

**LINGAYA'S VIDYAPEETH**



**School of Computer Applications**

**LINGAYA'S  
Scheme & Syllabus  
of  
VIDYAPEETH  
MCA**

**Deemed to be University  
Batch: 2024-2026  
u/s 3 of UGC Act 1956**

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## **VISION**

To be a school, committed to education, research & innovation and develop globally competent professionals in the area of Computer Science, Information Technology and Computer Applications who are responsible citizens and have respect for life and sensitivity towards environment.

## **MISSION**

1. To develop professionals and leaders in Computer Science, IT and allied areas who have right attitude and aptitude to serve the society.
2. To develop and maintain state-of-the-art infrastructure and research facilities to enable create, apply and disseminate knowledge.
3. To foster linkages with all stakeholders for continuous improvement in academics in Computer Science, IT and Computer Applications.
4. To develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge who have deep respect for human life and values.
5. To undertake disciplinary and inter-disciplinary collaborative research and innovation which offer opportunities for long term interaction with academia and industry and develop technologies relevant to the society.



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## **PROGRAM OUTCOMES:**

**PO1- Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering and Application fundamentals, and an engineering and Application specialization to the solution of complex engineering problems.

**PO2- Problem Analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3-Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4- Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5- Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

**PO6- The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7- Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8- Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9- Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10- Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11- Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12- Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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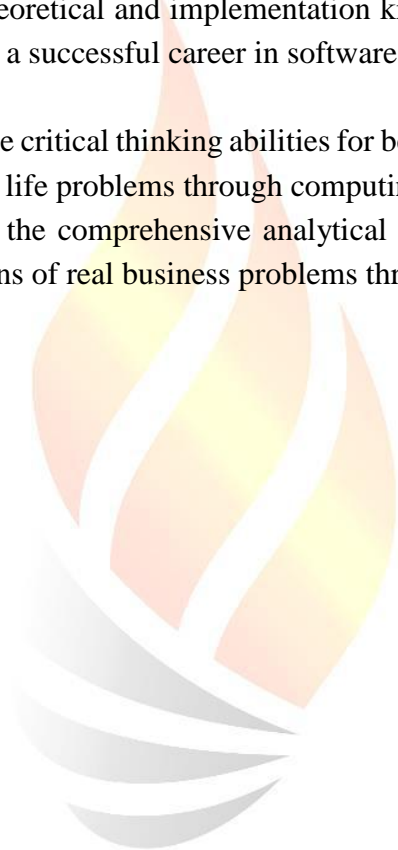
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**PROGRAM SPECIFIC OUTCOMES:**

**PSO1:** To equip the students with theoretical and implementation knowledgebase in all the latest areas of Computer Science & Engineering for a successful career in software industries, pursuing higher studies, or entrepreneurial establishments.

**PSO2:** To nurture the students with the critical thinking abilities for better decision making by offering them a socially acceptable solutions to real life problems through computing paradigm.

**PSO3:** To nurture the students with the comprehensive analytical and design abilities by offering them techno-commercially feasible solutions of real business problems through computing.



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# LINGAYA'S VIDYAPEETH

## SCHEME OF STUDIES

### SESSION: 2024-25

<b>School: School of Computer Applications</b>								<b>Batch: 2024-26</b>					
<b>Course: Master of Computer Applications</b>								<b>Year: 1<sup>st</sup></b>					
								<b>Semester: I</b>					
SN	Cate- gory	Course Code	Course Name	Periods			Cre dits	Evaluation Scheme					Subjec t Total Marks
				L	T	P		Theory			Practical		
								AB Q	MS E	ES E	IP	EX P	
1	PCC	MCA-101E	Programming and Problem-Solving using C	Compulsory Bridge Course									
2	PCC	MCA-103E	Advanced Operating System	3	0	0	3	15	25	60	-	-	100
3	PCC	MCA-105E	Computer Networks & Security	3	1	0	4	15	25	60	-	-	100
4	PCC	MCA-107E	Digital Logic & Computer Architecture	3	1	0	4	15	25	60	-	-	100
5	PEC	MCA-109E	Cyber Security	3	0	0	3	15	25	60	-	-	100
6	PCC	MCA-111E	Data Structure and Algorithm	3	0	0	3	15	25	60	-	-	100
7	PCC	MCA-113E	Advanced Database Management Systems	3	0	0	3	15	25	60	-	-	100
8	PCC	MCA-161E	Data Structure and Algorithm Lab	0	0	2	1	-	-	-	60	40	100
9	PCC	MCA-153E	Advanced Operating System Lab	0	0	2	1	-	-	-	60	40	100
10	PCC	MCA-163E	Advanced DBMS Lab	0	0	2	1	-	-	-	60	40	100
<b>Total----&gt;</b>				<b>18</b>	<b>2</b>	<b>6</b>	<b>23</b>						

LINGAYA'S VIDYAPEETH  
SCHEME OF STUDIES  
SESSION: 2024-25

School: School of Computer Applications								Batch: 2024-26					
Course: Master of Computer Applications								Year: 1 <sup>st</sup>					
								Semester: II					
S N	Cate- gory	Course Code	Course Name	Periods			Cre dits	Evaluation Scheme					Subjec t Total Marks
				L	T	P		Theory			Practical		
								AB Q	MS E	ES E	IP	EX P	
1	PCC	MCA-102E	Software Engineering & Quality Assurance	3	1	0	4	15	25	60	-	-	100
2	PCC	MCA-104E	Operational Research & Optimization	3	0	0	3	15	25	60	-	-	100
3	PCC	MCA-106E	Advanced Java	3	0	0	3	15	25	60	-	-	100
4	PCC	MCA-108E	Artificial Intelligence	3	0	0	3	15	25	60	-	-	100
5	PCC	MCA-110E	Advanced Web Technology	3	0	0	3	15	25	60	-	-	100
6	PEC		Elective-I	3	0	0	3	15	25	60	-	-	100
7	PCC	MCA-156E	Advanced Java Lab	0	0	2	1	-	-	-	60	40	100
8	PCC	MCA-158E	Artificial Intelligence Lab	0	0	2	1	-	-	-	60	40	100
9	PCC	MCA-160E	Advanced Web Technology Lab	0	0	2	1	-	-	-	60	40	100
10	PROJ	PROJ-102E	Minor Project	0	0	4	2	-	-	-	-	100	100
11	AUC	VAC-102E	Value Added Course – I	0	0	2	1	-	-	-	-	-	50
12	PEC	PEC(MCA) 102E	MOOC Courses – I (NPTEL)	1	0	0	3	-	-	-	-	-	100
<b>Total----&gt;</b>				<b>19</b>	<b>1</b>	<b>12</b>	<b>28</b>						



# LINGAYA'S VIDYAPEETH

## SCHEME OF STUDIES

SESSION: 2024-25

School: School Of Computer Applications								Batch: 2024-26					
Course: Master of Computer Applications								Year: 2 <sup>nd</sup>					
								Semester: III					
SN	Category	Course Code	Course Name	Periods			Credits	Evaluation Scheme					Subject Total Marks
				L	T	P		Theory			Practical		
								ABQ	MS E	ES E	IP	EX P	
1	PCC	MCA-201E	Statistical and Numerical Computing	3	0	0	3	15	25	60	-	-	100
2	PCC	MCA-203E	Machine Learning Using Python	3	0	0	3	15	25	60	-	-	100
3	PCC	MCA-205E	Dot Net Programming using C#	3	1	0	4	15	25	60	-	-	100
4	PCC	RM-201E	Research Methodology	3	1	0	4	15	25	60	-	-	100
5	PEC	MCA-207E	Deep Learning	3	0	0	3	15	25	60	-	-	100
6	PEC		<b>Elective-II</b>	3	0	0	3	15	25	60	-	-	100
7	PCC	MCA-253E	Machine Learning Using Python Lab	0	0	2	1				60	40	100
8	PCC	MCA-255E	Dot Net Programming using C# Lab	0	0	2	1				60	40	100
9	PEC	MCA-257E	Deep Learning Lab	0	0	2	1				60	40	100
10	AEC C	RA-201E	Reasoning & Aptitude	1	0	0	1				50	-	50
11	AUC	VAC-201E	Value Added Course – II	0	0	0	0						50
<b>Total----&gt;</b>				<b>19</b>	<b>2</b>	<b>6</b>	<b>24</b>						

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SCHEME OF STUDIES  
SESSION: 2025-26**

<b>School: School Of Computer Applications</b>								<b>Batch: 2024-26</b>					
<b>Course: Master of Computer Applications</b>								<b>Year: 2<sup>nd</sup></b>					
								<b>Semester: IV</b>					
SN	Category	Course Code	Course Name	Periods			Credits	Evaluation Scheme					Subject Total Marks
				L	T	P		Theory			Practical		
								ABQ	MSE	ESE	IP	EXP	
1	PROJ	MCA-282E	Internship/Major Project	0	0	36	18	-	-	-	-	100	100
2	PEC	PEC(MCA) 202E	MOOC Course – II (NPTEL)	0	0	0	3	-	-	-	-	-	100
<b>Total----&gt;</b>				<b>0</b>	<b>0</b>	<b>36</b>	<b>21</b>						

**Abbreviations:**

PCC: Programme Core Courses

ABQ: Assignment Based Quiz

PEC: Programme Elective Courses

MSE: Mid Semester Examination

AEC: Ability Enhancement Compulsory

ESE: End Semester Examination

C: course

GE: General English

IP: Internal Practical

DSE: Discipline Specific Elective Course

EXP: External Practical

L: Lecture

PROJ: Project

T: Tutorial

P: Practical



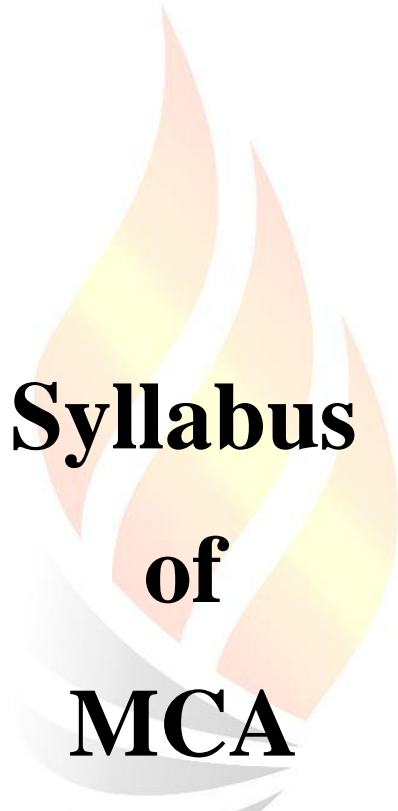
<b>ELECTIVE-I</b>	
<b>CODE</b>	<b>SUBJECT NAME</b>
MCAE-102E	E-Commerce
MCAE-104E	Data Mining & Data warehousing
MCAE-106E	Big Data Analysis

<b>ELECTIVE-II</b>	
<b>CODE</b>	<b>SUBJECT NAME</b>
MCAE-201E	Soft Computing
MCAE-203E	Graphics & Multimedia
MCAE-205E	Mongo DB & No SQL

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**Syllabus  
of  
MCA**

**1<sup>st</sup> Year**

**1<sup>st</sup> Semester**

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# LINGAYA'S VIDYAPEETH

## SCHEME OF STUDIES

### SESSION: 2024-25

School: School of Computer Applications								Batch: 2024-26					
Course: Master of Computer Applications								Year: 1 <sup>st</sup>					
								Semester: I					
SN	Category	Course Code	Course Name	Periods			Credits	Evaluation Scheme					Subject Total Marks
				L	T	P		Theory			Practical		
								ABQ	MS E	ES E	IP	EX P	
1	PCC	MCA-101E	Programming and Problem-Solving using C	Compulsory Bridge Course									
2	PCC	MCA-103E	Advanced Operating System	3	0	0	3	15	25	60	-	-	100
3	PCC	MCA-105E	Computer Networks & Security	3	1	0	4	15	25	60	-	-	100
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6	PCC	MCA-111E	Data Structure and Algorithm	3	0	0	3	15	25	60	-	-	100
7	PCC	MCA-113E	Advanced Database Management Systems	3	0	0	3	15	25	60	-	-	100
8	PCC	MCA-161E	Data Structure and Algorithm Lab	0	0	2	1	-	-	-	60	40	100
9	PCC	MCA-153E	Advanced Operating System Lab	0	0	2	1	-	-	-	60	40	100
10	PCC	MCA-163E	Advanced DBMS Lab	0	0	2	1	-	-	-	60	40	100
<b>Total----&gt;</b>				<b>18</b>	<b>2</b>	<b>6</b>	<b>23</b>						

MCA-101E	PROGRAMMING AND PROBLEM-SOLVING USING C  (Bridge Course)	L-T-P	Cr

## OBJECTIVES

1. Design solutions to simple engineering problem by applying the basic programming principles of C language and basic mathematical knowledge.
2. Choose a suitable C-construct to develop C code for a given problem.
3. Recognize the bugs in the C program.
4. Apply the C-language syntax rules to correct the bugs in the C program.
5. Develop simple C programs to illustrate the applications of different data types such as arrays, pointers, functions.

## PRE-REQUISITES

A Strongly recommended Computer fundamentals.

## COURSE OUTCOMES

Students after undergoing this course will be able to:

- CO1: Illustrate and explain the basic computer concepts and programming principles of C language.  
CO2: Develop C programs to solve simple mathematical and decision-making problems.  
CO3: Develop C programs to solve simple engineering problems using looping constructs.  
CO4: Develop C programs to demonstrate the applications of derived data types such as arrays, pointers, strings and functions  
CO5: Understanding and developing the c functions with their libraries.

## Unit I

**Introduction to Digital Computers:** Representation of Algorithm, Flowcharts, Examples, Introduction to Programming: Importance of C, Basic Structure of C Programs, Programming Style, executing a C Program  
**Constants, Variables, and Data Types:** Introduction, Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning Values to Variables, Defining Symbolic Constants. **Managing Input and Output Operations:** Reading a Character, Writing a Character, Formatted Input, Formatted Output. **Operators and Expressions:** Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operator, Bitwise Operators, Special Operators, Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators, Type Conversions in Expressions, Operator Precedence and Associativity.

## Unit II

**Decision Making and Branching:** Introduction, Decision Making with IF Statement, Simple IF Statement, the IF.....ELSE Statement, Nesting of IF....ELSE Statements, The ELSE IF Ladder, The Switch statement.

(T1: Section 5.1-5.7) Decision Making and Looping: The WHILE Statement, The DO Statement, the FOR Statement, Jumps in LOOPS.

### **Unit III**

**Arrays:** One-dimensional Arrays, Declaration of One-dimensional Arrays, Initialization of One-dimensional Arrays, Example programs- Linear search, Binary search, Bubble sort, Selection sort. Two-dimensional Arrays, Declaration of Two-dimensional Arrays, Initialization of Two-dimensional Arrays, Example programs – Matrix Multiplication, Transpose of a matrix.

### **Unit IV**

**Character Arrays and Strings:** Declaring and Initializing String Variables, Reading Strings from Terminal, Writing Strings to Screen, Arithmetic Operations on Characters, String-handling Functions (str len(), str cpy(), str cmp (), str cat(), str rev()), Example Programs (with and without using built-in string functions), Two-dimensional character arrays. **Pointers:** Introduction, Declaring Pointer Variables, Initialization of Pointer variables, accessing a Variable through its Pointer, Pointer Expressions, Pointer Increments and Scale Factor, Pointers and 1-D Arrays.

### **Unit V**

**User-defined Functions:** Elements of User-defined Functions, Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions, No Arguments and no Return Values, Arguments but no Return values, Arguments with Return Values, No Arguments but Returns a Value, Passing Arrays to Functions. Recursion - Factorial of an integer,  $X^n$ , Finding nth Fibonacci numbers.

### **TEXT BOOKS:**

1. Schaum's Outline of Programming with C by Byron Gottfried , McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill

### **REFERENCE BOOKS:**

1. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
2. Let Us C By Yashwant P. Kanetkar.
3. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley,

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MCA-103E	ADVANCED OPERATING SYSTEM	L-T-P	Cr
		3-0-0	3

## **COURSE OBJECTIVE**

This course helps the students to understand, how the computer resources like CPU, memory, I/O devices, etc. are managed by the operating system. The learners will also become familiar with the modern concepts of distributed operating system and virtualization

## **COURSE OUTCOMES (CO)**

**CO1:** Get familiar with the basics of advanced operating systems, concurrency, and various deadlock models

**CO2:** Comprehend the primitives of distributed operating systems with issues pertaining related to the deadlock detection.

**CO3:** Aware about security system call and Kerberos.

**CO4:** Explore the diverse protocols available for the resource management and, fault recovery and tolerance in the distributed system

**CO5:** Proverbial with the primitives and algorithms available for managing the database operating systems

## **UNIT I**

Introduction: Overview, Functions of an Operating System, Design Approaches, Types of Advanced Operating System - Synchronization Mechanisms, Concept of a Process, Concurrent Processes, The Critical Section Problem, Other Synchronization Problems, Language Mechanisms for Synchronization, Axiomatic Verification of Parallel Programs - Process Deadlocks - Preliminaries, Models of Deadlocks, Resources, System State, Necessary and Sufficient conditions for a Deadlock, Systems with Single-Unit Requests, Consumable Resources, Reusable Resources

## **UNIT II**

Distributed systems: network vs. distributed OS, robustness analysis, design issues; Remote procedure call (RPC), structure, parameter passing, handling partial failures, Sun RPC and XDR; Distributed file systems, Servers: stateless and stateful, REST; Distributed shared memory, architecture, design principles, consistency model; Distributed Scheduling, Issues, Components, Algorithms.

## **UNIT III**

Security systems calls, authentication & authorization, reliability, availability & privacy, common attacks, crypto systems, Kerberos, access control lists; OS design: MAC, and iOS; Virtualization: Types, models; Cloud computing, architecture, service and deployment models, cloud challenges

## **UNIT IV**

Failure Recovery and Fault Tolerance: Basic Concepts-Classification of Failures, Basic Approaches to Recovery; Recovery in Concurrent System; Synchronous and Asynchronous Check pointing and Recovery; Check pointing in Distributed Database Systems; Fault Tolerance; Issues - Two-phase and No blocking Commit Protocols; Voting Protocols; Dynamic Voting Protocols

## **UNIT V**

Multiprocessor and Database Operating Systems: Structures, Design Issues, Threads, Process Synchronization, Processor Scheduling, Memory Management, Reliability / Fault Tolerance; Database Operating Systems, Introduction, Concurrency Control, Distributed Database Systems, Concurrency Control Algorithms

### **TEXTBOOKS:**

- a) Silberschatz, A., Galvin, P.B. and Gagne, G., Operating System Concepts (10<sup>th</sup> ed.), John Wiley, 2018. ISBN 978-1-119-32091-3.
- b) Stallings, Willam, Operating Systems Internals and Design Principles (9<sup>th</sup> ed.), Prentice Hall, 2021. ISBN 978-0134670959.

### **REFERENCE BOOKS/LEARNING RESOURCES:**

- a) Andrew S Tanenbaum and Herbert Bos, Modern Operating Systems (1<sup>st</sup> ed.), Pearson, 2021. ISBN 9789332575776.
- b) Mukesh Singhal and N. G. Shivaratri, Advanced Concepts in Operating Systems (1<sup>st</sup> ed.), McGraw- Hill, 2000. ISBN NA.
- c) Maurice J. Bach, esign of the Unix Operating Systems (1<sup>st</sup> ed.), Pearson, 2015. ISBN NA.

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MCA-105E	COMPUTER NETWORKS & SECURITY	L-T-P	Cr
		3-1-0	4

### COURSE OBJECTIVES:

1. **Basic Network Technology:** Understand basic computer network technology, Data Communications Systems and their components, different types of network topologies and protocols.
2. **OSI and TCP/IP Models:** Study the layers of the OSI model and TCP/IP, understand the functions of each layer, identify various network devices and their roles within a network.
3. **Data Link Layer Protocols:** Learn about basic protocols of the data link layer, understand their applications in network design and implementation, explore IEEE standards for LAN and MAN.
4. **Network Layer and Protocols:** Analyze the features and operations of network layer and application layer protocols, study various switching mechanisms.

### COURSE OUTCOMES:

Upon successful completion of the course, students will be able to:

1. **Knowledge Acquisition:** Gain a solid understanding of basic computer network technology and Data Communications Systems, recognize different network topologies and protocols.
2. **OSI and TCP/IP Models:** Comprehend the layers of the OSI model and TCP/IP, identify the functions of each layer and network devices.
3. **Protocol Application:** Apply data link layer protocols in network design and implementation, understand IEEE standards for LAN and MAN.
4. **Analysis:** Analyze network layer and application layer protocols, examine various switching mechanisms.

### Unit-I:

#### **DATA COMMUNICATION**

Theoretical basis of data communication, analog and digital signals, asynchronous and synchronous transmission, data encoding and modulation techniques, broadband and baseband transmission, pulse code modulation, bandwidth, channel, baud rate of transmission, multiplexing, transmission medium, transmission errors, error detection and correction.

### Unit-II:

#### **NETWORK CLASSIFICATION AND DATA COMMUNICATION SERVICES**

Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN), wireless networks, internetworking, switched multi-megabit data services, X.25, frame relay, narrowband and broadband ISDN, asynchronous transfer mode (ATM), network reference models, layered architectures, protocol hierarchies, ISO-OSI reference model, TCP/IP reference model, internet protocol stacks.

### Unit-III:

#### **DATA LINK LAYER FUNCTIONS AND PROTOCOLS**

Framing, error control, flow control, sliding window protocol, data link layer of Internet and ATM, Medium Access Control (MAC) sub-layer, CSMA/CD protocol, switched and fast Ethernet, token ring, IEEE standards for LAN and MAN, satellite networks.



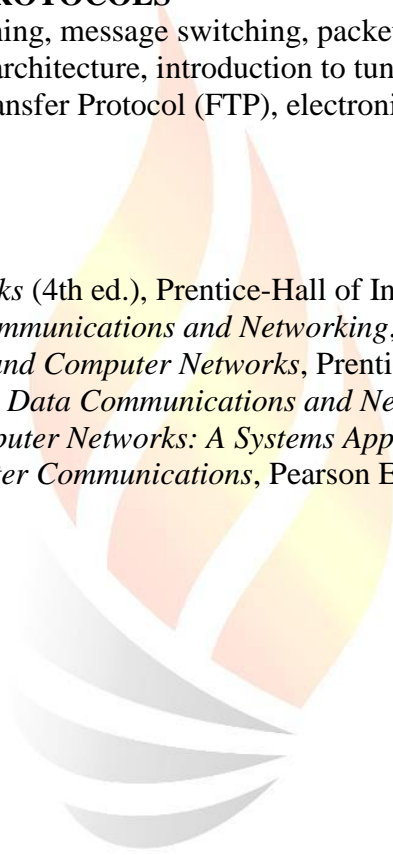
## **Unit-IV:**

### **NETWORK FUNCTIONS AND PROTOCOLS**

Switching mechanisms: circuit switching, message switching, packet switching, cell switching, routing and congestion control, TCP/IP protocol architecture, introduction to tunneling and Virtual Private Networks (VPN), network applications: File Transfer Protocol (FTP), electronic mail (email), World Wide Web (WWW).

### **TEXT / REFERENCE BOOKS:**

1. **A.S. Tanenbaum:** *Computer Networks* (4th ed.), Prentice-Hall of India.
2. **W. Tomasi:** *Introduction to Data Communications and Networking*, Pearson Education.
3. **P.C. Gupta:** *Data Communications and Computer Networks*, Prentice-Hall of India.
4. **Behrouz Forouzan and S.C. Fegan:** *Data Communications and Networking*, McGraw Hill.
5. **L.L. Peterson and B.S. Davie:** *Computer Networks: A Systems Approach*, Morgan Kaufmann.
6. **William Stallings:** *Data and Computer Communications*, Pearson Education.



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MCA-107E	DIGITAL LOGIC AND COMPUTER ARCHITECTURE	L	T	P	Credit
		3	1	0	4

### **OBJECTIVE**

The objective of this course is to introduce the organization of a computer and its principal components, digital logic gates, combinational and logical circuits and micro operations

### **COURSE OUTCOMES**

The students undergoing this course will be able to:

**CO1:** Understanding of Boolean algebra and Simplification of Boolean Functions

**CO2:** Understanding the digital logic gates

**CO3:** Understanding the Combinational Logic and Sequential Logic

**CO4:** Understanding of Microprocessor Architecture and Micro-operations

**CO5:** Understanding of CPU and Binary Arithmetic

### **UNIT I**

Information Representation: Number Systems - Binary, Octal, Decimal, and Hexa-Decimal; Number Base Conversions; Binary Arithmetic; Complements:  $(r-1)$ 's Complement,  $r$ 's Complement, Subtraction using Complements; Floating Number Fixed-point Representation, Floating-point Representation; Binary Codes for Decimal Digits: BCD Code, Excess-3 Code, 84- 2-1 Code, 2421 Code, Reflected Code; Error Detection Code; Character Representation – ASCII, EBCDIC.

### **UNIT II**

Boolean Algebra, Logic Gates and simplification: Boolean Algebra-Basic Definitions, Postulate, Basic Theorems and Properties of Boolean Algebra; Boolean Functions, Canonical and Standard Forms: Minterms and Maxterms, SOP, POS Conversion Between Canonical Forms, Standard Form of a Boolean Function; Other Logical Operations; Digital Logic Gates, Implementation of Boolean Functions, Simplification using Boolean Algebra and Karnaugh Maps (K-Map) Method.

### **UNIT III**

Combinational and Sequential Logic Circuit: Overview of Combinational Logic; Combinational Logic Design Procedure; Design of Some Standard Combinational Circuits: Half Adder, Full Adder, Half Subtractor, Full Subtractor, Code Conversion; Decimal Adder, BCD Adder, Magnitude Comparator, Decoders, Encoder, Multiplexers, De-multiplexer, Flip-Flops: RS Flip Flop, Clocked RS, JK Flip Flop, Master Slave JK Flip Flop, D Type Flip Flop, T Type Flip Flop, State Table, State Diagram, State Equations, Flip Flop Characteristic Tables; Flip Flop Excitation Tables; Design of Sequential Circuits.

### **UNIT IV**

Register Transfer and Micro Operations: Register Transfer Language (RTL); Register Transfer; Bus Transfer; Memory Transfers; Arithmetic Microoperations; Logic Microoperations, List of Logic Microoperations, Addressing Modes, Data Transfer.

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## **UNIT V**

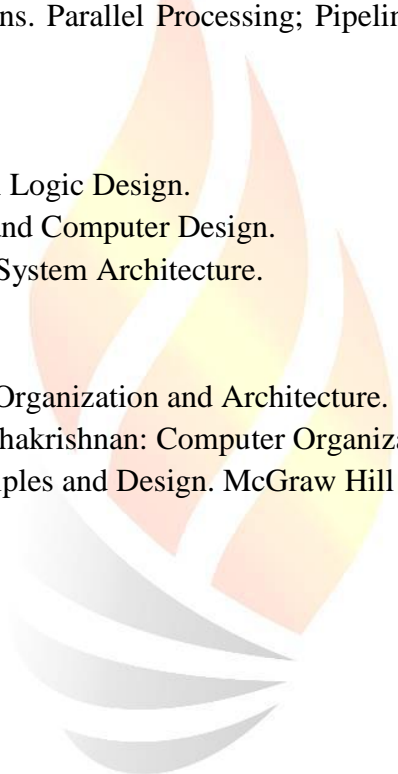
Central Processing Unit (CPU): Introduction; General Register Organization; Control Word; Stack Organization – Register Stack, Memory Stack, Reverse Polish Notation, Evaluation of Arithmetic Expression. Instruction Format – Three Address Instructions, Two Address Instructions, One Address Instructions, Zero Address Instructions. Parallel Processing; Pipelining – Arithmetic Pipeline, Instruction Pipeline

### **TEXT BOOKS**

1. Mansaf Alam & Bashir Alam: Digital Logic Design.
2. PHI M. Morris Mano: Digital Logic and Computer Design.
3. Pearson M. Morris Mano: Computer System Architecture.

### **REFERENCE BOOKS**

1. Pearson William Stalling: Computer Organization and Architecture.
2. Prentice Hall V. Rajaraman & T. Radhakrishnan: Computer Organization and Architecture.
3. PHI Donald D. Givone: Digital Principles and Design. McGraw Hill



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MCA-109E	CYBER SECURITY	L -T- P	Cr
		3- 0- 0	3

## **OBJECTIVES**

To protect information and information infrastructure in cyberspace. To build capabilities to prevent and respond to cyber threats. To reduce vulnerabilities and minimize damage from cyber incidents through a combination of institutional structures, people, processes, technology and cooperation.

## **COURSE OUTCOMES**

The students undergoing this course will be able to:

**CO1:** Introduce students to the fundamental concepts and principles of cybersecurity.

**CO2:** Provide students with an understanding of network security principles, protocols, and technologies.

**CO3:** Introduce students to the principles of cryptography and its application in securing information.

**CO4:** Provide students with an understanding of the most common cybersecurity threats and methods to defend against them.

**CO5:** Provide students with an understanding of cybersecurity governance and management principles and practices.

## **UNIT-I**

**INTRODUCTION TO CYBER SECURITY:** Introduction to cybersecurity concepts, principles, and practices; Cybersecurity history, evolution, and future trends; Types of cyber threats and attacks; Risk management in cybersecurity; Cybersecurity laws, regulations, and ethics

## **UNIT II**

### **NETWORK SECURITY:**

Network security principles, protocols, and technologies; Wired and wireless network security; Network threats and attacks; Firewalls, intrusion detection and prevention systems;;Virtual Private Networks (VPNs) and secure remote access

## **UNIT III**

### **CRYPTOGRAPHY:**

Cryptography principles and concepts; Types of encryption algorithms; Symmetric and asymmetric key cryptography; Cryptographic protocols and applications; Digital signatures and certificates;

## **UNIT IV:**

### **WEB AND APPLICATION SECURITY:**

Web security principles and technologies; Common web vulnerabilities (e.g., XSS, CSRF, SQL injection); Secure coding practices and techniques; Application security testing and assessment; Secure software development lifecycle (SDLC);

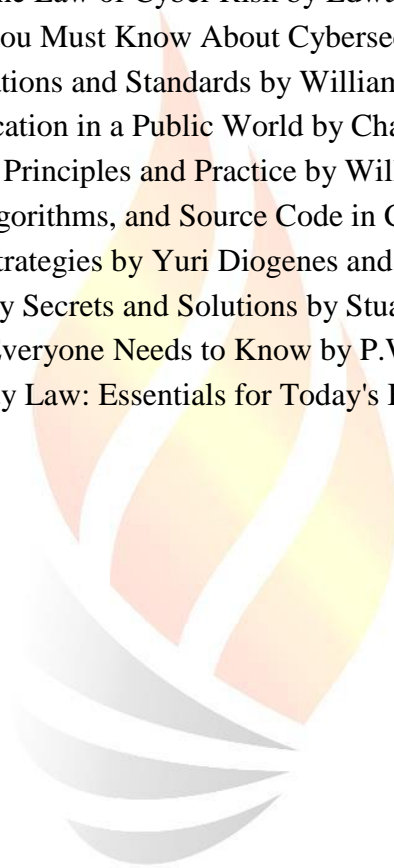
## **UNIT V**

### **INCIDENT RESPONSE AND MANAGEMENT:**

Incident response planning and preparation; Incident detection, analysis, and response; Incident containment, eradication, and recovery; Cybersecurity incident management frameworks (e.g., NIST, ISO);Business continuity and disaster recovery planning;

## REFERENCES

1. Cybersecurity: A Practical Guide to the Law of Cyber Risk by Edward R. McNicholas, et al.
2. Cybersecurity for Beginners: What You Must Know About Cybersecurity by Raef Meeuwisse.
3. Network Security Essentials: Applications and Standards by William Stallings.
4. Network Security: Private Communication in a Public World by Charlie Kaufman, et al.
5. Cryptography and Network Security: Principles and Practice by William Stallings.
6. Applied Cryptography: Protocols, Algorithms, and Source Code in C by Bruce Schneier.
7. Cybersecurity: Attack and Defense Strategies by Yuri Diogenes and Erdal Ozkaya.
8. Hacking Exposed 7: Network Security Secrets and Solutions by Stuart McClure, et al.
9. Cybersecurity and Cyberwar: What Everyone Needs to Know by P.W. Singer and Allan Friedman.
10. The Manager's Guide to Cybersecurity Law: Essentials for Today's Business by Tari Schreider.



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MCA-111E	DATA STRUCTURE AND ALGORITHMS	L –T- P	Cr
		3 -0- 0	3

### **COURSE OBJECTIVE:**

To relay the theoretical and practical fundamental knowledge of most basic data structure like array linked list, stack, queue, tree & graph To understand the implementation of these data structure ,to be familiar with basic techniques of algorithm analysis and analysis of the algorithms used for implementation of these data structure.

### **PRE-REQUISITES:**

Knowledge of basic computer programming.

### **COURSE OUTCOMES**

**CO1:** Understand the concept of dynamic memory management, data types, algorithm, Big O notation.

**CO2:** Understand basic data structures such as arrays, linked list, stack and queue.

**CO3:** Describe the hash function and concepts of collision and its resolution methods.

**CO4:** Solve problem involving graph, trees and heaps.

**CO5:** Apply algorithm for solving problems like sorting, searching, insertion and deletion of data.

### **UNIT I:**

#### **INTRODUCTION TO DATA STRUCTURES AND RUNNING TIME:**

Definition of data structures and abstract data types; linear vs. non-linear data structure; primitive vs. non-primitive data structure; static and dynamic implementations; arrays, 1,2-dimensional arrays, insertion & deletion in 1-D array; examples and real life applications. Time complexity; Big Oh notation; running times; best case, worst case, average case; factors depends on running time; introduction to recursion.

### **UNIT II:**

#### **STACKS AND QUEUES:**

Stacks: definition, array based implementation of stacks, examples: infix, postfix, prefix representation; conversions, applications; definition of queues, circular queue; array based implementation of queues.

### **UNIT III:**

#### **LINKED LISTS:**

Lists; different type of linked Lists; implementation of singly linked list, linked list implementation of stacks and queues; implementation of circular linked list; implementation of doubly linked list, applications.

## **UNIT IV:**

### **TREES AND GRAPHS:**

Definition of trees and binary trees; properties of binary trees and implementation; binary traversal pre-order, post-order, in-order traversal; binary search trees: searching, insertion & deletion. Definition of undirected and directed graphs; array based implementation of graphs; adjacency matrix; path matrix implementation; linked list representation of graphs; graph traversal: breadth first traversal, depth first traversal; implementations and applications.

## **UNIT V:**

### **SORTING AND SEARCHING ALGORITHMS:**

Introduction, selection, insertions, bubble sort, efficiency of above algorithms; merge sort, merging of sorted arrays and algorithms; quick sort algorithm analysis, heap sort, searching algorithms: straight sequential search, binary search (recursive & non-recursive algorithms).

### **TEXT BOOKS**

1. Langsam, Augentem M.J. and Tenenbaum A. M., —Data Structures using C & C++, Prentice Hall of India, 2009.
2. R. S.Salaria, Data Structure and Algorithm, Khanna Publications.

### **REFERENCE BOOKS**

1. Aho A. V., Hopcroft J. E. and Ullman T. D., —Data Structures and Algorithms, Original Edition, Addison-Wesley, Low Priced Edition, 1983.
2. Horowitz Ellis and Sahni S artaj, —Fundamentals of Data Structures, Addison-Wesley Pub, 1984.
3. Horowitz, Sahni and Rajasekaran, —Fundamentals of Computer Algorithms 2007.
4. Kruse Robert, —Data Structures and Program Design in C, Prentice Hall of India, 1994
5. Lipschetz Jr. Seymour, —Theory & Problems of Data Structures, Schaum's Outline, Tata McGraw Hill
6. Weiss Mark Allen, —Data Structures and Algorithms Analysis in C, Pearson Education, 2000
7. Cormen T. H. et al., —Introduction to Algorithms, 2nd Edition, Prentice Hall of India, 2001.
8. Dasgupta Sanjay, Christos P. and Vazirani Umesh, —Algorithms, Tata McGraw Hill, 2008

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<b>MCA-113E</b>	<b>ADVANCED DATABASE MANAGEMENT SYSTEM</b>	<b>L-T-P</b>	<b>Cr</b>
		<b>3-0-0</b>	<b>3</b>

## **OBJECTIVE**

To provide knowledge about various organizations and management information systems, keeping in view the aspects of shareability, availability, evolvability and integrity.

## **COURSE OUTCOMES**

The students undergoing this course will be able:

**CO1:** Recap to use DBMS features and be familiar with advanced SQL usage

**CO2:** Understanding of Query Processing and Query Optimization

**CO3:** Be proficient with Transactions, Concurrency Control and Recovery Systems

**CO4:** Be exposed to parallel, distributed and deductive databases and object database systems

**CO5:** To learn about the Database System Architectures.

## **UNIT I**

Coping with System Failures: Introduction to ADBMS, ACID properties, Issues and Models for Resilient Operation, Undo Logging, Redo Logging, Undo/Redo Logging, Logging Rules, Recovery using different Logging methods, Protecting against Media Failures, Non-quiet Archiving, Recovery using an Archive and Log, Transactions in SQL Serializability, Atomicity, Read-only Transactions, Dirty Reads, other Isolations Levels, Review of PL/SQL

## **UNIT II**

Concurrency Control: Serial and Serializable Schedules, Conflict-Serializability, Precedence Graphs and a Test for Conflict-Serializability, Enforcing Serializability by Locks, The Locking Scheduler, Two-Phase Locking (2PL), Locking Systems with several Lock Modes: shared and Exclusive Locks, The Lock Table, Managing Hierarchies of Database Elements: Locks with Multiple Granularity, The Tree Protocol, Concurrency Control by Timestamps, Concurrency Control by Validation, Constraints and Triggers.

## **UNIT III**

Advanced Transaction Management: Serializability and Recoverability, Recoverable Schedules, ACR, Logical Logging, Recovery from Logical Logs, View Serializability, Polygraphs and the Test for View-Serializability, Resolving Deadlocks, Deadlock Prevention by Ordering Elements and Timestamps, Distributed Databases: Distributed Commit, Two-phase Commit (2PC), Distributed Locking, Long-duration Transactions, Sagas and Compensating Transactions

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## **UNIT IV**

The Query Compiler: Parsing, Estimating the cost of operations, Query optimization, Completing the Physical-Query-Plan and Query Execution; Storage management.

## **UNIT V**

Database System Architectures: Object Definition Language (ODL), Object-relational Model, XML and its Data Model, Object-orientation in Query Languages, Logical Query Languages, Centralized and Client-Server Architectures, Parallel Databases, Spatial and Geographic Databases, Multimedia Databases, Mobility and Personal Databases.

## **TEXT BOOKS**

1. Silberschatz A., Korth H. F. and Sudarshan S., “Database System Concepts”, 3rd edition, McGraw-Hill, International Edition, 1997.
2. S. Chand, Rajiv Chopra, “DBMS(A practical approach)”, Revised edition, Pearson.
3. H. Garcia-Molina, J. D. Ullman, and J. Widom: Database Systems: The Complete Book. Pearson

## **REFERENCE BOOKS**

1. R. Ramakrishnan & J. Gehrke, Database Management Systems. Mc Graw Hill
2. Date C. J., “An Introduction to Database Systems”, 7th edition, Addison- Wesley, Low Priced Edition, 2000.
3. Desai Bipin, “Introduction to Database Management System”, Galgotia Publications, 1991.
4. Elmasri R. and Navathe S. B., “Fundamentals of Database Systems”, 3rd edition, Addison-Wesley, Low Priced Edition, 2000

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MCA-161E	DATA STRUCTURES & ALGORITHMS LAB	L- T -P	Cr
		0 - 0- 2	1

## **LIST OF EXPERIMENTS**

### **ARRAY OPERATIONS**

1. Write a program to insert an element at given position in linear array
2. Write a program to insert an element in sorted array.
3. Write a program to delete an element from given position in linear array
4. Perform following operations on matrices using functions only
  - a) Addition
  - b) Subtraction
  - c) Multiplication
  - d) Transpose

### **SEARCHING**

1. Search an element in a linear array using linear search.
2. Using iteration and recursion concepts write programs for finding the element in the array using Binary Search Method

### **RECURSION**

1. Write a program to compute factorial of given number using recursion
2. Write as program to solve Tower of Hanoi problem using recursion
3. Write a program to find power of given number using recursion

### **STACK & QUEUE**

1. Write a program for static implementation of stack
2. Write a program for dynamic implementation of queue
3. Write a program for static implementation of circular queue
4. Write a program for dynamic implementation of queue
5. Write a program to evaluate a postfix operation

### **LINKED LIST**

1. Create a linear linked list & perform operations such as insert, delete at end , at beg & reverse the link list
2. Create a circular linked list & perform search, insertion & delete operation
3. Create a doubly linked list & perform search, insertion & delete operation

### **TREE & GRAPH**

1. Write program to implement binary search tree. (Insertion and Deletion in Binary Search Tree)
2. Write program to simulates the various tree traversal algorithms
3. Write program to simulate various graph traversing algorithms.

## **SORTING ALGORITHMS**

1. Write program to implement Bubble, Insertion & selection sort.
2. Write program to implement quick sort
3. Write program to implement merge sort
4. Write a program to implement heap sort

## **TEXT BOOK**

A.K. Sharma – Data structure Using C, 2nd edition pearson 2013

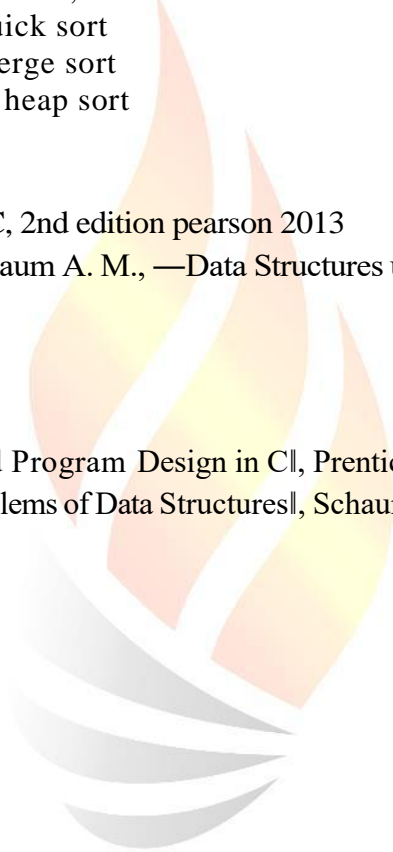
Langsam, Augentem M.J. and Tenenbaum A. M., —Data Structures using C & C++, Prentice Hall of India, 2009.

## **REFERENCE BOOKS**

R. S. Salaria -Data Structure Using C

Kruse Robert, —Data Structures and Program Design in Cl, Prentice Hall of India, 1994

Lipschitz Jr. Seymour, —Theory & Problems of Data Structuresl, Schaum’s Outline, 2nd Edition, Tata McGraw Hill



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MCA-153E	ADVANCED OPERATING SYSTEM LAB	L T P	Cr
		0-0-2	1

### **COURSE OBJECTIVES:**

1. To learn the fundamentals of Operating Systems.
2. To learn the mechanisms of OS to handle processes, threads and their communication.
3. To know the components and management aspects of concurrency management viz. Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols.

### **COURSE OUTCOMES:**

After the completion of the course, the students will be able to:

**CO1.** Learn the basic concepts of operating system, its various types and architecture

**CO2.** Learn and implement process management issues including process life cycle, scheduling, synchronization and deadlocks

**CO3.** Learn and implement memory management issues including memory partitioning, memory allocation and virtual memory concept

**CO4.** Learn and implement files systems and I/O systems including file management, disk management and kernel I/O subsystems.

### **List of Experiments:**

1. Study of **General UNIX commands** with their meaning, syntax and usage.
2. Study of **Directory Related UNIX** commands with their meaning, syntax and usage.
3. Study of **File related UNIX commands** with their meaning, syntax and usage
4. Study of **Process Related UNIX Commands** with their meaning, syntax and usage.
5. Study of **User Communication UNIX commands** with their meaning, syntax and usage.
6. Study of **Simple Filter UNIX commands** with their meaning, syntax and usage
7. Study of **Advanced filters UNIX Commands** with their meaning, syntax and usage.
8. Study of **System Administrative UNIX commands** with their meaning, syntax and usage
9. Working with vi Editor
10. Write a shell program to calculate overtime pay of 5 employees; overtime is paid at the rate of Rs. 12/Hr for every hour worked above 40 hrs per week. Assume that no employee works for fraction of an hour.

MCA-163E	ADVANCED DATABASE MANAGEMENT SYSTEM LAB	L-T-P	Cr
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## **OBJECTIVE**

To provide knowledge about implementation of practical aspects of database i.e. creation of tables and applying queries using SQL queries

## **COURSE OUTCOMES**

The students undergoing this course will be able:

**CO1:** To know the basics of structured query language

**CO2:** To aware about applying different queries on database structured in the form of tables

**CO3:** To learn about the different SQL queries performed using operators as well as constraints

**CO4:** To create views from created table to further organize the data

**CO5:** To learn about the basic operations of relational algebra

## **LIST OF EXPERIMENTS/EXERCISES**

### **Basic**

1. Introduction to SQL.
2. Write a query for:
3. Creation of table.
4. Insertion of data into table.
5. Displaying the data of table.
7. Deletion of data from table.
8. Updating the data in a table.
9. Modifying the structure of a table.
10. Write a query to implement: Key constraints: primary key constraints, foreign key constraints, not null constraints and unique constraints; use of check constraints.
11. Write a query to implement: Binary operations in Relational Algebra: Union, Intersection, Set Difference, Join, Cartesian product.
12. Write a query to implement: Grouping of data into tables and listing records in ascending order or descending order.
13. Write a query to implement: Creation of sequences and explain use of sequences.
14. Write a query to implement: Access permissions in SQL.

## Moderate

1. Finding unique names of all salesmen, deletion of the structure of a table, use of delete command with conditions, updating records of a table with conditions, altering structure of a table and changing size of existing column in the table.
2. Write a query to implement: Arithmetic operators, logical operators and pattern matching operator.
3. Write a query to implement: Aggregate and mathematical functions: count, count(\*), Avg, max, min, sum, lower, upper, power, sqrt.
4. Write a query to implement: Creating views from single and multiple tables, drop views and creating index on the table and drop them.
5. Create queries using Triggers and Procedures.

## Advance

1. Consider the insurance database given below. The primary keys are made bold and the data types are specified.  
PERSON( driver\_id:stringname:string,address:string)  
CAR( regno:string , model:string , year:int )  
ACCIDENT( report\_number:int , accd\_date:date , location:string )  
OWNS( driver\_id:string , regno:string )  
PARTICIPATED( driver\_id:string , regno:string , report\_number:int , damage\_amount:int)  
1)Create the above tables by properly specifying the primary keys and foreign keys.  
2)Enter at least five tuples for each relation.  
3)Demonstrate how you:  
a.Update the damage amount for the car with specific regno in the accident with report number 12 to 25000.  
b.Add a new accident to the database.  
4)Find the total number of people who owned cars that were involved in accidents in the year 2008.  
5)Find the number of accidents in which cars belonging to a specific model were involved.
2. Consider the following relations for a order processing database application in a company.  
CUSTOMER( custno:int , cname:string , city:string )  
ORDER( orderno:int , odate:date , custno:int , ord\_amt:int )  
ORDER\_ITEM( orderno:int , itemno:int , quantity:int )  
ITEM( item no: Int , unit price: int )  
SHIPMENT( order no: int , ware house no: Int , ship\_ date: date )  
WAREHOUSE( ware house no: int , city: string )  
1)Create the above tables by properly specifying the primary keys and foreign keys.  
2)Enter at least five tuples for each relation.  
3)Produce a listing: customer name , No. of orders , Avg\_ order\_ amount , where the middle column is the total number of orders by the customer and the last column is the average order amount for that customer.  
4)List the order no for orders that were shipped from all the warehouses that the company has in a specific city.  
5)Demonstrate the deletion of an item from the ITEM table and demonstrate a method of handling the rows in the ORDER\_ITEM table that contains this particular item.
3. Consider the following database of student enrollment in courses and books adopted for that course.  
STUDENT( regno: string , name: string , major: string , b date: date )  
COURSE( course no: int , c name: string , dept: string )  
ENROLL( regno: string , course no: int , sem: int , marks: int )  
BOOK\_ADOPTION( course no: Int , sem: int , book\_ is bn: Int )

TEXT( book\_ id: int , book\_ title: string , publisher: string , author: string )

- 1) Create the above tables by properly specifying the primary keys and foreign keys.
- 2) Enter at least five tuples for each relation.
- 3) Demonstrate how you add a new text book to the database and make this book to be adopted by some department.
- 4) Produce a list of text books ( includes course no., book price , book \_title ) in the alphabetical order for courses offered by the 'CS' department that use more than two books.
- 5) List any department that has all its books published by a specific publisher.

4. The following are maintained by a book dealer.

AUTHOR( author\_ id: int \_ name: string , city: string , country: string )

PUBLISHER( publisher\_ id int , name: string , city: string , country: string )

CATALOG( book\_ id: int , title: string , author\_ id int , publisher\_ id int , category\_ id int , year Int price: int)

5. CATEGORY( category\_ id int , description :string )

ORDER\_DETAILS( order\_ no: int , book\_ id: Int , quantity: int )

- 1) Create the above tables by properly specifying the primary keys and foreign keys.
- 2) Enter at least five tuples for each relation.
- 3) Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2000.
- 4) Find the author of the book that has maximum sales.
- 5) Demonstrate how you increase the price of books published by a specific publisher by 10%.

1. Consider the following database for a banking enterprise.

BRANCH( branch\_ name:string , branch\_ city:string , assets:real )

ACCOUNT( accno:int , branch\_ name:string , balance:real )

DEPOSITOR( customer\_ name:string , accno:int )

CUSTOMER( customer\_ name:string , customer\_ street:string , customer\_ city:string )

LOAN( loan\_ number:int , branch\_ name:string , amount:real )

BORROWER( customer\_ name:string , loan\_ number:int )

- 1) Create the above tables by properly specifying the primary keys and foreign keys.
- 2) Enter at least five tuples for each relation.
- 3) Find all the customers who have at least two accounts at the main branch.
- 4) Find all the customers who have an account at all the branches located in a specific city.
- 5) Demonstrate how you delete all account tuples at every branch located in a specific city.

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**Syllabus  
of  
MCA**

**1<sup>st</sup> Year**

**2<sup>nd</sup> Semester**

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# LINGAYA'S VIDYAPEETH

## SCHEME OF STUDIES

### SESSION: 2024-25

School: School of Computer Applications								Batch: 2024-26					
Course: Master of Computer Applications								Year: 1 <sup>st</sup>					
								Semester: II					
S N	Cate- gory	Course Code	Course Name	Periods			Cre dits	Evaluation Scheme					Subject Total Marks
				L	T	P		Theory			Practical		
								AB Q	MS E	ES E	IP	EX P	
1	PCC	MCA-102E	Software Engineering & Quality Assurance	3	1	0	4	15	25	60	-	-	100
2	PCC	MCA-104E	Operational Research & Optimization	3	0	0	3	15	25	60	-	-	100
3	PCC	MCA-106E	Advanced Java	3	0	0	3	15	25	60	-	-	100
4	PCC	MCA-108E	Artificial Intelligence	3	0	0	3	15	25	60	-	-	100
5	PCC	MCA-110E	Advanced Web Technology	3	0	0	3	15	25	60	-	-	100
6	PEC		Elective-I	3	0	0	3	15	25	60	-	-	100
7	PCC	MCA-156E	Advanced Java Lab	0	0	2	1	-	-	-	60	40	100
8	PCC	MCA-158E	Artificial Intelligence Lab	0	0	2	1	-	-	-	60	40	100
9	PCC	MCA-160E	Advanced Web Technology Lab	0	0	2	1	-	-	-	60	40	100
10	PROJ	PROJ-102E	Minor Project	0	0	4	2	-	-	-	-	100	100
11	AUC	VAC-102E	Value Added Course – I	0	0	2	1	-	-	-	-	-	50
12	PEC	PEC(MCA)10 2E	MOOC Courses – I (NPTEL)	1	0	0	3	-	-	-	-	-	100
<b>Total----&gt;</b>				<b>19</b>	<b>1</b>	<b>12</b>	<b>28</b>						

MCA-102E	SOFTWARE ENGINEERING & QUALITY ASSURANCE	L T P	Cr
		3 -1-0	4

## **COURSE OBJECTIVE**

To provide basic knowledge of properties of software and its development processes, software quality, CASE tools, etc.

## **PREREQUISITE**

Knowledge of computer programming, principles of management

## **COURSE OUTCOMES**

The students undergoing this course will be able to:

1. Plan a software engineering process life cycle, including the specification, design, implementation, and testing of software system that meet specification, performance, Maintenance and quality requirement
2. Able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project
3. Analyze and translate a specification into a design, and then realize that design practically, using an appropriate software engineering methodology.
4. Know how to develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice.
5. Able to use modern engineering tools necessary for software project management, time management and software reuse.

## **UNIT I**

**INTRODUCTION:** Definition and Emergence of Software Engineering, Evolving Role of Software, Software Life Cycle Models, Software Characteristics, Applications, Software Product, Software Process, Software Crisis, Software Myths.

## **UNIT II**

**SOFTWARE PROJECT MANAGEMENT:** Project management concepts, software process and project metrics project planning, project size estimation metrics, project estimation techniques, empirical estimation techniques, COCOMO- a heuristic estimation techniques, staffing level estimation, team structures, staffing, risk analysis and management, project scheduling and tracking.

## **UNIT III**

**REQUIREMENTS ANALYSIS AND SPECIFICATION:** Requirements engineering, system modeling and simulation, analysis principles: modeling, partitioning, software, prototyping: methods and tools; specification principles, representation, the software requirements specification and reviews analysis modeling: data modeling, functional modeling and information flow: data flow

diagrams, behavioral modeling; the mechanics of structured analysis: creating entity/ relationship diagram, data flow model, control flow model, the control and process specification.

#### **UNIT IV**

##### **SYSTEM DESIGN AND COMPUTERAIDEDSOFTWARE ENGINEERING:** Design

Process: design and software quality, design principles; design concepts: abstraction, refinement, modularity, software architecture, control hierarchy, structural partitioning, software procedure, information hiding; functional independence, cohesion, coupling; design heuristics for effective modularity; design model; design documentation, architectural design: software architecture, CASE, building blocks; integrated case environments and architecture, repository.

#### **UNIT V**

**TESTING AND MAINTENANCE:** Software testing techniques, software testing fundamentals: objectives, principles, testability; test case design, white box testing, basis path testing: control structure testing: black box testing, testing for specialized environments, architectures and applications. software testing strategies: verification and validation, unit testing, integration testing, validation testing, alpha and beta testing; system testing, acceptance testing debugging approaches; software re-engineering, reverse engineering, restructuring, forward engineering, Software maintenance, Adaptive , corrective and perfective, software reliability: measures of reliability and availability, software safety.

#### **TEXT BOOKS**

Pressman Roger S., —Software Engineering – A Practitioner’s Approach I , McGraw Hill, 2004

#### **REFERENCE BOOKS**

1. Jalote Pankaj, —An Integrated Approach to Software Engineering I, 3<sup>rd</sup> edition, Narosa Book Distributors Private Ltd, 2005
2. Mall Ra j i b, —Fundamentals of Software Engineering I, Prentice Hall of India,2003
3. Sommerville Ian, —Software Engineering I, 8th edition, Addison Wesley, 2007
4. Gustafson David, —Software Engineering I, Tata McGraw Hill, 2002
5. Behforooz Ali and Hudson Frederick J., —Software Engineering Fundamentals I, Oxford University press, John Wiley & Sons, 2005

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MCA-104E	OPERATIONAL RESEARCH & OPTIMIZATION	L- T- P	CR
		3 - 0- 0	3

**COURSE OBJECTIVES:**

Study the role of operational research in decision-making. Learn, identify, and develop operational research models from the verbal description of the real system. Understand the mathematical tools needed to solve optimization problems.

**COURSE OUTCOMES(COs):**

At the end of the course, the student shall be able to:

**CO1.** Discuss the role of operations research in decision-making and its applications in industry, and formulate and design real-world problems through models and experiments.

**CO2.** Discuss the role of operations research in decision-making and its applications in industry, and formulate and design real-world problems through models and experiments.

**CO3.** Acquire knowledge of various types of deterministic models, such as linear programming and transportation model.

**CO4.** Explore various types of stochastic models, such as waiting line model, project line model, and simulation.

**CO5.** Deduce the relationship between a linear program and its dual, and perform sensitivity analysis.

**CO6.** Describe different decision-making environments and apply the decision-making process in real-world situations.

**UNIT I:**

Introduction: Definition, role of operations research in decision-making, applications in industry, concept of O.R. model building – types and methods.

**UNIT II:**

Programming (LP): Programming definition, formulation, solution methods – graphical, simplex, BIG-M methods, duality, PRIMAL-DUAL relations and their solution, shadow price, economic interpretation, dual-simplex, post-optimality and sensitivity analysis, problems.

**UNIT III:**

Deterministic Model: Transportation model – balanced and unbalanced, north-west rule, Vogel's Method, least cost or matrix minimal, Stepping Stone method, MODI method, degeneracy, assignment, traveling salesman problems.

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#### **UNIT IV:**

Waiting Line Models: Introduction, queue parameters, M/M/1 queue, performance of queuing systems, applications in industries, problems.

#### **UNIT V:**

Project Line Models: Network diagram, event, activity, defects in network, PERT & CPM, float in network, variance and probability of completion time, project cost – direct, indirect, total, introduction to crashing of network and resource leveling in project, problems.

#### **TEXT BOOKS:**

1. Operations Research – Taha, PHI, New Delhi
2. Quantitative Techniques – Vohra, TMH, New Delhi

#### **REFERENCE BOOKS:**

1. Operations Research – Gupta & Sharma, National Publishers, New Delhi.
2. Introduction to Operations Research – Churchman, Ackoff, Arnoff, John Wiley.
3. Principles of Operations Research (with Applications to Managerial Decisions) – H.M. Wagner, Prentice Hall of India, New Delhi.
4. Operations Research – Sharma, Gupta, Wiley Eastern, New Delhi.
5. Operations Research – Philips, Ravindran, Solgberg, Wiley ISE.

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MCA-106E	ADVANCED JAVA	L- T- P	CR
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### **COURSE OBJECTIVES:**

1. **To understand the various concepts of advanced Java programming**, and to familiarize students with the AWT (Abstract Window Toolkit) hierarchy, including concepts of event handling in Java.
2. **To understand the concepts of the Swing package**, and learn the basics of data access using JDBC (Java Database Connectivity).
3. **To implement server-side programming using Servlets**, and to familiarize students with the concepts of reusable classes using JavaBeans and the Struts Framework.
4. **To understand the concept of scripting languages like JavaScript**, and master JSP (JavaServer Pages).

### **COURSE OUTCOMES:**

At the end of the course, the student will have:

1. **An understanding of various concepts of advanced Java programming**, including the AWT hierarchy and event handling in Java.
2. **Knowledge of the Swing package**, and the basics of data access using JDBC.
3. **The ability to implement server-side programming using Servlets**, and familiarity with reusable classes using JavaBeans and the Struts Framework.
4. **Skills in scripting languages like JavaScript**, and proficiency in JSP.

### **UNIT I:**

Numbers, Strings & Collections: The Numbers Class, Formatting Numeric Print Output, Strings, Converting Between Numbers and Strings, Manipulating Characters in a String, The StringBuilder Class, Autoboxing and Unboxing, The Collection Interface, The Set Interface, The List Interface, The Map Interface, Generics and Annotations.

### **UNIT II: I/O in Java**

#### **I/O Streams:**

Byte Streams, Character Streams, Buffered Streams, Scanning, Formatting, I/O from the Command Line, Data Streams, Object Streams

#### **File I/O:**

The Path Class, Path Operations, File Operations, Checking a File or Directory, Deleting a File or Directory, Copying a File or Directory, Moving a File or Directory, Managing Metadata (File and File Store Attributes), Reading, Writing, and Creating Files, Random Access Files.

### **UNIT III: AWT & Swing**

AWT Class Hierarchy, Creating Containers and Adding Components, Layouts, Panels, Event Handling, Adapter Classes, Dialog Boxes, Scrollbars, Menus, Differences Between AWT and Swing, Containment Hierarchy of Swing; Adding Components: J Text Field, J Password Field, J Table, J Combo Box, J Progress Bar, J List, J Tree, J Color Chooser, Dialogs

### **UNIT IV: Servlets & JDBC**

Advantages Over Applets, Servlet Alternatives and Features, Servlet Architecture, Servlet Lifecycle, Generic Servlet, Http Servlet, Passing and Retrieving Parameters to Servlets, Server-Side Includes, Cookies, Filters, Security Issues

Introduction to JDBC: JDBC vs. ODBC, JDBC Drivers, JDBC Architecture, JDBC Classes and Interfaces

### **UNIT V:**

**JavaBeans and Java Script:** Introduction and Advantages of JavaBeans, JDK (Java Development Kit) Introspection, Properties, JavaBeans API, EJB (Enterprise JavaBeans), Introduction to the Struts Framework, Need for JavaScript, Features and Basic Programming Constructs of JavaScript: Variables, Arrays, Functions, Objects, Dialog Boxes, Event Handling

### **TEXT / REFERENCE BOOKS**

1. Uttam K. Roy, Advanced Java Programming, Oxford University Press, ISBN: 0-19-945550-3
2. Ivan Bayross, HTML, DHTML, JavaScript, Perl & CGI, BPB Publication
3. Raj Kamal, Internet & Web Technologies, TMH
4. Herbert Schildt, The Complete Reference – Java 2, TMH

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<b>MCA-108E</b>	<b>ARTIFICIAL INTELLIGENCE</b>	<b>L- T- P</b>	<b>CR</b>
		<b>3 - 0 - 0</b>	<b>3</b>

### **COURSE OBJECTIVES:**

1. To understand the Domain of AI and basics techniques used for searching and knowledge representation.
2. To learn the different methods of Planning and learning, and to learn Neural network and genetic algorithms and their applications.
3. To introduce the architecture of Rule based and Non Rule based expert system
4. To design and apply various machine learning algorithms for supervised learning.
6. To design and apply Explore supervised and unsupervised learning paradigms of machine learning.

### **COURSE OUTCOMES:**

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

**CO1.** Understood basic concepts and the Applications of AI and able to apply various search and knowledge representation techniques used for Intelligent systems

**CO2.** Apply the planning and learning techniques and also understand the phases and the architecture of various advanced system like NLP based system and Expert System.

**CO3.** Compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.

**CO4.** Understand the strength and weaknesses of various supervised and un-supervised techniques for the solving a real - world problem.

### **UNIT-I**

**BASICS OF AI:** Definition of AI, History, Domains AI, AI problems & State space, Some examples problems representations like Travelling Salespersons, Syntax

analysis Problem, Basic issues to solve AI problems, Underlying assumptions, AI techniques, Level of model, Criteria for success, Control strategies.

Searching Techniques: DFS, BFS, Heuristic Search Techniques: Generate & Test:

Hill Climbing (simple & steepest), Best first search/A\*, Problem Reduction/AO\*,

Constraint satisfaction, MEA. And Knowledge Representation Techniques such as

Knowledge Representation Techniques: Syntax & Semantic for Propositional

logic, Syntax & Semantic for FOPL, Properties for WFF's, Resolution: Resolution

Basics, conversion to clausal form, Resolution of proposition logic, Unification of

predicates, Resolution algorithms for predicates, Problems with FOPL, Semantic

nets, Frames, Scripts

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## **UNIT-II**

**PLANNING & LEARNING:** Planning, Planning in Situational calculus, Representation for planning, Partial order planning, Partial order planning algorithm, Learning by Examples, Learning by Analogy, Explanation based learning, Neural network, Genetics algorithms, Architecture of expert system (Rule Based and Non-Rule Based)

## **UNIT-III**

**MACHINE LEARNING-Supervised Learning (Regression/Classification):** Introduction to Machine Learning, Types of Machine Learning (Supervised/Unsupervised), Distance-based methods, Nearest- Neighbours, Decision Trees, Naive Bayes, Linear models: Linear Regression, Logistic Regression, Support Vector Machines, Nonlinearity and Kernel Methods.

## **UNIT-IV**

**UNSUPERVISED LEARNING:** K-means/Kernel K-means, Dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion, Ensemble Methods (Boosting, Bagging, Random Forests)

### **TEXT / REFERENCE BOOKS:**

1. David W. Rolston: Principles of Artificial Intelligence and Expert System Development, McGraw Hill Book Company.
2. Artificial Intelligence by Elaine Rich & Kevin Knight, TMH
3. AI by DAN. W. Petterson
4. AI by Russel and Norvig, Pearson education

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<b>MCA-110E</b>	<b>ADVANCED WEB TECHNOLOGY</b>	<b>L- T- P</b>	<b>CR</b>
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## **OBJECTIVE**

It aims to provide the information to students to study the architecture of Dot Net framework. It helps them to understand the basic principles of C# development. Students will learn advanced windows and web development techniques using dot NET.

## **PRE-REQUISITE:**

Basics of programming, Structure and HTML Tags, Images, List, Tables, Anchors and Form Elements

## **COURSE OUTCOMES**

The students undergoing this course will be able:

CO1: To Study the architecture of Dot Net framework

CO2: To Understand the basic principles of C# development

CO3: To Create UI applications using C#

CO4: To Design and develop secure web applications using asp.net according to industry standards

CO5: To Define and create custom web services

## **UNIT I**

**Introduction to ADO.NET:** Benefits of ADO.NET, ADD.NET compared to classic ADO, ADO.NET architecture (Connected and Disconnected), Shared and Database-Specific Classes, Using Database connection. Working with Data Sets, Managed Providers, Data Binding, Typed Data Sets, Working with Data Reader, Transactions

## **UNIT II**

**OOP C#:** Classes and Objects Instance Variables, Methods, Constructors, Properties, Access Specifiers, Static members and methods Inheritance Levels of Inheritance, Constructor and Inheritance, Polymorphism, Interfaces, Abstract classes, Delegates, Indexers, Sealed Classes, Exception handling Collections and Generics Bounded and Unbounded Collections, Generic Programming Generic classes, Functions, Constraints on Generic Programming 10

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### **UNIT III**

#### **DATABASES and C#:**

File Handling Text Files, Binary Files, String Processing, Serialization and Deserialization ADO.Net Connected and Disconnected, Architecture of ADO. Net, Commands, Datasets, Data Readers, Data Adapters, Working with Stored Procedures LINQ and the ADO.NET Entity Framework LINQ Introduction, Mapping Your Data Model to an Object Model, Introducing Query Syntax 08

### **UNIT IV**

#### **DATA & STATE MANAGEMENT IN ASP.NET:**

ASP.NET Websites with Themes and MasterPages, Data Source Controls, Data Bound Controls, ASP.NET State Management-Client Side and Server Side. ASP.NET and AJAX 10

### **UNIT V**

#### **WEB SERVICES:**

XML, Web Services Architecture, UDDI, SOAP and its Format, WSDL, Create and Consuming XML Web Service Simple and Databases, WCF- Architecture, End Points, Types of Contracts, Web Applications and Security 08

#### **TEXT BOOKS:**

Uttam K. Roy, “Web Technology”, Oxford Publication

#### **REFERENCE BOOKS:**

1. Musciano Chuck, “HTML & XHTML: The Definitive Guide”, Bill Kennedy, 4th Edition, 2000.
2. Holzner Steven, “XHTML Black Book”, Paraglyph Press, 2000.
3. Guy W. Lecky-Thompson, “Web Programmin”, Cengage Learning, 2008.
4. Kamal Raj, “Internet and Web Technologies”, Tata McGraw Hill, 2002

#### **WEB REFERENCES:**

1. <http://W3schools.com>.
2. <http://www.uniweb.be/>
3. <http://www.sagaciousindia.com/>
4. MSDN: Learn to Develop with Microsoft Developer Network: <https://msdn.microsoft.com/>

MCAE-102E	ELECTIVE-I	L -T -P	Cr
	E-COMMERCE	3 – 0- 0	3

**OBJECTIVE:**

To give the students knowledge about the e-business and transactions done electronically

**PRE-REQUISITE:**

Knowledge of internet and web development, data mining, computer networks, software engineering.

**COURSE OUTCOMES:** The students undergoing this course will be able:

CO1: To learn the basic concepts of E-commerce (EC) and its various categories

CO2: To aware about the infrastructure required in e-commerce

CO3: To know about the payment system operated electronically

CO4: To aware about e-business and e-auctions and its related aspects

CO5: To learn about e-commerce and EC support service

**UNIT I**

**Overview of Electronic Commerce:** E-Commerce Definition and Concepts, classification of e-commerce; application of e-commerce technology; ,Benefits; impact of e-commerce; business models; framework of e-commerce.; business to business; business to customer; customer to customer; advantages and disadvantages of e-commerce; electronic commerce environment and opportunities: back ground – the electronic commerce environment – electronic market place technologies.

**UNIT II**

**NETWORK INFRASTRUCTURE OF E-COMMERCE:** Network infrastructure to e-commerce & internet; LAN; Ethernet ( IEEE 802.3); WAN; internet; TCP/IP reference model; domain names; internet industry structure; FTP applications; protocols required for ecommerce; HTTP; CGI 3; firewalls; securing web service; secure payment system transaction security (SET); cryptology; digital signatures

### **UNIT III**

**ELECTRONIC PAYMENT SYSTEM & EDI:** Electronic Payment System Definition and Methods; Introduction to electronic cash and electronic payment schemes – internet monetary payment; different models; framework; prepaid and post-paid payment model and security requirements – payment and purchase order process – online electronic cash. Search tools: directories; search engines; Meta search engines. EDI & E-content: Business Trade Cycle; EDI; EDI Fact, Electronic content.

### **UNIT IV**

**E-BUSINESS & E-Auctions:** Business requirements – concepts; payment processing. launching your e business- marketing an e-business; public relations; consumer communication; news groups & forums; exchanging links; web rings; e-business back end systems; business record maintenance; back up procedures and disaster recovery plans. An Introduction of E-Auctions ;E-Auctions Models and Types ;Future of E-Auctions

### **UNIT V**

**M-COMMERCE, ADVERTISING & CRM:** Introduction to mobile commerce; framework; applications; design methodology and advantages; future trends in m-commerce. Supply chain management in e-commerce. Internet Advertising; Models of Internet advertising; sponsoring content; Corporate Website; Weaknesses in Internet advertising; web auctions. E-retailing; Role of retailing in E-commerce; E-marketing and advertising. CRM in e-commerce.

**CASE STUDY:** Discussion on a corporate web site, E-commerce legal issues & cyber laws.

### **TEXT BOOK**

Chaffey, Dave, “E-business and E-commerce Management”, Pearson Education

### **REFERENCE BOOKS**

1. Kalkota Ravi, Winston Andrew B “E-Commerce-A Manager’s guide”, Addison Wesley.
2. David Whatley; E-commerce concepts.

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MCAE-104E	ELECTIVE-I (Data Mining & Data warehousing)	L T P	Cr
		3-0-0	3

## OBJECTIVE

This course introduces basic concepts, tasks, methods, and techniques in data mining. The emphasis is on various data mining problems and their solutions. Students will develop an understanding of the data mining process and issues, learn various techniques for data mining, and apply the techniques in solving data mining problems using data mining tools and systems. Students will also be exposed to a sample of data mining applications.

## COURSE OUTCOMES

The students undergoing this course will be able to:

**CO1:** Understand the functionality of the various data mining and data warehousing component

**CO2:** Appreciate the strengths and limitations of various data mining and data warehousing models

**CO3:** Explain the analyzing techniques of various data

**CO4:** Describe different methodologies used in data mining and data warehousing.

**CO5:** Compare different approaches of data warehousing and data mining with various technologies.

## UNIT I

**DATA WAREHOUSING:** Definition, usage and trends. DBMS vs data warehouse, data marts, metadata, multidimensional data model, data cubes, schemas for multidimensional database: stars, snowflakes and fact constellations.

## UNIT II

**DATA WAREHOUSE ARCHITECTURE AND IMPLEMENTATION:** OLTP vs. OLAP, ROLAP vs MOLAP, types of OLAP, servers, 3-Tier data warehouse architecture, distributed and virtual data warehouses, data warehouse manager, Computation of data cubes, OLAP queries manager, data warehouse back end tools, complex aggregation at multiple granularities, tuning and testing of data warehouse.

choose to know

### **UNIT III**

**DATA MINING & ITS CURRENT TRENDS:** Definition and task, KDD versus data mining, data mining techniques, Spatial databases, multimedia databases, time series and sequence data, mining text databases and mining Word Wide Web tools and applications. Strategy and business model current trends in data mining, open research area should be added in the course.

### **UNIT IV**

**DATA MINING QUERY LANGUAGES:** Data specification, specifying knowledge, hierarchy specification, pattern presentation and visualization specification, data mining languages and standardization of data mining.

### **UNIT V**

**DATA MINING TECHNIQUES:** Association rules, clustering techniques and implementation, decision tree knowledge discovery through neural networks and genetic algorithm, rough sets, support vector machines and fuzzy techniques.

### **TEXT BOOK**

1. Data Mining Techniques by Arjun Puri, PHI, Publication

### **REFERENCES:**

1. Berson, "Data Warehousing, Data-Mining & OLAP", TMH
2. Mallach, "Decision Support and Data Warehousing System", TMH
3. Bhavani Thura is ingham, "Data-Mining Technologies, Techniques Tools & Trends", CRC Press
4. Navathe, "Fundamental of Database System", Pearson Education
5. Margaret H. Dunham, "Data-Mining. Introductory & Advanced Topics", Pearson Education
6. Pieter Adians, Dolf Zantinge, "Data-Mining", Pearson Education

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MCAE-106E	ELECTIVE-I (Big Data Analysis)	L T P	Cr
		3-0-0	3

### **COURSE OBJECTIVES:**

- CO1. Understand the Big Data Platform and its Use cases
- CO2. Provide an overview of Apache Hadoop
- CO3. Provide HDFS Concepts and Interfacing with HDFS
- CO4. Understand Map Reduce Jobs
- CO5. Provide hands on Hadoop Eco System
- CO6. Apply analytics on Structured, Unstructured Data.
- CO7. Exposure to Data Analytics with R.

### **COURSE OUTCOMES:**

The students will be able to:

- CO1. Identify Big Data and its Business Implications.
- CO2. List the components of Hadoop and Hadoop Eco-System
- CO3. Access and Process Data on Distributed File System
- CO4. Manage Job Execution in Hadoop Environment
- CO5. Develop Big Data Solutions using Hadoop Eco System
- CO6. Analyze Infosphere BigInsights Big Data Recommendations.
- CO7. Apply Machine Learning Techniques using R.

### **UNIT I:**

**INTRODUCTION TO BIG DATA AND HADOOP**-Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere Big Insights and Big Sheets.

### **UNIT II:**

HDFS (Hadoop Distributed File System) The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

### **UNIT III:**

Map Reduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

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## **UNIT IV:**

Hadoop Eco System Pi; Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.

Hive : Hive Shell, Hive Services, Hive Meta store, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. H base : H Basics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL : Introduction

## **UNIT V:**

### **Data Analytics with R**

Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with Big R.

### **Text Books**

- Tom White “ Hadoop”: The Definitive Guide” Third Edit on, O’reily Media, 2012.
- Seema Acharya, “Subhasini Chellappan”, "Big Data Analytics" Wiley 2015.

### **References**

- Michael Berthold, David J. Hand, "Intelligent Data Analysis”, Springer, 2007.
- Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press (2013)
- Tom Plunkett, Mark Hornick, “Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop”, McGraw-Hill/Osborne Media (2013), Oracle press.
- Anand Rajaraman and Jeffrey David Ulman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
- Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
- Glen J. Myat, “Making Sense of Data”, John Wiley & Sons, 2007

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<b>MCA-156E</b>	<b>ADVANCED JAVA LAB</b>	<b>L- T- P</b>	<b>CR</b>
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## **OBJECTIVE**

The objective of an Advanced Java Lab is to provide students with hands-on experience in developing complex and scalable applications using advanced Java technologies and frameworks. The lab is designed to supplement theoretical concepts covered in lectures and to help students understand how to apply these concepts in practice.

## **COURSE OUTCOMES**

The students undergoing this course will be able:

**CO1:** Ability to develop scalable and maintainable enterprise-level applications using advanced Java technologies and frameworks.

**CO2:** Proficiency in designing and implementing web-based applications using Servlets, Java Server Pages (JSP), Enterprise JavaBeans (EJB), Spring Framework, and Hibernate Framework.

**CO3:** Knowledge of web service development using Java and ability to create RESTful web services.

**CO4:** Familiarity with software testing methodologies and ability to test and debug Java applications using testing frameworks such as JUnit.

**CO5:** Capability to integrate different Java technologies and frameworks to develop comprehensive and robust applications.

## **LIST OF TOPICS**

### **Session 1: Introduction to Advanced Java**

Installation of Java EE tools

Overview of Java Database Connectivity (JDBC)

Introduction to Servlets and Java Server Pages (JSP)

### **Session 2: Servlets**

Creating a servlet

Handling HTTP requests and responses

Servlet lifecycle and filters

### **Session 3: Java Server Pages (JSP)**

JSP architecture and lifecycle

Basic JSP syntax and directives

Using JSP tags and expressions

#### **Session 4: JavaBeans**

Introduction to JavaBeans  
Creating and using JavaBeans in JSPs  
JSTL and EL expressions

#### **Session 5: Enterprise JavaBeans (EJB)**

Introduction to EJBs  
Session and message driven EJBs  
EJB lifecycle and deployment

#### **Session 6: Spring Framework**

Introduction to Spring Framework  
Spring configuration and dependency injection  
Spring MVC architecture and controllers

#### **Session 7: Hibernate Framework**

Introduction to Hibernate Framework  
Hibernate configuration and mapping.  
CRUD operations using Hibernate.

#### **Session 8: Web Services**

Introduction to web services  
SOAP and RESTful web services  
Developing web services using Java

#### **Session 9: Project Work**

Implementation of a web application using advanced Java concepts and frameworks, Integration of different advanced Java technologies in the project Testing and deployment of the project

#### **TEXT BOOKS:**

Title: "Advanced Java Programming: A Practical Guide to Developing Applications"  
Author: B. N. Suresh  
Publication Date: 2018  
Publisher: Wiley India Pvt Ltd  
ISBN-10: 8126567068  
ISBN-13: 978-8126567065

#### **Reference:**

Suresh, B. N. (2018). Advanced Java Programming: A Practical Guide to Developing Applications. Wiley India Pvt Ltd.

<b>MCA-158E</b>	<b>ARTIFICIAL INTELLIGENCE LAB</b>	<b>L- T- P</b>	<b>CR</b>
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### **LIST OF EXPERIMENTS**

1. Study of Python programming language.
2. Write a program to find out route distance between two cities using Python.
3. Write a program to implement Tower of Hanoi using Python.
4. Write a program to calculate factorial of a number using Python.
5. Write a program to print the list of customer having different colored cars with price and model available using Python.
6. Write a program to implement water jug problem using Python.
7. Write a program to implement Breadth First Search using Python
8. Write a program to implement Depth First Search using Python
9. Write a program to solve 8-Queens problem using Python.
10. Write a program to solve Monkey Banana problem using Python.
11. Study of robotic programming.

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<b>MCA-160E</b>	<b>ADVANCED WEB TECHNOLOGY LAB</b>	<b>L- T- P</b>	<b>CR</b>
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### **COURSE OUTCOMES**

**CO1:** Implement and Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet.

**CO2:** Utilize the concepts of JavaScript and Java

**CO3:** Use web application development software tools i.e. Ajax, PHP and XML etc. and identify the environments currently available on the market to design web sites.

### **LIST OF EXPERIMENT**

#### **HTML**

1. Hyper Links
2. Hyper Text
3. Using Frames
4. Registration Form with Table

#### **CSS**

5. Inline Style , Internal Style ,and external Style Sheets

#### **JAVA SCRIPT**

6. user defined function to get array of values and sort them in ascending order
7. Demonstrate String and Math Object's predefined methods
8. Demonstrate Array Objects and Date Object's predefined methods
9. Exception Handling
10. Calendar Creation : Display all month

#### **Event Handling**

11. Validation of registration form
12. Open a Window from the current window
13. Change color of background at each click of button or refresh of a page
14. Display calendar for the month and year selected from combo box
15. OnMouseover event

## **XML**

16. Create a any catalog
17. Display the catalog created using CSS and XSL

## **PHP**

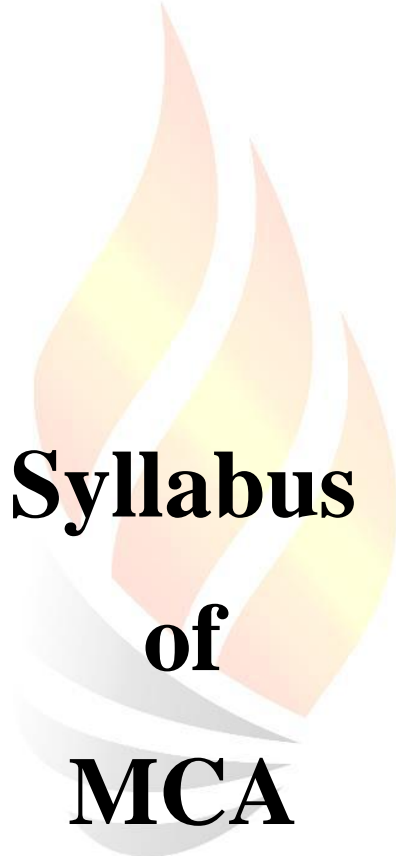
18. File operation
19. Regular Expression, Array, Math, Date function.



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**Syllabus  
of  
MCA**

**2<sup>nd</sup> Year  
3<sup>rd</sup> Semester**

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**LINGAYA'S VIDYAPEETH**  
**SCHEME OF STUDIES**  
**SESSION: 2025-26**

School: School Of Computer Applications								Batch: 2024-26					
Course: Master of Computer Applications								Year: 2 <sup>nd</sup>					
								Semester: III					
SN	Cate- gory	Course Code	Course Name	Periods			Cre dits	Evaluation Scheme					Subject Total Marks
				L	T	P		Theory			Practical		
								ABQ	MSE	ESE	IP	EXP	
1	PCC	MCA-201E	Statistical and Numerical Computing	3	0	0	3	15	25	60	-	-	100
2	PCC	MCA-203E	Machine Learning Using Python	3	0	0	3	15	25	60	-	-	100
3	PCC	MCA-205E	Dot Net Programming using C#	3	1	0	4	15	25	60	-	-	100
4	PCC	RM-201E	Research Methodology	3	1	0	4	15	25	60	-	-	100
5	PEC	MCA-207E	Deep Learning	3	0	0	3	15	25	60	-	-	100
6	PEC		<b>Elective-II</b>	3	0	0	3	15	25	60	-	-	100
7	PCC	MCA-253E	Machine Learning Using Python Lab	0	0	2	1				60	40	100
8	PCC	MCA-255E	Dot Net Programming using C# Lab	0	0	2	1				60	40	100
9	PEC	MCA-257E	Deep Learning Lab	0	0	2	1				60	40	100
10	AECC	RA-201E	Reasoning & Aptitude	1	0	0	1				50	-	50
11	AUC	VAC-201E	Value Added Course – II	0	0	0	0						50
<b>Total----&gt;</b>				<b>19</b>	<b>2</b>	<b>6</b>	<b>24</b>						

choose to know



MCA-201E	STATISTICAL AND NUMERICAL COMPUTING	L-T-P	Cr
		3-0-0	3

### **OBJECTIVE**

Students will be able to understand basic theoretical and applied principles of statistics needed to enter the job force. Students will be able to communicate key statistical concepts to non-statisticians. Students will gain proficiency in using statistical software for data analysis.

### **PRE-REQUISITE:**

This subject requires the basic knowledge of Linear Algebra and Computing. An added advantage of learning the basics of R programming first will be beneficial, as R is a language and an environment that is used for statistical computing and graphics.

### **COURSE OUTCOMES**

**CO1:** To apply discrete and continuous probability distributions to various business problems.

**CO2:** To perform Test of Hypothesis as well as calculate confidence interval and understand the concept of p-values.

**CO3:** To learn non-parametric and parametric tests in order to analysis and interpret the data

**CO4:** To compute Bivariate and Multivariate Correlation, Regression and perform ANOVA, ANCOVA and MANOVA

### **UNIT I**

**OVERVIEW OF R:** R data types and objects, reading and writing data; Control structures, functions, scoping rules, dates and times; Loop functions, debugging tools; Simulation, code profiling.

### **UNIT II**

**SOLUTION OF EQUATIONS AND SYSTEM OF SIMULTANEOUS EQUATIONS:** Solution of Algebraic and Transcendental Equations using Bisection, Regula False, and Newton Raphson Methods, Gauss Elimination, Gauss Seidel, and Jacobi Methods.

### **UNIT III**

**INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION, AND DIFFERENTIAL EQUATIONS:** Interpolation using Lagrange, and Newton's methods, Extrapolation, Least Square Fitting, Numerical Integration using Trapezoidal, and Simpson's Rules, Numerical Solution of Ordinary Differential Equations using Euler's and Range-Kutta Methods.

#### **UNIT IV**

**STATISTICS:** Population, Sample, Sample Collection Methods, Data Representations and Classification, Central Tendency and Dispersion: Mean, Median and Mode, Quartiles and Percentiles, Measures of Dispersion: Range, Variance, Standard Deviation, and Coefficient of Variation. Skewness, and Kurtosis.

#### **UNIT V**

**Probability and Hypothesis Testing:** Sample Space, Events, Equally Likely Events, Probability, Independent Events, Addition and Multiplication Rules, Conditional Probability, Probability Distributions – Normal, Binomial, and Poisson Distributions; Hypothesis Testing: Correlation using Karl Pearson and Spearman Rank Methods; Linear Regression; t-Test, Chi-Square Test, Analysis of Variance (ANOVA), Analysis of covariance (ANCOVA), Multivariate Analysis of Variance (MANOVA).

#### **TEXTBOOK**

1. M. K. Jain, S. R. K. Iyengav, and R. K. Jain: Numerical Methods for Scientific and Engineering Computation. New Age
2. Andy Field, J. Miles, and Z. Field: Discovering Statistics Using R. SAGE

#### **REFERENCE BOOKS**

S.C. Chapra & R.P.Canale: Numerical Methods for Engineering. TMH  
V. Rajaraman: Computer oriented numerical methods. PHI  
A. S. Grewal: Higher Engineering Mathematics. Khanna

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MCA-203E	MACHINE LEARNING USING PYTHON	L T P	Cr
		3-0-0	3

**COURSE OBJECTIVE:**

The main objective of this course is to enabling the student with basic knowledge on the techniques to build an intellectual machine for making decisions behalf of humans. This course covers the techniques on how to make learning by a model, how it can be evaluated, what are all different algorithms to construct a learning model.

**PRE-REQUISITES:** Knowledge of python programming and probability and statistics.

**COURSE OUTCOMES**

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

**CO2:** Appreciate the importance of visualization in the data analytics solution.

**CO3:** Identify various machine learning algorithms and terminologies and perform data pre-processing using standard ML library.

**CO4:** Understand appropriate unsupervised learning algorithms for performing clustering and dimensionality reduction.

**CO5:** Implement probabilistic graphical models for suitable applications.

**UNIT I: CONCEPTS OF PYTHON PROGRAMMING:**

Python data structures, Control statements, Functions, Object Oriented programming concepts using classes, objects and methods, Exception handling, Implementation of user-defined Modules and Package, File handling in python.

**UNIT II: INTRODUCTION TO MACHINE LEARNING:**

Machine Learning Fundamentals –Types of Machine Learning - Supervised, Unsupervised, Reinforcement- The Machine Learning process. Terminologies in ML- Testing ML algorithms: Overfitting, Training, Testing and Validation Sets Confusion matrix -Accuracy metrics- ROC Curve- Basic Statistics: Averages, Variance and Covariance, The Gaussian The Bias-Variance trade off- Applications of Machine Learning.

**UNIT III: SUPERVISED LEARNING:** Regression: Linear Regression – Multivariate Regression- Classification: Linear Discriminant Analysis, Logistic Regression- K-Nearest Neighbor classifier. Decision Tree based methods for classification and Regression- Ensemble methods.

**UNIT IV: UNSUPERVISED LEARNING:** Clustering- K-Means clustering, Hierarchical clustering - The Curse of Dimensionality -Dimensionality Reduction - Principal Component Analysis - Probabilistic PCA- Independent Components analysis.

**UNIT V: PROBABILISTIC GRAPHICAL MODELS:** Bayesian Networks - Learning Naive Bayes classifiers-Markov Models – Hidden Markov Models Sampling – Basic sampling methods – Monte Carlo -Reinforcement Learning.

#### **TEXT-BOOKS**

1. Machine Learning: An Algorithmic Perspective by Stephen Marsland, Chapman and Hall/CRC.
2. T. Mitchell, Machine Learning, McGraw Hill.
3. M. Gopal, Applied Machine Learning, McGraw Hill.
4. Sutton R. S. and Barto, A. G., Reinforcement Learning: An Introduction, The MIT Press (2017).

#### **REFERENCE-BOOKS**

1. Introduction to Machine Learning by Ethem Alpaydin, PHI Learning.
2. M. Evangelia, Supervised and Unsupervised Pattern Recognition, CRC Press.
3. G. James, D. Witten, T. Hastie, R. Tibshirani, Introduction to Statistical Learning, Springer.

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MCA-205E	DOT NET PRORAMMING USING C#	L-T-P	Cr
		3-1-0	4

### OBJECTIVE

To equip students with C# programming Concepts

### PRE-REQUISITES

Knowledge of C programming language.

### COURSE OUTCOMES

The students undergoing this course will be able:

**CO1:** To know the basics of Dot net programming language

**CO2:** To learn about the basics of C# programming

**CO3:** To learn about objects and classes in C# programming language

**CO4:** To know about the exception handling and delegates in C# programming

**CO5:** To learn about different database connectivity like ADO etc.

### UNIT I

**PHILOSOPHY OF .NET AND ITS MAJOR COMPONENTS:** Origin of .NET technology; .NET platform; benefits and limitations of .NET; building blocks of .NET framework; .NET programming languages; .NET types and namespaces; Understanding CLR, CTS and CLS; developing C# Applications using Visual Studio .Net

### UNIT II

**UNDERSTANDING C#:** Data Types, Variables & Constants, Operators in C#, Arithmetic Operators, Prefix and Postfix notation, Assignment Operators, Relational Operators, Other Operators, Operators precedence, Flow Control and Conditional Statements if-else statement, switch statement, Loops in C#, for loop, do-while loop, Array in C#, foreach Loop, Comparison among C++; Java and C#; benefits of C#; object-oriented programming using C#

### UNIT III

**OBJECTS AND CLASSES:** Concept of a class, Objects, Fields, Methods, Instantiating the class, Accessing the members of a class, Access modifiers, Properties, Static members of the class, Constructors, Desturctors, Implementing inheritance in C#, The base keyword, Protected Access Modifier, sealed keyword, Polymorphism, using the reference of the base type for referencing the objects of the child class, Overriding the methods, the new keywords, Type casting, is and as keywords.

## **UNIT IV**

**EXCEPTION HANDLING AND DELEGATES:** Exceptions in C# and .Net, Handling Exceptions using the try-catch-finally blocks, Delegates Basics, Delegates in the .Net Framework, Passing delegates to methods, Multicast Delegates.

## **UNIT V**

**ADO .NET AND ASP.NET:** Comparison of ADO and ADO. NET, Introduction to data access with ADO.NET, Components of ADO. NET; Comparison of ASP and ASP .NET, Features of ASP .NET, Features provided by ASP .NET; web forms and their components.

## **TEXT BOOKS**

1. Bala Goswami, E, “Programming in C#”, Tata McGraw Hill
2. Gunnerson Eric, “A programmer’s Introduction to C#”, IDG Books

## **REFERENCE BOOKS**

1. Jain, V K, “The Complete Guide to C# Programming”, IDG Books India.
2. Pappas & Murray, “C# Essentials”, Prentice Hall of India
3. Wakefield, “C# and .NET Web Developers Guide”, IDG Books India.

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RM-201E	RESEARCH METHODOLOGY	L	T	P	Credit
		3	1	0	4

### **OBJECTIVES**

1. To familiarize participants with basic of research and the research process.
2. To enable the participants in conducting research work and formulating research synopsis and report.
3. To familiarize participants with Statistical packages such as SPSS/EXCEL.
4. To impart knowledge for enabling students to develop data analytics skills and meaningful interpretation to the data sets so as to solve the business/Research problem.

### **COURSE OUTCOMES**

The students undergoing this course will be able to:

**CO1:** Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling.

**CO2:** Discuss different methodologies and techniques used in research work.

**CO3:** Have basic knowledge on qualitative research techniques.

**CO4:** Have adequate knowledge on measurement & scaling techniques as well as the quantitative data analysis

**CO5:** Propose the required numerical skills necessary to carry out research.

### **UNIT I**

**RESEARCH METHODOLOGY:** Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India.

### **UNIT II**

**RESEARCH DESIGN:** Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration. Reviewing the literature: Place of the literature review in research, bringing clarity and focus to your research problem, improving research methodology, broadening knowledge base in research area, enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature.

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### **UNIT III**

Developing a theoretical framework, developing a conceptual framework, Writing about the literature reviewed. Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. Design of Sample Surveys: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs

### **UNIT IV**

**DATA COLLECTION:** Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, **UNIT V:** Layout. Introduction to Intellectual Property (IP), different types of IPs and its importance in the present scenario, Indian patent acts 1970. Design act 2000. The Semi-Conductor Integrated Circuits Layout Design (SICLD) Act, 2000. Copyright Act 1957. Trade Mark Act, 1999

### **TEXT BOOKS**

1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.
2. Research Methodology a step-by- step guide for beginners. (For the topic Reviewing the literature under module Ranjit Kumar SAGE Publications Ltd 3rd Edition, 2011 Study Material.
3. Intellectual property, Debirag E. Bouchoux, Cengage learning, 2013.

### **REFERENCE BOOKS**

1. Research Methods: the concise knowledge base Trochim, Atomic Dog Publishing, 2005.
2. Conducting Research Literature Reviews: From the Internet to Paper Fink A Sage Publications, 2009.

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MCA-207E	DEEP LEARNING	L T P	Cr
		3-0-0	3

## OBJECTIVES

The objective of this course is to cover the fundamental of neural networks as well as some advanced topics such as recurrent neural networks, long short term memory cells and convolutional neural networks. The course also requires students to implement programming assignments related to these topics.

## COURSE OUTCOMES

**CO1:** Understand the fundamentals and current usage of the TensorFlow library for deep learning research and the graphical computational model of TensorFlow

**CO2:** Understand the context of neural networks and deep learning

**CO3:** Design recurrent neural networks with attention mechanisms for natural language classification, generation, and translation.

**CO4:** Perform regularization, training optimization, and hyperparameter selection on deep models.

**CO5:** Explore the parameters for neural networks

## UNIT 1

**BASICS:** Biological Neuron, Idea of computational units, McCulloch–Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability. Convergence theorem for Perceptron Learning Algorithm.

**FEEDFORWARD NETWORKS:** Multilayer Perceptron, Gradient Descent, Backpropagation, Empirical Risk Minimization, regularization, autoencoders.

## UNIT II

**DEEP NEURAL NETWORKS:** Difficulty of training deep neural networks, Greedy layerwise training.

**BETTER TRAINING OF NEURAL NETWORKS:** Newer optimization methods for neural networks (Adagrad, adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point problem in neural networks, Regularization methods (dropout, drop connect, batch normalization)

### **UNIT III**

**RECURRENT NEURAL NETWORKS:** Back propagation through time, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs

**CONVOLUTIONAL NEURAL NETWORKS:** LeNet, AlexNet.

### **UNIT IV**

**GENERATIVE MODELS:** Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines.

### **UNIT V**

**RECENT TRENDS:** Variational Autoencoders, Generative Adversarial Networks, Multi-task Deep Learning, Multi-view Deep Learning

**APPLICATIONS:** Vision, NLP, Speech (just an overview of different applications in 2-3 lectures)

### **TEXT BOOKS**

Deep Learning, Ian Goodfellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016.

### **REFERENCES**

1. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2. Pattern Recognition and Machine Learning, Christopher Bishop, 2007

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MCAE-201E	ELECTIVE-II (Soft Computing)	L-T-P	Cr
		3-0-0	3

### **COURSE OBJECTIVES:**

This course enables the students:

1. To know the basic functions of different AI branches.
2. To understand the functionalities of neural networks.
3. To know the application of fuzzy logic.
4. To understand the basic functionalities of optimizations through soft computing.
5. To find the basic functions of soft computing.

### **COURSE OUTCOMES:**

After the completion of this course, students will be able to:

**CO1:** Solve numerical on Fuzzy sets and Fuzzy Reasoning.

**CO2:** Develop Fuzzy Inference System (FIS).

**CO3:** Solve problems on Genetic Algorithms

**CO4:** Explain concepts of neural networks

**CO5:** Develop neural networks models for various applications.

### **UNIT – I**

Introduction to Artificial Intelligence System, Neural Network, Fuzzy Logic & Genetic Algorithm.  
Fuzzy Set Theory: Fuzzy Versus Crisp, Crisp Set, Fuzzy Set, Crisp Relation, Fuzzy Relations.

### **UNIT -II**

Fuzzy System: Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule Based System, Defuzzification Methods, and Applications.

### **UNIT – III**

Genetic Algorithms, Basic Concepts, Creation Of Offspring, Working Principle, Encoding, Fitness Function, Reproduction. Genetic Modeling, Inheritance Operations, Cross Over, Inversion And Deletion, Mutation Operator, Bit Wise Operators, Generation Cycle, Convergence Of Genetic Algorithm, Application, Multi-Level Optimization, Real Life Problems, Difference And Similarities Between GA And Other Traditional Methods, Advanced In GA.

choose to know

#### **UNIT- IV**

Fundamentals Of Neural Networks, Basic Concepts Of Neural Network, Human Brain, Model Of An Artificial Neuron, Neural Network Architectures, Characteristic Of Neural Networks, Learning Method, History Of Neural Network Research, Early Neural Network Architectures, MP Neurons.

#### **UNIT – V**

Back Propagation Network Architecture Of Back Propagation Network, Back Propagation Learning, Illustration, Applications, Effect Of Tuning Parameters Of The Back Propagation Neural Network, Selection Of Various Parameters In BPN, Variations Of Standard Back Propagation Algorithm. Associative Memory And Adaptive Resonance Theory, Autocorrelations, Hetrocorrelators , Multiple Training Encoding Strategy, Exponential BAM, Associative Memory For Real Coded Pattern Pairs, Applications, Introduction To Adaptive Resonance Theory.

#### **TEXT BOOK:**

1. Rajasekharan S. & Vijayalakshmi G. A. “Neural Network Fuzzy Logic and Genetic Algorithm Synthesis and Applications”, Prentice Hall of India PLT, Pai, 2004.

#### **REFERENCE BOOK:**

1. Jang Jai Singh R, Sun C. T. Mizutani E. “Neuro Fuzzy and Soft Computing –A Computational Approach to Learning and Machine Intelligence”, Prentice Hall of India, 1997.

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MCAE-203E	ELECTIVE-II (GRAPHICS & MULTIMEDIA)	L T P	Cr
		3-0-0	3

## OBJECTIVE

To impart the knowledge about the different graphics, image, colour models as well as its role in real world applications

## COURSE OUTCOMES

The students undergoing this course will be able to:

1. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
2. Use of geometric transformations on graphics objects and their application in composite form.
3. Extract scene with different clipping methods and its transformation to graphics display device
4. Explore projections and visible surface detection techniques for display of 3D scene on 2D screen. Render projected objects to naturalize the scene in 2D view and use of illumination models for this.
5. Understand the basics of computer graphics, framework for multimedia systems; multimedia devices.
6. Understand the basics of Multimedia graphics, different graphics systems and applications of computer graphics.

## UNIT-I

**INTRODUCTION:** What is computer graphics, computer graphics applications, computer graphics hardware and software, two-dimensional graphics primitives: points and lines, line drawing algorithms: DDA, Bresenham; circle drawing algorithms: using polar coordinates, Bresenham circle drawing, midpoint circle drawing algorithm; polygon filling algorithm, boundary filled algorithm, scan-line algorithm, flood fill algorithm.

## UNIT-II

**TWO-DIMENSIONAL VIEWING Clipping:** The 2-D viewing pipeline, windows, viewports, window to View port mapping; clipping: point, clipping line (algorithms): 4 bit code algorithm, Sutherland-Cohen algorithm, parametric line clipping algorithm (Cyrus Beck). Sutherland-Hodgeman polygon clipping algorithm

choose to know

### **UNIT-III**

**2D TRANSFORMATION & 3D GRAPHICS:** Homogeneous coordinates system, two dimensional transformations: transformations, translation, scaling, rotation, reflection, shearing, transformation, composite transformation. Three dimensional graphics concept, matrix, Representation of 3-D transformations, composition of 3-D transformation.

### **UNIT-IV**

**BASICS OF MULTIMEDIA TECHNOLOGY & APPLICATIONS:** Computers, communication and entertainment, multimedia an introduction; framework for multimedia systems; multimedia devices; CD Audio, CD-ROM, CD-I, presentation devices and the user interface; multimedia presentation and authoring; professional development tools; Applications of environment in various fields.

### **UNIT-V**

**LAN AND MULTIMEDIA:** internet, World WideWeb and multimedia distribution network: ATM & ADSL; multimedia servers and databases; vector graphics; 3D graphics programs; animation techniques; shading; anti-aliasing; morphing; video on demand.

### **TEXT BOOK**

Computer Graphics – Donald Hearn & M.Pauline Baker, Prentice Hall of India

### **REFERENCES:**

1. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill
2. Asthana, Sinha, "Computer Graphics", Addison Wesley Newman and Sproul,
3. "Principle of Interactive Computer Graphics", McGraw Hill
4. Steven Harrington, "Computer Graphics", A Programming Approach, 2nd Edition

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MCAE-205E	ELECTIVE-II (MONGO DB & No SQL)	L T P	Cr
		3-0-0	3

### **COURSE OBJECTIVES:**

The goal of this course is to provide students with a thorough understanding of NoSQL databases, with a focus on MongoDB. Students will learn about the different types of databases and their uses, delve into MongoDB's architecture and functionalities, and develop skills in managing data through CRUD operations and aggregation. The course also covers advanced topics such as indexing, database operations, and replication to prepare students for real-world database management and optimization.

### **COURSE OUTCOMES:**

Upon successful completion of this course, students will be able to:

1. Understand the need for and differentiate between various types of databases, including relational and non-relational (NoSQL) databases.
2. Navigate MongoDB's architecture, components, and configuration settings effectively.
3. Manage data using documents and collections in MongoDB, including insertion, updating, and deletion of documents.
4. Implement CRUD operations and indexing strategies to optimize database performance.
5. Utilize MongoDB's aggregation framework and understand database operations such as backup, restore, and replication for reliable data management.

**UNIT 1: Introduction to Databases and NoSQL:** Need for a database, Different types of databases, Relational vs. Non-relational databases, Overview of NoSQL databases, Features and benefits of NoSQL, Different types of NoSQL databases

**UNIT 2: Introduction to MongoDB:** Introduction to MongoDB, MongoDB architecture and components, Advantages of MongoDB over RDBMS, Mongo Shell, Configuration file in MongoDB

**UNIT 3: Working with Documents and Collections:** JSON file format for storing documents, Introduction to Documents and Collections, Basic database commands in MongoDB, Inserting and saving documents, Inserting multiple documents

choose to know

**UNIT 4: CRUD Operations and Indexing:** Updating documents, Removing documents, Document replacement, Operators and modifiers, Indexing concepts and strategies, Single index and multikey index, Finding and optimizing indexes

**Unit 5: Aggregation, Database Operations, and Replication:** Aggregation Framework, Pipeline operations: \$match, \$sort, \$group, Pipeline operations: \$project, \$unwind, \$limit, \$skip, Introduction to MapReduce, Aggregation commands, Backup and restore procedures, Exporting and importing data, Importing from JSON files, Overview of replication, Advantages and implementation of replication, Managing configuration files and setting up replica sets

### Textbooks

1. "MongoDB: The Definitive Guide" by Kristina Chodorow

### REFERENCE

1. **Supplementary Text:** "The Little MongoDB Book" by Karl Seguin
2. **Online Resources:** MongoDB Manual on [MongoDB.com](http://MongoDB.com)

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MCA-253E	MACHINE LEARNING USING PYTHON LAB	L -T- P	Cr
		0- 0 -2	1

### **LIST OF EXPERIMENTS**

1. Installation of Python / Python Libraries.
2. Data pre-processing using Python Machine Learning libraries.
3. Design a model to predict the housing price using Multivariate Linear Regression.
4. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
5. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
6. Build a classifier using Logistic Regression, k- Nearest Neighbor to classify whether the given user will purchase a product or not from a social networking dataset.
7. Segment a customer dataset based on the buying behavior of customers using K-means.
8. Implement the decision tree using publically available dataset.
9. Dimensionality reduction of any CSV/image dataset using Principal Component Analysis.
10. Build an email spam classifier using SVM.

### **TEXT-BOOKS**

1. Machine Learning: An Algorithmic Perspective by Stephen Marsland, Chapman and Hall/CRC.
2. T. Mitchell, Machine Learning, McGraw Hill.
3. M. Gopal, Applied Machine Learning, McGraw Hill.
4. Sutton R. S. and Barto, A. G., Reinforcement Learning: An Introduction, The MIT Press (2017).

### **REFERENCE-BOOKS**

1. Introduction to Machine Learning by Ethem Alpaydin, PHI Learning.
2. M. Evangelia, Supervised and Unsupervised Pattern Recognition, CRC Press.
3. G. James, D. Witten, T. Hastie, R. Tibshirani, Introduction to Statistical Learning, Springer.

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MCA-255E	DOT NET PROGRAMMING	L T P	Cr
	USING C# LAB	0- 0 -2	1

### C# & .NET FRAMEWORK LAB MANUAL

#### LAB-1

1. Write a program to C# to find the smallest single digit factor for a given value.
2. Write a program in C# to print a number if it is prime; otherwise display the largest factor of that number.
3. Write a program in C# to find the magnitude of a number.

#### LAB-2

1. Write a C# program for addition and multiplication of two matrices.
2. Write a C# program to display the digits of an integer in words.
3. Write a C# program to which reads a set of strings into the rows a two dimensional array and then prints the string having more number of vowels.

#### LAB-3

1. Write a C# programs to demonstrate the concepts of Structures and Enumerations.
2. Write a C# programs to demonstrate the concepts of Constructors and Inheritance.
3. Write a C# programs to demonstrate the concepts of Polymorphism.

#### LAB-4

1. Write a C# programs to demonstrate the concepts of Partial classes and Extension methods.
2. Write a C# programs to demonstrate the concepts of Delegates.

#### LAB-5

1. Write a C# programs to demonstrate the concepts of Label, Text Box and Button controls.
2. Write a C# programs to demonstrate the concepts of Combo Box and List Box controls.

#### LAB-6

1. **Create** a Windows application in C# for registration form and fill the details and when you click the submit button it display the details in the message box.
2. Create a Windows application in C# having two text boxes and three buttons named as factorial, prime, factorial series. When you click any button the resultant value will be displayed on the second textbox.

#### LAB-7

1. Create a ADO.NET application in C# to verify if the connection is established with OLEDB and MS-ACCESS.
2. Create a ADO.NET applications in C# to demonstrate the Data Reader, Data Set, Data Adapter and Data View Objects.

**LAB-8**

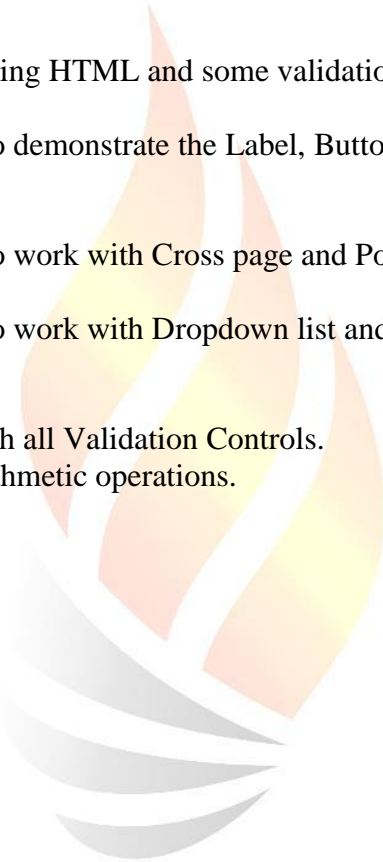
1. Develop the Static Web pages using HTML and some validations along with Java Script.
2. Design an ASP.NET Webpage to demonstrate the Label, Button and Textbox controls.

**LAB-9**

1. Design an ASP.NET Webpage to work with Cross page and Post back Submissions.
2. Design an ASP.NET Webpage to work with Dropdown list and ListBox controls.

**LAB-10**

1. Develop a Registration Form with all Validation Controls.
2. Create a Web Service for all Arithmetic operations.



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MCA-257E	DEEP LEARNING LAB	L-T-P	Cr
		0-0-2	1

### **OBJECTIVES**

- Understand basic building blocks for deep neural network architectures, through applied mathematics and machine learning basics.
- Discuss how to design a neural network to solve a particular business problem within an optimized time.
- Familiarize students with various types of deep networks and how to customize them.

### **COURSE OUTCOMES**

The student after undergoing this course will be able:

**CO1:** Develop design thinking skills to build deep neural network models.

**CO2:** Generate morph and search images with deep learning.

**CO3:** Solving Problems through pre-trained models.

**CO4:** Utilise several deep-net architectures and apply them for different tasks with sequential input/output.

### **LIST OF EXPERIMENTS:**

1. Predict the stock of the company using RNN and LSTM networks.
2. Text classification using LSTM.
3. Create SOM for Text Clustering based on the Retail Transactions.
4. Classify the Hand-written digits using SOM networks.
5. Build an Image Re-constructor using Auto-encoders.

Build a recommendation engine using Boltzmann machines for the entertainment sector.

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RA-201E	REASONING & APTITUDE	L T P	Cr
		1 -0 -0	1

**UNIT 1** – Logical Reasoning – Logical Deductions (Syllogism & Venn Diagrams) logical connectives

**UNIT 2**- Analytical Reasoning – Seating Arrangements, combinations, selections, comparisons, blood relations, directions etc

**UNIT 3** – Non – Verbal Reasoning ( Alpha Numeric & Visual Puzzles) – To solve problems on numbers, alphabet, symbols, visuals, problem types and series, analogies, odd man out, coding, decoding and symbols & notations.

**UNIT 4** – Higher Maths – Algebra & Mensuration

**UNIT 5**- Business Maths – Number system, ratios & averages, time & work, time & distance, percentages, profit & loss, simple & compound interest

**UNIT 6** –Date Interpretation & Sufficiency – Tables, Bar Chart, Line Graph & Pie Chart

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VIDYAPEETH

Deemed-to-be University  
u/s 3 of UGC Act 1956

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**Syllabus**  
**MCA 2<sup>nd</sup> year**  
**4<sup>th</sup> Semester**

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# LINGAYA'S VIDYAPEETH

## SCHEME OF STUDIES

### SESSION: 2025-26

School: School Of Computer Applications								Batch: 2024-26					
Course: Master of Computer Applications								Year: 2 <sup>nd</sup>					
								Semester: IV					
SN	Cate- gory	Course Code	Course Name	Periods			Credits	Evaluation Scheme					Subject Total Marks
				L	T	P		Theory			Practical		
								ABQ	MSE	ESE	IP	EXP	
1	PROJ	MCA-282E	Internship/Major Project	0	0	36	18	-	-	-	-	100	100
2	PEC	PEC(MCA)20 2E	MOOC Course – II (NPTEL)	2	0	0	2	-	-	-	-	-	100
<b>Total----&gt;</b>				<b>2</b>	<b>0</b>	<b>36</b>	<b>20</b>						

**Abbreviations:**

PCC: Programme Core Courses

ABQ: Assignment Based Quiz

PEC: Programme Elective Courses

MSE: Mid Semester Examination

AECC: Ability Enhancement Compulsory course

ESE: End Semester Examination

GE: General English

IP: Internal Practical

DSE: Discipline Specific Elective Course

EXP: External Practical

L: Lecture

PROJ: Project

T: Tutorial

P: Practical

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