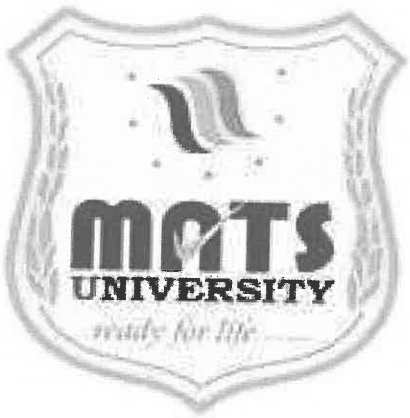
PROGRAMME PROJECT REPORT

(PPR)

Master of Computer Applications

(MCA)



MATS Centre for Distance and Online Education (MCDOE)

MATS University, Raipur, Chhattisgarh

MATS UNIVERSITY: VISION

To become a world-class Centre in providing globally relevant education. MATS will be the Global University, known for the quality academic programmes and outstanding faculty, products and services to student and clients independent of place and time constraints. MATS University will be a benchmark institution for lifelong partnership with students, the workforce and public and private enterprises. Building on its proud tradition, MATS university will extend educational opportunities to those who will make our state (Chhattisgarh), our nation and global society a better place to live and work.

MATS UNIVERSITY: MISSION

To foster an intellectual and ethical environment in which the spirit and skills within MATS will thrive so as to impart high quality education, training, research and consultancy services with a global outlook and human values. To create and develop technocrats, entrepreneurs and business leaders who will strive to & improve the quality of human life. To create truly world class schools of Management Sciences, Engineering Sciences, Information Technology, Life Sciences, Basic and Applied Sciences, Humanities & Social Sciences and Life Skills.

[Dr. Sunita Kushwaha]
Asso. Professor

[Dr. Poonam Singh]
Asst. Professor

[Ms. Tanuja Sahu]
Asst. Professor

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A. Programme's Mission and Objectives:

Mission:

The mission of the programme Master of Computer Applications (MCA) in Open and Distance Learning mode of Education is to empower students with comprehensive theoretical knowledge and practical skills in computer Applications through accessible, flexible, and innovative open and distance learning education, fostering adept professionals for the evolving digital landscape. The programme aims to produce competent computer professionals with the ability to face future challenges.

Objectives:

The Master of Computer Applications (MCA) programme is designed to equip students with advanced knowledge and skills in computer science, software development, and information technology. The primary objective of the programme is to develop competent professionals who can contribute effectively to the IT industry and research domains.

Key Objectives:

1. Strong Theoretical Foundation: Provide in-depth knowledge of computer science principles, algorithms, data structures, database management, and software engineering.
2. Advanced Programming Skills: Develop expertise in multiple programming languages, frameworks, and tools used in software development and Applications design.
3. System and Applications Development: Train students to design, develop, and manage software Applications, enterprise solutions, and web-based systems.
4. Artificial Intelligence & Emerging Technologies: Introduce AI, Machine Learning, Cloud Computing, Cybersecurity, Blockchain, and other emerging technologies to prepare students for future industry trends.
5. Problem-Solving & Analytical Thinking: Enhance logical reasoning, critical thinking, and problem-solving abilities to address real-world challenges in computing and IT domains.

6. Software Project Management: Equip students with project planning, execution, testing, deployment, and maintenance skills to manage software development life cycles efficiently.
7. Industry Readiness & Practical Exposure: Provide hands-on experience through laboratory work, internships, and industry collaborations to bridge the gap between academia and industry

The Master of Computer Applications programme aims to create skilled IT professionals who can excel in software development, research, academia, and industry leadership roles while adapting to evolving technological landscapes.

B. Relevance of the Programme with University's Mission and Goals:

The Open and Distance Learning mode of the MASTER OF COMPUTER APPLICATIONS programme aligns with MATS's University mission to cultivate a learning environment that fosters creativity, innovation, and critical thinking among students. The programme is designed to provide a world-class education in computer science and Applications, with a focus on developing skilled professionals who can make valuable contributions to the industry and society. The MASTER OF COMPUTER APPLICATIONS programme also aims to provide an inclusive and diverse learning environment, which is essential for the development of professionals who can work effectively in multicultural and global environments. The programme provides opportunities for students to engage in practical and project-based learning, which helps them develop teamwork skills, leadership skills, and communication skills. These are essential skills that prepare students to become successful professionals in the field of computer science and Applications.

C. Nature of prospective target group of learners:

The programme aims at providing learning opportunities to a diverse group of learners falling under the category of non-traditional learners such as full-time working professionals, entrepreneurs, individuals in remote regions, non-residents and homemakers. The Open and Distance Learning mode of education ODL Master of Computer Applications programme is for students who cannot afford to pursue the education in regular mode due to time, cost and distance constraints.

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D. Appropriateness of Programme to be Conducted in Online and Open and Distance Learning Mode to Acquire Specific Skills and Competence:

The open and distance learning Master of Computer Applications program will be delivered with flexibility, allowing students to learn at their own pace while balancing work, family, and education. The learning resources are designed to support self-sufficient, self-directed, and independent learning. The program will be supported by a robust Learning Management System, offering a variety of resources including e-tutorials, e-materials, e-assignments, quizzes, discussion forums for doubt-solving, assessment and progress tracking tools, and display of results.

E. Instructional Design:

Programme Structure:

- The Master of Computer Applications programme is structured into four semesters and it has the minimum duration of 2 years.

Programme Credits:

- Any student of the Master of Computer Applications programme who earns 88 credits by pursuing the prescribed course work and passing all tests, examinations, assignments, laboratory work, projects and all other evaluation components as per the passing standards of the University will be eligible for the award of the Master of Computer

- (ODL MCA) degree.

Semester-wise distribution of Credits for Master of Computer Applications (MCA):

Sr. No.	Semester	Number of Credits
1	Semester – 1	22
2	Semester – 2	22
3	Semester – 3	22
4	Semester – 4	22
	Total Credits	**88**

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Teaching & Examination Scheme
Semester – I

Course: Master of Computer Applications (MCA) Sem: I						
Subject			Credits	Evaluation Scheme		Total Marks
Category	Name	Course Code		Theory		
				Internal	University	
Compulsory Subjects						
Core Major	Object Oriented Programming Concepts	ODL MCA101	4	30	70	100
	Object Oriented Programming Concepts Lab	ODL MCA101-P	2	15	35	50
Core Major	Database Technologies	ODL MCA102	4	30	70	100
	Database Technologies Lab	ODL MCA102-P	2	15	35	50
Core Major	Data Structure Concepts	ODL MCA103	4	30	70	100
	Data Structure Concepts Lab	ODL MCA103-P	2	15	35	50
Inter - disciplinary	Mathematical Foundation for Computer Applications	ODL MCA104	4	30	70	100
		Total	**22**	**165**	**385**	**550**

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Semester-II

Course: Master of Computer Applications (MCA) Sem: II						
Courses			Evaluation Scheme			Total Marks
Category	Name	Code	Credits	Theory		
				Internal	University	
Core Major	Advanced JAVA Programming	ODL MCA201	3	30	70	100
	Advanced JAVA Programming Lab	ODL MCA201-P	2	15	35	50
Core Major	Operating System Concepts and Shell Programming	ODL MCA202	3	30	70	100
	Operating System Concepts and Shell Programming Lab	ODL MCA202-P	2	15	35	50
Project Work	Industrial Training with Project	ODL MCA203	4	30	70	100
Discipline Specific Elective	Elective I		3	30	70	100
	Elective I Lab		2	15	35	50
Discipline Specific Elective	Elective II		3	30	70	100
		Total	**22**	**195**	**455**	**650**

Elective Courses

Category	Name	Code
Elective I	Data Warehousing and Data Mining	ODL MCA204
	Data Warehousing and Data Mining Lab	ODL MCA204-P
Elective I	Software Testing	ODL MCA205
	Software Testing Lab	ODL MCA205-P
Elective II	Advanced Networking Concepts	ODL MCA206
Elective II	Digital Image Processing	ODL MCA207

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Semester-III

Course: Master of Computer Applications (MCA) Sem: III						
Courses			Evaluation Scheme			Total Marks
Category	Name	Code	Credits	Theory		
				Internal	University	
Core Major	Software Project Management	ODL MCA301	4	30	70	100
Core Major	Machine Learning	ODL MCA302	4	30	70	100
	Machine Learning Lab	ODL MCA302-P	2	15	35	50
Core Major	Artificial Intelligence	ODL MCA303	4	30	70	100
	Artificial Intelligence Lab	ODL MCA303-P	2	15	35	50
Skill Enhancement Course	Elective III		2	15	35	50
Project Work	Minor Project	ODL MCA306	4	30	70	100
		Total	**22**	**165**	**385**	**550**

Elective Courses		
Category	**Name**	**Code**
Elective III	Internet of Things	ODL MCA304
	Cloud Computing	ODL MCA305

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Semester-IV

Course: Master of Computer Applications (MCA) Sem: IV						
Courses			**Evaluation Scheme**			**Total Marks**
			Credits	**Theory**		
Category	**Name**	**Code**		**Internal**	**University**	
Internship	Major Project	ODL MCA401	20	150	350	500
Ability Enhancement Course	MOOC: Organizational Behaviour and Professional Ethics	ODL MCA402	2	50	0	50
		Total	**22**	**200**	**350**	**550**

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Detailed Syllabus & Reference Book

Master of Computer Applications (MCA) Sem I
Object Oriented Programming Concepts
Course Code: ODL MCA101 Credit: 04

No.	Module Description	
1	**Programming Paradigms**	
	1.1	Programming Language Concepts
	1.2	Types Of Programming Language and Its Applications Area
	1.3	Source File Creation, Compilation and Linking
	1.4	Features And Structure of C++ Program
	1.5	Data Types, Tokens: Keywords, Identifiers, Variables and Constants, Operators
	1.6	Control Statements: Branching, Looping and Jumping
	1.7	Array Declaration and Initialization
	1.8	Access the Array Elements
	1.9	Types of Arrays
2	**Class, Object, Constructor and Destructor**	
	2.1	Object Oriented Programming Concepts, Advantage
	2.2	Object and Class
	2.3	Member Function
	2.4	Array within the Class
	2.5	Memory Allocation of Objects
	2.6	Friend Function
	2.7	Local Class
	2.8	Constructors: Parameterized, Multiple, Default Argument
	2.9	Dynamic Initialization of Objects, Copy Constructor, Dynamic Constructor
	2.10	Destructors
3	**Operator Overloading and Inheritance**	
	3.1	Operator Overloading: Unary and Binary
	3.2	Overloading Binary Operators Using Friends
	3.3	Rules of Overloading Operators, Type Conversion
	3.4	Inheritance, Derived Classes
	3.5	Inheritance: Single, Multilevel, Multiple, Hierarchical and Hybrid
	3.6	Virtual Base Classes, Abstract Class
	3.7	Constructors In Derived Classes, Member Classes
4	**Pointer, Virtual Function and Polymorphism**	
	4.1	Pointers: Pointers To Objects, This Pointer
	4.2	Pointer To Derived Classes
	4.3	Virtual Function, Pure Virtual Function
	4.4	Polymorphism: Compile Time, Run Time
	4.5	Overloading and overriding
5	**Console I/O Operations and File Handling**	
	5.1	Stream Classes
	5.2	I/O Operations: Unformatted and Formatted

	5.3	Managing Output with Manipulators
	5.4	Classes For File Stream Operations
	5.5	Opening and Closing a File, Detecting End-of-File
	5.6	File Modes, File Pointers and Their Manipulations
	5.7	Sequential Input and Output Operations
	5.8	Random Access File
	5.9	Error Handling During File Operations

Text Books/ Resources:	1. E. Balagurusamy , "Object Oriented Programming with C++", Tata McGraw- Hill.
Reference Books/ Resources:	1. Herbert Schildt , "The Complete Reference" Tata McGraw-Hill 2. Robert Lafore , "Object Oriented Programming in Turbo C++" The Waite Group 3. Programming in Modern C++ NPTEL SWAYAM:https://onlinecourses.nptel.ac.in/noc23_cs78/previw Tutorial https://www.javatpoint.com/cpp-tutorial

Master of Computer Applications (MCA) Sem I

Course: Database Technologies
Course Code: ODL MCA102 Credit: 04

No.	Module Description	
1	**Introduction to Database Management System**	
	1.1	Purpose of Database Systems
	1.2	View of Data: Data Abstraction, Instances and Schemas
	1.3	Data Models: Relational Model, Entity-Relationship Model, Object- Based Data Model, Semi structured Data Model, Database Languages
	1.4	Data Storage and Querying, Database Architecture
	1.5	Database Users and Administrators
2	**Relational Data Modeling and Database Design**	
	2.1	Relational Model Concepts, Super Key, Candidate Key and Primary Key
	2.2	Constraints: Domain, Key, Entity and Referential Integrity constraints
	2.3	E.F. Codd's Rule
	2.4	Functional dependency, Armstrong's Inference rules
	2.5	Decomposition of Relations: Lossless Join and Dependency Preservation property
	2.6	Normalization: First, Second, Third, BCNF, PJNF
3	**SQL and Procedural SQL**	
	3.1.	Conditional statements and Iterative statements
	3.2.	User-defined functions
	3.3.	Stored Procedures, Parameter types: IN, OUT and INOUT
	3.4.	Triggers: Introduction, Needs, Before trigger and After trigger
4	**Transaction management and Concurrency**	
	4.1.	Transaction: Introduction, Transaction Model
	4.2.	Properties of Transactions
	4.3.	Transaction isolation, Schedules: Serial, Non-Serial Schedules

	4.4.	Serializability, Conflict Serializability
	4.5.	Concurrency Control
	4.6.	Concurrency Control Protocols: Lock based and Timestamp based
	4.7.	Deadlock Handling: Detection and Prevention
5	**Object-Oriented Database**	
	5.1.	Limitations of RDBMS
	5.2.	Introduction: OODBMS and ORDBMS
	5.3.	Storing and Accessing Objects in a Relational Database
	5.4.	Object-Oriented Database Design
	5.5.	Introduction to Object-Oriented Data Models

Text Books/ Resources:	1. Henry F. Korth, "Database System Concepts", Tata McGraw Hills Ivan Bayross, "MySQL 5.1 for Professionals", SPD
Reference Books/ Resources:	1. Elmasri and Navathe, "Fundamentals of Database Systems", Pearson Education. 2. Thomas Connolly and Carolyn Begg, "Database Systems, A Practical Approach to Design Implementation and Management", Pearson Education 3. MySQL Reference Manual - https://dev.mysql.com/doc/refman/8.0/en/ PostgreSQL Reference Manual - https://www.postgresql.org/docs/

Master of Computer Applications (MCA) Sem I
Course: Data Structure Concepts
Course Code: ODL MCA103 Credit: 04

No.	Module Description	
1	**Linear Data Structure**	
	1.1	Data structure concepts, Data type, Abstract data type
	1.2	Linear data structures using sequential organization, Operations
	1.3	Linear Array in data structure and its classification, Properties and representation of an array, Operation and Memory location
	1.4	Searching Algorithms: Linear, Binary
	1.5	Sorting Algorithm—Insertion, Selection, Merge sort
2	**Stack, Queue and Recursion**	
	2.1	Representation of Stacks using sequential organization, Applications
	2.2	Recursion and its Applications
	2.3	Queue, Representation of Queues using sequential organization, Dequeue, Priority Queue
3	**Linked List**	
	3.1	Linked list and its representation
	3.2	Operations on Linked list: Traversing, Searching, Insertion, Deletion
	3.3	Memory Allocation

4	**Tree and Graph**	
	4.1	Tree concepts
	4.2	Binary Tree-Representation
	4.3	Operations: Searching, Insertion, Deletion
	4.4	Algorithms: Binary Search Tree and AVL
	4.5	Graph, Graph Representation, Operations: Searching, Insertion, Deletion, Traversing
5	**Algorithm Analysis and Design**	
	5.1	The Role of Algorithm in Computing, Characteristics of algorithm, P and NP problem
	5.2	Analyzing algorithms: Time and space complexity, Execution time
	5.3	Asymptotic notations
	5.4	Algorithm design techniques: • Greedy algorithm • Divide and conquer • Dynamic programming And it's implementation.

Text Books/ Resources:	1. Seymour Lipschutz, "Data Structures", McGraw Hill Education: 2. Alfred V. Aho, John E. Hopcroft, Jeffry D. Ullaman" Data Structure and Algorithms", Pearson Education: 3. Thomas H Coreman , "Introduction to algorithms", MIT Press:
Reference Books/ Resources:	1. Michael T. Goodrich, Roberto Tamassia, David M. Mount, "Data Structure and Algorithm", John Wiley &-Sons 2. G.S. Baluja, "Data Structures Through C++"

Master of Computer Applications (MCA) Sem I
Course: Mathematical Foundation of Computer
Course Code: ODL MCA104 Credit: 04

No.	Module Description	
1	**Set Theory, Mathematical Logic, Relation and Function**	
	1.1	Introduction to Set theory, Cartesian Product
	1.2	Statements and Notations, Logical Connectives
	1.3	Tautology, Contradiction, Logical equivalence
	1.4	Relation, Types of Binary relation, Equivalence relation
	1.5	Function, Properties of function, Composition of Functions
2	**POSETS and Lattices**	
	2.1	Introduction, Partial order relation
	2.2	Partial ordered set, HASSE diagram
	2.3.	Lattice, Sub-Lattices, Well ordered set, Complete lattice
	2.4	Distributive and Complemented lattice
3	**Boolean Algebra**	
	3.1	Basic concepts of Boolean Algebra, Boolean lattice, Boolean algebra
	3.2	Boolean functions, Disjunctive and Conjunctive normal form, Complement function, Bool's Expansion theorem
	3.3	Karnaugh map method for simplification of Boolean expressions
	3.4	Applications of Boolean Algebra in switching circuits, logic circuits

4	**Graph Theory**	
	4.1	Basic concepts of graph theory
	4.2	Subgraph, Walk, Paths and Circuits
	4.3	Types of graphs
	4.4	Matrix Representation of Graphs, Directed Graphs
	4.5	Tree and its properties, Rooted Tree, Binary Trees, Spanning tree, Fundamental Circuits
5	**Semi Group and Monoids**	
	5.1	Algebraic structure, Binary operation, Properties, Semi group, Monoid, Group theory,
	5.2	Abelian group, Cyclic group, Generators, Permutation group, Subgroup,
	5.3	Homomorphism, Isomorphism and Automorphism.
	5.4	Cosets, Langranges Theorem, Normal Subgroup and Quotient group

Text Books/ Resources:	1. H.K Pathak, J.P. Chauhan "Advanced Discrete Mathematics", Shree Shiksha Sahitya Prakashan 2. Swapan Kumar Sarkar, "Discrete Mathematics", S. Chand & Company Ltd.
Reference Books/ Resources:	1. Ralph, Gimaldi, Discrete and Combinatorial Mathematics, Pearson Education. 2. N.Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall. 3. H.K Pathak, Discrete Mathematics 4. 5. Kolman, B, Busby, R.C.Ross, S.C. Discrete Mathematical Structures, Pearson Education. 6. Liu, C.L. Elements of Discrete Mathematics, Tata McGraw Hill.

Master of Computer Applications (MCA) Sem II

Course: Advanced JAVA Programming

Course Code: ODL MCA201 Credit: 04

No.	**Module Description**	
1	**Object Oriented Programming Concepts and Implementations**	
	1.1	OOPS Concepts and implementation: Class, Object, Encapsulation,Polymorphism, Inheritance, Abstraction
	1.2	Package Concepts and Implementation: Defining and use of Package
	1.3	Managing Errors and Exceptions
	1.4	Multithreading: Concepts, Life Cycle, Methods
	1.5	Network Programming: Introduction, Classes and its methods
	1.6	Java Database Connectivity: Architecture, Drivers, Connectivity with database

2	**JAVA FX Technology**	
	1.1	Introduction to Java FX, Features, Architecture & Applications
	1.2	Java 2D Shapes, Colors, Text
	1.3	Java FX Effects
	1.4	Java FX Transformation
	1.5	Java FX Animation
	1.6	Java FX 3D Shapes
	1.7	Java FX Layout
	1.8	Java FX UI Controls
	1.9	Java FX Images
	1.10	Java FX Event Handling
3	**Servlet Technology**	
	3.1	J2EE Introduction and Architecture
	3.2	Java Servlet: Basic Servlet Structure
	3.3	Servlet Life Cycle
	3.4	Reading Form Data from Servlet
	3.5	Handlin the Client Request, Generating the Server Response
	3.6	Handling Cookies: Benefit of Cookies, Deleting Cookies, Sending and Receiving Cookies, Cookies Attributes
	3.7	Session Tracking: Need of Session Tracking, Session Tracking Basics, Session Tracking API,
4	**JSP Technology**	
	4.1	Introduction, Need and Benefit of JSP, Life Cycle of JSP
	4.2	JSP Scripting Elements : Scriptlet tag, Expression Tag, Declaration
		Tag
	4.3	Implicit Object: Request, Response, Config, Applications, Session, Page Context, Page, Exception
	4.4	Directive Elements: Page directive, include directive, taglib Directive
	4.5	Action Elements: forward, include
5	**Spring and Spring Boot Framework**	
	5.1	Introduction to Spring Initializing and Writing Spring Applications
	5.2	Dependency Injection: IOC Container, Dependency Injection, Constructor Injection.
	5.3	Developing web Applications: Displaying & processing information, Validating Form Input, Working with View Controller
	5.4	Working with Data: Reading and Writing data with JDBC, Working with Spring data JDBC
	5.5	Introduction to Spring Boot, Difference between Spring and Spring Boot, Spring Boot Architecture
	5.6	Project Component: Annotations, Dependency Management, Applications Properties,
	5.7	Developing Spring Boot Applications: Putting spring boot to work, using starter dependencies, using automatic configurations
	5.8	AOP (Aspect Oriented Programming) : Before, After, Around, Returning, Throwing

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Text Books/ Resources:	1. E. Balagurusamy , "Programming with Java", Tata McGraw-Hill: 2. Marty Hall, Larry Brown, "Core Servlet and JavaServer Pages", PEARSON: 3. Carl Dea, Mark Heckler, Gerrit Grunwald, Jose Pereda Ph.D, Sean 4. M Philips, "Java FX 8 Introduction by Example", Apress: 5. Craig Walls, "Spring IN ACTION",Manning: Craig Walls, Andrew 6. Glover, "Spring Boot in Action",Manning:
Reference Books/ Resources:	1. Bruce Eckel, "Thinking in JAVA", Pearson 2. JDK Release Notes - https://www.oracle.com/java/technologies/javase/jdk-relnotes-index.html 3. JavaFX - https://jenkov.com/tutorials/javafx/index.html.

Master of Computer Applications (MCA) Sem II
Course: OS Concepts and Shell Programming
Course Code: ODL MCA202 Credit: 04

No.	Module Description	
1	**Introduction to Operating System**	
	1.1	Introduction to Operating System.
	1.2	Need and Functions of Operating Systems
	1.3	Computer System Operations
	1.4	Types of OS -Batch processing, Multi-programming, Time sharing
	1.5	Operating-System Services
	1.6	System Calls.
	1.7	Operating-System Structure
	1.8	Design Goals
2	**Process Management and Synchronization**	
	2.1	Process Concepts
	2.2	Process State
	2.3	Process Control Block
	2.4	Operations on Processes
	2.5	Inter process communications
	2.6	Process Scheduling
	2.7	CPU Scheduling algorithms
	2.8	Process Threads – Overview
	2.9	Critical Section problem
	2.10	Semaphores.
	2.11	Classical problems of synchronization
	2.12	Deadlock Characterization
	2.13	Deadlock Handling: Avoidance, Detection &Prevention

3	**Storage Management**	
	3.1.	Contiguous Memory Allocation
	3.2.	Paging Techniques: Swapping, Paging, Segmentation, Fragmentation
	3.3.	Demand Paging.
	3.4.	Page Replacement : Page Replacement Algorithm
	3.5.	Virtual Memory.
	3.6.	File Concepts, Access Methods
	3.7.	File Systems Structures
	3.8.	File System Implementation
	3.9.	Free Space Management
4	**Disk Scheduling and Distributed Systems**	
	4.1.	I/O Hardware
	4.2.	Applications of I/O Interface
	4.3.	Disk Structures
	4.4.	Disk Scheduling Algorithms
	4.5.	Disk Management
	4.6.	RAID Structure
	4.7.	Distributed System Structure
	4.8.	Distributed File Systems
	4.9.	Naming and Transparency
	4.10.	Remote File Accesses
	4.11.	Stateful Versus Stateless Service
5	**Shell Programming**	
	5.1.	Introduction to shell programming
	5.2.	Various types of Shells and their Comparisons
	5.3.	Command Execution
	5.4.	Command Execution Process
	5.5.	Shell programming in different shells
	5.6.	Decision Making Selections
	5.7.	Concept of Function , Parameter passing and argument
	5.8.	Filters, Basic of Shell Programming
Text books/ Resources:		1. Abraham Silberschatz, Peter B Galvin, and Gerg 2. Gagne– "Operating System Concepts", Wiley. Behrouz A. Forouzan and Richard F. Gilberg – "UNIX and Shell Programming".
Reference Books/ Resources		1. Tanenbaum A - Modern Operating Systems - Pearson Education. 2. Dhamdhere D. M. – "Operating Systems", Tata McGraw Hill. 3. Sumitabha Das – "UNIX Concepts and Applications", Tata McGraw Hill. Halder S. and Aravind A. – "Operating Systems", Pearson.

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Master of Computer Applications (MCA) Sem II Course: Advanced Networking Concepts Concepts ODL MCA210 Credit: 04		
No.	**Module Description**	
1	**Introduction to Networking and Physical layer**	
	1.1	Data Communication: Components like Sender, receiver, protocols etc.
	1.2	Network Models: OSI and TCP/IP , Protocol
	1.3	Addressing : Physical, Logical, Port
	1.4	Transmission Media: Wired media, Wireless media
	1.5	Multiplexing Techniques; Frequency Division, Time Division, Synchronous time division, Statistical Time Division
2	**Data link layer**	
	2.1	Type of error, redundancy, detection and correction
	2.2	Block Coding: Error Detection, Error correction , hamming distance
	2.3	Cyclic code redundancy and checksum
	2.4	Flow control and error control
	2.5	Noiseless and Noisy channels
3	**Network layer**	
	3.1	Logical addressing : IPv4 addressing, IPv6 Addressing
	3.2	IPv4: Datagram, Fragments, Checksum
	3.3	IPv6: Advantages, Packet Format, Extension
	3.4	Address Mapping, ICMP,IGMP
4	**Transport layer and Applications layer**	
	4.1.	Process To Process Delivery
	4.2.	TCP and UDP Protocol
	4.3.	Name Space, Domain Name Space
	4.4.	DNS, Resolution
	4.5	Applications layer protocols: SMTP, FTP, POP, IMAP
5	**Network Security and Cryptography**	
	5.1	Introduction to security services
	5.2	Digital signature
	5.3	Introduction to cryptography: Types
	5.4	IP Security

Text books/ Resources:	1. Forouzan B., "Data Communication and Networking", 4rd Edition, McGraw- Hill 2. Andrew S. Tanenbaum, "Computer Networks" , 5th Edition, Person Publication
Reference Books/ Resources	1. James Kurose, Keith Ross, "Computer Networking: A Top-Down Approach", 7th Edition, Pearson Publication. 2. Russ White, Ethan Banks, "Computer Networking Problems and Solutions ", 1st Edition, Cisco Press. 3. https://www.javatpoint.com/computer-network-tutorial 4. https://www.geeksforgeeks.org/computer-network-tutorials/

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Master of Computer Applications (MCA) Sem II

Course: Data Warehousing and Data Mining
Course Code: ODL MCA206 Credit: 04

No.	Module Description	
1	**Introduction to Data Mining**	
	1.1	Introduction to Data Science: Data mining, Machine Learning, Deep Learning, Artificial Intelligence, Data Warehouse, Big Data
	1.2	Data Mining, Knowledge Discovery from Data (KDD) Framework
	1.3	Types of data for Data Mining
	1.4	Data Mining: Confluence of multiple disciplines
	1.5	Data Mining Applications
2	**Data Preprocessing**	
	2.1	Data types: Nominal attributes, Binary attributes, Ordinal attributes
	2.2	Statistics of data: Central tendency, dispersion of data - Range, quartiles, Variance and standard Deviation
	2.3	Covariance and correlation analysis
	2.4	Data quality, Data cleaning: Missing values, Noisy data, Data integration
	2.5	Data transformation: Normalization, Discretization
3	**Data warehousing and Online Analytical Processing**	
	3.1	Introduction to Data Warehouse
	3.2	Data Warehouses Architecture: The three-tier architecture, ETL, Enterprise data warehouse and data mart
	3.3	Data cube: a multidimensional data model
	3.4	Schemas for multidimensional data models: stars, snowflakes and fact constellations
	3.5	Concept hierarchies
	3.6	OLAP operations
4	**Association Rule Mining**	
	4.1.	Market basket analysis
	4.2.	Frequent itemset
	4.3.	Apriori algorithm: finding frequent itemset
	4.4.	Generating association rules from frequent itemset
	4.5	From association analysis to correlation analysis
5	**Classification and Cluster Analysis**	
	5.1	Introduction to Classification
	5.2	Decision tree induction
	5.3	Attribute selection measures: Information gain, Gain ratio
	5.4	Naïve Bayesian classification
	5.5	Cluster Analysis
	5.6	Partitioning methods
	5.7	k-Means: a centroid-based technique

Text books/ Resources:	1. Han, J. and Kamber, M. - Data Mining: Concepts & Techniques, 3rd Edition - Morgan Kaufmann Publishers: 2. Ian H. Witten, Eibe Frank, Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann Publications

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Reference Books/ Resources	1. Mohammed J. Zaki Wagner Meira Jr - Data Mining and Machine Learning: Fundamental Concepts and Algorithms 2. Pujari, A. - Data Mining techniques - Universities Press 3. Pudi, V. and Radhakrishnan, P. - Data Mining - Oxford University Press 4. Larose, D. - Data Mining Methods & Models - Wiley-India 5. Berry, M. and Linoff, G. - Data Mining Techniques - Wiley-India

Master of Computer Applications (MCA) Sem

II Course: Elective I Software Testing
Course Code: ODL MCA205 Credit: 04

No.	Module Description	
1	**Introduction to Software Testing**	
	1.1	Definition of Software Testing: Importance and objectives.
	1.2	Software Development Life Cycle (SDLC): Role of testing in different SDLC models (Waterfall, Agile, V-Model, Spiral).
	1.3	Levels of Testing: Unit testing, Integration testing, System testing, and Acceptance testing.
	1.4	Types of Testing: Manual vs Automated Testing.
	1.5	Error, Fault, and Failure: Understanding the differences between them
2	**Testing Process and Life Cycle**	
	2.1	Testing Process: Requirement analysis, Test planning, Test design, Test execution, Defect reporting, and Closure.
	2.2	Test Levels: Unit testing, Integration testing, System testing, User acceptance testing (UAT).
	2.3	Test Documentation: Test plan, Test case design, Test scripts, Test reports.
	2.4	Defect Life Cycle: Steps from defect detection to closure.
	2.5	Test Case Design: Writing effective test cases and using test case design techniques.
3	**Test Design Techniques**	
	3.1	Black-box Testing: Equivalence partitioning, Boundary value analysis, Decision tables, and State transition testing.
	3.2	White-box Testing: Code-based testing techniques such as statement coverage, branch coverage, path coverage.
	3.3	Experience-based Testing: Exploratory testing, Error guessing, and Ad-hoc testing.
	3.4	Test Case Design Techniques: Writing test cases based on requirements and use cases.
4	**Types of Testing**	
	4.1	**Functional Testing**: Focus on the functionality of the software, ensuring the system meets specified requirements. Smoke Testing, Sanity Testing, Regression Testing, Retesting, UAT, and Interface Testing.
	4.2	Non-Functional Testing, Testing non-functional aspects like performance, security, usability, etc, Performance Testing, Load Testing, Stress Testing, Scalability Testing, and Security Testing.
	4.3	Regression Testing: Ensuring that new code changes do not affect the existing system.
	4.4	Exploratory Testing: Simultaneously learning about the system and testing it.

5	**Automated Testing**	
	5.1	Automation Introduction: Importance, benefits, and challenges.
	5.2	Tools for Automation: Selenium, QTP, JUnit, TestNG, Appium, etc.
	5.3	Automated Test Script Design: How to design maintainable and reusable test scripts.
	5.4	Continuous Integration/Continuous Testing: Integration of automated testing in CI/CD pipelines.

Text books/ Resources:	1. Software Testing: Principles and Practices – Srinivasan Desikan, Gopalaswamy Ramesh, Pearson 2. Foundations of Software Testing – Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black, Cengage Learning
Reference Books/ Resources	1. Software Testing: A Craftsman's Approach – Paul C. Jorgensen, CRC Press 2. Introduction to Software Testing – Paul Ammann, Jeff Offutt, Cambridge University Press 3. Software Testing and Quality Assurance: Theory and Practice – Kshirasagar Naik, Priyadarshi Tripathy, Wiley India 4. Effective Software Testing: 50 Specific Ways to Improve Your Testing – Elisabeth Hendrickson, Addison-Wesley

Master of Computer Applications (MCA) Sem II

Course: Elective II Digital Image Processing
Course Code: ODL MCA207 Credit: 04

No.	Module Description	
1	**Introduction to Digital Image Processing**	
	1.1	Overview of Digital Image Processing
	1.2	What is Image Processing? Applications and Examples, Image Representation: Pixels, Resolution, and Color Models
	1.3	Types of Images (Gray-scale, RGB, Binary, and Multispectral)
	1.4	Basic Image Operations,Image Sampling and Quantization,Image Representation in Memory,Image File Formats (BMP, JPEG, PNG, TIFF, etc.)
	1.5	Introduction to Image Processing Tools,MATLAB/Octave, Python (OpenCV, NumPy), ImageJ
2	**Image Enhancement**	
	2.1	Point Processing Operations, Contrast Adjustment (Brightness, Histogram Equalization), Thresholding and Image Binarization
	2.2	Spatial Domain Filtering,Smoothing Filters (Mean, Gaussian Filters), Sharpening Filters (Laplacian, Sobel, Prewitt) Edge
	2.3	Frequency Domain Processing,Fourier Transform and Image Filtering, Frequency Filtering (Low-pass, High-pass filters), Image Compression (Lossless, Lossy Compression Techniques)
3	**Image Restoration**	
	3.1	Noise Models and Types

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	3.2	Types of Noise (Gaussian, Salt and Pepper, Speckle), Noise Removal Techniques (Median Filtering, Wiener Filtering)
	3.3	Image Deconvolution, Degradation Models (Blur, Motion Blur),Inverse Filtering and Wiener Deconvolution .Blind Deconvolution and Regularization Techniques
4	**Thresholding Techniques**	
	4.1.	Thresholding Techniques, Global Thresholding (Otsu's Method), Adaptive Thresholding.
	4.2.	Edge-based Segmentation, Canny Edge Detection, Region Growing and Watershed Segmentation
	4.3.	Clustering-based Segmentation, k-Means Clustering, Mean-Shift Segmentation, Region-based Segmentation, Active Contours (Snakes)Graph- based Segmentation Techniques
5	**Morphological Image Processing**	
	5.1	Basic Morphological Operations, Dilation, Erosion, Opening, and Closing Hit- or-Miss Transform
	5.2	Advanced Morphological Techniques
	5.3	Applications of Morphology, Shape Analysis and Object Recognition, Noise Removal and Object Detection

Text books/ Resources:	1. Digital Image Processing – Rafael C. Gonzalez, Richard E. Woods, Pearson 2. Digital Image Processing Using MATLAB – Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Pearson
Reference Books/ Resources	1. Fundamentals of Digital Image Processing – Anil K. Jain, Pearson 2. Digital Image Processing: An Algorithmic Introduction Using Java – Wilhelm Burger, Mark J. Burge, Springer 3. Image Processing, Analysis, and Machine Vision – Milan Sonka, Vaclav Hlavac, Roger Boyle, Cengage Learning 4. Computer Vision: Algorithms and Applications – Richard Szeliski, Springer 5. Digital Image Processing and Analysis: Human and Computer Vision Applications with CVIPtools – Scott E. Umbaugh, CRC Press 6. Practical Image and Video Processing Using MATLAB – Oge Marques, Wiley

Master of Computer Applications (MCA) Sem II Course: Software Project Management Course Code: ODL MCA301 Credit: 04		
No.	**Module Description**	
1	**Fundamentals of Software Project Planning and Estimation**	
	1.1	Introduction
	1.2	Tools and Techniques
	1.3	Software Project Planning
	1.4	Understand the Project Need
	1.5	Create the Project Plan
	1.6	Diagnosing Project Planning Problems
	1.7	Project Estimation
	1.8	Element of Successful Estimate
	1.9	Wideband Delphi Estimation
	1.10	Other Estimation Techniques
	1.11	Diagnosing Estimation Problems
2	**Advanced Project Scheduling and Quality Assurance Techniques**	
	2.1	Project Schedule
	2.2	Building the Project Schedules
	2.3	Managing Multiple Projects
	2.4	Use the Schedule to Manage Commitments
	2.5	Diagnosing Scheduling Problems
	2.6	Review, Inspections
	2.7	Desk checks, Walkthrough
	2.8	Code Reviews, Pair Programming
	2.9	Use Inspections to Manage Commitments
	2.10	Diagnosing Review Problems
3	**Comprehensive Software Requirements Management**	
	3.1	Software Requirements
	3.2	Requirement Elicitation
	3.3	Use Case
	3.4	Software Requirements Specification
	3.5	Change Control
	3.6	Introduce Software Requirements Carefully
	3.7	Diagnosing Software Requirement Problems
4	**Overview of Software Development Life Cycle (SDLC) Models**	
	4.1	Software Development File Cycle: Introduction, Software Process
	4.2	SDLC Life Cycle, Need of SDLC,
	4.3	SDLC Models
	4.4	Waterfall Model, RAD Model, Spiral Model
	4.5	V-Model, Incremental Model, Agile Model
	4.6	Iterative Model, Big-Bang Model, Prototype Model
5	**Advanced Software Design, Testing, and Process Improvement**	

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	5.1	Design and Programming
	5.2	Review the Design, Vision Control with Subversion
	5.3	Refactoring, Unit Testing, Use Automation, Be Careful with Existing Projects
	5.4	Diagnosing Design and Programming Problems
	5.5	Software Testing: Test Plan and Test Case, Test Execution
	5.6	Defect Tracking and Triage
	5.7	Test Environment and Performance Testing
	5.8	Smoke Test, Test Automation, Postmortem Reports
	5.9	Using Software Testing Effectively
	5.10	Diagnosing Software Testing Problem
	5.11	Understanding Change: Why Change Fails, How make Change Succeed
	5.12	Process Improvement: Life without a Software Process, Software Process Improvement
	5.13	Moving Forward

Textbooks/ Resources:	1. Andrew Stellman and Jennifer Greene, "Applied Software Project Management", O'REILLY. https://www.javatpoint.com/software-engineering-software-development-life- cycle
Reference Books /Resources	1. Jack T. Marchewka, "Information Technology Project Management", WILEY 2. Bob Hughes and Mike Cotterell, "Software Project Management", McGraw Hill

Master of Computer Applications (MCA) Sem III Course: Machine Learning Course Code: ODL MCA302 Credit: 04		
No.	**Module Description**	
1	**Introduction to Machine Learning Techniques**	
	1.1	Introduction and Future Scope of Machine Learning
	1.2	Techniques of Machine Learning
	1.3	Applications of Machine Learning
	1.4	Types of data in Machine Learning
	1.5	Data Preprocessing Techniques
	1.6	Continues and discrete data Dimensionality Reduction
2	**Regression**	
	2.1	Introduction to Regression
	2.2	Types of Regression model
	2.3	Simple Linear Regression
	2.4	Multiple Linear Regression
	2.5	Polynomial Regression
	2.6	Decision Tree Regression
	2.7	Random Forest Regression
	2.8	Model Building using Least squares

	2.9	Model Accuracy & Selection
3	**Classification**	
	3.1	Introduction to Classification
	3.2	Logistic Regression
	3.3	K-Nearest Neighbors (K-NN)
	3.4	Support Vector Machine (SVM)
	3.5	Naive Bayes
	3.6	Ensemble Methods
4	**Unsupervised Learning & Association Rule Mining**	
	4.1	Introduction to Unsupervised learning
	4.2	K-Means Algorithm
	4.3	K-Means – Variations
	4.4	Detecting Outliers
	4.5	Hierarchical Clustering
	4.6	Association Rule Mining
	4.7	Apriori Algorithm
	4.8	Time series Prediction
	4.9	Markov Process
	4.10	Hidden Markov Model
5	**Natural Language Processing**	
	5.1	Introduction to NLP
	5.2	Applications of NLP
	5.3	Classical Vs Deep Learning Models
	5.4	Bag of words model
	5.5	Tools and techniques for NLP

Text Books/ Resources:	1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, "Machine Learning", Pearson
Reference Books/ Resources	1. Aurelien Geron ,"Hands–On Machine Learning with Scikit–Learn and TensorFlow"(3rd Edition") Paperback, 2017. 2. Sebastian Raschka ,Vahid Mir Jalili, "Python Machine Learning", Third Edition Packt Publications, 2019. 3. Kevin P. Murph, "Machine learning: a probabilistic perspective", MIT Press, 2012.

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Master of Computer Applications (MCA) Sem III Course: Artificial Intelligence Course Code: ODL MCA304 Credit: 04		
	Module Description	
1	**Introduction to Artificial Intelligence.**	
	1.1	Introduction: What Is AI?
	1.2	The Foundations of Artificial Intelligence.
	1.3	The History of Artificial Intelligence, AI Techniques, advantages, and limitations of AI, Impact and Examples of AI, Applications domains of AI.
	1.4	The State of the Art.
	1.5	Intelligent Agents: Agents and Environments.
	1.6	Good Behavior: The Concept of Rationality.
	1.7	The Nature of Environments.
	1.8	The Structure of Agents.
2	**Introduction to Algorithms in Artificial Intelligence.**	
	2.1	Introduction to Algorithms in Artificial Intelligence: Definition
	2.2	Significance of algorithms in artificial intelligence.
	2.3	Basic components of an algorithm: input, output,
	2.4	Control structures.
	2.5	Introduction to problem-solving techniques in Artificial Intelligence
	2.6	Knowledge representation.
	2.7	Reasoning.
3	**Search Algorithms**	
	3.1	Introduction to search algorithms
	3.2	Depth-first search.
	3.3	Breadth-first search
	3.4	Heuristic search techniques
	3.5	A* search
	3.6	Hill climbing, Min-Max Search, Alpha-Beta.
4	**Introduction to neural networks and Expert System**	
	4.1.	Models of neuron McCulloch – Pitts model.
	4.2.	Perceptron, Adaline model, Basic learning laws.
	4.3.	Topology of neural network architecture, Multilayer Neural Networks, Learning Methods.
	4.4	The human element in expert systems.
5	**Introduction of Fuzzy logic and Neuro Fuzzy Systems and Case Study with Artificial Intelligence**	
	5.1	Fuzzy sets, Fuzzy model, Fuzzy rule generation Fuzzy inference system.
	5.2	Integrating Artificial Intelligence in Yoga Applications.
	5.3	Personalized yoga routines based on user preferences and goals.
	5.4	AI-powered progress tracking and performance analytics.
	5.5	Design considerations for AI-enhanced yoga Applications.

Text books/ Resources:	1. "Artificial Intelligence" by Stuart Russell and Peter Norvig, Third Edition 2010, Pearson Education, Inc. 2. "Artificial Intelligence: Foundations of Computational Agents" by David L. Poole and Alan K. Mackworth. 3. "Introduction to Artificial Intelligence and Expert Systems" by Dan W. 4. Patterson, Publisher. Pearson Education India, 2015, Pages 464. 5. Introduction to Neural Network Using MatLab 6.0 by Dr. S N Sivanandam. 6. Neural Network Design by Martin T. Hagan.
Reference Books/ Resources	1. "Artificial Intelligence" by Rich, E., Knight, K., & Nair, S. (2009), Tata McGraw 2. Hill. 3. " AI Algorithms Lab: Hands-On Exercises in Artificial Intelligence" By John Smith (Year: 2023). 4. SWAYAM NPTEL/MOOCs: 5. https://onlinecourses.nptel.ac.in/noc22_cs56/preview 6. https://onlinecourses.nptel.ac.in/noc23_cs18/preview 7. GitHub Links: 1. https://github.com/topics/artificial-intelligence.

Master of Computer Applications (MCA) Sem III Course: Internet of Things Course Code: ODL MCA310 Credit: 02		
No.	**Module Description**	
1	**Fundamentals of IoT**	
	1.1	Introduction, Definitions & Characteristics, Challenges of IoT.
	1.2	IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT.
	1.3	History of IoT, About Things in IoT.
	1.4	The Identifiers in IoT, About the Internet in IoT
	1.5	IoT frameworks, IoT and M2M.
2	**Sensors Networks**	
	2.1	Definition, Types of Sensors, Types of Actuators, Examples and Working,
	2.2	IoT Development Boards: Arduino IDE and Board Types, Raspberri Pi Development Kit
	2.3	RFID Principles and components,
	2.4	History and Context
	2.5	The node, Connecting nodes, Networking Nodes, WSN and IoT.
3	**Applications of IoT**	
	3.1	Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT
	3.2	Legal challenges, IoT design Ethics
	3.3	IoT in Environmental Protection.

Text Books/ Resources:	1. CunoPfister, "getting started with the Internet of Things : Connecting Sensors and MicroController to the Cloud"kindle2011 : TB#1 2. ArsheepBagha ,Vijay Madisetti,"Internet of Things":A Hands On
Reference Books/ Resources:	1. https://github.com/jollyvjacob/Books/blob/master/book/Internet%20of%20 Things%20wit h%20ESP8266.pdf 2. https://youtu.be/WUYAjxnwjU4?si=e2svqjWRREf9SZL9

Master of Computer Applications (MCA) Sem III
Course: Cloud Computing
Course Code: MCA 307 Credit: 02

No.	Module Description	
1	**Cloud Computing Basics**	
	1.1	Cloud Computing Overview, Advantages, Disadvantages
	1.2	How it works, cloud computing architecture and its components
	1.3	Cloud deployment models, Applications
	1.4	IAAS (infrastructure as a service)
	1.5	SAAS (Software as a service)
	1.6	PAAS (Platform as a service)
2	**Virtualization and Abstraction**	
	2.1	Overview of virtualization, Type of virtualization, uses of virtualization.
	2.2	How abstraction is provided in cloud, advantages, disadvantages
	2.3	Hypervisor, Type of hypervisor
	2.4	Load balancing, cloud security tools and technologies
	2.5	Security concerns, legal issues and aspects, multitenancy issues
3	**Introduction to Simulator**	
	3.1	Overview of simulator
	3.2	Understanding of Cloud sim simulator
	3.3	Cloud sim architecture (user code, Cloud Sim, Grid Sim, Sim java)
	3.4	Working Platform of Clod Sim
	3.5	Introduction to Green Cloud
4	**Introduction to AWS**	
	4.1	Introduction to AWS, AWS free tier account setup
	4.2	Amazon web services ecosystem
	4.3	Compute services, Storage services
	4.4	AWS networking services
	4.5	Aws glacier, Terminology, Amazon glacier vs Amazon S3

Text Books/ Resources:	1. Cloud Computing: Web based Applications that change the way you work and collaborate online -Michael Miller. 2. Link of Book: https://books.google.co.in/books?id=mfoLMXve2gEC&printsec=frontcover#v=onepage&q&f=false
Reference Books/ Resources:	1. Sandeep Bhowmik, "Cloud Computing" CAMBRIDGE 2. https://www.javatpoint.com/cloud-computing 3. https://www.geeksforgeeks.org/what-is-cloudsim/ 4. https://www.tutorialspoint.com/green-cloud-computing-and-its-strategies

Master of Computer Applications (MCA) Sem IV Course: Organizational Behavior and Professional Ethics Course Code: ODL MCA402 Credit: 02		
No.	**Module Description**	
1	**Introduction to Organizational Behavior**	
	1.1	Definition and Importance of Organizational Behavior (OB)
	1.2	Foundations of OB: Psychological, Social, and Cultural Influences
	1.3	Key Concepts in OB: Motivation, Leadership, Communication, Teamwork, etc.
	1.4	Levels of Analysis: Individual.
	1.5	Group, and Organizational
2	**Individual Behavior in Organizations**	
	2.1	Personality and its Impact on Work Behavior,Types of Personality Models (Big Five, MBTI)
	2.2	Perception and Decision Making,Process of Perception,Biases in Decision Making
	2.3	Attitudes: Job Satisfaction, Organizational Commitment and Engagement
	2.4	Emotions in the Workplace
	2.5	Type of emotions
3	**Entrepreneurship and Motivation Theories**	
	3.1.	Classical Motivation Theories, Maslow's Hierarchy of Needs Herzberg's Two-Factor Theory, McGregor's Theory X and Y
	3.2.	Entrepreneurship Small Business Entrepreneurship, Scalable Start-up Entrepreneurship, Social Entrepreneurship and Large Company Entrepreneurship.
	3.3.	Goal Setting Theory (Locke & Latham),
	3.4.	Equity Theory (Adams Self-Determination Theory
	3.5	Motivational Techniques in Organizations
4	**Group Behavior and Team Dynamics**	
	4.1.	Types of Groups: Formal and Informal Groups
	4.2.	Group Development Stages (Tuckman's Model)
	4.3.	Teamwork and Team Effectiveness
	4.4.	Conflict in Groups and Conflict Resolution Strategies
5	**Leadership and Power in Organizations**	
	5.1.	Leadership Theories, Trait Theory, Behavioral Theories,and Contingency Models (e.g., Fiedler's Contingency Theory), Transformational and Transactional Leadership, Servant Leadership
	5.2.	Power and Politics in Organizations
	5.3.	Sources of Power, Organizational Politics and Influence Tactics
	5.4.	Ethical Leadership

Textbooks/ Resources:	1. "Organizational Behavior" by Stephen P. Robbins and Timothy A. Judge 2. "Organizational Behavior: A Practical, Problem-Solving Approach" by Debra L: Nelson and James Campbell Quick 3. "Essentials of Organizational Behavior" by Stephen P. Robbins and Timothy A. Judge
Reference Books/ Resources	1. "The Moral Compass of the Corporation: Business Ethics and the Path to Corporate Social Responsibility" by Denise Rousseau. 2. "Ethics in the Workplace: Tools and Tactics for Organizational Transformation" by Craig E. Johnson

Duration of the Programme:

The minimum duration of the programme is two years, and maximum duration is four years.

Medium of the Programme:

English is the medium and examination will be written in English or in Hindi as per learner's choice of the medium.

Requirement of Faculty and Supporting Staff:

Supporting staff will be deputed at the learner supported Centre as per the need of course curriculum.

Category	Existing
Professor	02
Associate Professor	01
Assistant Professor	00

Instructional Delivery Mechanism and Usage of Media:

As the programme will offer in MATS Centre of Open and Distance Learning Mode of Education, there are various instructional delivery mechanisms and media will be used to effectively deliver content to the learners. The programme delivery mechanism used by MCDOE follows a multimedia approach for instructions, which are as follows:

- The printed self-learning material (SLM) which covers all the metrics of the programme will be deliver to the learners for every course.
- Learning Management System (LMS) is an online platform that provides a centralized location for students to access learning content, engage in discussions, submit assignments, and take assessments. The LMS provides a user-friendly interface that is accessible on multiple devices, such as desktops, laptops, tablets, and smartphones.
- Webinars can be used for lectures, discussions, or interactive sessions with students. Pre-recorded video lectures can be used to deliver course content in a concise and engaging way. Interactive multimedia includes simulations, games, and quizzes that are designed to reinforce learning.
- Discussion forums can be used to facilitate group discussions, peer-to-peer learning, and to provide feedback and support. Online and face-to-face counselling will be provided by academic counsellors appointed for the programme.
- The counseling sessions are held as per schedule drawn by the MCDOE. These counselling sessions are held in non-working hours for the learners so they can

attend the counselling session properly and regularly to enhance their learning skills.

- Live session will be conducted through the use of Internet Communication Technologies (ICT) from the University's studio, the schedule of which is made available at the Leaner Support System.
- Programmes which have industrial training/practical/ project component are heldat University's learners support centers and Attendance of the leaner in this part of the courses is compulsory. As per guidelines Project Work of the programme will be done by the learners and regarding this a complete guide will be deliver to the learner along with study material.
- The e-SLM will be dispatched periodically to the enrolled learners for each course of the programme. These e-SLM's will be very helpful to the learners in effective learning. The assignment for internal assessment of learner's shall be deliver to the learners along with the e-SLM. Online modules are also available in the University's website for some programme.
- The contact classes and counselling schedule will be of 30 days in a year which will be divided as 15 days in each semester. The schedule of contact classes of the programme shall be communicated to the student through the various medium.

Learner Support Services:

MATS Centre for Open and Distance Education has a fully-fledged Learner Support Services to provide guidance and help to its learners. All the necessary information has been provided to all the learner via various medium like website, helpdesk, email and by person-to-person interaction via teleconferencing and calling.

Programme Delivery for Open and Distance Learning mode:

The curriculum is delivered through the Self Learning Materials (SLMs) in the form of e-Contents/e-SLM/e-Books supported by various learning resources including audio-video aids through Learning Management System (as per four quadrant approach) along with the online contact hours with discussion forums and synchronous live interactive sessions conducted through LMS as per the UGC norms for delivery of course.

Learning Management System (LMS) to Support Course Delivery for Open and Distance Learning mode:

The Learning Management System (LMS) is designed to facilitate the students to have a Global learning experience. LMS has user friendly interface approach through which the learning is made easy, interesting and meeting the global standards of learning. The audio-visual mode of teaching, the self-learning materials, discussion forums and evaluation

patterns are unique and meeting the requirements of the industry and as per UGC guidelines of four quadrants approach.

The students can experience uninterrupted learning 24x7 through web and mobile at the pace chosen by them. The user interface will be simple and easy to navigate through the e-learning modules; the LMS will provide seamless accessibility with all the learning tools designed as per standard norms for an easy and interesting learning experience.

Nature of Contact Classes:

Based on the course material, the counsellors are expected to guide and talk with the learners during the contact class sessions. By talking with their coworkers and the counsellor during contact sessions, the learners can work through their problems and this will help them to understand the programme objectives to learn with ease. In addition to these contact sessions, learners must participate in various training programs run by the relevant learner support system provided by the University which also including practical training approach as per Programme's structure.

Counseling Session & Structure of Study in ODL Mode:

Delivery in Open and Distance Education Mode:

Sl. No.	Course Code	Title of the Course	No. of Credit	Total Study Hours	Counselling Sessions Study Structure in Hours				
Semester: I					Face to Face Counselling	Self-Study	Practical Work	Assignments	Project
1	ODL MCA101	Object Oriented Programming Concepts	4	120	16	68	0	36	0
2	ODL MCA101-P	Object Oriented Programming Concepts Lab	2	60	6	10	40	4	0
3	ODL MCA102	Database Technologies	4	120	16	68	0	36	0
4	ODL MCA102-P	Database Technologies Lab	2	60	6	10	40	4	0
5	ODL MCA103	Data Structure Concepts	4	120	16	68	0	36	0
6	ODL MCA103-P	Data Structure Concepts Lab	2	60	6	10	40	4	0
7	ODL MCA104	Mathematical Foundation for Computer Applications	4	120	16	68	0	36	0
Total			22	660	82	302	120	156	0

Semester: II									
8	ODL MCA201	Advanced JAVA Programming	4	120	16	68	0	36	0
9	ODL MCA202	Operating System Concepts and Shell Programming	4	120	16	68	0	36	0
10	ODL MCA201-P	Advanced JAVA Programming Lab	2	60	6	10	40	4	0
11	ODL MCA202-P	Operating System Concepts and Shell Programming Lab	2	60	6	10	40	4	0
12	ODL MCA203	Industrial Training with Project	4	120	16	68	0	36	0
13	ODL MCA204	Data Warehousing and Data Mining	4	120	16	68	0	36	0
14	ODL MCA204-P	Data Warehousing and Data Mining Lab	2	60	6	10	40	4	0
15	ODL MCA206	Advanced Networking Concepts	4	120	16	68	0	36	0
Total			**26**	**780**	**98**	**370**	**120**	**192**	**0**
Semester: III									
16	ODL MCA301	Software Project Management	4	120	16	68	0	36	0
17	ODL MCA302	Machine Learning	4	120	16	68	0	36	0
18	ODL MCA302-P	Lab: Machine Learning Lab	2	60	6	10	40	4	0
19	ODL MCA303	Artificial Intelligence	4	120	16	68	0	36	0
20	ODL MCA303-P	Lab: Artificial Intelligence Lab	2	60	6	10	40	4	0
21	ODL MCA304	Internet of Things	2	60	8	32	0	20	0
22	ODL MCA306	Minor Project	4	120	12	12	06	30	60
Total			**22**	**660**	**80**	**268**	**86**	**166**	**60**
Semester: IV									
23	ODL MCA401	Major Project	20	600	60	100	0	40	400
24	ODL MCA402	MOOC: Organizational Behaviour and Professional Ethics	2	60	6	36	0	18	0
TOTAL			**22**	**660**	**66**	**136**	**0**	**58**	**400**

F. Procedure for Admissions, Curriculum, Transaction and Evaluation:

for Steering

For admission to Online and Open Distance Learning Master of Computer Applications (ODL MCA) programme the aspiring candidates will have to adhere to the following steps:

Step-1: Online/offline submission of Applications form and relevant documents

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Step-2: Document Verification

Step-3: If eligible – Directions to pay fees within given time

Step-4: Post Fees payment – Email of admission confirmation

Step-5: Getting the LMS credentials and access to students' portal

Curriculum Transaction

- Course curriculum will be designed by well-trained faculty members with relevant experience. Inputs from industry experts will be considered for ensuring the dynamic nature of the curriculum.
- The course structure and curriculum will be approved through Board of Studies, Faculty Board and Academic Council of University. This will enhance the qualityof the curriculum.
- The board of study of Computer Science and Applications will keep the curricula current and in tune with the changes happening in the world of IT and make it relevant to the needs of different organs of society.
- The review of the programme, its structure, the course curricula, pedagogy and evaluation will be undertaken by the individual Boards of Studies at least once in every two years.
- **Fees Structure:**

  The fee structure of the programme for Open and Distance Learning mode is as follow:

Programme	Semester Tuition Fees	Semester Examination Fees	Registration Fees (One Time)
MCA	11500	1500	1000

- **Exam and Evaluation System**

  Evaluation shall be based on continuous assessment, in which sessional work and the terminal examination shall contribute to the final grade. Sessional work shall consist of class tests, mid-semester examination(s), homework assignments, etc., as determined by the faculty in charge of the courses of study. Progress towards achievement of learning outcomes shall be assessed using the following: time-constrained examinations; closed-book and open-book tests; problem-based assignments; practical assignment laboratory reports; observation of practical skills;individual projectreports (case-study reports); team project reports; oral presentations, including seminar

presentation; viva voce interviews; computerized adaptive assessment, examination on demand, modular certifications, etc.

Each course shall correspond to an examination paper comprising of external and internal evaluations. The semester end theory examinations for Major, Minor, Open/Generic and DSC(Discipline specific Course) vocational, value added, SEC (Skill Enhancement Course) and AEC (Ability Enhancement Course) shall be of a duration as promulgated through the examination's regulations approved by the Academic Council of the University. The credit structure for theory/Practical/tutorial, internal, external examinations and total marks for an examination shall be as per the programme structure approved by the Academic Council of the University as per UGC norms. Students shall acquire a minimum passing mark in internal and external examinations separately to be declared as pass in the respective courses, as prescribed by the Academic Council.

1. The academic performance of a candidate shall be evaluated in respect of the courses of study prescribed for each semester through the evaluation. The evaluation of students admitted in the programme shall be based on
   I. End Semester Examinations - 70% marks of total marks and
   II. Continuous Internal Assessment - 30% of total marks
2. The End Semester examinations shall be held as per the academic calendar notified by the University and the duration of end semester examination shall be of three or two hours.
3. The minimum percentage of marks to pass the programme in each semester shall be 40% in each course comprising of end semester examinations and continuous evaluation.
4. A programme shall have a specified number of credits in each semester. The number of credits along with grade points that the student has satisfactorily cleared shall measure the performance of the student.
5. Semester examination results shall have following categories:
6. Passed, i.e., those who have passed in all courses of the semester examination in internal and external examination separately.
7. Promoted (ATKT), i.e., those who have earned minimum 50% of credits in a particular year including both the semesters (even and odd) or those who have earned any number of credits in odd semester.
8. Detained, i.e., those who are not promoted as per the above provisions shall be

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detained. Such students have to appear in the examination of next academic session to earn required credits (excluding the credits already earned) as per the provisions of this ordinance and only then he/she may continue the programme within stipulated period as per the provisions of this ordinance.

9. However, a student of any semester who has been detained/ not appeared in examination due to less attendance/ not applied for examination/ applied but not appeared shall be out from the programme. Such a student has to take admission in the next session as an ex-student through the procedure adopted/notified by the University.

- **Continuous Internal Assessment**
  1. Continuous Internal Assessment shall be of 30% marks of total marks allotted for the course.
  2. The components for continuous internal assessment for each course shall be decided by the Board of Studies of concerned subject.
  3. Continuous Internal assessment shall be carried forward in case of ATKT students, there shall not be any provision of conducting internal assessment tests for ATKT students at any circumstances.
- **Evaluation and Certification of MOOCS and Vocational Courses:**
  The guidelines of the University/SWAYAM portal/UGC shall be followed for evaluationand certification of MOOCs, Vocational Courses, Field Projects/ Internship/ Apprenticeship/ Community engagement and service/ Honours with Research Project.
- **Letter Grades and Grade Points**
  The Semester Grade Point Average (SGPA) is computed from the grades as a measure of the student's performance in a given semester. The SGPA is based on the grades of the current term, while the Cumulative GPA (CGPA) is based on the grades in all courses taken after joining the programme of study.

The University may also mention marks obtained in each course and a weighted average of marks based on marks obtained in all the semesters taken together for the benefit of students.

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Table-3: Grading System

Letter Grade	Grade Points	Description	Range of Marks(%)
O	10	Outstanding	>90 to <=100
A+	9	Excellent	>80 to <=90
A	8	Very Good	>70 to <=80
B+	7	Good	>60 to <=70
B	6	Above Average	>50 to <=60
C	5	Average	>40 to <=50
P	4	Pass	=40
F	0	Fail	<40
Ab	0	Absent	Absent

Computation of SGPA and CGPA

UGC recommends the following procedure to compute the Semester Grade Point Average(SGPA) and Cumulative Grade Point Average (CGPA):

I. The SGPA is the ratio of the sum of the product of the number of credits with the grade pointsscored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

SGPA (Si) = $\sum$(Ci x Gi) / $\sum$Ci

Where Ci is the number of credits of the ith course and Gi is the grade point scored by thestudent in the ith course.

Example for Computation of SGPA

Semester	Course	Credit	Letter Grade	Grade point	(Credit x Grade)
1	Course 1	3	A	8	3 x 8 = 24
1	Course 1	4	B +	7	4 x 7 = 28
1	Course 1	3	B	6	3 x 6 = 18
1	Course 1	3	O	10	3 x 10 = 30
1	Course 1	3	C	5	3 x 5 = 15
1	Course 1	4	B	6	4 x 6 = 24
		20			139
SGPA					139/20=6.95

II. The Cumulative Grade Point Average (CGPA) is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$CGPA = \sum(Ci \times Si) / \sum Ci$

where Si is the SGPA of the i^{th} semester and Ci is the total number of credits in that semester.

Example for Computation of CGPA

Semester 1	Semester 2	Semester 3	Semester 4
Credit 20	Credit 20	Credit 20	Credit 20
SGPA 6.9	SGPA 7.8	SGPA 5.6	SGPA 6.0
CGPA= (20 x 6.9 + 20 x 7.8 + 20 x 5.6 + 20 x 6.0)/80 = 6.6			

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts. On completing all requirements for the award of the undergraduate certificate/ diploma/ degree, the CGPA shall be calculated, and this value shall be indicated on the certificate /diploma/degree. The 3-years (6 semester) and 4-years (8 semester) undergraduatedegrees should also indicate the Division obtained as per following Table:

Distribution of Divisions

Division	Criterion
First division with distinction	The candidate has earned minimum number of credits forthe award of the degree with CGPA of 7.5 or above
First division	The candidate has earned minimum number of credits required for the award of the degree with CGPA of 6.0 above but less than 7.5
Second division	The candidate has earned minimum number of credits required for the award of the degree with CGPA of 4.5 or above but less than 6.0
Third Division	The candidate has earned minimum number of credits required for the award of the degree with CGPA of 4.00 or above but less than 4.5

Note: - The conversion of CGPA into percentage shall be as followed to facilitate its Applications in other academic matters.

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Equivalent Percentage = CGPA×10. The percentage shall be rounded off up to the second decimal point.

The candidate shall be awarded a certificate/diploma/degree when he/she successfully earns the minimum required credits for the certificate/diploma/degree.

- **Issue of Transcript:**

Based on the recommendations on Letter grades, grade points and SGPA and CGPA, the university shall issue the transcript for each semester and a consolidated transcript indicating the performance in all semesters.

- **Credit Transfer:**

1. The credit transfer shall be implemented as per the policy of the University framed in accordance with the guidelines issued by the UGC from time to time.
2. The member institutions of the Academic Bank of Credit established vide University Grants Commission (Establishment and Operation of Academic Bank of Credits in Higher Education) Regulations 2021 shall accept and transfer the credits as per the provisions of this regulation as amended from time totime.
3. Except for the cases of provisional promotions, the university shall facilitate credit transfer of students between them however, the student may be required to fulfil some eligibility criteria, drawing parity for a course, framed by the University in which the student seeks admission.

G. Requirement of the Laboratory Support and Library Resources:

In an online and open and distance learning Master of Computer Applications ODL MCA programme, laboratory support will be provided through various means such as virtual labs, cloud-based labs, or remote access to physical labs. Simulations and virtual labs will be used to provide students with a virtual environment in which they can perform practical tasks. In some cases, it may be possible to provide students with remote access to physical labs. Moreover, Instructors will record practical demonstrations and provide students with access to these videos. Students can watch these videos and practice the tasks on their own computers. Instructors will use video conferencing tools to demonstrate practical tasks and answer students' questions.

H. Cost Estimates of the Programme and the Provision:

This programme was already designed and developed in the conventional mode. In this process of overall development according to the current scenario, the cost estimate of all the metrics, components, equipment, advanced lab & maintenance cost for this programme this programme comes to amount of Rs. 2684700 and provision is made of Rs. 2700000.

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I. Quality Assurance Mechanism and Expected Programme Outcomes:

The programme structure of open and distance learning Master of Computer Applications ODL MCA programme is designed under the guidance of the expert committee and Board of Studies and Faculty Board. It is developed as per the guideline of statutory bodies. It is approved by Board of Studies, Faculty Board and Academic Council of the University. Every year the curriculum of the course will be reviewed as per the need of IT Industry and forwarded to the Board of Studies, Faculty Board and Academic Council with suggestions. The changes in the course curriculum as pe the needs and a l l t h e requirements from time to time. The University will help the passed-out students in their placement in different industries through the training and placement cell.

Quality of the instructions delivered will be regularly assessed through students' feedback on instructional methodology, LMS platform and experience while learning. Feedback of stakeholders viz. Industry experts, Employers, Alumni, Parents will be taken for further improvement.

CIQA will play a major role in ensuring the quality of open and distance learning education and reviewing the teaching learning and evaluationprocess.

CIQA will be responsible to improve the standards of open and distance learning education through strategic planning, implementation, regular academic audits and Annual Quality Assurance Report to be submitted to NACC on regular basis.

Expected Outcomes of the Programme:

a. Computational Knowledge: Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate forthe computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

b. Problem Analysis: Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

c. Design /Development of Solutions: Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

d. Conduct investigations of complex Computing problems: Use research-based

knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e. Modern Tool Usage: Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

f. Professional Ethics: Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices.

g. Life-long Learning: Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

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

i. Communication Efficacy: Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

j. Societal and Environmental Concern: Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practices.

k. Individual and Team Work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

l. Innovation and Entrepreneurship: Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

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