

THANTHAI PERIYAR GOVERNMENT
ARTS & SCIENCE
COLLEGE (AUTONOMOUS):
TIRUCHIRAPPALLI - 620 023

**Department of
Computer Applications**

**MCA
SYLLABUS
2023
ONWARDS**



**THANTHAI PERIYAR GOVERNMENT ARTS AND SCIENCE COLLEGE (AUTONOMOUS),
TIRUCHIRAPPALLI-23.**

MASTER OF COMPUTER APPLICATIONS 2023-2024

SL. NO.	PART	COURSE	Sub Code	COURSE TITLE	Hrs.	Credits	CIA	Sem. Exam	Total
I SEMESTER									
1	-	Core I		Operation Research (Statistics Department)	6	5	25	75	100
2	-	Core II		Python Programming	6	5	25	75	100
3	-	Core III		Cyber Security	5	4	25	75	100
4	-	Core IV		Data Structures and Algorithms	5	4	25	75	100
5	-	Core V-P		Python Programming Lab	6	4	40	60	100
6	-	GE I-P		Generic Elective - I : Data Structures and Algorithms Lab	2	2	40	60	100
TOTAL					30	24	180	420	600
II SEMESTER									
7	-	Core VI		Advanced Database Management Systems	5	5	25	75	100
8	-	Core VII		Mobile Computing	5	5	25	75	100
9	-	Core VIII		Internet of Things	5	4	25	75	100
10	-	Core IX-P		Database Lab	5	4	40	60	100
11	-	DSE I		*Discipline Specific Elective - I :	5	3	25	75	100
12	-	NME I		Non-Major Elective - I : Fundamentals of Human Rights (History Department)	3	2	25	75	100
13	-	GE II		Generic Elective - II: Mobile Computing Lab	2	2	40	60	100
TOTAL					30	25	205	495	700
III SEMESTER									
14	-	Core X		Advanced Java Programming	6	5	25	75	100
15	-	Core XI		Web Technology	5	4	25	75	100
16	-	Core XII-P		Java & Web Technology Lab	5	4	40	60	100
17	-	DSE II		*Discipline Specific Elective - II :	4	3	25	75	100
18	-	DSE III		*Discipline Specific Elective - III:	5	3	25	75	100
19	-	NME II		Non-Major Elective - II : R Programming Lab (Statistics Department)	3	2	40	60	100
20	-	IA		Internship	2	2	25	75	100
TOTAL					30	23	205	495	700
IV SEMESTER									
21	-	Core XIII		Dot Net Programming	6	4	25	75	100
22	-	Core XIV-P		Dot Net Programming Lab	5	4	40	60	100
23	-	DSE IV		*Discipline Specific Elective - IV :	5	3	25	75	100
24	-	SEC I		Skill Enhancement Course - I: General Aptitude	2	2	25	75	100
25	-	EA		Extension Activity	-	1	25	75	100
26	-	Project		Project	12	4	25	75	100
TOTAL					30	18	165	435	600
GRAND TOTAL					120	90	755	1845	2600

Thanthai Periyar

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திருச்சிராப்பள்ளி - 620 023.

THANTHAI PERIYAR GOVERNMENT ARTS AND SCIENCE COLLEGE (AUTONOMOUS),
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MASTER OF COMPUTER APPLICATIONS 2023-2024

***DISCIPLINE SPECIFIC ELECTIVES (DSE)**

SEMESTER	COURSE		Sub Code	COURSE TITLE
II	DSE	I		Computer Architecture
				Block Chain Technologies
				Computer Vision
III	DSE	II		Machine Learning
				Network Protocols
				Social Networking
III	DSE	III		Cloud Computing
				Software Development Technologies
				Soft Computing
IV	DSE	IV		Big Data Analytics
				Cryptography and Network Security
				Optimization Techniques

சுற்று
4/2/24

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THANTHAI PERIYAR GOVERNMENT ARTS AND SCIENCE COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI-23.									
MASTER OF COMPUTER APPLICATIONS 2023-2024									
MANDATORY BRIDGE COURSE FOR NON-COMPUTER SCIENCE STREAM STUDENTS - 10 CREDITS									
SL. NO.	COURSE		Sub Code	COURSE TITLE	Hrs.	Credits	CIA	Sem. Exam	Total
I SEMESTER									
1	Addl. Core	I		Problem Solving Skills	-	3	-	100	100
2	Addl. Core	II		Problem Solving Skills Lab	-	2	-	100	100
TOTAL					-	5	-	200	200
II SEMESTER									
3	Addl. Core	III		Multi-Operating Systems	-	3	-	100	100
4	Addl. Core	IV		Computer Networks	-	2	-	100	100
TOTAL					-	5	-	200	200

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துறைத் தலைவர்
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THANTHAI PERIYAR GOVERNMENT ARTS AND SCIENCE COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI-23.					
CBCS - GENERAL COURSE PATTERN FOR MCA					
2023-24 Batch CREDIT ALLOCATION					
PART	COURSE	Total No. of Papers	Credit Allotment	Total Credit	Grand Total
PART	Core Paper	10	5x5 5x4	45	61
	Core Practical	4	4x4	16	
	Discipline Specific Elective (CBE)	4	4x3	12	12
	Generic Elective (GE)	2	2x2	4	4
	Internship	1	1x2	2	2
	Skill Enhancement Course	1	1x2	2	2
	Non-Major Elective	2	2x2	4	4
	Project	1	1x4	4	4
	Extension Activities	1	1x1	1	1
Total		26		90	90

Chairman

- Dr. K. Fathima Bibi
Head & Assistant Professor
Department of Computer Applications
Thanthai Periyar Govt. Arts and Science College (Autonomous)
Tiruchirappalli – 23.

*Yale n. ale
3/2/24*

University Representative

- Dr. M. Balamurugan
Professor
Department of Computer Science, Engg. & Technology,
School of Computer Science and Engineering
Khajamalai Campus, Bharathidasan University
Tiruchirappalli – 23.

*M. Balamurugan
07/2/2024*

Subject Experts

- Dr. A. R. Mohamed Shanavas
Associate Professor
PG & Research Department of Computer Science
Jamal Mohamed College (Autonomous)
Tiruchirappalli – 20.

*A. R. Mohamed Shanavas
07.02.24*

4. Dr. D. J. Evanjaline
Assistant Professor
Department of Computer Science
Government Arts & Science College
Tiruchirappalli – 22.

[Signature]
7/2/2024

Members

5. Mr. P. S. S. Gopi
Assistant Professor
Department of Computer Applications
Thanthai Periyar Govt. Arts and Science College (Autonomous)
Tiruchirappalli – 23.

[Signature]
07/02/2024

6. Mr. R. Ramesh
Assistant Professor
Department of Computer Applications
Thanthai Periyar Govt. Arts and Science College (Autonomous)
Tiruchirappalli – 23.

R. Ramesh
07/2/2024

Alumni

7. Mr. G. Arunachalprabu
Guest Lecturer in Computer Science
Thanthai Periyar Govt. Arts and Science College (Autonomous)
Tiruchirappalli – 23.

G. Arunachalprabu
07.02.2024

**COPY OF THE MINUTES OF BOARD OF STUDIES MEETING OF
COMPUTER APPLICATIONS**

Thanthai Periyar Government Arts and Science College (Autonomous), Tiruchirappalli – 23.

Minutes of the Board of Studies meeting of Computer Applications

The Board of Studies for Master of Computer Applications (MCA) programme, comprising the following members met on 07/02/2024 (Wednesday) at 2.30 p.m.

Chairman

1. Dr. K. Fathima Bibi
Head & Assistant Professor
Department of Computer Applications
Thanthai Periyar Govt. Arts & Science College (Autonomous)
Tiruchirappalli – 23.

University Representative

2. Dr. M. Balamurugan
Professor
Department of Computer Science, Engg. & Technology
School of Computer Science and Engineering
Khajamalai Campus, Bharathidasan University
Tiruchirappalli – 23.

Subject Experts

3. Dr. A. R. Mohamed Shanavas
Associate Professor
PG & Research Department of Computer Science
Jamal Mohamed College (Autonomous)
Tiruchirappalli – 20.
4. Dr. D. J. Evanjaline
Assistant Professor
Department of Computer Science
Government Arts & Science College
Tiruchirappalli – 22.

4

Members

5. Mr. P. S. S. Gopi

Assistant Professor

Department of Computer Applications

Thanthai Periyar Govt. Arts and Science College (Autonomous)

Tiruchirappalli – 23.

6. Mr. R. Ramesh

Assistant Professor

Department of Computer Applications

Thanthai Periyar Govt. Arts and Science College (Autonomous)

Tiruchirappalli – 23.

Alumni

7. Mr. G. Arunachalprabu

Guest Lecturer in Computer Science

Thanthai Periyar Govt. Arts and Science College (Autonomous)

Tiruchirappalli – 23.

Master of Computer Applications (MCA):-

The proposed syllabus for MCA was discussed in detail, and the following have been resolved.

- 1) Include Data Structures and Algorithms in Semester I and Advanced Database Management Systems in Semester II.
- 2) May include the courses such as Probability and Statistics, Discrete Mathematics and Compiler Design.
- 3) In Advanced Java Programming Servlets, EJB and RMI may be included.
- 4) List of Elective Courses should be added.
- 5) Mandatory bridge course should be added for non-computer science stream students.

/ TRUE COPY /

Signature of the Members:

1. Dr. K. Fathima Bibi

Fathima
8/2/24

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திருச்சிராப்பள்ளி - 620 023.

2. Dr. M. Balamurugan

M. Balamurugan
7/2/2024

Prof. M. Balamurugan
Professor
Dept. of Computer Science and Applications
Bharathidasan University
Tiruchirappalli 23.

3. Dr. A. R. Mohamed Shanavas

A.R. Mohamed Shanavas
07.02.24

Dr.A.R.MOHAMED SHANAVAS
Associate Professor of Computer Science,
Jamal Mohamed College (Autonomous)
Tiruchirappalli- 620 020.

4. Dr. D. J. Evanjaline

D. J. Evanjaline
7/2/2024

Dr. D.J. EVANJALINE
Assistant Professor
Department of Computer Science,
Government Arts College,
Trichy-620 022.

5. Mr. P. S. S. Gopi

P. S. S. Gopi
07/02/2024

Assistant Professor
Dept. of Computer Applications
Thandiyal Periyar Government
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Tiruchirappalli-620 023

6. Mr. R. Ramesh

R. Ramesh
07/02/2024

Assistant Prof
Dept. of Computer App
Thangai Periyar Gov
Arts & Science College
Tiruchirappalli-620 023

7. Mr. G. Arunachalprabu

G. Arunachalprabu
07.02.2024

MASTER OF COMPUTER APPLICATIONS (MCA)

Programme Outcomes (POs)

1. Apply knowledge of management theories and human resource practices to solve business problems through research in global context.
2. Foster analytical and critical thinking abilities for data-based decision-making.
3. Inculcate contemporary business practices to enhance employability skills in the competitive environment.
4. Equip with skills and competencies to become an entrepreneur.
5. Possess knowledge of the values and beliefs of multiple cultures and global perspective.

Programme Specific Outcomes (PSOs)

1. To prepare the students who will demonstrate respectful engagement with others' ideas, behaviours, beliefs and apply diverse frames of reference to decisions and actions.
2. To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate start-ups and high potential organizations.
3. Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.
4. To produce employable, ethical and innovative professionals to sustain in the dynamic business world.
5. To contribute to the development of the society by collaborating with stakeholders for mutual benefit.

Course	MCA	Subject Code:	Semester	I
Major	Computer Applications	Core I: Operation Research (Statistics Department)	Credit	5
			Hours	6

Course Objectives

1. Understand the Linear Programming Problem and Methods to Solve it.
2. Understand the Transportation and Assignment Problems.
3. Explore the Knowledge of Theory of Games and Replacement Problems.
4. Understand Network Analysis.
5. Master CPM/PERT techniques for network analysis including construction, time calculations, slack interpretation, network crashing and cost optimization

UNIT I

Linear Programming Problem: Formulation of Linear Programming Problem – Graphical Solution of LPP in two Variables – LPP in Standard form – Simplex Method – Algorithm – Need for Artificial Variables – Charne’s Big M–Technique.

UNIT II

Transportation Problem: Transportation Problem Formulation – North West Corner – Least Cost – Vogel’s Approximation Method – UV Method – Assignment Problem and Algorithm.

UNIT III

Theory of Games: Basic definition – Maximin and Minimax Criterion – Solution of Games with Saddle Points – Two by Two (2x2) Games without Saddle Point – Principle of Dominance – Problems based on Dominance Rule – Graphical Method for (2xn) and (mx2) Games.

UNIT IV

Sequencing Problem – Meaning, Procedure for Solving Sequencing Problems – Processing ‘n’ jobs through two Machines, Processing ‘n’ jobs through three Machines, Processing ‘n’ jobs through ‘m’ machines and processing of two jobs through ‘m’ Machines and Graphic Solutions.

UNIT V

Network Analysis by CPM / PERT: Basic Concept – Constraints in Network – Construction of the Network – Time Calculations – Concept of Slack and float in Network Analysis – Network Crashing – Finding Optimum Project duration and Minimum Project Cost.

Course Outcomes

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

1. Solve an LPP using Simplex Method and Charne’s Method.
2. Solve Transportation Problem using MODI’s Method and Assignment Problem using Hungarian Algorithm.
3. Find the Value of the Game using Dominance Property and Graphical Method.
4. Estimate the Critical Path and Project duration of a Network Problem.
5. Acquiring expertise in utilizing CPM/PERT Network Analysis for project network construction, time calculation, slack analysis, network crashing, and project optimization.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	3	2	2	3	3	3	2	2	3
CO2	3	2	1	3	2	3	2	1	3	2
CO3	2	3	3	3	1	2	3	3	3	1
CO4	1	2	3	3	1	1	2	3	3	1
CO5	3	2	1	2	2	3	2	1	2	2

1: LOW 2: MEDIUM 3: STRONG

Text Books

1. Swarup K, Mohan M, and Gupta P K (2001). Operations Research, Sultan Chand and Sons, New Delhi.
2. Taha H.A. (1996) Operations Research, Sixth Edition, Prentice Hall, New Delhi.

Reference Books

1. Goel B.S. and Mittal, S.K. (1982) Operations Research, Pragati Prakashan, Meerut.
2. Gupta R.K. (1985) Operations Research, Krishna Prakashan, Mandir, Meerut.
3. Hillier F. and Lieberman, G.J. (1987) Operations Research, CBS Publishers and Distributors, New Delhi.
4. Gass S.I. (1985) .Linear Programming, Methods and Applications. Courier Dover Publications. (Reprint 2003)
5. Hadley G (1963): Linear Programming Addison Wesley Publishing Company.
6. Hillier F.S. and Lieberman, G.J. (2005). Introduction to Operations Research, Ninth Edition, McGraw Hill Publishing Company.
7. Sharma J.K. (2013). Operations Research: Problems and Solutions, Fifth Edition, Macmillan India Limited.

Course	MCA	Subject Code:	Semester	I
Major	CA	Core II: Python Programming	Credit	5
			Hours	6

Course Objectives

1. To attain programming ideas & logics in core Python.
2. To be trained on Strings and functions.
3. To develop object oriented skills in Python.
4. To comprehend various Python Packages.
5. To extend knowledge on web applications using Django.

UNIT I

Introduction: Strings, Assignment, and Comments – Numeric Data types and Character sets – Expressions – Loops and Selection Statements: Definite iteration: for Loop – selection: if and if-else statements – Conditional iteration: while Loop.

UNIT II

Strings and Text Files: Accessing Characters and substrings in strings – Data encryption– Strings and Number systems– String methods – Text – Lists and Dictionaries: Lists – Dictionaries – Design with Functions: A Quick review – Problem Solving with top–Down– Design – Design with recursive Functions – Managing a Program’s namespace – Higher– Order Functions.

UNIT III

Design with Classes: Objects and Classes – Data Modeling Examples – Building a New Data Structure – The Two–Dimensional Grid – Structuring Classes with Inheritance and Polymorphism – Graphical User Interfaces – The Behavior of terminal Based programs and GUI Based programs – Coding Simple GUI Based programs – Windows and Window Components – Command Buttons and responding to events.

UNIT IV

Working with Python Packages: NumPy Library–Ndarray – Basic Operations – Indexing, Slicing and Iteration – Array manipulation – Pandas –The Series – The Data Frame – The Index Objects – Data Vizualization with Matplotlib – The Matplotlib Architecture – pyplot – The Plotting Window – Adding Elements to the Chart – Line Charts – Bar Charts – Pie charts.

UNIT V

Django: Installing Django – Building an Application – Project Creation – Designing the Data Schema – Creating an administration site for models – Working with Query Sets and Managers – Retrieving Objects – Building List and Detail Views.

Course Outcomes

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

1. Attain the programming skills in python and develop applications using conditional branches and loop.
2. Create python applications with strings and functions.
3. Understand and implement the Object Oriented Programming paradigm with the concept of objects and classes, Inheritance and polymorphism.

- Evaluate the use of Python packages to perform numerical computations and data visualization.
- Able to design interactive web applications using Django.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	1	1	1	3	2	1	1	1
CO2	2	2	1	1	1	2	2	1	1	1
CO3	1	2	3	3	3	1	2	3	3	3
CO4	1	1	3	3	3	1	1	3	3	3
CO5	1	2	3	3	3	1	2	3	3	3

1: LOW 2: MEDIUM 3: STRONG

Text Books

- K.A. Lambert, “Fundamentals of Python: first programs”, Second Edition, Cengage Learning, 2018
- Fabio Nelli, “Python Data Analytics: With Pandas, NumPy, and Matplotlib”, Second Edition, Kindle Edition, 2018
- Django Software foundation, “Django documentation”, Release 2.2.29, 2022.

Reference Books

- Dr. M. Suresh Anand, Dr. R. Jothikumar, Dr. N. Vadivelan, “Python Programming” First Edition Notion Press, 2020.
- Book: <http://marvin.cs.uidaho.edu/Teaching/CS515/pythonTutorial.pdf>.
- Mastering Django: Core Copyright©Nigel George 2016. Released under GFDL v1.3 (Book: <http://www.masteringdjango.com>).
- Antonio Mele, “Django 3 by Example”, Third Edition, 2020.

Course	MCA	Subject Code:	Semester	I
Major	Computer Applications	Core III: Cyber Security	Credit	4
			Hours	5

Course Objectives

1. To understand the various types of cyber-attacks and cyber-crimes.
2. To identify the appropriate WLAN and Phone security.
3. To have an overview of the cyber laws & concepts of cyber forensics.
4. To study the defensive techniques against the attacks.
5. To learn threats and risks within context of the cyber security.

UNIT I

Introduction to cybercrime: Classification of cybercrimes – reasons for commission of cybercrime – malware and its type – kinds of cybercrime – authentication – encryption – digital signatures – antivirus – firewall – steganography – computer forensics – why should we report cybercrime – introduction to counter cyber security initiatives in India – generating secure password – using password manager-enabling two-step verification – security computer using free antivirus.

UNIT II

Tips for buying online: Clearing cache for browsers – Wireless LAN-Major issues with WLAN-Safe browsing guidelines for social networking sites – Email security tips – Introduction-smart phone security guidelines – purses, wallets, smart phones – platforms, setup and installation-communicating securely with a smart phone.

UNIT III

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The Indian Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics.

UNIT IV

Cybercrime: Mobile and Wireless Devices- Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Organizational security Policies and Measures in Mobile Computing Era, Laptops.

UNIT V

Cyber Security: Organizational Implications- Introduction to cost of cybercrimes and IPR issues, Web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Course Outcomes

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

1. Assess cyber security risk management policies in order to adequately protect an organizations critical information and assets
2. Measure the performance of security systems within an enterprise–level information system.
3. Troubleshoot, maintain and update an enterprise–level information security system.
4. Implement continuous network monitoring and provide real–time security solutions.
5. Formulate, update and communicate short– and long–term organizational cyber security strategies and policies.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	2	2	1	3	2	2	2	1
CO2	2	2	2	2	3	2	2	2	2	3
CO3	2	3	3	2	2	2	3	3	2	2
CO4	2	2	2	3	2	2	2	2	3	2
CO5	1	2	3	1	3	1	2	3	1	3

1: LOW

2: MEDIUM

3: STRONG

Text books

1. Dr. Jeetendra Pande, “Introduction to Cyber Security” Published by Uttarakhand Open University, 2017.
2. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley.
3. B.B.Gupta, D.P.Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.
4. Anthony Reyes, Kevin o’shea, Jim Steele, Jon R. Hansen, Captain Benjamin R. Jean Thomas Ralph, “Cyber–crime investigations” – bridging the gaps between security professionals, law enforcement, and prosecutors, 2007.

Reference Books

1. John G.Voller Black and Veatch, “Cyber Security” Published by John Wiley & Sons, Inc., Hoboken, New Jersey Published simultaneously in Canada ©2014.
2. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press. Introduction to Cyber Security, Chwan–Hwa (john) Wu, J. David Irwin, CRC Press T&F Group.

Course	MCA	Subject Code:	Semester	I
Major	Computer Applications	Core IV: Data Structures and Algorithms	Credit	4
			Hours	5

Course Objectives

1. Learn fundamental data structures (arrays, stacks, queues) and their operations.
2. Explore trees and binary search trees, including their operations and traversal methods.
3. Study graphs, sorting algorithms and merging techniques.
4. Understand algorithm basics, divide and conquer greedy algorithms and optimization problems.
5. Delve into dynamic programming and backtracking for complex problem-solving.

UNIT I

Introduction: Basic Terminology – Classification of Data Structures– Operations on Data Structure. Arrays: Declaration of Arrays – Accessing the Elements of Array – Storing Values in Arrays – Operations on Arrays. Stacks: Array Representation of Stacks – Operations on Stacks. Queues: Array Representation of Queues – Types of Queues.

UNIT II

Trees: Introduction – Terminology – Representation of Trees – Binary Trees – Abstract Data Type – Properties of Binary Trees – Binary Tree Representations – Binary Tree Traversals – Inorder Traversal – Preorder Traversal – Postorder Traversal – Threaded Binary Trees – Binary Search Trees – Definition – Searching – Insertion – Deletion – Joining and Splitting.

UNIT III

Graphs: Introduction – Definition – Representation – Operations: Depth First Search – Breadth First Search – Spanning Trees. Sorting: Insertion Sort – Quick Sort – Merge Sort – Heap Sort – Selection Sort – List and Table Sort.

UNIT IV

Algorithms: What is an Algorithm? – Algorithm Specification – Performance Analysis – Divide and Conquer: General Method – Binary Search – Finding the Maximum and Minimum – The Greedy Method: The General Method – Minimum Cost Spanning Trees: Prim's Algorithm – Single Source Shortest Paths.

UNIT V

Dynamic Programming: The General Method – Multi Stage Graphs – All Pairs Shortest Paths – Backtracking: The General Method – The 8 Queens Problem – Sum of Subsets – Graph Coloring. Branch and Bound: FIFO Branch and Bound – Least Cost (LC) Branch and Bound – Travelling Salesperson.

Course Outcomes

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

1. Develop proficiency in a wide range of fundamental data structures, including arrays, stacks and queues, with the ability to apply operations effectively.
2. Acquire a comprehensive understanding of binary trees, graphs and sorting algorithms, enabling efficient manipulation and organization of data.

3. Master algorithmic techniques like divide and conquer, dynamic programming, greedy method, backtracking and branch and bound, empowering effective problem-solving across various scenarios.
4. Cultivate expertise in analyzing and implementing algorithms, including single source shortest paths, spanning trees and optimization strategies, to address real-world challenges.
5. Build a strong foundation in computer science concepts, fostering the skills needed to design, analyze and optimize a variety of algorithms and data structures.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	1	3	2	3	1	2	2	1
CO2	3	2	2	1	2	2	3	2	3	2
CO3	1	2	3	2	2	3	2	3	2	2
CO4	1	3	2	1	2	2	1	3	2	3
CO5	2	3	2	2	2	2	3	3	2	2

1: LOW

2: MEDIUM

3: STRONG

Text Books

1. Reema Thareja, Data Structures using C, Oxford Higher Education, Second Edition, 2020.
2. Ellis Horowitz | Sartaj Sahni | Anderson Freed, Fundamentals of Data Structures in C, University Press, Second Edition, 2008.
3. Ellis Horowitz | Sartaj Sahni | Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, University Press, 2017.

Reference Books

1. Seymour Lipschutz, Data Structures, McGraw Education Pvt. Ltd., Revised First Edition, 2018.

Course	MCA	Subject Code:	Semester	I
Major	Computer Applications	Core V–P: Python Programming Lab	Credit	4
			Hours	6

Course Objectives

1. To master the fundamentals of writing python scripts.
2. To create program using elementary data items.
3. To implement Python programs with conditionals and loops.
4. To use functions for structuring Python programs.
5. To develop web programming with Django.

Exercises

1. Program using elementary data items, lists, dictionaries and tuples
2. Program using conditional branches, loops
3. Program using functions
4. Program using classes and objects
5. Program using inheritance
6. Program using polymorphism
7. Program using Numpy
8. Program using Pandas
9. Program using Matplotlib
10. Program for creating dynamic and interactive web pages using forms

Course Outcomes

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

1. Comprehend the programming skills in python and write scripts
2. Create python applications with elementary data items, lists, dictionaries and tuples
3. Implement the Object Oriented Programming concepts such as objects and classes, Inheritance and polymorphism
4. Assess the use of Python packages to perform numerical computations and perform data visualization
5. Create interactive web applications using Django

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	2	3	2	3	2	1	2	2
CO2	3	2	1	2	3	2	3	2	1	1
CO3	2	1	2	2	1	2	1	2	1	2
CO4	3	2	2	3	2	3	2	3	3	3
CO5	3	2	1	2	3	3	2	2	1	2

1: LOW

2: MEDIUM

3: STRONG

Reference Books

1. K.A. Lambert, “ Fundamentals of Python: first programs”, Second Edition, Cengage Learning, 2018
2. Fabio Nelli, “Python Data Analytics: With Pandas, NumPy, and Matplotlib”, Second Edition, Kindle Edition, 2018
3. Django Software foundation, “Django documentation”, Release 2.2.29, 2022.
4. Reema Thareja, Python Programming using Problem Solving Approach, Oxford University Press, 2017.

Course	MCA	Subject Code:	Semester	I
Major	Computer Applications	GE I-P: Data Structures and Algorithms Lab	Credit	2
			Hours	2

Course Objectives

1. Master C programming skills through practical implementation of sorting algorithms (Bubble Sort, Selection Sort, Quick Sort, Insertion Sort).
2. Enhance data search abilities by implementing Linear Search and Binary Search algorithms in C.
3. Acquire hands-on experience with fundamental data structures by implementing stack and queue operations in C.
4. Understand and implement the concept of Singly-Linked Lists using C programming.
5. Explore advanced topics including Huffman's Tree creation and traversal (BFS, DFS), along with Minimum Spanning Tree cost calculation using C

Exercises

1. Write a C program to implement Bubble Sort.
2. Write a C program to implement Selection Sort.
3. Write a C program to implement Quick Sort.
4. Write a C program to implement Insertion Sort.
5. Write a C program to implement Linear Search.
6. Write a C program to implement Binary Search.
7. Write a C program to implement Stack Operation.
8. Write a C program to implement Queue Operation
9. Write a C program to implement the concept of Singly-Linked List.
10. Create a Huffman's Tree with the following nodes arranged in priority queue.

A	B	C	D	E	F	G	H	I	J
7	9	11	14	18	21	27	29	35	40

11. Write a program to implement breadth first search algorithm.
12. Write a program to implement depth first search algorithm.
13. Write a program which finds the cost of a minimum spanning tree.

Course Outcomes

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

1. Develop a strong command of C programming techniques, enabling them to implement various sorting algorithms (Bubble Sort, Selection Sort, Quick Sort, Insertion Sort) and search algorithms (Linear Search, Binary Search) effectively.
2. Gain hands-on experience in working with fundamental data structures, including stacks, queues and singly-linked lists, fostering a solid foundation in data manipulation.
3. Acquire practical skills in graph algorithms by implementing breadth-first search, depth-first search and minimum spanning tree calculations, enhancing their ability to analyze and traverse complex networks.

4. Enhance problem-solving abilities and algorithmic thinking through the implementation of priority queues and Huffman's Tree, facilitating efficient data organization and encoding.
5. Cultivate a comprehensive understanding of software development by applying C programming concepts to a diverse set of algorithms and data structures, preparing them for practical coding challenges.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	1	3	2	3	1	2	2	1
CO2	3	2	2	1	1	3	3	2	3	2
CO3	3	2	1	2	2	2	2	1	2	3
CO4	2	1	2	1	1	2	1	3	2	2
CO5	2	3	2	2	1	2	3	1	2	2

1: LOW

2: MEDIUM

3: STRONG

Reference Books

1. Reema Thareja, Data Structures using C, Oxford Higher Education, Second Edition, 2020.
2. Ellis Horowitz | Sartaj Sahni | Anderson Freed, Fundamentals of Data Structures in C, University Press, Second Edition, 2008.
3. Ellis Horowitz | Sartaj Sahni | Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, University Press, 2017.

Course	MCA	Subject Code:	Semester	II
Major	Computer Applications	Core VI: Advanced Database Management Systems	Credit	5
			Hours	5

Course Objectives

1. To gain knowledge about the types and relations between databases.
2. To build foundation for Distributed database and Decision support.
3. To explore the temporal databases and XML.
4. To delineate the logic Based Database and Deductive database.
5. To apprehend various object and Relational database.

UNIT I

Overview of Database Management – Database System Architecture – Introduction to Relational Databases – Introduction to SQL – Types – Relations – Relational Algebra.

Database Design: Functional Dependencies – Introduction – Definition – Trivial and Non-trivial Dependencies – Closure Set of Dependencies – Closure Set of Attributes – Irreducible Sets Dependencies.

Normalization: 1NF, 2NF, 3NF, BCNF, 4NF and 5NF.

UNIT II

Distributed Databases: Introduction – Preliminaries – The Twelve Objectives – Problems of Distributed Databases – Client /Server System.

Decision Support: Introduction – Aspects of Decision Support – Database Design for Decision Support – Data Preparation – Data Warehouses – Data Marts – On-Line Analytical Processing – Data Mining.

UNIT III

Temporal Databases: Introduction – Intervals – Packing and Unpacking Relations – Generalizing the Relational Operators – Database Design – Integrity Constraints.

XML: Introduction – The Web – The Internet – Overview of XML – XML Data Definition – XML Data Manipulation – XML and Database.

UNIT IV

Logic-based Database: Introduction, Overview, Propositional Calculus, Predicate Calculus, A Proof– Theoretic View of Database, Deductive Database System, Recursive Query Processing .

UNIT V

Object / Relational Databases: Introduction, Objects, Classes, Methods and Messages, A Closer Look, A Cradle – to – Grave Example, The First & Second Great Blunder, Implantation Issues, Benefits of True Rapprochement .

Course Outcomes

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

1. Attain the knowledge on the Database Architecture & apply normalization techniques.
2. Know about the Distributed Database and Decision Support.
3. Know about the Temporal Database and XML Database.
4. Understand the logic–Based Database.
5. Handle object/Relational databases.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	1	2	2	3	2	1	3	2
CO2	2	2	1	3	2	2	2	1	3	2
CO3	1	2	3	3	3	1	2	3	3	3
CO4	2	2	3	2	1	2	2	1	2	2
CO5	1	2	3	3	3	1	2	3	3	3

1: LOW 2: MEDIUM 3: STRONG

Text Books

1. C.J. Date, A. Kannan & S. Swamynathan, An Introduction to Database Systems, Pearson Eighth Edition.
2. Abraham Silberschatz, Henry F Korth, S. Sudarshan, Database System Concepts, Tata McGraw–Hill International, Sixth Edition.

Reference Books

1. Ramez Elmasri, Shamkant B Navathe, Fundamental of Database Systems, Pearson Education, 7th Edition.
2. Thomas Connolly, Carolyn Begg, Database Systems: A practical approach to Design, Implementation and Management, Pearson Education, 6th Edition.
3. Panneerselvam R, Database Management Systems, PHI, Second Edition, 2015.
4. Abraham Silberchatz, Henry F. Korth and S. Sudharshan, “Data Base System concepts” Mc Graw Hill, Fifth Edition, 2006.

Course	MCA	Subject Code:	Semester	II
Major	Computer Applications	Core – VII: Mobile Computing	Credit	5
			Hours	5

Course Objectives

1. To grasp the concepts and features of mobile computing technologies & applications.
2. To explore the spread spectrum of near and far terminals.
3. To build foundation for Mobile Application Tools.
4. To delineate the Applications development and DLLs.
5. To apprehend various Graphics and Multimedia.

UNIT I

Introduction – Applications – History of wireless communication – A Simplified reference model – Wireless transmission – Frequencies for radio transmission – Regulations – Signals – Antennas – Signal Propagation: Path loss of radio signals – Additional signal propagation effects – Multi-path propagation – Multiplexing – Modulation.

UNIT II

Spread spectrum – Direct sequence spread spectrum – Frequency hopping spread spectrum – Cellular systems.

Medium access control: Hidden and exposed terminals – Near and far terminals – SDMA, FDMA, TDMA, Fixed TDM, Classical Aloha, slotted Aloha, Carrier sense multiple access – Reservation TDMA – Multiple access with collision avoidance – Polling – CDMA – Spread Aloha multiple access.

UNIT III

Tools: Google Android Platform – Eclipse Simulator – Android Application Architecture – Event based programming – Apple iPhone Platform – UI and Toolkit Interfaces – Event handling – Graphical Services – Animation Techniques.

UNIT IV

Application Design: Memory Management – Design Patterns for Limited Memory – Work Flow for Application development – Techniques for Composing Applications – Dynamic Linking – Plug ins and rule of thumb for using DLLs – Concurrency and Resource Management – Look and Feel.

UNIT V

Application Development: Intents and Services – Storing and Retrieving data – Communication via the Web – Notification and Alarms – Graphics and Multimedia – Telephony – Location based Services – Packaging and Deployment – Security and Hacking.

Course Outcomes

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

1. Understand the basic concepts of Mobile and Wireless Communication and wireless LAN.
2. Understand the basic concepts of Spread Spectrum and analyze the concepts of Medium Access Control.
3. Analyze the concepts of Global System for Mobile Communication and Satellite Communications.
4. Understand the basic concepts of Application Design and Techniques.

5. Understand the basic concepts of Wireless Application Protocol and create a Mobile App with real time application.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	1	3	2	3	1	2	2	1
CO2	3	2	2	1	1	3	3	2	3	2
CO3	3	2	1	2	2	2	2	1	2	3
CO4	2	1	2	1	1	2	1	3	2	2
CO5	2	3	2	2	1	2	3	1	2	2

1: LOW 2: MEDIUM 3: STRONG

Text Books

1. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2013.
2. KumKumGarg, "Mobile Computing Theory and Practice", Pearson Education, 2014.
3. Reza B'Far, (2009), "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", Cambridge Press University.
4. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, (2010), "Mobile Computing Technology, Applications and Service Creation", 2nd edition, Tata McGraw.

Reference Books

1. Rifaat A. Dayen, "Mobile Data & Wireless LAN Technologies", Prentice Hall, 1997.
2. Steve Mann and Scoot Schibli, "The Wireless Application Protocol", John Wiley & Inc., 2000.

Course	MCA	Subject Code:	Semester	II
Major	Computer Applications	Core VIII: Internet of Things	Credit	4
			Hours	5

Course Objectives

1. To build foundation for proverbial on evolution of IOT with its design principles.
2. To delineate the functionalities and protocols of internet communication.
3. To explore the hardware and software components needed to construct IOT applications.
4. To identify the appropriate protocol for API construction and writing embedded code.
5. To apprehend various business models and ethics in Internet of Things.

UNIT I

Genesis of IoT – IoT and Digitization – IoT Impact – Convergence of IT and OT – IoT Challenges – IoT Architectures: oneM2M, IOT World Forum (IoTWF) – Additional IoT Reference Models – Simplified IoT Architecture – Core IoT Functional Stack – Edge, Fog and cloud in IOT – Functional blocks of an IOT: Sensors, Actuators and Smart Objects.

UNIT II

IOT Access Technologies: Physical and MAC layers, topology and Security – Optimizing network: Constrained Nodes – Constrained Networks – Optimizing IP for IoT – Optimizing IP for IoT: From 6LoWPAN to 6Lo – 6TiSCH – ACE – DICE – Application Protocols: Application Transport Methods, SCADA – Adapting, Tunneling, Protocol Translation and Transport over LLNs with MAP-T – CoAP and MQTT.

UNIT III

Prototyping Embedded Devices: Electronics – Embedded Computing Basics – Arduino – Raspberry Pi – Beagle Bone Black – Electric Imp. Prototyping the Physical Design: Non digital Methods – Laser Cutting – 3D printing – CNC Milling – Repurposing/Recycling.

UNIT IV

Prototyping Online Components: Getting started with an API – Writing New API – Real-Time Reactions – Other Protocols – Techniques for Writing Embedded Code: Memory Management – Performance and Battery Life – Libraries – Debugging.

UNIT V

Business Models: History of Business Models – Model – Internet of Starting up – Lean Start-ups. Moving to Manufacture: Designing Kits – Designing Printed circuit boards – Certification – Costs – Scaling up Software. Ethics: Privacy – Control – Environment – Solutions.

Course Outcomes

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

1. Comprehend the IoT evolution with its architecture and sensors.
2. Understand the networking concepts for communication and underlying IoT protocols.
3. Assess the embedded technologies and develop prototypes for the IoT products.
4. Evaluate the use of Application Programming Interface and design an API for IoT in real-time.
5. Recognize the ethics of business models and perform security analysis.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	2	2	2	3	2	2	2	1
CO2	2	2	2	2	3	2	2	2	2	2
CO3	2	3	3	2	2	2	2	3	2	3
CO4	2	2	2	3	1	2	3	2	3	2
CO5	1	3	2	1	3	1	2	1	2	3

1: LOW 2: MEDIUM 3: STRONG

Text Books

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017 (UNIT I and II)
2. Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, Wiley, 2014. (UNIT III, IV and V)

Reference Books

2. Raj Kamal, “Internet of things – Architecture and Design Principles of IoT”, McGraw Hill Education, 2017.
3. Ammar Rayes and Samer Salam, “Internet of Things from Hype to Reality”, Second Edition, Springer, 2019.
4. B.K. Tripathy and J. Anuradha, “INTERNET OF THINGS (IoT) – Technologies, Applications, Challenges, and Solutions”, Taylor & Francis Group, 2018.

Course	MCA	Subject Code:	Semester	II
Major	Computer Applications	Core IX–P: Database Lab	Credit	4
			Hours	5

Course Objectives

1. To describe a sound introduction to the discipline of database management systems.
2. To give a good formal foundation on the relational model of data and usage of Relational Algebra.
3. To introduce the concepts of basic SQL as a universal Database language.
4. To enhance knowledge in DDL, DML and DCL commands
5. To design the effective database models.

Exercises (Simple SQL)

1. Employee Management System Using SQL Commands.
2. Students Management System Using SQL Commands.
3. Bank Management System Using SQL Commands.
4. Index Creation.
5. Implementation of SQL queries for route database.
6. Creating view using SQL commands.
7. Creation of Table Partition.
8. Default triggers procedure and drop command
9. Report creation.

Exercises (PL/SQL)

1. Factorial of number
2. Checking whether a number is prime or not
3. Fibonacci series
4. Reversing the string
5. Swapping of two numbers
6. Odd or even number
7. Duplication of records

Course Outcomes

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

1. Identify the data types, draw appropriate conceptual models, design database structure, and forms.
2. Implement simple database systems using relational database concepts.
3. Understand the needs of Structured Query Language.
4. Acquire knowledge in DDL, DML and DCL methods in Business data models.
5. Able to develop database models which implements normalization and decomposition techniques.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	2	3	2	3	2	1	2	2
CO2	3	2	1	2	3	2	3	2	2	1
CO3	2	1	2	2	1	2	1	2	2	2
CO4	3	2	2	3	2	3	2	3	3	3
CO5	3	2	1	2	3	3	2	2	1	2

1: LOW

2: MEDIUM

3: STRONG

Reference Books

1. Ramez Elmasri, Shamkant B Navathe, Fundamental of Database Systems, Pearson Education, 7th Edition.
2. Thomas Connolly, Carolyn Begg, Database Systems: A practical approach to Design, Implementation and Management, Pearson Education, 6th Edition.
3. Panneerselvam R, Database Management Systems, PHI, Second Edition, 2015.
4. Abraham Silberchatz, Henry F. Korth and S. Sudharshan, "Data Base System concepts" Mc Graw Hill, Fifth Edition, 2006.

Course	MCA	Subject Code:	Semester	II
Major	Computer Applications	Discipline Specific Elective – I : Computer Architecture	Credit	3
			Hours	5

Course Objectives

1. To develop a comprehensive understanding of Boolean algebra, logic gates and their practical implementation in digital systems.
2. To acquire proficiency in gate-level minimization methods, utilizing techniques like Karnaugh Maps for logic simplification.
3. To master the design and analysis of combinational logic circuits, including components like binary adder-subtractor and multiplexers.
4. To gain expertise in synchronous sequential circuits, encompassing storage elements, flip-flops and clocked circuit analysis.
5. To explore the design and application of registers, counters, memory modules and programmable logic devices within digital systems.

UNIT I

Number Systems and Codes: Decimal, Binary, Octal and Hexadecimal Number Systems – Conversion from one Number System to Another – Binary Addition, Subtraction, Multiplication and Division. The ASCII Code – The Excess-3 Code – The Gray Code – The Hamming Code.

UNIT II

Logic Gates – Universal Logic Gates – Boolean Expressions – Sum of Products – Product of Sums – Simplification of Boolean Expressions – Algebraic Method – Karnaugh Map Method – Boolean Algebra – Boolean Laws and Theorems – De Morgan's Theorems – Complement of a Function – Duality.

UNIT III

Arithmetic Circuits: Half Adder – Full Adder – Half Subtractor – Full Subtractor – The Adder/Subtractor – Fast Adder – BCD Adder. Combinational Circuits: Multiplexer – Demultiplexer – Decoder – Encoder.

UNIT IV

Sequential Circuits: Flip Flops – RS, Clocked RS, D, JK, T and Master-Slave Flip Flops – Shift Register – Counters – Asynchronous and Synchronous Counters – Ring Counter – Shift Counter.

UNIT V

Central Processing Unit: General Register Organization – Stack Organization – Instruction Formats – Addressing Modes – Data Transfer and Manipulation – Program Control: Status Bit Conditions, Conditional Branch Instructions, Subroutine Call and Return, Program Interrupt, Types of Interrupts – Reduced Instruction Set Computer: CISC and RISC Characteristics.

Course Outcomes

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

1. Attain a solid grasp of Boolean algebra and logic gate principles, vital for digital circuit understanding.

2. Master gate-level minimization methods, including K-map simplification and gate implementation techniques.
3. Showcase competence in designing and analyzing combinational logic circuits with essential components like adders and multiplexers.
4. Become proficient in sequential logic concepts, covering synchronous and asynchronous circuitry, storage elements and analysis.
5. Illustrate expertise in registers, counters, memory systems and programmable logic devices, pivotal in digital circuit applications.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	2	2	1	3	2	2	2	1
CO2	2	2	2	2	1	2	2	2	2	1
CO3	2	3	3	2	1	2	3	3	2	1
CO4	2	2	2	3	1	2	2	2	3	1
CO5	1	1	1	1	3	1	1	1	1	3

1: LOW 2: MEDIUM 3: STRONG

Text Books

1. Donald P. Leach, Albert Paul Malvino and GoutamSaha, Digital Principles and Applications, Tata McGraw Hill, Eighth Edition, 2016.
2. Morris Mano M, Computer System Architecture, Prentice Hall of India, Revised Third Edition, 2018.

Reference Books

1. Morris Mano M | Michael D. Ciletti, Digital Design, Pearson Edition, Sixth Edition, 2018.
2. Thomas C. Bartee, Digital Computer Fundamentals, Tata McGraw Hill, 6th Edition, 25th Reprint, 2006.

Course	MCA	Subject Code:	Semester	II
Major	Computer Applications	Discipline Specific Elective – I : Block Chain Technologies	Credit	3
			Hours	5

Course Objectives

1. To understand about Block chain is an emerging technology platform for developing decentralized applications and data storage.
2. To comprehend fundamentals of Public Key Cryptography technology and Consensus Algorithms.
3. To familiarize with Bitcoin Network, Bitcoin Clients, APIs and Payments technology of Block chain operations.
4. To engage with Components of the Ethereum ecosystem.
5. To grasp about Development Tools and Frameworks.

UNIT I

Block chain: The growth of Block chain technology – Distributed systems – The history of Block chain and Bitcoin – Block chain – Consensus – CAP theorem and Block chain. Decentralization: Decentralization using Block chain – Methods of decentralization – Routes to decentralization – Block chain and full ecosystem decentralization – Pertinent terminology – Platforms for decentralization – Innovative trends.

UNIT II

Public Key Cryptography: Asymmetric cryptography – Cryptographic constructs and Block chain technology. Consensus Algorithms: Introducing the consensus problem – Analysis and design – Classification – Algorithms – Choosing an algorithm. Smart Contracts: History – Definition – Ricardian contracts – Smart contract templates – Oracles – Deploying smart contracts – DAO

UNIT III

Bitcoin: Bitcoin—an overview – Cryptographic keys – Transactions – Block chain – Mining. Bitcoin Network and Payments: The Bitcoin network – Wallets – Bitcoin payments – Innovation in Bitcoin – Advanced protocols – Bitcoin investment and buying and selling Bitcoin. Bitcoin Clients and APIs: Bitcoin client installation – Experimenting further with bitcoin-cli – Bitcoin programming.

UNIT IV

Alternative Coins: Theoretical foundations – Difficulty adjustment and retargeting algorithms – Bitcoin limitations – Extended protocols on top of Bitcoin – Development of altcoins. Ethereum: Ethereum – an overview – Ethereum network – Components of the Ethereum ecosystem – Ethereum Virtual Machine (EVM) – Smart contracts. – Blocks and Block chain – Wallets and client – Nodes and miners – APIs, tools, and DApps – Supporting protocols – Programming languages.

UNIT V

Development Tools and Frameworks: Languages – Compilers – Tools and libraries – Frameworks – Contract development and deployment – Layout of a Solidity source code file – Solidity language. Use Cases: IoT – Government – Health – Finance – Media. Scalability and Other Challenges: Scalability – Privacy – Security – Other challenges.

Course Outcomes

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

1. Understand, apply and examine the characteristics of Block chain, bitcoin and consensus algorithm in centralized and decentralized methods.
2. Comprehend and demonstrate the application of hashing and public key cryptography in protecting the Blockchain.
3. Understand and analyse the elements of trust in a Blockchain: validation, verification, and consensus.
4. Comprehend and evaluate the alternate coin, Ethereum and smart contract.
5. Grasp and apply the knowledge of Tools and languages for applications.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	2	2	1	3	2	2	2	1
CO2	2	2	2	2	3	2	2	2	2	3
CO3	2	3	3	2	2	2	3	3	2	2
CO4	2	2	2	3	2	2	2	2	3	2
CO5	1	2	3	1	3	1	2	3	1	3

1: LOW

2: MEDIUM

3: STRONG

Text Book

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder. Bitcoin and Cryptocurrency Technologies. Princeton University Press, 2016.

References

1. Andreas Antonopoulos. Mastering Bitcoin: Programming the open block chain. Oreilly Publishers, 2017.

Course	MCA	Subject Code:	Semester	II
Major	Computer Applications	Discipline Specific Elective – I : Computer Vision	Credit	3
			Hours	5

Course Objectives

1. To get understanding about Computer vision techniques behind a wide variety of real-world applications.
2. To get familiar with various Computer Vision fundamental algorithms and how to implement and apply.
3. To get an idea of how to build a computer vision application with Python language.
4. To understand various machine learning techniques that are used in computer vision tasks.
5. To incorporate machine learning techniques with computer vision systems.

UNIT I

Basic Image Handling and Processing: PIL – the Python Imaging Library–Matplotlib–NumPy–SciPy–Advanced example: Image de-noising. Local Image Descriptors: Harris corner detector–SIFT – Scale-Invariant Feature Transform–Matching Geotagged Images.

UNIT II

Image to Image Mappings: Homographies–Warping images–Creating Panoramas. Camera Models and Augmented Reality: The Pin-hole Camera Model–Camera Calibration–Pose Estimation from Planes and Markers–Augmented Reality.

UNIT III

Multiple View Geometry: Epipolar Geometry–Computing with Cameras and 3D Structure–Multiple View Reconstruction–Stereo Images. Clustering Images: K-means Clustering–Hierarchical Clustering–Spectral Clustering.

UNIT IV

Searching Images: Content based Image Retrieval–Visual Words–Indexing Images–Searching the Database for Images–Ranking Results using Geometry–Building Demos and Web Applications. Classifying Image Content: K-Nearest Neighbors–Bayes Classifier–Support Vector Machines–Optical Character Recognition.

UNIT V

Image Segmentation: Graph Cuts–Segmentation using Clustering–Variational Methods. OpenCV: Python Interface–OpenCV Basics–Processing Video–Tracking.

Course Outcomes

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

1. To understand and recall computer vision and its application areas.
2. To develop build a computer vision system.
3. To apply and analyze a design range of algorithms for image processing and computer vision.
4. To develop incorporate machine learning techniques with computer vision system.
5. To apply and analyze image segmentation and image registration.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	1	3	2	3	1	2	2	3
CO2	3	2	2	3	3	2	3	2	2	2
CO3	3	2	1	2	2	3	2	3	3	2
CO4	2	1	2	3	3	2	1	3	3	1
CO5	2	3	2	2	2	2	3	1	2	3

1: LOW 2: MEDIUM 3: STRONG

Text Books

1. Forsyth and Ponce, "Computer Vision – A Modern Approach", Second Edition, Prentice Hall, 2011.
2. Emanuel Trucco and Alessandro Verri, "Introductory Techniques for 3-D Computer Vision", Prentice Hall, 1998.
3. Olivier Faugeras, "Three Dimensional Computer Vision", MIT Press, 1993.
4. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer, 2011.
5. Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Third Edition, CL Engineering, 2013.

Reference Book

1. Ahad, Md. Atiqur Rahman, "Computer Vision and Action Recognition–A Guide for Image Processing and Computer Vision Community for Action Understanding", Atlantis Press, 2011.

Course	MCA	Subject Code:	Semester	II
Major	Computer Applications	Non-Major Elective – I : Fundamentals of Human Rights	Credit	2
			Hours	3

Course Objectives

1. To inculcate the values and importance of Human Rights.
2. To explore the integration of Human Rights principles in the Indian Constitution and their implementation.
3. To investigate the protective mechanism for safe guarding the rights of disadvantaged.
4. To examine the role of NGOs in protecting of Human Rights.
5. To appreciate the redressal mechanism for Human Rights in India.

UNIT I

Introduction: Meaning and Definitions of Human Rights – Characteristics and Importance of Human Rights – Objectives of Human Rights Education – Evolution of Human Rights – Universal Declaration of Human Rights – International Covenants – Violations of Human Rights in the Contemporary Era.

UNIT II

Human Rights in India: Development of Human Rights in India – Indian Constitution – Fundamental Rights and its Classification – Directive Principles of State Policy – Fundamental Duties.

UNIT III

Rights of Marginalized and other Disadvantaged People: Rights of Women – Rights of Children – Rights of Differently Abled – Rights of Elderly – Rights of Scheduled Castes – Rights of Scheduled Tribes – Rights of Minorities – Rights of Prisoners .

UNIT IV

Human Rights Movements and NGOs: National and International Revolution NGOs – PUDR – Peasant Movements (Tebhaga and Telangana) – Scheduled Caste Movements (Mahar and Ad-Dharmi) – Scheduled Tribes Movements (Santhal and Munda) – PUCR – Amnesty International America Asia Watch.

UNIT V

Redressal Mechanisms: Protection of Human Rights Act, 1993 (Amendment 2019) – Structure and Functions of National and State Human Rights Commissions – National Commission for SCs – National Commission for STs – National Commission for Women – National Commission for Backward Class and Minorities – Ragging – RTI – POSCO.

Course Outcomes

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

1. Establish a profound comprehension of human rights.
2. Discuss how Human Rights were incorporated in Indian Constitution.
3. Explain the protective mechanism available for the help of marginalised and disadvantaged sections.
4. Evaluate the role of NGOs in protecting and promoting HR.
5. Describe the redressal mechanism available for protecting Human Rights.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	1	3	2	3	1	2	2	3
CO2	3	2	2	3	3	2	3	2	2	2
CO3	3	2	1	2	2	3	2	3	3	2
CO4	2	1	2	3	3	2	1	3	3	1
CO5	2	3	2	2	2	2	3	1	2	3

1: LOW 2: MEDIUM 3: STRONG

Reference Books

1. Sudarshanam Gankidi, Human Rights in India: Prospective and Retrospective, Rawat Publications, Jaipur, 2019.
2. Satvinder Juss, Human Rights in India, Routledge, New Delhi, 2020.
3. Namita Gupta, Social Justice and Human Rights in India, Rawat Publications, Jaipur, 2021.
4. Mark Frezo, The Sociology of Human Rights, John Willy & Sons, U.K. 2014.
5. Chiranjivi J. Nirmal, Human Rights in India: Historical, Social and Political Perspectives, Oxford University Press, New York, 2000.
6. Dr. S. Mehartaj Begum, Human Rights in India: Issues and perspectives, APH Publishing Corporation, New Delhi, 2010.
7. Asha Kiran, the History of Human Rights, Mangalam Publications, Delhi, 2011.
8. Bani Borgohain, Human Rights, Kanishka Publishers & Distributors, New Delhi–2, 2007.
9. Jayant Chudhary, A Textbook of Human Rights, Wisdom Press, New Delhi, 2011.

Course	MCA	Subject Code:	Semester	II
Major	Computer Applications	Generic Elective – II: Mobile Computing Lab	Credit	2
			Hours	2

Course Objectives

1. To introduce Android platform and its architecture.
2. To learn activity creation and Android UI designing.
3. To be familiarized with Intent, Broadcast receivers and Internet services.
4. To work with SQLite Database and content providers.
5. To integrate multimedia, camera and Location based services in Android Application.

Exercises (Mobile Computing)

1. Create an android application to display welcome message using Toast.
2. Create an android application to demonstrate checkbox in linear layout.
3. Create an android application to demonstrate radio button in linear layout.
4. Design an android application using spinner to display various country names.
5. Create an android application to display a date using date picker.
6. Design an android application to change a background color using button.
7. Develop an android application to perform basic arithmetic operation (Addition, Subtraction, Multiplication and Division) using the Edit text and button tools.
8. Display an alert message using dialog box in an android application.
9. Display your picture using image viewer in an android application.
10. Design an android application to move one page to another page using intent.

Course Outcomes (CO)

1. Understand the Android platform, Architecture and features.
2. Design User Interface and develop activity for Android App.
3. Use Intent, Broadcast receivers and Internet services in Android App.
4. Design and implementation of Database Application and Content providers.
5. Use multimedia, and Location based services in Android App.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	1	3	2	3	1	2	2	1
CO2	3	2	3	1	1	1	3	2	3	2
CO3	3	2	2	2	2	1	3	1	2	1
CO4	2	1	2	1	1	2	2	3	2	3
CO5	2	3	2	2	3	2	3	1	2	2

1: LOW 2: MEDIUM 3: STRONG

Reference Books

1. Rifaat A. Dayen, “Mobile Data & Wireless LAN Technologies”, Prentice Hall, 1997.
2. Steve Mann and Scoot Schibli, “The Wireless Application Protocol”, John Wiley & Inc., 2000.

Course	MCA	Subject Code:	Semester	III
Major	Computer Applications	Core X: Advanced Java Programming	Credit	5
			Hours	6

Course Objectives

1. Establish a strong grasp of Java basics, encompassing object declaration, method utilization, constructors and 'this' keyword understanding.
2. Evolve into advanced topics such as method overriding, recursion, access control, inheritance, abstract classes and final methods.
3. Navigate package management, member access and interface implementation alongside comprehensive exception handling techniques.
4. Attain mastery in multithreaded programming, covering thread creation, synchronization and concurrent execution control.
5. To understand dynamic GUI development using Swing components, delve into Java Database Connectivity (JDBC) to seamlessly integrate databases for a cohesive user experience.

UNIT I

Classes: Class Fundamentals – Declaring Objects – Assigning Object Reference Variable – Introducing Methods – Constructors – The This Keyword – Methods: Overriding Methods – Using Objects as Parameters – Returning Objects – Recursion – Introducing Access Control – Understanding Static – Inheritance: Basics – Using Super – Creating Multilevel Hierarchy – Method Overriding – Using Abstract Classes – Using Final.

UNIT II

Packages and Interfaces: Packages – Packages and Member Access – Importing Packages – Interfaces – Exception Handling: Fundamentals – Exception Types – Using Try and Catch – Multiple Catch Clauses – Throw – Throws – Finally – Multithreaded Programming: The Java Thread Model – The Main Method – Creating Multiple Threads – Using Alive() and Join() – Thread Priorities – Synchronization – Suspending, Resuming and Stopping Threads.

UNIT III

String Handling: The String Constructors – String Length – Special String Operations – Character Extraction – String Comparison – Searching Strings – Modifying a String – String Buffer – The Collections Framework: Collections Overview – Collection interfaces: List & Set – Collection Classes: Array List & Linked List – Vector – Stack – Dictionary – Hash table.

UNIT IV

Input/Output: The I/O Classes and Interfaces – File – The Byte Streams: Input Stream – Output Stream – FileInputStream – FileOutputStream – PrintStream – DataOutputStream and DataInputStream – The Character Streams: Reader – Writer – FileReader – FileWriter – PrintWriter – Swing: JLabel and ImageIcon – JTextField – JButton – JToggleButton – Check Boxes – Radio Buttons – JtabbedPane – JscrollPane – JList – JComboBox – Trees – Jtable

UNIT V

Java Database Connectivity: Establishing a Connection – Creation of Data Tables – Entering Data into the Tables – Table Updating – Use of PreparedStatement – Obtaining Metadata –

Transactions. Introducing Servlets: Background – Life cycle of Servlet – Servlet Development Options – Using Tomcat – A Simple Servlet – The Servlet API – The javax.servlet Package.

Course Outcomes

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

1. Develop a strong command of object-oriented programming concepts, including class fundamentals, methods, constructors and inheritance.
2. Acquire practical skills in handling exceptions and multithreaded programming, enhancing their ability to create robust and efficient code.
3. Gain proficiency in string manipulation and collection handling, enabling effective data management and manipulation.
4. Master event handling mechanisms in Java, with the ability to manage user interactions and respond to events effectively.
5. Cultivate expertise in building Graphical User Interfaces (GUI) using Swing components and leveraging Java Database Connectivity (JDBC) for efficient database management.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	2	2	1	3	2	2	2	1
CO2	2	2	2	2	2	2	2	2	2	2
CO3	2	3	3	2	1	2	3	3	2	1
CO4	2	3	2	3	2	2	3	2	3	3
CO5	3	2	1	2	3	1	2	1	2	3

1: LOW 2: MEDIUM 3: STRONG

Text Books

1. Herbert Schildt, Java The Complete Reference, McGraw Hill Education, Tenth Edition, 2018.
2. Muthu C, Programming with Java, Vijay Nicole Imprints Private Limited, Second Edition, 2008 (For JDBC).

Reference Books

1. E. Balagurusamy, Programming With Java a Primer, McGraw Hill Education, Fifth Edition, 2018.
2. P. Radha Krishna, Object Oriented Programming through Java, University Press (India) Private Ltd (2007).

Course	MCA	Subject Code:	Semester	III
Major	Computer Applications	Core XI: Web Technology	Credit	4
			Hours	5

Course Objectives

1. To comprehend the origins, syntax and structure of HTML and XHTML.
2. To master CSS techniques, encompassing selectors, properties and conflict resolution.
3. To proficiently utilize JavaScript for dynamic content manipulation and event handling.
4. To explore advanced concepts such as XML integration and dynamic content creation using JavaScript.
5. To delve into PHP, JQuery and Angular JS for the creation of interactive and dynamic web applications.

UNIT I

HTML and XHTML: Introduction to HTML– Origins and Evolution of HTML and HTML– Basic Syntax – Standard HTML Document Structure – Basic Text Markup– Images– Hypertext Links – Lists– Tables– Forms– The Audio Element– The Video Element – Organization Elements– The Time Element– Basic syntax– Standard structure– Basic text– markup– Images– Hypertext Links. Lists– Tables– Forms– Frames– syntactic differences between HTML and XHTML

UNIT II

CSS: Introduction– Levels of style sheets–Style specification formats– Selector forms– Property value forms – Font properties– List properties– Color– Alignment of text– The box model– Background images– The and <div>tags– Conflict resolution.

UNIT III

THE BASICS OF JAVASCRIPT: Overview of JavaScript– Object orientation and JavaScript– General Syntactic characteristics– Primitives– operations– and expressions– Control statements– Object creation and modification– Arrays– Functions– The Document Object Model–Elements Access in Java Script– Events and Event Handling– Handling Events from Body Elements– HandlingEvents from Text Box and password Elements– The DOM2 Model.

UNIT IV

DYNAMIC DOCUMENTS WITH JAVASCRIPT AND XML: Introduction– Positioning Elements– Moving Elements– Element Visibility– Changing Colorand Fonts– Dynamic Content– Stacking Elements– Locating the MouseCursor– Reacting to a Mouse Click– Slow Movement of Elements– Dragging and Dropping Elements. Introduction to XML– Syntax of XML– XML Document Structure– Document type definitions– Namespaces– XML schemas– displaying raw XML documents– Displaying XML documents with CSS– XSLT Style Sheets– Web services.

UNIT V

PHP– ANGULAR JS AND JQUERY: Introduction to PHP: Overview of PHP–General Syntactic Characteristics – Primitives–Operations and Expressions – Output – Control Statements – Arrays – Functions – PatternMatching – Form Handling – Cookies – Session Tracking – Introduction to JQuery–Syntax –selectors– events– JQuery HTML– JQuery

Effects– JQuery CSS. Introduction to Angular JS– Directives– Expressions– Controllers– Filters– Services– Events– Forms– Validations– Examples.

Course Outcomes

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

1. Develop proficiency in HTML and XHTML, encompassing text mark-up, multimedia integration, lists, tables, forms and organization elements, with an awareness of syntactic distinctions.
2. Acquire expertise in CSS, enabling the design and styling of web content through font properties, colors, alignments, backgrounds and more.
3. Master JavaScript's core concepts, including object-oriented programming, control statements, arrays, functions, event handling and interaction with the Document Object Model (DOM).
4. Gain practical skills in JavaScript for creating dynamic web content, encompassing interactivity, element manipulation and event-driven behaviour, while also exploring XML fundamentals and integration.
5. Explore server-side scripting with PHP, delve into JQuery for client-side interactivity and introduce AngularJS to develop interactive web applications with enhanced user experience.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	1	3	2	3	1	2	2	1
CO2	3	2	2	1	1	2	3	2	2	2
CO3	1	2	1	2	2	2	2	2	2	2
CO4	3	2	2	3	2	2	1	3	2	2
CO5	2	3	2	2	1	2	3	1	2	2

1: LOW 2: MEDIUM 3: STRONG

Text Books

1. Robert W. Sebesta: Programming the World Wide Web, Eighth Edition, Pearson education, 2015. Units: 1, 2, 3, 4.
2. Dayley Brad, Dayley Brendan, “AngularJS, JavaScript, and jQuery All in One”, Sams Teach Yourself 1st Edition, Kindle Edition, 2015. Unit: 5.

Reference Books

1. M. Srinivasan: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2009.
2. Jeffrey C. Jackson: Web Technologies–A Computer Science Perspective, Pearson Education, 7th Impression, 2012.
3. Chris Bates: Web Technology Theory and Practice, Pearson Education, 2012.
4. Raj Kamal: Internet and Web Technologies, McGraw Hill Education.

Course	MCA	Subject Code:	Semester	III
Major	Computer Applications	Core XII–P: Java & Web Technology Lab	Credit	4
			Hours	5

Course Objectives

1. To develop programs that arrange student marks, convert months and generate digit combinations.
2. To explore inheritance and class design for players in different sports.
3. To understand package usage, exception handling and multithreading concepts.
4. To create dynamic web pages displaying current time and date, while also demonstrating basic HTML formatting.
5. To explore frames and framesets, delve into CSS styling with border properties and apply diverse CSS techniques for webpage design.

Exercises (Java)

1. Classes and Objects.
 - a. Write a program to accept 10 student's marks in an array, arrange it into ascending order, convert into the following grades and print marks and grades in the tabular form.
Between 40 and 50: PASS
Between 51 and 75: MERIT
and above: DISTINCTION
 - b. Write a program to input a number of a month (1 – 12) and print its equivalent name of the month. (e.g. 1 to Jan, 2 to Feb. 12 to Dec.)
 - c. Write a program to accept three digits (i.e. 0 – 9) and print all its possible combinations. (For example if the three digits are 1, 2, 3 then all possible combinations are: 123, 132, 213, 231, 312, 321).
2. Inheritance
 - a. Write a Java program to show that private member of a super class cannot be accessed from derived classes.
 - b. Write a program in Java to create a Player class. Inherit the classes Cricket _Player, Football Player and Hockey Player from Player class.
3. Package
 - a. Write a Java program to implement the concept of importing classes from user defined package and created packages.
4. Exception Handling
 - a. Write a Java program to throw an exception for an employee details.
 - If an employee name is a number, a name exception must be thrown.
 - If an employee age is greater than 50, an age exception must be thrown.
 - Or else an object must be created for the entered employee details.
5. Multithreading
 - a. Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
6. String Handling
 - a. Write a Java program to accept a string from user and display number of vowels, consonants, digits and special characters present in each of the words of the given text.
 - b. Write a program to Text Encryption and Decryption using the Caesar Cipher Method.

7. Collection Classes
 - a. Write a program to prepare inventory management system using Array List class.
 - b. Write a program for the following Hash Map
 - Find whether specified key exists or not.
 - find whether specified value exists or not
 - get all keys from the given Hash Map
 - get all key–value pair as Entry objects
8. I/O Streams
 - a. Write a program to read a password from the user using Scanner and check if it meets certain criteria (e.g., minimum length, contains uppercase, lowercase, and digits).
 - b. Write a program to implement a simple shopping list program that allows the user to add items using Scanner, displays the list, and calculates the total cost.
9. Swing
 - a. Write a Java program to design login form using swing components.
 - b. Write a Java program to develop a Swing–based Calendar Application.
10. JDBC
 - a. Design a web application for employee details with database operations insert, delete and update.

Exercises (Web Technology)

1. Develop a web page to display the current time and date.
2. Develop a HTML document to basic alignments on headers and format the document using suitable tags
3. Develop a Complete Web Page using Frames and Framesets which gives the Information about a Hospital using HTML.
4. Write a program to illustrate CSS border style properties.
5. Design a web page to demonstrate the usage of inline CSS– internal CSS and external CSS.
6. Develop a HTML document using CSS to create table with rows and columns and split them using rows span and column span.
7. Develop a JavaScript program to compute the sum of an array of integers.
8. Develop a JavaScript program to generate ten random numbers within 1 to 100 and display the numbers in a table.
9. Design a web page to perform input validation using JavaScript
10. Design a web page to change the color and font using JavaScript.
11. Design a web page to implement the slow movement of the element using Java Script
12. Write a XML program to create XSL for displaying various country names and their currency name
13. Develop a web page in PHP to fetch details from the database.
14. Illustrate the use of filters using AngularJS
15. Apply keyboard and mouse events.

Course Outcomes

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

1. Attain proficiency in Java programming, demonstrated through array manipulation, conditional grading based on student marks and user input/output handling.
2. Develop a strong foundation in inheritance, showcasing the ability to create class hierarchies, demonstrate accessibility of private members and establish relationships between base and derived classes.

3. Acquire practical skills in utilizing user-defined packages, importing classes and organizing code effectively, contributing to a modular and organized coding approach.
4. Demonstrate competence in creating web pages showcasing real-time data, such as current time and date, through effective integration of HTML.
5. Exhibit proficiency in structuring and formatting web documents using appropriate HTML tags, emphasizing proper alignments, header presentation and content formatting.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	2	2	1	3	2	2	2	1
CO2	2	2	2	2	2	2	2	2	2	2
CO3	2	3	3	2	1	2	3	3	2	1
CO4	2	3	2	3	2	2	3	2	3	3
CO5	3	2	1	2	3	1	2	1	2	3

1: LOW

2: MEDIUM

3: STRONG

Reference Books

1. Herbert Schildt, Java The Complete Reference, McGraw Hill Education, Tenth Edition, 2018.
2. Muthu C, Programming with Java, Vijay Nicole Imprints Private Limited, Second Edition, 2008 (For JDBC).

Course	MCA	Subject Code:	Semester	III
Major	Computer Applications	Discipline Specific Elective – II: Machine Learning	Credit	3
			Hours	4

Course Objectives

1. To disseminate fundamental concepts and techniques in machine learning.
2. To pioneer advanced supervised learning techniques beyond linear models.
3. To explore unsupervised learning methods and dimensionality reduction techniques.
4. To provide a prologue to deep learning concepts and applications.
5. To portray emerging trends and ethical considerations in machine learning.

UNIT I

Foundations of Machine Learning: Introduction: Fundamental machine learning concepts – Types of learning: supervised, unsupervised, reinforcement – Data Pre-processing and Exploration Handling: missing data, outliers – Data visualization and summary statistics – Advanced Feature Engineering: Feature transformation and creation – Handling categorical data – Model Evaluation Metrics: Precision, recall, F1-score, ROC – AUC – Hyperparameter Tuning: Grid search, random search – Balancing bias-variance trade-off.

UNIT II

Advanced Supervised Learning: Advanced Regression Techniques: Polynomial regression, regularization – Feature selection and dimensionality reduction – Support Vector Machines (SVM): SVM for classification and regression – Kernel functions and tuning – Introduction to Neural Networks: Neural network architecture and components – Activation functions and back propagation – Handling Multiclass Classification: One-vs.-All and softmax – Neural networks for multiclass problems – Model Interpretability and Fairness: Interpreting complex models – Addressing bias and fairness issues.

UNIT III

Unsupervised Learning and Clustering: Clustering Algorithms: K-means, hierarchical clustering – Evaluating cluster quality – Dimensionality Reduction Techniques: Principal Component Analysis (PCA) – t-SNE for visualization – Recommender Systems: Collaborative filtering and content-based methods – Hybrid approaches – Anomaly Detection: Identifying outliers and anomalies – Isolation Forest, auto encoders.

UNIT IV

Introduction to Deep Learning: Fundamentals of Neural Networks: Neuron structure, activation functions – Feed forward neural networks – Deep Learning with CNN: CNN architecture and layers – Image classification and feature visualization – Sequence Data and RNN: Understanding sequential data – Long Short-Term Memory (LSTM) networks – Transfer Learning and Pretrained Models: Leveraging existing neural network architectures – Fine-tuning for specific tasks.

UNIT V

Emerging Technology and Future Trends: Advanced Model Interpretability: Explainable AI (XAI) techniques – Interpreting deep learning models – Reinforcement Learning Fundamentals: Introduction to reinforcement learning – Markov Decision Processes (MDPs) – Natural Language Processing (NLP) Basics: Text pre-processing, sentiment analysis –

Introduction to language models – Computer Vision Applications: Image classification, object detection.

Course Outcomes

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

1. Understand the types of machine learning, their applications, and the significance of proper data pre-processing.
2. Gain proficiency in applying techniques like Support Vector Machines (SVM) and basic neural networks for various tasks.
3. Develop skills in applying clustering algorithms and using dimensionality reduction for better data representation.
4. Acquire foundational knowledge of neural networks, convolutional neural networks (CNNs), and recurrent neural networks (RNNs).
5. Gain awareness of topics such as explainable AI, reinforcement learning, and the ethical implications of AI technologies.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	1	3	2	3	1	2	2	1
CO2	3	2	2	3	3	1	3	2	3	2
CO3	3	2	1	2	2	1	2	1	2	1
CO4	2	3	2	1	1	2	1	3	2	3
CO5	2	2	2	2	3	2	3	1	2	2

1: LOW 2: MEDIUM 3: STRONG

Text Books

1. Introduction to Machine Learning with Python, Andreas C. Müller and Sarah Guido, O'Reilly Media, 2017. (Unit I)
2. Python Machine Learning, Sebastian Raschka and Vahid Mirjalili, Pact publishing, 2019. (Unit II)
3. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, Aurélien Géron, O'Reilly Media, 2019. (Unit III)
4. Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT, 2017. (Unit IV)
5. Interpretable Machine Learning, Christoph Molnar, Lean Pub, 2020. (Unit V)

Reference Books

1. Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer, 2006.
2. Introduction to Machine Learning, Ethem Alpaydin, The MIT Press, 2014
3. Reinforcement learning An introduction (Second Edition), Richard S. Sutton and Andrew G. Barto, The MIT Press, 2018.

Course	MCA	Subject Code:	Semester	III
Major	Computer Applications	Discipline Specific Elective – II: Network Protocols	Credit	3
			Hours	4

Course Objectives

1. To understand the basic concepts of Transmission Control Protocol/Internet Protocol and associated functions
2. Explore to describe the internet architecture and its processes associated with the data transfer and to provide the quality of service
3. To understand technologies and services associated with network protocols along with the challenges of data transfer.
4. Learners will understand the importance and functioning of Routing Protocols over communication service.
5. Empower the learners to comprehend and manage the issues associated with IP protocols like data traffic problems, security and mobility.

UNIT I

Transmission Control Protocol/Internet Protocol: Fundamental Architecture – Internet Protocol Basics – Routing – Transport-Layer Protocols: Transmission Control Protocol – User Datagram Protocol – Stream Control Transmission Protocol – Real-Time Transport Protocol.

UNIT II

Internet Architecture: Internet Exchange Point – History of Internet Exchange Points – Internet Service Provider Interconnection Relationships – Peering and Transit – IP Routing Protocols: Overview of Routing Protocols – Routing Information Protocol – Open Shortest Path First – Border Gateway Protocol – Multiprotocol Label Switching.

UNIT III

IP Quality Of Service : Introduction – Quality of Service in IP Version 4 – Integrated Services – Differentiated Services – Quality of Service with Nested Differentiated Services Levels – IP Multicast and Any cast: Addressing – Multicast Routing – Routing Protocols – Any casting– IPv6 Any cast Routing Protocol: Protocol Independent Any cast—Sparse Mode – Transport over Packet: Draft–Martini Signalling and Encapsulation – Layer–2 Tunnelling Protocol.

UNIT IV

Virtual Private Wired Service – Types of Private Wire Services – Generic Routing Encapsulation – Layer–2 Tunnelling Protocol – Layer–3 Virtual Private Network 2547bis, Virtual Router – IP and Optical Networking: IP/Optical Network Evolution – Challenges in Legacy Traditional IP/Optical Networks – Automated Provisioning in IP/Optical Networks – Control Plane Models for IP/Optical Networking – Next–Generation Multilayer Network Design Requirements – Benefits and Challenges in IP/Optical Networking – IP Version 6: Addresses in IP Version 6 – IP Packet Headers – IP Address Resolution – IP Version 6 Deployment: Drivers and Impediments.

UNIT V

IP Traffic Engineering: Models of Traffic Demands – Optimal Routing with Multiprotocol Label Switching – Link–Weight Optimization with Open Shortest Path First – Extended

Shortest-Path-Based Routing Schemes – IP Network Security: Introduction – Detection of Denial-of-Service Attack – IP Trace back– Edge Sampling Scheme – Advanced Marking Scheme – Mobility Support for IP: Mobility Management Approaches – Security Threats Related to IP Mobility – Mobility Support in IPv6 – Reactive Versus Proactive Mobility Support – Relation to Multihoming – Protocols Supplementing.

Course Outcomes

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

1. Understand, analyse and examine the concepts of Communication Protocols with its architecture and functions.
2. Illustrate and apply the appropriate internet architecture along with efficient protocol models for the user defined communication environment
3. Comprehend, categorize and formulate the appropriate IP routing protocol to establish a efficient data transfer
4. Comprehend, analyse and evaluate the concepts of Virtual wired service and IP/optical networking with its functions and deployment.
5. Elucidate, analyse and inspect the IP traffic engineering and its models along with the security mechanisms.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	2	2	1	3	2	2	2	3
CO2	2	2	2	2	2	2	2	2	2	2
CO3	2	3	3	2	3	2	3	3	2	3
CO4	2	2	2	3	1	2	2	2	3	2
CO5	1	2	1	2	3	1	2	3	1	3

1: LOW 2: MEDIUM 3: STRONG

Text Book

1. “Advanced Internet Protocols, Services and Applications”, Eiji Oki, Roberto Rojas-Cessa, Mallikarjun Tatipamula, Christian Vogt, Copyright © 2012 by John Wiley & Sons, Inc.

Reference Books

1. “TCP/IP Protocol Suite”, Behrouz A. Forouzan, Fourth Edition, Tata Mcgraw-Hill Edition 2010.
2. “Computer Communications and Networking Technologies” – Michael A. Gallo & William M. Hancock– BROOKS&COLE
3. “Computer Networks and Internets” –Douglas E. Comer– PEARSON.
4. Data and Computer Communications– Eighth Edition– William Stallings– Pearson Education.
5. Network Security Bible, 2nd edition, Eric Cole, Wiley Publishers.
6. Data communication and networks –James Irvine and David Harley– Publishers: Wiley India

Course	MCA	Subject Code:	Semester	III
Major	Computer Applications	Discipline Specific Elective – II: Social Networking	Credit	3
			Hours	4

Course Objectives

1. To learn about Social media, Social networking and Webcasts
2. To understanding and building a Word Press Powered Website
3. To analysis the Social Networking & Micro–Blogging.
4. To learn and analysis the Widgets & Badges.
5. To explore the importance of Website optimization.

UNIT I

Introduction: Social Media Strategy–Important First Decisions –Websites, Blogs – RSS Feeds Mapping –Preparation – Multimedia Items Gathering Content for Blog Posts RSS Feeds & Blogs–RSS Feeds–The Feed Reader–The Feed–Options for Creating an RSS Feed–Planning Feed–Blogs–Options for Starting. Blog and RSS Feed–Feed or Blog Content–Search Engine Optimization (SEO)–Feed Burner–RSS Feed and Blog Directories–An Optimization Plan for Blog or RSS Feed.

UNIT II

Building a Word Press Powered Website: Word Press as A CMS – Diversity of Word Press Sites–The Anatomy of a Word Press Site –a Brief Look at the Word Press Dashboard Planning – Site Themes Plug–ins setting up Sidebars Building Pages– Posting Blog Entries. Podcasting, Vidcasting, & Webcasting– Publishing Options for Podcast– Creating and Uploading Podcast Episodes–Publishing Podcast Optimizing Podcast– Webcasting.

UNIT III

Social Networking & Micro–Blogging: Facebook–The Facebook Profile –Myspace LinkedIn–Twitter–Niche Social Networking Sites–Creating Own Social Network–Promoting Social Networking Presence– Social Bookmarking & Crowd–Sourcing – Social Bookmarking–A Social Bookmarking Strategy– Crowd–Sourced News Sites– Preparation And Tracking Progress Media Communities–Image Sharing Sites–Image Sharing Strategy–Video Sharing Sites–Video Sharing Strategy–Searching And Search Engine Placement–Connecting With Others.

UNIT IV

Widgets & Badges: Highlighting Social Web Presence–Sharing And Syndicating Content Making Site More Interactive–Promoting Products And Making Money–Using Widgets In Word Press–Widget Communities And Directories– Working Widgets Into Strategy Social Media Newsrooms–Building Social Media Newsroom – Populating The Newsroom–Social Media News Releases–Social Media Newsroom Examples. More Social Tools–Social Calendars – Social Pages Wikis–Social Search Portals–Virtual Worlds.

UNIT V

Website optimization: A Website Optimization Plan–Streamlining Web Presence–An Integration Plan– Looking to the Future–Life streaming: The Future of Blogging–Distributed Social Networking–Social Ranking, Relevancy, and —Befriending–Web 3.0 or The Semantic Web–Mobile Technology– Measuring Your Success–A Qualitative Framework–A Quantitative Framework–Tools to Help You Measure–Come to Your Own Conclusions.

Course Outcomes

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

1. To understand, impart and summarize the concepts of Social media, Social networking and Webcasts.
2. To comprehend, design and develop a Word Press Powered Website.
3. To understand, implement and perform evaluation of Social Networking and Micro-Blogging
4. To collaborate, implement and analyse the Widgets and Badges in social networking environment.
5. To understand, illustrate and perform evaluation of web optimization for social networks.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	1	3	2	3	1	2	2	1
CO2	3	2	2	1	1	2	3	2	2	2
CO3	1	2	1	2	2	2	2	2	2	2
CO4	3	2	2	3	2	2	1	3	2	2
CO5	2	3	2	2	1	2	3	1	2	2

1: LOW

2: MEDIUM

3: STRONG

Text Book:

1. Deltina hay —A Survival Guide To social Media and Web 2.0 Optimization, Dalton Publishing, 2009.

Reference Books

1. Miriam Salpeter —Social networking for Career Success, Learning Express, 2011.
2. Miles, Peggy, —Internet world guide to webcasting, Wiley, 2008
3. Professionals”, Wiley Publication, 2015.

Course	MCA	Subject Code:	Semester	III
Major	Computer Applications	Discipline Specific Elective – III: Cloud Computing	Credit	3
			Hours	5

Course Objectives

1. To endow with comprehensive and deep knowledge of Cloud Computing concepts
2. To attain the mandatory elements and essentials of Cloud Computing
3. To accomplish using and adopting Cloud Computing services and accessing in their real life scenarios
4. To facilitate exploring important rudiments of cloud computing software driven commercial systems and applications
5. To expose the frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study.

UNIT I

Introduction: A Glance – The Vision of Cloud Computing – Defining a Cloud – The Cloud Computing Reference Model – Characteristics and Benefits – Challenges Ahead – Historical Developments: Distributed Systems – Virtualization – Service Oriented Computing – Utility Oriented Computing – Building Cloud Computing Environments: Application Development – Infrastructure and System Development – Computing Platforms and Technologies: AWS – Appengine – Azure – Hadoop.

UNIT II

Cloud Computing Architecture – The Cloud Reference Model: Architecture – Infrastructure and Hardware as a Service – Platform as a Service – Software as a Service – Types of Clouds: Public – Private – Hybrid – Community – Economics of the Cloud – Open Challenges: Definition – Interoperability and Standards – Scalability and Fault Tolerance – Security, Trust and Privacy.

UNIT III

Organization and Cloud Computing: Benefits – Limitations – Security Concerns – Regulatory Issues – Business Case: Cloud Computing Services – Help Benefits – Deleting your Data Centre – Hardware and Architecture: Clients – Security – Network – Services – Accessing the Cloud: Platforms – Web Applications – Web Apis – Web Browsers – Cloud Storage: Overview – Providers – Standards: Application – Client – Infrastructure – Service.

UNIT IV

Software as Service: Overview – Driving Forces – Company Offerings – Industries – Software Plus Services: Overview – Mobile Device Integration – Providers – Microsoft Online – Developing Applications: Google – Microsoft Intuit Quickbase – Cast Iron Cloud – Bungee Connect – Development (Appengine, Azure, Openstack) – Application Management.

UNIT V

Local Clouds and Thin Clients: Virtualization – Server Solutions – Thin Clients. Cloud Migration: Cloud Services for Individuals – Enterprise Cloud – Methods for Migration – Analyzing Cloud Services.

Course Outcomes

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

1. Comprehend the different cloud models as per the need.
2. Assess the broad perceptive of cloud architecture and its interfaces.
3. Analyze the organization based Cloud computing services and accessing design patterns for solution.
4. Understand the rudiments of cloud computing software driven commercial systems and applications.
5. Twig the sufficient foundations to enable further study of legacy system.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	2	2	1	3	2	2	2	3
CO2	2	2	2	2	2	2	2	2	2	2
CO3	2	3	3	2	3	2	3	3	2	3
CO4	2	2	2	3	1	2	2	2	3	2
CO5	1	2	1	2	3	1	2	3	1	3

1: LOW

2: MEDIUM

3: STRONG

Text Books

1. Dan C. Marinescu, "Cloud Computing Theory and Practice" Second Edition, Elsevier Inc., 2018.
2. Rajkumar Buyya, "Mastering Cloud Computing – Foundations and Applications Programming", Elsevier Inc., 2020.

Reference Books

1. Rittinghouse and Ransome, (2016), Cloud Computing: Implementation, Management, and Security, CRC Press, 1st Edition.
2. Michael Miller, (2008), Cloud Computing Web based application that change the way you work and collaborate online, Pearson Education, 1st Edition.
3. Kris Jamsa, (2012), Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More, Jones & Bartlett Learning, 1st Edition.

Course	MCA	Subject Code:	Semester	III
Major	Computer Applications	Discipline Specific Elective – III: Software Development Technologies	Credit	3
			Hours	5

Course Objectives

1. To learn and Implementing Micro services
2. To analysing the Azure Kubernetes Service
3. To learn and analyse .NET DevOps for Azure and its applications
4. To building code for .NET core applications
5. To get familiarized with Azure pipelines

UNIT I

Implementing Micro services: Client to micro services communication, Interservice communication, data considerations, security, monitoring, micro services hosting platform options. Azure Service Fabric: Introduction, core concepts, supported programming models, service fabric clusters, develop and deploy applications of service fabric. Monitoring Azure Service Fabric Clusters: Azure application, resource manager template, Adding Application Monitoring to a Stateless Service Using Application Insights, Cluster monitoring, Infrastructure monitoring.

UNIT II

Azure Kubernetes Service (AKS): Introduction to kubernetes and AKS, AKS development tools, Deploy applications on AKS. Monitoring AKS: Monitoring, Azure monitor and analytics, monitoring AKS clusters, native kubernetes dashboard, Prometheus and Grafana. Securing Micro services: Authentication in micro services, implanting security using API gateway pattern, creating application using Ocelot and securing APIs with Azure AD. Database Design for Micro services: Data stores, monolithic approach, Micro services approach, harnessing cloud computing, database options on MS Azure, overcoming application development challenges. Building Micro services on Azure Stack: Azure stack, Offering IaaS, PaaS on-premises simplified, SaaS on Azure stack.

UNIT III

.NET DevOps for Azure: DevOps introduction, Problem and solution. Professional Grade DevOps Environment: The state of DevOps, professional grade DevOps vision, DevOps architecture, tools for professional DevOps environment, DevOps cantered application. Tracking work: Process template, Types of work items, customizing the process, working with the process. Tracking code: Number of repositories, Git repository, structure, branching pattern, Azure repos configuration, Git and Azure.

UNIT IV

Building the code: Structure of build, using builds with .NET core and Azure pipelines, validating the code: Strategy for defect detection, Implementing defect detection. Release candidate creation: Designing release candidate architecture, Azure artifacts workflow for release candidates, deploying the release: Designing deployment pipeline, implementing deployment in Azure pipelines. Operating and monitoring release: Principles, Architectures for observability, Jumpstarting observability.

UNIT V

Introduction to APIs: Introduction, API economy, APIs in public sector. API Strategy and Architecture: API Strategy, API value chain, API architecture, API management. API Development: Considerations, Standards, kick-start API development, team orientation. API Gateways: API Gateways in public cloud, Azure API management, AWS API gateway. API Security: Request-based security, Authentication and authorization.

Course Outcomes

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

1. To understand, apply and summarize the basic concepts of Micro services communication Microsoft Azure and Dev Ops for software development life cycle.
2. To illustrate, and implement Azure Kubernetes Service tools for software development life cycle.
3. To recognize, analyse and summarize the functionalities of .NET Dev Ops for Azure applications.
4. To understand, design and evaluate the principles and architecture service tools for software development life cycle.
5. To comprehend, implement and review the functionalities of API and API gateways for cloud and Azure applications.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	1	3	2	3	1	2	2	1
CO2	3	2	2	1	1	2	3	2	2	2
CO3	1	2	1	2	2	2	2	2	2	2
CO4	3	2	2	3	2	2	1	3	2	2
CO5	2	3	2	2	1	2	3	1	2	2

1: LOW 2: MEDIUM 3: STRONG

Text Books

1. Harsh Chawla and Hemant Kathuria, Building Micro services Applications on Microsoft Azure– Designing, Developing, Deploying, and Monitoring, Apress, 2019.
2. Jeffrey Palermo, NET DevOps for Azure A Developer’s Guide to DevOps Architecture the Right Way, Apress, 2019.
3. Thurupathan and Vijayakumar, Practical API Architecture and Development with Azure and AWS – Design and Implementation of APIs for the Cloud, Apress, 2018.

Reference Books

1. Karl Matthias and Sean P. Kane, Docker: Up and Running, O'Reilly Publication, Second Edition 2018.
2. Len Bass, IngoWeber, LimingZhu, "DevOps, A Software Architects Perspective", AddisonWesley–Pearson Publication, First Edition 2015.
3. John Ferguson Smart, "Jenkins, The Definitive Guide", O'Reilly Publication, First Edition 2011.

Course	MCA	Subject Code:	Semester	III
Major	Computer Applications	Discipline Specific Elective – III: Soft Computing	Credit	3
			Hours	5

Course Objectives

1. Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
2. To understand supervised and unsupervised learning algorithms
3. To enable the students to gain a basic understanding of neural networks.
4. To know about fuzzy logic, fuzzy inference systems, and their functions.
5. To impart basic knowledge on Genetic algorithms and their applications

UNIT I

INTRODUCTION TO SOFT COMPUTING: Artificial Neural Networks– Biological Neurons– Basic Models of Artificial Neural Networks–Connections–Learning–Activation Functions– Important Terminologies of ANNs– Muculloch and Pitts Neuron–Linear Separability– Hebb Network–Flowchart of Training Process–Training Algorithm.

UNIT II

SUPERVISED LEARNING NETWORK : Perceptron Networks–Perceptron Learning Rule–Architecture–Flowchart for Training Process–Perceptron Training Algorithms for Single Output Classes–Perceptron Training Algorithm for Multiple Output Classes–Perceptron Network Testing Algorithm – Adaptive Linear Neuron–Delta Rule for Single Output Unit–Flowchart for training algorithm–Training Algorithm – Testing Algorithm – Multiple Adaptive Linear Neurons–Architecture–Flowchart of Training Process–Training Algorithm–Back Propagation Network–Architecture–Flowchart for Training Process–Training Algorithm–Learning Factors of Back–Propagation Network–Radial Basis Function Network–Architecture–Flowchart for Training Process–Training Algorithm.

UNIT III

UNSUPERVISED LEARNING NETWORK: Associative Memory Networks – Auto Associative Memory Network–Architecture–Flowchart for Training Process–Training Algorithm–Testing Algorithm– Bidirectional Associative Memory– Architecture–Discrete Bidirectional Associative Memory–Iterative Auto Associative Memory Networks – Linear Auto Associative Memory–Kohonen Self–Organizing Feature Map– Architecture–Flowchart for Training Process–Training Algorithm.

UNIT IV

INTRODUCTION TO FUZZY LOGIC: Classical Sets –Operations on Classical Sets–Fuzzy sets – Fuzzy Sets– Properties of Fuzzy Sets– Fuzzy Relations –Membership Functions: Fuzzification– Methods of Membership Value Assignments – Defuzzification – Lambda–Cuts for Fuzzy sets and Fuzzy Relations – Defuzzification Methods–Max–Membership Principle–Centroid Method–Weighted Average Method–Mean Max Membership–Center of Sums–Center of Largest Area–First of Maxima – Fuzzy Set Theory – Fuzzy Arithmetic And Fuzzy Measures: Fuzzy Measures – Belief and Plausibility Measures–Probability Measures– Possibility and Necessity Measures– Formation of Rules –Fuzzy Inference Systems (FIS) – Fuzzy Decision Making – Fuzzy Logic Control Systems.

UNIT V

GENETIC ALGORITHM: Introduction – Biological Background – Traditional Optimization and Search Techniques –Gradient Based Local Optimization Method–Random Search–Stochastic Hill Climbing–Simulated Annealing–Symbolic Artificial Intelligence–Operators in Genetic Algorithm –Encoding–Selection–Crossover–Mutation – Stopping Conditions for Genetic Algorithm Flow–Genetic Programming–Working of Genetic Programming–Characteristics of Genetic Programming–Data Representation.

Course Outcomes

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

1. To provide an introduction to the basic principles, techniques, and applications of soft computing
2. To get familiar with Neural network architectures and supervised learning algorithms
3. To understand the architectures and algorithms of Unsupervised Learning techniques
4. Develop the skills to gain a basic understanding of fuzzy logic theory and fuzzy inference systems
5. Ability to learn traditional optimization and search techniques and genetic programming.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	2	2	1	3	2	2	2	3
CO2	2	2	2	2	2	2	2	2	2	2
CO3	2	3	3	2	3	2	3	3	2	3
CO4	2	2	2	3	1	2	2	2	3	2
CO5	1	2	1	2	3	1	2	3	1	3

1: LOW 2: MEDIUM 3: STRONG

Text Books

1. Principles of Soft Computing, S.N. Sivanandam, S.N.Deepa, Wiley, Third Edition, 2019.

Reference Books

1. Das, A. (2018). Artificial Intelligence and Soft Computing for Beginners.
2. Amit, K. (2018). Artificial intelligence and soft computing: behavioural and cognitive modelling of the human brain. CRC press.
3. Rajasekaran, S., & Pai, G. V. (2011). Neural networks, fuzzy logic and genetic algorithm: synthesis and applications (with cd). PHI Learning Pvt. Ltd.

Course	MCA	Subject Code:	Semester	III
Major	Computer Applications	Non–Major Elective – II : R Programming Lab	Credit	2
			Hours	3

Course Objectives

1. To enhance their skills, participants will learn effective data representation using various visualization methods, including bar diagrams (simple and multiple) and pie diagrams.
2. To ensure structured analysis and interpretation, participants will develop proficiency in constructing frequency distributions.
3. To gain a comprehensive grasp of data characteristics, participants will delve into key measures of central tendency (mean, median, mode, geometric mean, harmonic mean).
4. To proficiently assess data distribution and variability, participants will master measures of dispersion (range, quartile deviation, standard deviation, coefficient of variation).
5. To deepen their insights into data distribution patterns, participants will cultivate practical expertise in analyzing skewness and kurtosis, while also exploring correlations and regression equations for variable relationships.

Exercises

1. Diagrammatic Representation of Data: Bar Diagram: Simple Bar Diagram, Multiple Bar Diagram, and Pie Diagram.
2. Formation of Frequency Distribution.
3. Measures of Central Tendency: Mean Median, Mode, Geometric Mean, and Harmonic Mean.
4. Measures of Dispersion: Range, Quartile Deviation, Standard Deviation, Co–Efficient Of Variation.
5. Skewness and Kurtosis.
6. Correlation Co–Efficient.
7. Regression Equations.
8. One Sample T Test
9. Independent T Test
10. Paired T Test
11. Chi Square Test: Independence of Attributes.
12. Design of Experiments: Completely Randomized Design Randomized Block Design and Latin Square Design.

Course Outcomes

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

1. Proficiency in utilizing diagrammatic tools, encompassing simple and multiple bar diagrams, along with pie diagrams, to enhance data visualization.
2. Mastery in constructing insightful frequency distributions, streamlining data analysis and interpretation.
3. A thorough understanding of central tendency measures—mean, median, mode, geometric mean and harmonic mean—to ensure accurate data representation.
4. Expertise in measures of dispersion—range, quartile deviation, standard deviation, coefficient of variation—to facilitate comprehensive data assessment.
5. Enhanced ability to discern data distribution intricacies using skewness and kurtosis measures, complemented by exploring correlation coefficients and regression equations to uncover variable interrelationships.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	1	3	2	3	1	2	2	1
CO2	3	2	2	1	1	2	3	2	2	2
CO3	1	2	1	2	2	2	2	2	2	2
CO4	3	2	2	3	2	2	1	3	2	2
CO5	2	3	2	2	1	2	3	1	2	2

1: LOW

2: MEDIUM

3: STRONG

Reference Books

1. Purohit, S. G., Gore, S. D., and Deshmukh, S. R. (2009). Statistics Using R, Narosa Publishing House, New Delhi.
2. Quick, J. M. (2010). Statistical Analysis with R, Pack, Publishing Ltd., UK.

Course	MCA	Subject Code:	Semester	III
Major	Computer Applications	IA: Internship	Credit	2
			Hours	2

Course	MCA	Subject Code:	Semester	IV
Major	Computer Applications	Core XIII: Dot Net Programming	Credit	4
			Hours	6

Course Objectives

1. To comprehend the fundamentals of ASP.NET Framework, .NET Framework and programming languages (VB.NET, C#).
2. To develop expertise in creating web forms using server controls, HTML controls and event handling.
3. To attain proficiency in validation techniques, state management and utilization of rich controls.
4. To master ADO.NET for efficient data access and manipulation, covering SQL operations and disconnected data handling.
5. To explore web services architecture, SOAP and effective communication with web servers.

UNIT I

ASP.NET Framework – The .Net Framework – The .Net Programming Framework – VB.NET, C#, and the .Net Languages – The Common Language Runtime – The .Net Class Library – ASP.NET – The .NET Languages – Data Types – Declaring Variables – Object-Based Manipulation – Conditional Structures – Loop Structures – Functions and Subroutines.

UNIT II

Web Form Fundamentals: A Simple Page Applet – Response Write – Server Controls – HTML Server Controls – View State – The HTML Control Classes – Events – Events – Event Handling Changes – Improving Currency Converter: Adding Support for Multiple Currencies – Adding Linked Images – Setting Styles – HTML Control Classes: HTML Control Events – HTML Control Base Class – HTML Container Control Class – HTML Input Control Class. Page Class: Controls Collection – HttpRequest & HttpResponse Classes – ServerUtility Class. Web Controls: Web Control Classes – Web Control Tags.

UNIT III

Validation and Rich Controls: Calendar Control – Formatting Calendar – AdRotator – Advertisement File – Validation Controls – Validation Process – Validation Classes – Server Side Validation – Display Options – Manual Validation. State Management: View State – Transferring Information – Custom Cookies – Session State – Configuration.

UNIT IV

Overview of ADO.NET: Introducing ADO.NET and Data Management – Characteristics – ADO.NET Object Model – ADO.NET Data Access: SQL Basics – SQL Select – Update – Insert – Delete Statement – Creating a Connection – Defining a Select Command – Using Command with DataReader – Updating Data – Accessing Disconnected Data – Selecting Multiple Tables.

UNIT V

Web Services Architecture: Internet Programming – WSDL – SOAP – Communicating with Web Server – Web Service Discovery and UDDI. Web Services: Basics – Data Types – Consuming Web Service – Configuring Web Service Client in Visual Studio .NET – Creating

Web Reference in Visual Studio .NET – Proxy Class – Waiting and Timeouts – Connecting through Proxy – State Management – SOAP Headers.

Course Outcomes

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

1. Comprehensive understanding of ASP.NET framework components, .NET languages and Common Language Runtime (CLR).
2. Mastering dynamic web form creation using server controls, HTML controls and event handling.
3. Proficiency in implementing validation controls, rich interface elements and effective state management.
4. Practical skills in ADO.NET for data management, including SQL commands and database access.
5. Ability to create, consume web services, comprehend web services architecture and efficient internet communication.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	1	3	2	3	3	2	2	1
CO2	3	2	3	3	1	3	2	2	3	2
CO3	3	2	2	2	2	2	2	1	2	1
CO4	2	1	2	1	1	2	1	3	2	3
CO5	2	3	2	2	3	2	3	1	2	2

1: LOW 2: MEDIUM 3: STRONG

Textbook

1. Mathew MacDonald, The Complete Reference ASP.NET, Indian Edition, Mc Graw Hill Education, 2014.

Reference Books

1. Benjamin Perkins, Jacob Vibe Hammer, Jon D. Reid, “Beginning C#7 Programming with Visual Studio 2017”, Wiley Publishing, 2018.
2. Nagel, Christian, “Professional C 7 and .NET Core 2.0 ”, Wrox Publishing, 2018.
3. Mehboob Ahmed Khan, Ovais, “C# 7 and .NET Core 2.0 High Performance”, Packt Publishing, 2018.

Course	MCA	Subject Code:	Semester	IV
Major	Computer Applications	Core XIV – P: Dot Net Programming Lab	Credit	4
			Hours	5

Course Objectives

1. Develop practical C#.Net programming skills through exercises focused on string handling, DateTime and TimeSpan objects.
2. Gain hands-on experience in web application development using HTML controls, dynamic table creation and Ad Rotator integration.
3. Explore data manipulation, interaction with controls and web service utilization, enhancing proficiency in ASP.Net programming.
4. To master ADO.NET for efficient data access and manipulation, covering SQL operations and disconnected data handling.
5. To explore web services architecture, SOAP and effective communication with web servers.

Exercises (Dot Net Programming)

1. Develop a C#.Net application to perform String Handling Functions.
2. To display current date and time using DateTime and TimeSpan Objects.
3. To display alphabetical flody's triangle.
4. Develop a web application using HTML controls (HTMLButton and HTMLImage).
5. Develop a web application to create a table dynamically.
6. Write a program to convert the currency.
7. Write a program to make use of AdRotator Control.
8. Develop a biodata for to validate the controls.
9. Write a program to display SessionId, Creation Time and Last Access Time of web page.
10. Write a program to manipulate student details using DML Commands.
11. Write a program to access the data in DataList and DataGrid control.
12. Write a program to update and delete a few records using disconnected approach.
13. Write a program to perform basic mathematical operations using web service.
14. Design an ASP.Net client for web service.
15. Design an ASP.Net Client page using the elements in WSDL.

Course Outcomes

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

1. Gain proficiency in C#.NET programming by developing applications that encompass various string handling functions and demonstrate currency conversion skills.
2. Acquire practical skills in utilizing C#.NET to display current date and time, create dynamic tables and biodata forms and manage session information.
3. Master the implementation of web controls and services in ASP.NET applications, including AdRotator usage, data manipulation and interaction with web services.
4. Practical skills in ADO.NET for data management, including SQL commands and database access.
5. Ability to create, consume web services, comprehend web services architecture and efficient internet communication.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	1	3	2	3	1	2	2	1
CO2	3	2	3	1	1	1	3	2	3	2
CO3	3	2	2	2	2	1	3	1	2	1
CO4	2	1	2	1	1	2	2	3	2	3
CO5	2	3	2	2	3	2	3	1	2	2

1: LOW 2: MEDIUM 3: STRONG

Reference Books

1. Benjamin Perkins, Jacob Vibe Hammer, Jon D. Reid, “Beginning C#7 Programming with Visual Studio 2017”, Wiley Publishing, 2018.
2. Nagel, Christian, “Professional C 7 and .NET Core 2.0 ”, Wrox Publishing, 2018.
3. Mehboob Ahmed Khan, Ovais, “C# 7 and .NET Core 2.0 High Performance”, Packet Publishing, 2018.

Course	MCA	Subject Code:	Semester	IV
Major	Computer Applications	Discipline Specific Elective – IV : Big Data Analytics	Credit	3
			Hours	5

Course Objectives

1. To introduce big data tools & Information Standard formats.
2. To understand the basic concepts of big data.
3. To learn Hadoop, HDFS and Map Reduce concepts.
4. To teach the importance of NoSQL.
5. To explore the big data tools such as Hive, HBase and Pig.

UNIT I

Big Data and Analytics: Types of Digital Data: Structured Data – Semi Structured Data and Unstructured Data. Introduction to Big Data: Characteristics – Evolution – Definition – Challenges with Big Data – Other Characteristics of Data – Big Data – Traditional Business Intelligence versus Big Data – Data Warehouse and Hadoop. Environment Big Data Analytics: Classification of Analytics – Challenges – Big Data Analytics important – Data Science – Data Scientist – Terminologies used in Big Data Environments – Basically Available Soft State Eventual Consistency – Top Analytics Tools.

UNIT II

Technology Landscape: NoSQL, Comparison of SQL and NoSQL, Hadoop – RDBMS Versus Hadoop – Distributed Computing Challenges – Hadoop Overview – Hadoop Distributed File System – Processing Data with Hadoop – Managing Resources and Applications with Hadoop YARN – Interacting with Hadoop Ecosystem.

UNIT III

MongoDB Programming: MongoDB: MongoDB – Terms used in RDBMS and Mongo DB – Data Types – MongoDB Query Language.

UNIT IV

Map Reduce Programming Map Reduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression.

UNIT V

Hive and JasperReport using Jaspersoft: Introduction – Architecture – Data Types – File Formats – Hive Query Language Statements – RCFile – Implementation – User Defined Function. JasperReport using Jaspersoft: Introduction to JasperReports – Connecting to MangoDB NoSQL Database.

Course Outcomes

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

1. Explain the concepts of big data analysis
2. Identify the various big data management, processing techniques
3. Explain NoSQL big data management.
4. Analyze performance of big data analysis in Hadoop environment.
5. Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	3	3	2	3	1	2	2	3
CO2	3	2	2	3	1	3	3	2	1	2
CO3	2	2	3	2	3	2	2	3	1	3
CO4	3	1	2	3	2	3	1	2	2	3
CO5	2	3	2	2	3	2	3	3	2	2

1: LOW 2: MEDIUM 3: STRONG

Text Book

1. Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, Wiley Publications, Second Edition, 2022.

Reference Books

1. Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, “Big data for dummies”, John Wiley & Sons, Inc. (2013).
2. Tom White, “Hadoop The Definitive Guide”, O’Reilly Publications, Fourth Edition, 2015.
3. Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, “Hadoop for Dummies”, Wiley Publications, 2014.
4. Robert D.Schneider, “Hadoop for Dummies”, John Wiley & Sons, Inc. (2012).
5. Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill, 2012 Chuck Lam, “Hadoop in Action”, Dreamtech Publications, 2010.

Course	MCA	Subject Code:	Semester	IV
Major	Computer Applications	Discipline Specific Elective – IV : Cryptography and Network Security	Credit	3
			Hours	5

Course Objectives

1. To familiarize classical encryption techniques and advanced encryption standards
2. To explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
3. To recognize different encryption and decryption techniques to solve problems related to confidentiality and authentication
4. To develop the ability to use existing cryptographic utilities to build programs for secure communication.
5. To learn the need of digital signatures to secure the document with key management.

UNIT I

Overview: Computer Security Concepts – The OSI Security Architecture – Security Attacks – Security Services – Security Mechanisms – A Model for Network Security – Classical Encryption Techniques: Symmetric Cipher Model – Substitution Techniques – Transposition Techniques – Rotor Machines – Steganography.

UNIT II

Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure – The Data Encryption Standard – The DES Example – The Strength of DES – Block Cipher Design Principles – Basic Concepts in Number Theory and Finite Fields: Divisibility and the Division Algorithm – The Euclidean Algorithm – Modular Arithmetic – Groups, Rings, and Fields – Finite Fields of the Form $GF(p)$ – Polynomial Arithmetic.

UNIT III

Advanced Encryption Standard: Finite Field Arithmetic – AES Structure – AES Transformation Functions – AES Key Expansion – Block Cipher Operation: Multiple Encryption and Triple DES – Stream Ciphers – RC4 – Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems – The RSA Algorithm – Diffie-Hellman Key Exchange – Elgamal Cryptographic System – Elliptic Curve Arithmetic – Elliptic Curve Cryptography – Pseudorandom Number Generation Based on an Asymmetric Cipher.

UNIT IV

Cryptographic Hash Functions: Applications of Cryptographic Hash Functions – Two Simple Hash Functions – Requirements and Security – Hash Functions Based on Cipher Block Chaining – Secure Hash Algorithm (SHA) – SHA-3 – Message Authentication Codes: Requirements – Functions – Security of MACs – MACs Based on Hash Functions: HMAC – MACs based on Block Ciphers: DAA and CMAC – Authenticated Encryption: CCM and GCM – Key Wrapping.

UNIT V

Digital Signatures – Elgamal Digital Signature Scheme – Schnorr Digital Signature Scheme – NIST Digital Signature Algorithm – Elliptic Curve Digital Signature Algorithm – RSA-PSS Digital Signature Algorithm – Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption – Symmetric Key Distribution Using Asymmetric Encryption – Distribution of Public Keys – X.509 Certificates – Public-Key Infrastructure.

Course Outcomes

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

1. Comprehend and analyze the security concepts to apply and evaluate the encryption techniques in various models
2. Understand and examine the various data encryption standards and number theory. Illustrate and evaluate the various techniques in different applications
3. Grasp the knowledge of AES techniques and apply to evaluate the performance with different key types
4. Comprehend and analyse the basics of hash function and MAC that helps to develop the encryption models in various application
5. Understand and illustrate the need of digital signature to examine the method of providing good security to the document. And also learn the concept of key management.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	2	3	2	3	2	1	2	2
CO2	3	2	1	2	3	2	3	2	1	1
CO3	2	1	2	2	1	2	1	2	1	2
CO4	3	2	2	3	2	3	2	3	3	3
CO5	3	2	1	2	3	3	2	2	1	2

1: LOW 2: MEDIUM 3: STRONG

Text Books

1. William Stallings, "Cryptography and Network Security – Principles and Practices", Pearson Education / PHI, 7th Edition.
2. Behrouz A Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", McGraw Hill Education, 3rd Edition.

Reference Books

1. Bernard Menezes, "Network Security and Cryptography", Cengage, 1st Edition, 2010.
2. William Stallings, "Cryptography and Network Security", Pearson Education India, Sixth Edition, 2016.
3. V.K. Jain, "Cryptography and Network Security", Khanna Book Publishing, New Delhi, 2016.
4. C.K. Shyamala, N. Harini, Dr. T. R. Padmanabhan, "Cryptography and Security", Wiley India Pvt. Ltd., 2011.

Course	MCA	Subject Code:	Semester	IV
Major	Computer Applications	Discipline Specific Elective – IV : Optimization Techniques	Credit	3
			Hours	5

Course Objectives

1. To understand the concept of Linear optimization
2. To develop mathematical models of transportation and assignment Problems
3. To understand the Networking models
4. To study non-linear optimization models
5. To develop optimization algorithms based on Evolutionary concepts

UNIT I

Linear Programming Problem (LPP): Mathematical Formulation of Linear Programming Problem – Graphical Solution of LPP – canonical and standard forms of linear programming problem– Simplex method for solving LPP.

UNIT II

Transportation Model: North West corner Method, Least cost method, and Vogel's Approximation Method. Assignment Model: Hungarian assignment model – Travelling Sales Man Problem.

UNIT III

Project Scheduling PERT/CPM Networks – Fulkerson's Rule – Measure of Activity –PERT Computation – CPM Computation – Resource Scheduling.

UNIT IV

Simplex Method – Gradient of function – Steepest Descent method – Conjugate Gradient method.

UNIT V

Particle Swarm Optimization method – Ant Colony optimization algorithm – Fruit Fly method – Fire Fly method.

Course Outcomes

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

1. Develop Linear Programming models for industrial problems.
2. Formulation of Transportation and Assignment problems for real life problems.
3. Critical path estimation can be done for a project.
4. Non-Linear optimization models can be solved.
5. Evolutionary Optimization algorithms can be used to solve any optimization problems to overcome the issues in the traditional optimization models.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	2	2	1	3	2	2	2	1
CO2	2	2	2	2	2	2	2	2	2	2
CO3	2	3	3	2	1	2	3	3	2	1
CO4	2	3	2	3	2	2	3	2	3	3
CO5	3	2	1	2	3	1	2	1	2	3

1: LOW

2: MEDIUM

3: STRONG

Text Books

1. KantiSwarup, P. K. Gupta and Man Mohan, Operations Research, Sultan Chand and Sons, New Delhi, 2014. (Unit 1, 2, and 3)
2. S. S. Rao, Engineering Optimization: Theory and Practice, JOHN WILEY & SONS, INC., 2009. (Unit 4)
3. Bo Xing and Wen–Jing GAO, Innovative Computational Intelligence: A Rough Guide to Clever Algorithms, Springer, 2014. (Unit 5).

Reference Books

1. Hamdy A. Taha, Operations Research: An Introduction, Pearson, 2010.

Course	MCA	Subject Code:	Semester	IV
Major	Computer Applications	Skill Enhancement Course – I: General Aptitude	Credit	2
			Hours	2

Course Objectives

1. To develop fundamental arithmetic skills encompassing HCF, LCM, simplification and average calculations, along with square and cube roots.
2. To acquire advanced problem-solving abilities in scenarios related to ages, percentages, ratios and time and work.
3. To master financial concepts such as simple and compound interest calculations, while also gaining expertise in geometric measurements like area, volume and surface area.
4. To enhance logical reasoning skills through exercises in series completion, analogy, coding-decoding and understanding blood relations.
5. To strengthen abstract reasoning and logic by engaging with puzzle tests, direction sense tests, alpha-numeric sequence puzzles and various logical challenges.

UNIT I

HCF and LCM of Numbers – Simplification – Square and Cube Roots – Average.

UNIT II

Problems on Ages – Percentage – Ratio and Proportion – Time and Work.

UNIT III

Simple Interest – Compound Interest – Area – Volume and Surface Area.

UNIT IV

Series Completion – Analogy – Coding Decoding – Blood Relations.

UNIT V

Puzzle Test – Direction Sense Test – Alpha Numeric Sequence Puzzle – Logic.

Course Outcomes

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

1. Exhibit proficiency in foundational mathematical concepts including HCF, LCM, simplification, square and cube roots and average calculation.
2. Apply problem-solving strategies to quantitative scenarios involving ages, percentages, ratios and time and work.
3. Demonstrate practical application of mathematical principles in financial calculations, as well as geometric measurements such as area, volume and surface area.
4. Showcase logical and analytical reasoning skills by successfully solving problems related to series completion, analogy, coding-decoding and blood relations.
5. Illustrate adeptness in solving puzzles, direction sense tests, alpha-numeric sequence puzzles and logic-based challenges

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	3	3	2	3	1	2	2	3
CO2	3	2	2	3	1	3	3	2	1	2
CO3	2	2	3	2	3	2	2	3	1	3
CO4	3	1	2	3	2	3	1	2	2	3
CO5	2	3	2	2	3	2	3	3	2	2

1: LOW

2: MEDIUM

3: STRONG

Text Books

1. Dr. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations (Fully Solved), S. Chand Publications, 2017.
2. Dr. R. S. Aggarwal, Verbal and Non-Verbal Reasoning (Revised Edition), S. Chand Publications, 2015.

Reference Book

1. Sakthi's TNPSC CCS-II / II-A Supreme Guide, General Studies, 2020.

Course	MCA	Subject Code:	Semester	IV
Major	Computer Applications	Project	Credit	4
			Hours	12

**MANDATORY BRIDGE COURSE FOR NON-COMPUTER SCIENCE
STREAM STUDENTS**

Course	MCA	Subject Code:	Semester	I
Major	Computer Applications	Problem Solving Skills	Credit	3
			Hours	–

Course Objectives

1. To know the basic paradigm of Problem Solving.
2. To expertise the basic essentials for a computer program.
3. To solve recurrence using control structures.
4. To be acquainted with Functions and Modular Programming.
5. To increase the capable understanding on Arrays, Strings and Pointers.

UNIT I

Introduction to Programming and Problem Solving: Introduction to programming concepts – Problem-solving methodologies – Basics of algorithms and flowcharts – Introduction to C and C++ programming languages – Simple programs and their execution – Handling basic input/output operations.

UNIT II

Data Types, Variables, and Operators: Data types in C and C++ – Variables and constants – Operators and expressions – Type conversion and casting – Input validation and error handling.

UNIT III

Control Structures: Selection structures (if, else if, else) – Iteration structures (for loop, while loop, do-while loop) – Switch case statements – Nested loops and conditional statements – Writing structured and readable code.

UNIT IV

Functions and Modular Programming: Introduction to functions – Function prototypes and definitions – Passing arguments to functions – Return types and values – Recursive functions – Modular programming concepts.

UNIT V

Arrays, Strings, and Pointers: Arrays and multidimensional arrays – String manipulation in C and C++ – Pointers and their applications – Dynamic memory allocation and deallocation – Pointer arithmetic and array-pointer relationships.

Course Outcomes

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

1. Understand the fundamental concepts of computers, algorithms, flowcharts and problem solving techniques.
2. Exhibit proficiency in foundational programming concepts including data types, variables and operators.
3. Apply problem-solving strategies to control structures involving selection structures, iteration structures and switch case statements.
4. Demonstrate practical application of functions and modular programming.
5. Illustrate adeptness in arrays, strings and pointers.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	3	3	2	3	1	2	2	3
CO2	3	2	2	3	1	3	3	2	1	2
CO3	2	2	3	2	3	2	2	3	1	3
CO4	3	1	2	3	2	3	1	2	2	3
CO5	2	3	2	2	3	2	3	3	2	2

1: LOW

2: MEDIUM

3: STRONG

Text Books

1. "C Programming Absolute Beginner's Guide" by Greg Perry and Dean Miller
2. "C++ Primer" by Stanley B. Lippman, Josée Lajoie, and Barbara E. Moo
3. "Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein

Reference Books

1. "C Programming: A Modern Approach" by K.N. King
2. "Accelerated C++: Practical Programming by Example" by Andrew Koenig and Barbara E. Moo
3. "Understanding Pointers in C" by Yashavant Kanetkar.

Course	MCA	Subject Code:	Semester	I
Major	Computer Applications	Problem Solving Skills Lab	Credit	2
			Hours	—

Course Objectives

1. To know the basic paradigm of Problem Solving.
2. To expertise the basic essentials for a computer program.
3. To solve recurrence using control structures.
4. To be acquainted with Functions and Modular Programming.
5. To increase the capable understanding on Arrays, Strings and Pointers.

Introduction to Programming and Problem Solving

1. Write a C program to print "Hello, World!" to the console.
2. Create a program to calculate the area of a rectangle given its length and width.
3. Write a C++ program to find the sum and average of three numbers.
4. Implement a program to convert temperature from Celsius to Fahrenheit and vice versa.
5. Develop a program to calculate the factorial of a given number.
6. Create a simple calculator program that performs addition, subtraction, multiplication, and division.

Data Types, Variables, and Operators

1. Write a program to swap two numbers without using a temporary variable.
2. Develop a program to find the roots of a quadratic equation.
3. Implement a program to calculate the area of a circle using predefined values for π .
4. Create a program to check whether a given number is even or odd.
5. Write a C++ program to calculate the area of a triangle using Heron's formula.
6. Develop a program to convert a decimal number to binary and vice versa.

Control Structures

1. Write a program to check whether a given year is a leap year or not.
2. Implement a program to find the largest among three numbers using nested if-else statements.
3. Create a program to print the Fibonacci series up to a specified limit.
4. Develop a program to find the factorial of a number using recursion.
5. Write a C++ program to display the multiplication table of a given number.
6. Implement a program to find the sum of digits of a number using a while loop.

Functions and Modular Programming

1. Write a program to find the maximum and minimum of two numbers using functions.
2. Implement a program to calculate the power of a number using a recursive function.
3. Create a program to check whether a given number is prime or not using a function.
4. Develop a program to calculate the area of different geometric shapes (circle, rectangle, triangle) using separate functions.
5. Write a C++ program to find the GCD (Greatest Common Divisor) of two numbers using Euclid's algorithm.
6. Implement a program to reverse a given number using a user-defined function.

Arrays, Strings, and Pointers

1. Write a program to find the sum of elements in an array.
2. Create a program to find the largest element in an array.
3. Implement a program to sort an array of integers in ascending order.
4. Develop a program to concatenate two strings without using library functions.
5. Write a C++ program to count the number of vowels and consonants in a given string.
6. Implement a program to find the length of a string using pointers.

Course Outcomes

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

1. Apply and practice logical ability to solve the problems.
2. Apply the basic knowledge of data types, variables and operators.
3. Apply control structures techniques such as selection structures, iteration structures and switch case statements to develop algorithms.
4. Understand and apply the in-built functions and customized functions for solving the problems.
5. Understand and apply the arrays, strings and pointers for dealing with variety of problems.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	1	1	1	3	2	1	1	1
CO2	2	2	1	1	1	2	2	1	1	1
CO3	1	2	3	3	3	1	2	3	3	3
CO4	1	1	3	3	3	1	1	3	3	3
CO5	1	2	3	3	3	1	2	3	3	3

1: LOW

2: MEDIUM

3: STRONG

Text Books

1. "C Programming Absolute Beginner's Guide" by Greg Perry and Dean Miller
2. "C++ Primer" by Stanley B. Lippmann, Josée Lajoie, and Barbara E. Moo
3. "Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein

Reference Books

1. "C Programming: A Modern Approach" by K.N. King
2. "Accelerated C++: Practical Programming by Example" by Andrew Koenig and Barbara E. Moo
3. "Understanding Pointers in C" by Yashavant Kanetkar.

Course	MCA	Subject Code:	Semester	II
Major	Computer Applications	Multi-Operating Systems	Credit	3
			Hours	–

Course Objectives

1. To be familiar with the basic proposition of Operating System.
2. To expertise the vital rudiments of Desktop Operating System.
3. To be proverbial on Network Operating System.
4. To be acquainted with the functions of Mobile Operating System.
5. To increase the indulgent on Cloud & IoT Operating System.

UNIT I

Introduction to Operating Systems: Overview of operating system concepts – History and evolution of operating systems – Types of operating systems: Batch processing, Multiprogramming, Time-sharing, Distributed, Real-time – Introduction to system calls and APIs.

UNIT II

Desktop Operating Systems: Introduction to desktop operating systems (Windows, macOS, Linux) – Installation and configuration of desktop operating systems – File system management and permissions – User account management – System maintenance and troubleshooting.

UNIT III

Network Operating Systems: Introduction to network operating systems (Windows Server, Linux Server) – Network services and protocols – Domain Name System (DNS) configuration – Active Directory and LDAP integration – Network security and access control.

UNIT IV

Mobile Operating Systems: Overview of mobile operating systems (Android, iOS) – Mobile application development frameworks – Device management and security – Mobile application deployment strategies – Emerging trends in mobile computing.

UNIT V

Cloud and IoT Operating Systems: Introduction to cloud computing and virtualization – Cloud service models: IaaS, PaaS, SaaS – IoT operating systems and platforms – IoT protocols and communication standards – Security and privacy considerations in cloud and IoT environments.

Course Outcomes

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

1. Exhibit proficiency in foundational mathematical concepts including HCF, LCM, simplification, square and cube roots and average calculation.
2. Apply problem-solving strategies to quantitative scenarios involving ages, percentages, ratios and time and work.
3. Demonstrate practical application of mathematical principles in financial calculations, as well as geometric measurements such as area, volume and surface area.
4. Showcase logical and analytical reasoning skills by successfully solving problems related

- to series completion, analogy, coding–decoding and blood relations.
5. Illustrate adeptness in solving puzzles, direction sense tests, alpha–numeric sequence puzzles and logic–based challenges

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	3	2	2	2	2	3	2	2	2	1
CO2	2	2	2	2	3	2	2	2	2	2
CO3	2	3	3	2	2	2	2	3	2	3
CO4	2	2	2	3	1	2	3	2	3	2
CO5	1	3	2	1	3	1	2	1	2	3

1: LOW 2: MEDIUM 3: STRONG

Text Books

1. "Operating System Concepts" by Abraham Silberschatz, Peter B. Galvin, Greg Gagne.
2. "A Practical Guide to Ubuntu Linux" by Mark G. Sobell.
3. "Windows Server Administration Fundamentals" by Microsoft Official Academic Course.
4. "Android Programming: The Big Nerd Ranch Guide" by Bill Phillips, Chris Stewart, Kristin Marsicano.
5. "Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl, Ricardo Puttini, Zaigham Mahmood.

Course	MCA	Subject Code:	Semester	II
Major	Computer Applications	Computer Networks	Credit	2
			Hours	–

Course Objectives

1. Acquire knowledge of networks, including data flow, connection types, topologies and OSI model layers to enable students to design and implement network systems.
2. Equip students with knowledge of physical layer concepts, guided media types and switching techniques
3. Expertise students' in error detection and correction techniques and data link layer protocols.
4. Acquire in-depth knowledge of connecting devices such as hubs, repeater, bridges and routers as well as routing algorithms used in the network layer of computer networks.
5. Learn about transport layer and TCP/IP protocol suite as well as application layer protocols.

UNIT I

Networks: Data flow – Types of Connection – Topologies of Networks – Categories of Networks – The Open System Interconnection (OSI) Model: Layers in the OSI Model

UNIT II

Physical Layer: Multiplexing – Frequency Division – Wave Division – Time Division. Guided Media: Twisted Pair – Coaxial Cable – Fiber Optic Cable – Switching.

UNIT III

Data Link Layer: Redundancy Check: Vertical – Longitudinal – Cyclic – Checksum – Error Correction. Error Correction. Data Link Protocols: Asynchronous and Synchronous Protocols – Character and Bit Oriented Protocols.

UNIT IV

Network Layer: Connecting Devices – Passive Hubs – Repeaters – Active Hubs – Bridges – Routers – Gateways. Routing Algorithms: Distance Vector – Link State.

UNIT V

Transport Layer: Process to Process Delivery – TCP/IP Protocol Suite. Application Layer: Domain Name System – File Transfer Protocol – Hypertext Transfer Protocol.

Course Outcomes

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

1. Understand the foundational concept of networking, including data flow, connection types, topologies and network categories.
2. Learn the OSI model and its layers, including physical, data link, network, transport, session presentation and application layers.
3. Apply the basic knowledge of multiplexing, guided media and switching in the physical layer of networking.
4. Describe the error detection and correction techniques, protocols and various network layer devices.
5. Acquire knowledge of process-to-process delivery in the transport layer and various protocols in application layer.

Mapping with POs and PSOs

	POs					PSOs				
	1	2	3	4	5	1	2	3	4	5
CO1	2	2	1	3	2	3	1	2	2	3
CO2	3	2	2	3	3	2	3	2	2	2
CO3	3	2	1	2	2	3	2	3	3	2
CO4	2	1	2	3	3	2	1	3	3	1
CO5	2	3	2	2	2	2	3	1	2	3

1: LOW

2: MEDIUM

3: STRONG

Text Book

1. Behrouz A. Forouzan, Data Communications and Networking, Tata McGraw–Hill, Fourth Edition, 2017.

Reference Book

1. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, PHI, Fifth Edition, 2019.