Ethical responsibilities of Business Professionals – Business, technology. Computer crime – Hacking, cyber theft, unauthorized use at work. Piracy – software and intellectual property. Privacy – Issues and the Internet Privacy. Challenges – working condition, individuals. Health and Social Issues, Ergonomics and cyber terrorism.	

Text Book:

Management Information Systems", W. S. Jawadekar, Tata McGraw Hill Edition, 6/e

Reference Books:

1. "Management Information Systems", Kenneth J Laudon, Jane P. Laudon, Pearson/PHI,10/e
2. Introduction to Information System", James A. O' Brien, Tata McGraw Hill, 12th Edtion.

COURSE OUTCOMES (CO):

CO1: Relate the basic concepts and technologies used in the field of management information systems;

CO2: Compare the processes of developing and implementing information systems.

CO3: Outline the role of the ethical, social, and security issues of information systems.

CO4: Translate the role of information systems in organizations, the strategic management processes, with the implications for the management

LEVEL OF CO-PO MAPPING TABLE

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	2	1	2	1	1	2	1	1	2	2
2	2	3	3	2	2	2	-	2	1	2	2	2
3	1	2	1	2	1	1	1	3	1	2	2	3
4	2	3	2	3	2	2	2	2	1	2	2	2

COURSE TITLE: Artificial Intelligence

Course Code: MCA24108DCE						Examination Scheme	T	P
Total number of Lecture Hours: 56 Total number of Practical Hours: -						External	80	-
						Internal	20	-
Lecture(L):	4	Practical (P):	-	Tutorial(T):	-	Total Credits	4	

Course Objective:

- To develop a solid understanding of the basic principles and history of artificial intelligence.
- Learn how to represent and organize knowledge for intelligent systems.
- Understand and apply reasoning methods for decision-making and problem-solving.
- To implement and apply algorithms to solve complex problems.

Course Content	TEACHING HOURS
UNIT 1: Introduction to Artificial Intelligence	**-14 Hrs**
Definition and history of artificial intelligence. AI applications and scope. Logic-based representation (Propositional logic, First-order logic), Knowledge-based systems and expert systems. Forward chaining, backward chaining. Agents: Intelligent agents, Agents and Environment, Structure of Agents Knowledge.	
UNIT 2: Fuzzy Logic	**- 14 Hrs**
Fuzzy logic and uncertainty. Fuzzification. Linguistic terms. Fuzzy sets. Hedges. Reasoning in Fuzzy Logic. Fuzzy set operations. Fuzzy vector matrix multiplication. Fuzzy Max-Min inferencing. FuzzyMax-Product inferencing. Multiple premise fuzzy inferencing. Mamdani Inference. Fuzzy multiple rule aggregation. Defuzzification. Applications of fuzzy logic.	
UNIT 3: Inductive Learning Algorithms	**-14 Hrs**
Inductive learning algorithms. Categories of inductive learning algorithms. Rule extraction with inductive learning algorithms, Decision trees, ID3 algorithm. AQ algorithm, SAFARI algorithm Applications of Inductive Learning Machine Learning: Supervised, Unsupervised and Reinforcement Learning.	
UNIT 4: Search Algorithms	**-14 Hrs**
Search Algorithms – Uninformed search strategies, Informed search strategies, Hill Climbing, Constraint satisfaction problems, Optimization techniques: Genetic algorithms, Simulated annealing, Ant colony optimization, Swarm Particle optimization	

Textbooks

1. "Artificial Intelligence: A Guide to Intelligent Systems" by Michael Negnevitsky, Latest Edition, 2020.
2. "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig, 4th Edition, 2020.
3. "Artificial Intelligence: A Guide for Thinking Humans" by Melanie Mitchell, Latest Edition, 2019

Reference Books

1. "Artificial Intelligence" by Elaine Rich, Kevin Knight, and Shivashankar B. Nair, 4th Edition, 2021.
2. "Artificial Intelligence: Foundations of Computational Agents" by Michael Wooldridge, Ist Edition, 2021.
3. "Nature-Inspired Optimization Algorithms" by Saeid Aziznejad, Gholamreza Z. Naderpour, and Mohammad A. H. Sadeghi, Ist Edition, 2019.

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COURSE OUTCOMES(CO):

CO1: Identify and discuss various applications of AI across different domains and their impacts.
CO2: Develop and implement knowledge-based systems and expert systems for decision-making and problem-solving.
CO3: Utilize constraint satisfaction problems and optimization techniques to tackle complex issues.
CO4: Implement and evaluate informed and uninformed search algorithms to solve problem-solving tasks.

LEVEL OF CO-PO MAPPING TABLE

	POs											
COs	1	2	3	4	5	6	7	8	9	10	11	12
1	1	3	1	2	1	2	1	1	-	1	-	1
2	3	2	3	2	1	3	2	2	-	2	1	1
3	2	2	2	3	3	1	2	1	-	1	2	1
4	2	2	1	2	2	1	1	1	-	2	3	1

COURSE TITLE: Software Engineering								
Course Code: MCA24107CR						Examination Scheme	T	P
Total number of Lecture Hours: 56 Total number of Practical Hours: -						External	80	-
						Internal	20	-
Lecture (L):	4	Practical (P):	-	Tutorial (T):	-	Total Credits		4

Course Objectives

- **Understand Software Engineering Fundamentals**: Gain knowledge of the nature, goals, and challenges of software engineering and its historical context.
- **Apply Software Development Processes**: Learn and utilize various software development models, including Waterfall, Agile, and Spiral.
- **Measure Software Processes and Projects**: Analyze software processes using measures, metrics, and models like CMMI and COCOMO.
- **Master Requirements Engineering**: Develop skills in eliciting, analyzing, modeling, and validating both functional and non-functional requirements.
- **Design Engineering Proficiency**: Understand design principles, modularity, and patterns, and apply function-oriented and object-oriented design methodologies.
- **Achieve Competence in Software Testing and Reliability**: Understand core testing concepts and techniques, and explore software reliability and reengineering processes.

Course Content	TEACHING HOURS
UNIT 1: Fundamentals of Software Engineering	**14 Hrs**
Concept and Nature of Software: Concept and Nature of Software, Software Crisis, Software Engineering – Concept, Goals and Challenges, Software Engineering Approach. Software Development Process, Process Models - Waterfall Model, Evolutionary and Throwaway Prototyping Model, Incremental and Iterative Models, Spiral Model, Agile Process Model, Component based and Aspect Oriented development Software Process and Project Measurement: Measures, Metrics and Indicators, Size -Oriented Metrics vs. Function - Oriented Metrics, Capability Maturity Model Integration (CMMI). COCOMO Model.	
UNIT 2: Requirements Engineering	**14 Hrs**
Introduction to Requirements Engineering - Why, What and Where. Requirements Types: functional and nonfunctional requirements. Requirement Engineering Framework. Requirement Elicitation Process and Techniques. Requirement Analysis and Modelling, Requirements prioritization, verification, and validation.	
UNIT 3: Design Engineering	**14 Hrs**
Basics of Design Engineering - Abstraction, Architecture, Patterns, Separation of concerns, Modularity, Functional Independence, refinement, Refactoring. Function oriented design, Design principles, Coupling and Cohesion, Design Notations & Specifications, Structured Design Methodology. Object-Oriented Design - Design Concepts, Design Methodology, Object-oriented analysis and design modeling using Unified Modeling Language (UML), Dynamic & Functional Modeling, Design Verification.	

UNIT 4: Software Testing and Reliability	14 Hrs
Software Testing – Concepts, Terminology, Testing & Debugging, Adequacy Criteria, Static vs. Dynamic Testing, Black Box vs. White Box Testing. Structural testing and its techniques. Functional Testing and its techniques, Mutation testing, Random Testing. Non-Functional Testing like Reliability, Usability, Performance and Security Testing. Introduction to Software Reliability: Basic Concepts, Correctness Vs Reliability, Software Reliability metrics, Operational Profile, Reliability Estimation and Predication, Reliability and Testing. Concept of Software reengineering, reverse engineering and change management.	

Textbooks

1. Shari Lawrence Pfleeger and Joanne M. Atlee - "Software Engineering: Theory and Practice," 4th Edition, Pearson, 2010.

Reference Books

1. Ian Sommerville - "Software Engineering," 10th Edition, Pearson, 2015.
2. Pankaj Jalote - "An Integrated Approach to Software Engineering," 3rd Edition, Narosa Publishing House, 2005.
3. Hans Van Vliet - "Software Engineering: Principles and Practice," 4th Edition, Wiley, 2016.
4. James F. Peters - "Software Engineering: An Engineering Approach," 1st Edition, Wiley & Sons, 2000.
5. Roger Pressman - "Software Engineering: A Practitioner's Approach," 8th Edition, McGraw-Hill Publications, 2014.

COURSE OUTCOMES (CO):

CO1: Students will explain the nature of software, the software crisis, and the goals and challenges of software engineering.
CO2: Students will implement appropriate software development models such as Waterfall, Agile, and Spiral based on project needs.
CO3: Students will assess software processes using metrics and models like CMMI and COCOMO.
CO4: Students will perform requirement elicitation, analysis, modeling, prioritization, verification, and validation.
CO5: Students will apply design principles and object-oriented design methodologies using UML.
CO6: Students will execute various testing techniques and evaluate non-functional requirements like reliability and performance.

LEVEL OF CO-PO MAPPING TABLE

	POs											
COs	1	2	3	4	5	6	7	8	9	10	11	12
1	2	2	1	1	1	3	2	3	2	2	1	2
2	2	3	2	2	3	2	2	1	2	2	2	1
3	2	2	1	3	2	1	1	1	1	1	3	1
4	1	3	2	3	2	1	1	1	3	3	2	1
5	2	2	3	2	3	2	3	2	2	2	2	2
6	1	2	2	2	2	1	1	1	1	1	1	3

COURSE TITLE: Block Chain Technologies								
Course Code: MCA24109DCE						Examination Scheme	T	P
Total number of Lecture Hours: 56 Total number of Practical Hours: -						External	80	-
						Internal	20	-
Lecture (L):	4	Practical (P):	-	Tutorial (T):	-	Total Credits	4	

Course Objectives:

- Develop a deep understanding of the fundamental principles of blockchain technology, including distributed ledger technology (DLT), cryptographic methods, and consensus mechanisms, and apply this knowledge to evaluate different blockchain architectures.
- Analyze and compare various consensus algorithms such as Proof of Work (PoW), Proof of Stake (PoS), and other emerging methods, understanding their impact on blockchain security, efficiency, and scalability.
- Demonstrate proficiency in blockchain development, including the creation and deployment of smart contracts using Solidity and other blockchain programming languages, and the development of decentralized applications (DApps) on platforms like Ethereum and Hyperledger.
- Assess the security challenges associated with blockchain and cryptocurrencies, including potential threats, vulnerabilities, and the implementation of secure coding practices to mitigate risks in blockchain applications.
- Investigate advanced applications of blockchain technology in fields such as IoT, AI, and healthcare, and evaluate the potential of blockchain to solve real-world problems in these domains.
- Critically analyze the future trends and emerging technologies in the blockchain ecosystem, such as quantum-resistant blockchains, decentralized identity solutions, and cross-chain interoperability, to understand their potential impact on industry and society.

Course Content	TEACHING HOURS
Unit 1: Introduction to Blockchain Technology	**14 Hrs**
Introduction to Blockchain - Definition, History, and Evolution. Basic Concepts - Distributed Ledger Technology (DLT), Cryptography, and Consensus Mechanisms. Types of Blockchains - Public, Private, Consortium, and Hybrid Block chains. Blockchain Structure - Blocks, Chains, Nodes, and Transactions. Cryptographic Foundations - Hash Functions, Digital Signatures, Public and Private Keys. Consensus Algorithms - Proof of Work (PoW), Proof of Stake (PoS), Delegated PoS. Smart Contracts - Definition, Creation, Execution, and Security Issues. Overview of Major Blockchain Platforms - Bitcoin, Ethereum, Hyperledger .	
Unit 2: Blockchain and Cryptocurrencies	**14 Hrs**
Blockchain Networks - Nodes, Peer-to-Peer Networks, and Distributed Consensus. Security in Blockchain - Threats, Attacks, and Countermeasures. Blockchain Use Cases - Financial Services, Supply Chain, Healthcare. Introduction to Cryptocurrencies - Bitcoin and Altcoins. Bitcoin Architecture - Blockchain, Mining, Wallets, and Transactions. Ethereum and Smart Contracts - Solidity, DApps, and Gas. Cryptocurrency Wallets - Types, Security, and Key Management.	
Unit 3: Blockchain Development and Implementation	**14 Hrs**
Introduction to Blockchain Development - Tools, Platforms, and IDEs. Blockchain Development Languages - Solidity, Vyper, Go, and JavaScript. Building Smart Contracts - Basics, Writing, and Deploying. Developing DApps - Frontend, Backend, and Smart Contract Integration. Ethereum Development Environment - Truffle, Ganache, Remix. Hyperledger Fabric - Architecture, Components, and	

Development. Testing Blockchain Applications - Unit Tests, Integration Tests .	
Unit 4: Advanced Topics and Future Directions in Blockchain	**14 Hrs**
Blockchain in IoT - Use Cases, Challenges, and Solutions. Blockchain and Big Data - Integration, Analytics, and Use Cases. Blockchain in AI - Synergies, Applications, and Challenges. Blockchain and Cloud Computing - Decentralized Cloud Solutions. Green and Sustainable Blockchain Technologies. Quantum Computing and its Impact on Blockchain . Future Directions - Web 3.0, Decentralized Identity, and Tokenization of Assets.	

Textbooks:

1. "Blockchain Technology: Concepts and Applications" by Kumar Saurabh and Ashutosh Saxena, McGraw-Hill Education (2020).
2. "Cryptocurrency and Blockchain Technology" by Shaik Nasrullah and M. Balamurugan, Pearson (2021).
3. "Blockchain and Cryptocurrency" by B. B. Gupta and Hemraj Saini, PHI Learning (2020).

Reference Books:

1. "Cryptography and Blockchain Technology" by Atul Kahate, McGraw-Hill Education (2018).
2. "Blockchain: Principles and Applications" by Umesh Kumar Singh and Kavita Rani, Pearson (2020).
3. "Blockchain Technology and Applications" by M. S. Kiruthika and B. Prabu, PHI Learning (2021).

COURSE OUTCOMES (CO):

CO1: Students will be able to explain the core concepts of blockchain technology, including distributed ledgers, cryptographic principles, and consensus mechanisms, and demonstrate their application in real-world blockchain architectures.

CO2: Students will be capable of comparing and contrasting various blockchain consensus algorithms, assessing their impact on security, performance, and scalability, and determining the appropriate algorithm for specific use cases.

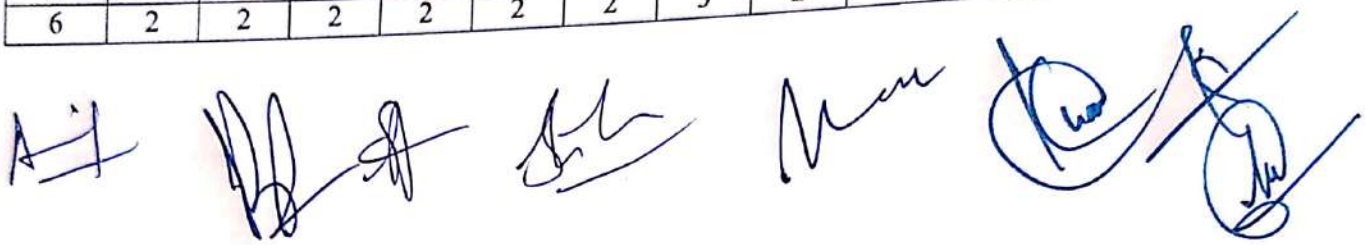
CO3: Students will acquire practical skills in blockchain development, including writing, testing, and deploying smart contracts using platforms like Ethereum and Hyperledger, and integrating these contracts into decentralized applications (DApps).

CO4: Students will be able to identify and analyze security threats and vulnerabilities in blockchain systems and cryptocurrencies, and implement secure coding practices and strategies to protect blockchain-based applications.

CO5: Students will critically evaluate the potential of blockchain technology in advanced applications, such as IoT, AI, & healthcare, and propose innovative solutions using blockchain to address challenges in these areas.

CO6: Students will demonstrate an understanding of emerging trends in the blockchain ecosystem, such as quantum-resistant blockchains, decentralized identity solutions, and cross-chain interoperability, and predict their potential impact on the future of the technology and its applications.

LEVEL OF CO-PO MAPPING TABLE												
	POs											
COs	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	2	1	1	2	2	1	1	-	-	3
2	3	3	2	3	2	2	1	1	1	-	-	3
3	2	3	3	2	3	2	2	1	2	2	2	2
4	2	2	2	3	2	3	2	2	1	1	1	3
5	2	2	3	2	2	3	3	2	2	-	-	3
6	2	2	2	2	2	2	3	2	1	-	-	3



COURSE TITLE: Computer Architecture & ALP

Course Code: MCA24110DCE	Examination Scheme	T	P
Total number of Lecture Hours: 56 Total number of Practical Hours: -	External	80	-
	Internal	20	-

Lecture (L):	4	Practical (P):	-	Tutorial (T):	-	Total Credits	4

Course Objectives

- Describe the architecture of 8086 microprocessor
- Differentiate between various addressing modes of 8086 microprocessor
- Illustrate the instruction format of 8086 microprocessor
- Explain various types of instructions available in 8086 microprocessor
- Use emu8086 to write basic 8086 assembly programs
- Develop advanced 8086 assembly programs using procedures and INT 21H services

Course Content	TEACHING HOURS
UNIT 1: 8086 Architecture	**14 Hrs**
Basic features of 8086 Microprocessor, 8086 Microprocessor Architecture (BIU, EU, Instruction Queue). 8086 Programming model (General Purpose Registers, Segment Registers, Pointer & Index Registers, Flag & Other Registers). Segmentation in 8086. 8086 Pin-out diagram, 8086 Operating modes (Minimum and Maximum Mode), 8086 Addressing modes.	
UNIT 2: Instruction Set	**14 Hrs**
8086 Instruction Format 8086 Instruction Set, Data-transfer Instructions, Arithmetic Instructions, Logical/Bit-manipulation Instructions. Branching instructions, Looping instructions. Shift instructions, Rotate instructions, String instructions, Processor control instructions.	
UNIT 3: Assembly language	**14Hrs**
Introduction, Instruction Statement and Assembler Directives, TASM using emu8086. Data Definition Directives, Named Constant Directives, Simplified Segment Directives. TASM Memory Models Writing basic assembly programs in emu8086	
UNIT 4: Advanced assembly concepts	**14 Hrs**
Stack: Defining a stack, PUSH and POP instructions. Procedures: Defining and Calling a procedure. CALL and RET instructions. Passing parameters to procedures (via registers and Stack). Macros and other Assembler directives. INT 21H Keyboard Services, INT 21H Display Services, INT 21H File Services. Writing advanced assembly programs using procedures and INT 21H.	

Textbooks:

M.T. Savalia. 8086 Programming and Advanced Processor Architecture. Wiley India, 2012

Reference Books:

1. T.P. Skinner. An Introduction to 8086/8088 Assembly Language Programming. John Wiley. 1985
2. W. A. Triebel, A. Singh. The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, And Applications. Pearson Education, 2007.
3. B. B. Brey, The Intel Microprocessors: Architecture, Programming and Interfacing, Merrill, 2nd Edition, 1991.

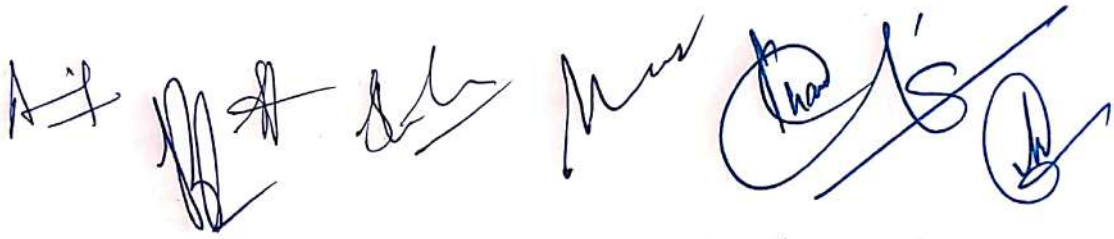
COURSE OUTCOMES (CO):

CO1: Students will be able to describe the architecture of 8086 microprocessor
CO2: Students will be able to differentiate between various addressing modes of 8086 microprocessor
CO3: Students will be able to illustrate the instruction format of 8086 microprocessor
CO4: Students will be able to explain various types of instructions available in 8086 microprocessor
CO5: Students will be able to use emu8086 to write basic 8086 assembly programs
CO6: Students will be able to develop advanced 8086 assembly programs using procedures and INT 21H services

LEVEL OF CO-PO MAPPING TABLE

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	-	-	-	-	-	2	-	-	-	-	-
2	3	-	-	-	-	-	2	-	-	-	-	-
3	3	-	2	-	-	-	2	-	-	-	-	-
4	3	-	2	-	-	-	2	-	-	-	-	-
5	2	2	3	2	3	2	2	-	3	2	2	2
6	2	2	3	2	3	2	2	-	3	2	2	2

OE/GE



To be effective from year-2024

COURSE TITLE: Digital and Technological Solutions							
Course Code: MCA24001OE					Examination Scheme	T	P
Total number of Lecture Hours:28 Total number of Practical Hours:-					External	40	-
					Internal	10	-
Lecture (L):	2	Practicals(P):	-	Tutorial (T):	Total Credits	2	

Course Objectives

- To gain familiarity with digital paradigms;
- To sensitize about role & significance of digital technology;
- To provide know how of communications & networks;
- To bring awareness about the e-governance and Digital India initiatives;
- To provide a flavor of emerging technologies - Cloud, Big Data, AI, 3D printing.

Course Content	TEACHING HOURS
UNIT 1: Digital Systems: Evolution, Applications, and Core Concepts	**-14 Hrs**
Introduction & Evolution of Digital Systems. Role & Significance of Digital Technology. Information & Communication Technology & Tools. Computer System & its working, Software and its types. Operating Systems: Types and Functions. Problem Solving: Algorithms and Flowcharts. Communication Systems: Principles, Model & Transmission Media. Computer Networks & Internet: Concepts & Applications, WWW, Web Browsers, Search Engines, Messaging, Email, Social Networking. Computer Based Information System: Significance & Types. E-commerce & Digital Marketing: Basic Concepts, Benefits & Challenges.	
UNIT 2: Digital Empowerment: e-Governance, Financial Tools, Cybersecurity, and Emerging Technologies	**- 14 Hrs**
Digital India & e-Governance: Initiatives, Infrastructure, Services and Empowerment. Digital Financial Tools: Unified Payment Interface, Aadhar Enabled Payment System, USSD, Credit / Debit Cards, e-Wallets, Internet Banking, NEFT/RTGS and IMPS, Online Bill Payments and PoS. Cyber Security: Threats, Significance, Challenges, Precautions, Safety Measures, & Tools, legal and ethical perspectives. Emerging Technologies & their applications: Overview of Cloud Computing, Big Data, Internet of Things, Virtual Reality, Blockchain & Cryptocurrency, Robotics, Machine Learning & Artificial Intelligence, 3-D Printing. Digital Signatures.	

Textbooks

1. F Masoodi, Digital and Technological Solutions, Ist Edition, BPB, 2024

COURSE OUTCOMES (CO):

CO1: Knowledge about digital paradigm;
CO2: Realization of importance of digital technology, digital financial tools, e-commerce;
CO3: Know-how of communication and networks;
CO4: Familiarity with the e-governance and Digital India initiatives;
CO5: An understanding of use & applications of digital technology;
CO6: Basic knowledge of machine learning and big data.

LEVEL OF CO-PO MAPPING TABLE

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	3	3	3	2	2	1	-	2	-	-
2	1	2	2	2	-	2	1	1	-	-	-	-
3	1	2	2	2	1	1	1	1	-	1	-	2
4	2	2	1	1	1	0	1	1	-	1	1	1

COURSE TITLE: Data Processing using Spreadsheets

Course Code: MCA24001GE	Examination Scheme	T	P
Total number of Lecture Hours: 28	External	40	-
Total number of Practical Hours: -	Internal	10	-

Lecture (L):	2	Practical (P):	-	Tutorial (T):	Total Credits	2

Course Objectives

- Proficiency in Spreadsheet Software: Understanding data management and organization in Excel.
- Advanced Data Analysis: Perform complex analyses with advanced formulas, functions, and PivotTables.
- Data Visualization and Automation: Create customized charts and automate tasks using macros.

Course Content	TEACHING HOURS
UNIT 1: Data Collection, Cleaning, and Transformation Using Spreadsheets	**14Hrs**
Introduction to Spreadsheets for Data Processing: Overview of spreadsheet software (e.g., Microsoft Excel, Google Sheets) for data handling. **Data Entry and Validation:** Accurate data entry techniques, using data validation tools to prevent errors. **Data Cleaning Techniques:** Using spreadsheet functions to identify and correct errors, handle missing data, and ensure consistency (e.g., TRIM, CLEAN, and FIND/REPLACE). **Data Transformation:** Sorting, filtering, and grouping data; applying formulas to transform raw data into useful formats (e.g., CONCATENATE, TEXT functions). **Data Integration:** Combining data from multiple sheets or sources using functions like VLOOKUP, HLOOKUP, and INDEX-MATCH.	
UNIT 2: Data Analysis, Visualization, and Reporting Using Spreadsheets	**14Hrs**
Descriptive Statistics in Spreadsheets: Using built-in functions for calculating mean, median, mode, variance, and standard deviation. **Exploratory Data Analysis (EDA):** Creating PivotTables and using conditional formatting to identify patterns, trends, and anomalies in data. **Data Visualization:** Creating charts and graphs (e.g., bar, line, pie, scatter) to visually represent data; using dynamic charts for interactive visualization **Creating Reports:** Compiling data insights into comprehensive reports with charts, tables, and narrative text using spreadsheets. **Advanced Spreadsheet Tools:** Introduction to automation using macros, collaborative features, and sharing options within spreadsheet applications.	

Textbooks

1. "Excel 2021 Bible" by Michael Alexander, Richard Kusleika, and John Walkenbach, Wiley, 1st edition (2021).
2. "Data Analytics Using Excel" by Seema Acharya and Subhashini Chellappan, McGraw Hill Education, 1st edition (2021).
3. Excel Data Analysis for Dummies" by Ankur Sharma, Wiley India, 1st edition (2022).
4. "Learn Excel 2019 Essentials" by Ritu Arora; BPB Publications, 1st Edition, 2019.

Reference Books

1. Microsoft Excel 2021 Data Analysis and Business Modeling" by Wayne Winston, Microsoft Press, 1st edition (2022). ISBN: 9780137613663
2. Advanced Excel 2019" by Lokesh Lalwani; BPB Publications, 1st Edition, 2019.

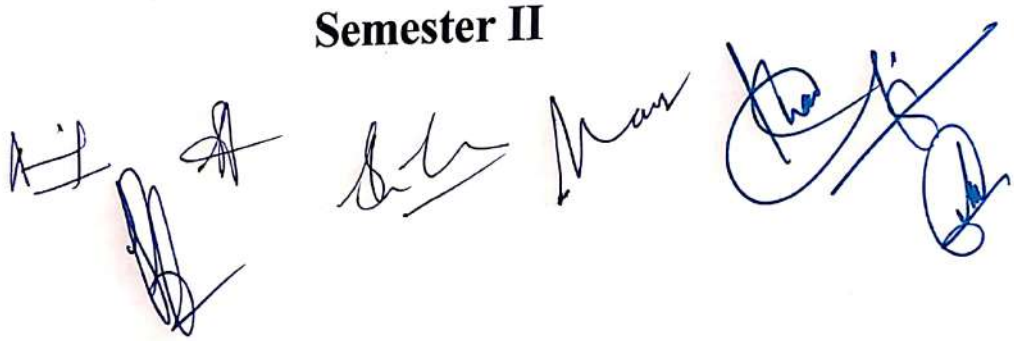
COURSE OUTCOMES (CO):

CO1: Efficiently organize and manage data within spreadsheets.
CO2: Utilize complex formulas, functions, and PivotTables for in-depth data analysis.
CO3: Create and format charts to effectively present data insights.
CO4: Automate repetitive tasks using macros to enhance productivity

LEVEL OF CO-PO MAPPING TABLE

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	2	2	2	1	2	1	1	-	1	1	-	-
2	2	3	3	2	2	1	1	-	2	2	1	-
3	1	1	2	1	2	1	1	-	2	2	-	-
4	1	1	2	2	3	1	1	-	1	1	1	2

Semester II



To be effective from year-2024

COURSE TITLE: Data Structures Using C++								
Course Code: MCA24201CR						Examination Scheme	T	P
Total number of Lecture Hours: 56 Total number of Practical Hours: 56						External	80	40
						Internal	20	10
Lecture (L):	4	Practical(P):	2	Tutorial (T):	0	Total Credits	6	

Course Objectives

- Understand and implement linear data structures such as arrays and linked lists, including operations like insertion, deletion, and searching.
- Master stack and queue operations, including their representations in memory and implementations using arrays and linked lists.
- Comprehend tree structures including binary trees, binary search trees, AVL trees, and B-trees, along with their traversal techniques and applications.
- Learn graph terminology, representations, traversal techniques, and practical applications in computer science.
- Explore advanced data structures such as threaded binary trees, M-way search trees, and various types of heaps.
- Study file organization techniques including sequential, relative, and indexed sequential file organizations, as well as multiple key file organizations like inverted files and multi-list organizations.

Course Content	TEACHING HOURS
Unit I: Linear Data Structures	**14 Hrs.**
Data types/objects/structures, Data structures and its types, Representation and implementation. Linear Data Structures: Array representation, operations, applications and limitations of linear arrays, Searching Techniques- Linear Search, Binary Search Sorting Techniques- Selection, Insertion sort, Bubble sort, Quick Sort, Merge Sort Two dimensional arrays, matrices, common operations of matrices, special matrices, Array representation of Sparse matrices. Linked Lists: Representation, Types and operations on Linked List.	
Unit II: Stack and Queues	**14 Hrs.**
Stack- Representation of stack in memory, Operations on Stacks, Implementation of Stack using arrays and linked list, Multiple Stacks: Representing two stacks and more than two stacks, Applications of stacks: Parenthesis Checker, Infix to postfix procedure, evaluating expressions in postfix notation, Implementation of recursion using stack. Queues- Representation of Queue in Memory, Operations on Queue, Implementation of Queue using arrays and linked list, Circular Queue and its operations, Representation and implementation, Multiple Queues, Deque, Priority Queue, Heap Representation of a Priority Queue, Applications of Queues.	
Unit III: Tree and Graph Data Structures	**14 Hrs.**

Trees, Definitions, terminologies and properties, Binary tree representation, traversals and applications, Threaded binary trees, Binary Search Trees, AVL Trees, M-way Search Trees, B-trees, B+ trees. Graphs, Terminology, Graph representations, Traversal Techniques, Operations on Graphs, Applications of Graphs	
Unit IV: Advanced Data Structures and Algorithms	**14 Hrs.**
Minimum spanning trees, Shortest Path Algorithms in Graphs, Eulerian Tour, Hamiltonian Tour Hashing: Direct Address Tables, Hash Table, Different Hash functions, resolving collisions, rehashing, Heap Structures, Binomial Heaps, Leftist Heaps. File Organizations: Sequential File Organization, Relative File Organization, Indexed Sequential File Organization, Multiple Key File Organizations: Inverted File and Multi-List Organizations	

Textbooks

1. Langsam, Augenstein, Tenenbaum, "Data Structures Using C and C++", 2nd Edition, 2015

Reference Books

1. Ellis Horowitz, Sartaj Sahni, Susan Anderson Freed, "Fundamentals of Data Structures In C", 2nd Edition, 2018
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rd Edition, 2007.
3. Aho Alfred V., Hopcroft John E., UIlman Jeffrey D, "Data Structures and Algorithms", 2017
4. R. S. Salaria, "Data Structures and Algorithms Using C++", 2018
5. Varsha H Patil, "Data Structures using C++", 2012
6. E.Balagurusamy, "Object Oriented Programming with C++", 8th Edition, 2020

Lab Manual

Week 1

- Write a program in C++ to insert, delete, and update the contents of an array.
- Write a program in C++ to search an element in an array.
- Write a program in C++ to perform various operations on matrices.
- Write a program in C++ to implement different string manipulation operations?
- Write a program to search an element in array using Binary Search.
- Write a program to implement Selection sort
- Write a program to implement bubble sort

Week 2

- Write a program to implement insertion sort
- Write a program to implement quick sort
- Write a program to implement merge sort
- Write a program to add two sparse matrices?
- Write a program to multiply two sparse matrices?

Week 3

- Write a program to implement singly linked list?
- Write a program to implement different operations like adding a node at beginning, end, center, after a certain element, after a certain count of nodes in a linkedlist.
- Write a program to implement different operations like deleting a node at beginning, end, center, after a certain element, after a certain count of nodes in a linkedlist.
- Write a program in C++ to reverse a linked list by changing the link in the nodes?

Week 4

- Write a program to add two polynomials represented as linked list?
- Write a program in C++ to multiply two polynomials represented as linked lists?
- Write a program in C++ to implement a doubly linked list?
- Write a program to implement different operations like adding a node at beginning, end, center, after a certain element, after a certain count of nodes in a doubly linkedlist.
- Write a program to implement different operations like deleting a node at beginning, end, center, after a certain element, after a certain count of nodes in a doubly linkedlist.

Week 5

- Write a program to implement different operations of a circular linked list.
- Write a program to implement various operations on an array based stack?
- Write a program to implement various operations on a stack represented using linked list.

Week 6

- Write a program to demonstrate the use of stack in checking whether the arithmetic expression is properly parenthesized?
- Write a program to demonstrate the use of stack in converting an arithmetic expression from infix to postfix?
- Write a program to demonstrate the use of stack in evaluating an arithmetic expression in postfix notation?

Week 7

- Write a program to demonstrate the use of stack in implementing quicksort algorithm to sort an array of integers in ascending order.
- Write a program to demonstrate the implementation of various operations on a linear queue represented using a linear array
- Write a program to demonstrate the implementation of various operations on a Circular queue represented using a linear array.

Week 8

- Write a program to demonstrate the implementation of various operations on a queue represented using a linked list?
- Write a program to demonstrate the use of multiple stacks?