and principles - Significance of decentralization in Blockchain networks.								
Unit – II	**Cryptography and Blockchain Fundamentals:**							**9**
Hash Functions – Consensus - Blockchain Components - Role of hash functions in blockchain security - Analysis of different consensus mechanisms - Key components in blockchain systems.								
Unit – III	**Advanced Concepts in Blockchain:**							**9**
Cryptography - Smart Contracts - cryptography for securing blockchain transactions - smart contracts and their implementation in blockchain networks.								
Unit – IV	**Applications and Use Cases:**							**9**
Bitcoins - Decentralized Applications - Bitcoin and its impact on the cryptocurrency landscape - Development, deployment, and use cases of decentralized applications (DApps)								
Unit – V	**Integration and Future Perspectives:**							**9**
Blockchain Vertical Solutions and Use Cases - Blockchain and Allied Technologies - Analysis of vertical solutions and real-world applications of blockchain across industries - Relationship between blockchain technology and other emerging technologies like IoT, AI, and cloud computing.								
								Total:45

REFERENCES:

1.	Kumar Saurabh, AshutoshSaxena, "Blockchain Technology: Concepts and Applications, Wiley Publication, 2020.
2.	Imran Bashir, "Mastering Blockchain", 2nd edition, Packt Publication, Mumbai, 2018.
3.	BikramadityaSinghal, GautamDhameja, PriyansuSekhar Panda, Beginning Blockchain, A Beginner's Guide to Building Blockchain Solutions, 2018, 1st edition, Apress, New York.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Understand DLT fundamentals, key blockchain concepts, and historical evolution.	Understanding (K2)
CO2	Analyze blockchain components, and cryptographic techniques, and differentiate public/private blockchains.	Applying (K3)
CO3	Analyzing smart contracts, developing in Solidity, and evaluating consensus mechanisms.	Analyzing (K4)
CO4	Analyze the blockchain applications, analyze benefits/challenges, and assess industry impact.	Analyzing (K4)
CO5	Analyze the blockchain challenges, predict trends, and analyze real-world implementations.	Analyzing (K4)

Mapping of COs with POs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	2	2					2
CO2	2	2	2				2	2
CO3	2	2	2				2	2
CO4		2	2	2	2		2	
CO5		2	2	2	2		2	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	60	40	-	-	-	100
CAT2	-	20	50	30	-	-	100
CAT3	-	30	40	30	-	-	100
ESE	-	20	40	40	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24MCE15 – VIRTUAL AND AUGMENTED REALITY								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**3**	**PE**	**3**	**0**	**0**	**NE**	**3**
Preamble	This course introduces the fundamentals of the Virtual Reality and Augmented Reality to efficiently incorporate user experience, identifying and resolving conflicts in real life. It aims to analyze the application of AR and VR in architecture, gaming, entertainment etc.							
Unit –I	**Design ,Art Across Digital Realities and eXtended Reality:**							**9**
Humans Interact with Computers-Modalities Through the Ages-Types of Common HCI Modalities -The Current State of Modalities for Spatial Computing Devices - Current Controllers for Immersive Computing Systems-A Note on Hand Tracking and Hand Pose Recognition-Designing for Our Senses, Not Our Devices-Sensory Design-Five Sensory Principles. Virtual Reality for Art-3D Art Optimization-Introduction-Draw Calls- Using VR Tools for Creating 3D Art -Acquiring 3D Models Versus Making Them from Scratch.								
Unit –II	**Hardware, SLAM, Tracking:**							**9**
How the Computer Vision That Makes Augmented Reality Possible Works-A Brief History of AR- Select an AR Platform-Mapping Platforms- Apple's AR Kit- Other Development Considerations –Lighting-The AR Cloud- The Dawn of the AR Cloud-The Bigger Picture— Privacy and A qR Cloud Data.								
Unit –III	**Creating Cross-Platform Augmented Reality and Virtual Reality:**							**9**
Virtual Reality and Augmented Reality: Cross-Platform Theory-The Role of Game Engines-Understanding 3D Graphics-Portability Lessons from Video Game Design-Simplifying the Controller Input-Virtual Reality Toolkit: Open Source Framework for the Community Three Virtual Reality and Augmented Reality Development Best Practices.								
Unit –IV	**Enhancing Data Representation:**							**9**
Data and Machine Learning Visualization Design and Development in Spatial Computing-Introduction-Understanding Data Visualization Principles for Data and Machine Learning Visualization-2D Data Visualizations versus 3D Data Visualization-Animation-Data Representations, Infographics, and Interactions-3D Reconstruction and Direct Manipulation of Real-World Data.								
Unit –V	**Character AI ,Behaviors and Use Cases in Embodied Reality:**							**9**
Introduction - Behaviors -Current Practice: Reactive AI-More Intelligence in the System: Deliberative AI-The Virtual and Augmented Reality Health Technology Ecosystem-VR/AR Health Technology Application Design - Standard UX Isn't Intuitive-The Fan Experience: SportsXR.								
								Total:45
REFERENCES:								
1.	Erin Pangilinan, Steve Lukas, Vasanth Mohan, "Creating Augmented and Virtual Realities", O'Reilly Media, 1st Edition, 2019							
2.	Paul Mealy, "Virtual & Augmented Reality For Dummies", Wiley, 1st Edition, 2018.							
3.	Dieter Schmalstieg, Tobias Hollerer, " Augmented Reality: Principles And Practice ", Pearson Education India, 1st Edition, 2016.							

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	apply the fundamentals of Design ,Art Across Digital Realities and extended Reality	Applying (K3)
CO2	make use of components of Hardware, SLAM, and Tracking	Applying (K3)
CO3	apply the concept by creating Cross-Platform Augmented Reality and Virtual Reality	Applying (K3)
CO4	apply the techniques for enhancing Data Representation for Data Visualization and Artificial Intelligence in Spatial Computing.	Applying (K3)
CO5	utilize the character of AI ,behaviors and use cases in embodied reality	Applying (K3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	2				
CO2	3	2	2	2				
CO3	3	2	2	2				
CO4	3	2	2	2				
CO5	3	2	2	2				

1–Slight,2–Moderate,3–Substantial, BT-Bloom's Taxonomy

ASSESSMENTPATTERN– THEORY

Test/Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	40	60	-	-	-	100
CAT2	-	40	60	-	-	-	100
CAT3	-	50	50	-	-	-	100
ESE	-	50	50	-	-	-	100

* ±3% may be varied ,CAT 1,2,3 – 50 marks , ESE – 100 marks

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24GET11- INTRODUCTION TO RESEARCH

Programme & Branch	MCA& Computer Applications	Sem.	Category	L	T	P	MP	Credit
Prerequisites	Nil	3	PE	2	1	0	NE	3

Preamble	Preamble: This course will familiarize the fundamental concepts/techniques adopted in research, problem formulation and patenting. Also will disseminate the process involved in collection, consolidation of published literature and rewriting them in a presentable form using latest tools.	
Unit –I	**Concept of Research:**	**9**
Meaning and Significance of Research: Skills, Habits and Attitudes for Research - Time Management - Status of Research in India. Why, How and What a Research is?-Types and Process of Research-Outcome of Research-Sources of Research Problem-Characteristics of a Good Research Problem - Errors in Selecting a Research Problem - Importance of Keywords - Literature Collection — Analysis - Citation Study - Gap Analysis - Problem Formulation Techniques.		
Unit –II	**Research Methods and Journals:**	**9**
Interdisciplinary Research - Need for Experimental Investigations - Data Collection Methods - Appropriate Choice of Algorithms / Methodologies / Methods - Measurement and Result Analysis - Investigation of Solutions for Research Problem - Interpretation - Research Limitations. Journals in Science/Engineering - Indexing and Impact factor of Journals - Citations - h Index - i10 Index - Journal Policies - How to Read a Published Paper - Ethical issues Related to Publishing - Plagiarism and Self-Plagiarism.		
Unit –III	**Paper Writing and Research Tools:**	**9**
Types of Research Papers - Original Article/Review Paper/Short Communication/Case Study - When and Where to Publish? - Journal Selection Methods. Layout of a Research Paper - Guidelines for Submitting the Research Paper – Review Process - Addressing Reviewer Comments. Use of tools /Techniques for Research -Hands on Training related to Reference Management Software - EndNote, SoftwareFor Paper Formatting like LaTeX /MS Office. Introduction to Origin, SPSS, ANOVA etc. Software for detection of Plagiarism.		
Unit –IV	**Effective Technical Thesis Writing /Presentation:**	**9**
How to Write a Report - Language and Style - Format of Project Report - Use of Quotations - Method of Transcription Special Elements: Title Page - Abstract - Table of Contents - Headings and Sub-Headings - Footnotes - Tables and Figures - Appendix - Bibliography etc. - Different Reference Formats. Presentation using PPTs.		
Unit –V	**Nature of Intellectual Property:**	**9**
Patents-Designs-Trade and Copyright. Process of Patenting and Development: Technological research-innovation-patenting-development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents.		
		Total:45

REFERENCES:

1.	DePoy, Elizabeth, andLauraN.Gitlin,"IntroductiontoResearch-E-Book:UnderstandingandApplyingMultipleStrategies", Elsevier Health Sciences, 2015.
2.	Walliman, Nicholas,"ResearchMethods:Thebasics",Routledge,2017.
3.	BettigRonaldV.,"Copyrightingculture:Thepoliticaleconomyofintellectualproperty",Routledge,2018.

COURSEOUTCOMES: On completion of the course, the students will be able to		BT Mapped (HighestLevel)
CO1	List the various stages in research and categorize the quality of journals.	Analyzing(K4)
CO2	Formulate a research problem from published literature / journal papers.	Analyzing(K4)
CO3	write, present a journal paper / project report in proper format.	Creating(K6)
CO4	Select suitable journal and submit a research paper.	Applying (K3)
CO5	Compile a research report and the presentation.	Applying (K3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	1					
CO2	3	2	3					
CO3	3	3	1					
CO4	3	2	1					
CO5	3	2	1					

1–Slight,2–Moderate,3– Substantial, BT-Bloom's Taxonomy

ASSESSMENTPATTERN– THEORY

Test/Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	30	40	30	-	-	100
CAT2	-	20	30	30	10	10	100
CAT3	-	40	60	-	-	-	100
ESE	-	40	60	-	-	-	100

*±3%may be varied,CAT1,2,3–50 marks , ESE–100marks

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24GET14 -INNOVATION,ENTREPRENEURSHIP ANDVENTUREDEVELOPMENT								
(Common to ME/MTech and MCAProgrammes)								
Programme & Branch	**All ME/MTech and MCA Programmes**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**3**	**PE**	**3**	**0**	**0**	**NE**	**3**

Preamble	This course will direct the students on how to employ their innovations towards a successful entrepreneurial venture development.	
Unit –I	**Innovationand Entrepreneurship:**	**9**
Creativity and Innovation – Types of innovation – challenges in innovation- steps in innovation management- Meaning and concept of entrepreneurship - Role of Entrepreneurship in Economic Development - Factors affecting Entrepreneurship – Entrepreneurship vs Intrapreneurship.		
Unit –II	**DesignThinking and Product Design:**	**9**
Design Thinking and Entrepreneurship – Design Thinking Stages: Empathize – Define – Ideate – Prototype – Test. Design thinking tools: Analogies – Brainstorming – Mind mapping. Techniques and tools for concept generation, concept evaluation – Product architecture–MinimumViableProduct(MVP)-Productprototyping–toolsandtechniques–overviewofprocessesandmaterials– Evaluation tools and techniques for user-product interaction.		
Unit –III	**Business Model Canvas(BMC) and Business Plan Preparation:**	**9**
Lean Canvas and BMC-difference and building blocks-BMC:Patterns–Design–Strategy–Process–Business model failures: Reasons and remedies. Objectives of a Business Plan - Business Planning Process and Preparation.		
Unit –IV	**IPR and Commercialization:**	**9**
Need for Intellectual Property-Basic concepts-Different Types of IPs:Copy Rights,Trade marks,Patents,Geographical Indications, Trade Secrets and Industrial Design– Patent Licensing - Technology Commercialization – Innovation Marketing.		
Unit –V	**Venture Planning and Means of Finance:**	**9**
Startup Stages-Forms of Business Ownership-Sources of Finance –Idea Grant–Seed Fund–Angel &Venture Fund–Institutional Support to Entrepreneurs – Bank and Institutional Finance to Entrepreneurs.		
		Total:45

REFERENCES:

1. GordonE.&NatarajanK.,"EntrepreneurshipDevelopment",6th Edition,HimalayaPublishingHouse,Mumbai,2017.
2. SangeetaSharma,"EntrepreneurshipDevelopment",1st Edition,PHILearningPvt.Ltd.,NewDelhi,2017.
3. CharantimathPoornimaM.,"EntrepreneurshipDevelopmentandSmallBusinessEnterprises", 3rd Edition,Pearson Education, Noida, 2018.
4. RobertD.Hisrich, MichaelP.Peters &DeanA.Shepherd,"Entrepreneurship",10thEdition, McGrawHill,Noida, 2018.

COURSEOUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Understand the relationship between innovation and entrepreneurship	Understanding(K2)
CO2	Understand and employ design thinking process during product design and development	Analyzing(K4)
CO3	Develop suitable business models as per the requirement of the customers	Analyzing(K4)
CO4	Practice the procedures for protection of the irideasIPR	Applying (K3)
CO5	Understand and plan for suitable type of venture and modes of finances	Applying (K3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1				3	2	1
CO2	1	2			3	2	1	
CO3	3	1	3			1		
CO4	1	2				3		
CO5	1	2				3		

1–Slight,2–Moderate,3–Substantial, BT-Bloom's Taxonomy

ASSESSMENTPATTERN– THEORY

Test/Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	50	40	10	-	-	100
CAT2	-	40	40	20	-	-	100
CAT3	-	40	60		-	-	100
ESE	-	40	60		-	-	100

*±3%may be varied,CAT1,2,3–50 marks, ESE–100marks

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24MCL31 & FULL STACK FRAMEWORK LABORATORY								
Programme & Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Nil**	**3**	**PC**	**0**	**0**	**4**	**NE**	**2**

Preamble	To make the students on developing web applications with advanced frameworks

LISTOF EXPERIMENTS / EXERCISES:

1.	Create a NodeJS server that serves static HTML and CSS files to the user without using Express.
2.	Create a NodeJS server using Express that stores data from a form as a JSON file and displays it in another page. The redirect page should be prepared using Handlebars.
3.	Create a NodeJS server using Express that creates, reads, updates and deletes students' details and stores them in MongoDB database. The information about the user should be obtained from a HTML form.
4.	Create a counter using AngularJS.
5.	Create a Todo application using AngularJSStore the data to a JSON file using a simpleNodeJS server and retrieve the information from the same during page reloads.
6.	Create a simple Sign up and Login mechanism and authenticate the user using cookies.The user information can be stored in either MongoDB or MySQL and the server should be built using NodeJS and Express Framework.
7.	Create and deploy a virtual machine using a virtual box that can be accessed from thehost computer using SSH.
8.	Create a docker container that will deploy a NodeJS ping server using the NodeJSimage..
9.	Build an online MCQ quiz app. The questions and options should be fetched based on the chosen topic from a NodeJS server. The questions can be stored in a JSON file in the backend. Once the user has answered the questions, the frontend must send the chosen options to the backend and the backend must identify the right answers and send the score back to the front end. The frontend must display the score in a separate neatly designed page.
10.	Build a blog website where you can add blog posts through a simple admin panel and the users can view the blog posts. The contents of the blog posts can be stored in either MongoDB or MySQL database. The home page should contain the titles of the blog post and the full post can be viewed by clicking the title. Frontend can be built either using AngularJS or through template engines served by the NodeJS server.
11.	Build a simple calculator app with AngularJS. The user should be able to add numbers and operations to the app by clicking on buttons, just like you would do in a mobile phone. The moment the operation and the two operations are defined, the answer should be displayed.

Total:60

REFERENCES/MANUAL /SOFTWARE:

1.	HTML and CSS
2.	AngularJS,MongoDB
3.	Visual studio

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	ability to introduce the nodejs with HTML and CSS and express with json file	Applying (K3), Precision (S3)
CO2	explore the program using nodejs,express and mongoDB for developing real time application	Applying (K3), Precision (S3)
CO3	get into the skill f developing AngularJS with developing todo application	Applying (K3), Precision (S3)
C04	develop real time application using AngularJS,NodeJs,Docker	Applying (K3), Precision (S3)

Mapping of COs with POs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	2	3			3
CO2	3	3	2	2	3			3
CO3	3	3	2	2	3			3
CO4	3	3	2	2	3			3

1–Slight,2–Moderate,3–Substantial,BT-Bloom's Taxonomy

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24MCL32 - C# AND .NET LABORATORY								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Understanding of the .NET Framework and Web Development Basics**	**3**	**PC**	**0**	**0**	**4**	**NE**	**2**
Preamble	To make the student to develop the object oriented feature of C# under the .NET framework for windows and web based applications with ADO.NET							

LIST OF EXPERIMENTS / EXERCISES:

1.	C# program using Late Binding
2.	Attribute based Programs using C#
3.	Language Integrated Query (LINQ) based programs using C#
4.	C# program that used Lambda Expressions
5.	Program for creating web services using C#
6.	C# program for Windows Presentation Foundation (WPF)
7.	C# programs for Windows Workflow foundations (WF)
8.	Program to perform ADO.NET
9.	Design a web application in ASP using ADO.
10.	Creating a Custom Data-Bound ASP.NET Web Control for ASP.NET2.0

Total:60

REFERENCES/ MANUAL /SOFTWARE:

1.	Front End: Microsoft Visual Studio 10.0, Microsoft .NET Framework SDK v2.0.
2.	Back End : ORACLE /MongoDB/ SQL Server / MYSQL
3.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (HighestLevel)**
CO1	ability to write programs using C# with advanced features like delegates ,Lambda Expression .	Applying(K3) Precision(S3)
CO2	Construct different object by LINQ based queries	Applying(K3) Precision(S3)
CO3	develop the web applications using WPF and to create web services using .NET	Applying(K3) Precision(S3)
CO4	develop ASP.NET web Forms and Connectivity through ADO.NET	Applying(K3) Precision(S3)

Mapping of COs with POs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	3	2	3	2	2	3
CO2	3	3	2	3	3	2	2	2
CO3	2	3	2	3	2	3	2	2
CO4	3	2	3	2	3	2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

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24MCL33 – UI / UX DESIGN LABORATORY								
Programme& Branch	**MCA & Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**MP**	**Credit**
Prerequisites	**Web Technology**	**3**	**PC**	**0**	**0**	**4**	**NE**	**2**

Preamble	To promote the development knowledge in UI / UX design

LIST OF EXPERIMENTS / EXERCISES:

1.	Identifying interface connectivity and establishing interface connectivity between the different program modules.
2.	Understand front-end and back-end interfacing and implementation of the interfacing.
3.	Identifying and implementing interaction design and functional layout.
4.	Identify, analyze and implement navigation design.
5.	Create a working UI/UX prototype using prototyping tools.
6.	Study and analysis of sharing and exporting the UI/UX design.
7.	Using tools, study about working flow of custom control and operational control.
8.	Study about the implementation of an information search module using UI/UX.
9.	Design a logo for an e-Commerce app.
10.	Design an email that showcases a promotional offer for the e-commerce app.
11.	Design a brochure that showcases different features of the e-commerce app.
12.	Study about Figma basics: create responsive elements.
13.	Design clickable prototyping using Figma.
14.	Create a design system for an e-commerce using grid and spacing, Typography, color system and UI elements.
15.	Create social media advertisements using online tools and applications.

Total:60

REFERENCES/ MANUAL /SOFTWARE:

1.	Operating System : Windows/Linux
2.	Software : Figma, Online design and Promotion Supporting Tools
3.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	implement the knowledge of establishing interface connectivity among the modules	Applying(K3) Precision(S3)
CO2	apply the creativity and innovation in UI/UX design	Applying(K3) Precision(S3)
CO3	apply the design knowledge in different media of promotions using advertisement	Applying(K3) Precision(S3)
CO4	Theme the visual look and feel of the user experiences	Applying(K3) Precision(S3

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	2	2	2				
CO2	2	2	3	3				
CO3	2	2	2	2	3	2	2	2
CO4	2	2	3	3	2			

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

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24MCP41-PROJECT WORK							
Programme & Branch	**MCA& Computer Applications**	**Sem.**	**Category**	**L**	**T**	**P**	**Credit**
Prerequisites	**Nil**	**4**	**EC**	**0**	**0**	**24**	**12**
							Total:360

COURSEOUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	Identify the problem by applying acquired knowledge	Applying(K3) Precision(S3)
CO2	Analyze and categorize executable project modules after considering risks	Analyzing(K4) Precision(S3)
CO3	Analyze efficient tools for designing project modules	Analyzing(K4) Precision(S3)
CO4	Integrate all the modules through effective teamwork after efficient testing and validation	Evaluating(K5) Precision(S3)
CO5	Elaborate the completed work and compile the project documentation	Creating(K6) Precision(S3)

Mapping of COs with POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	3	3	3	2
CO2	3	3	3	3	3	3	3	2
CO3	3	3	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3	2

1–Slight,2–Moderate,3–Substantial, BT-Bloom's Taxonomy

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