

**Khandesh College Education Society's
Institute of Management and Research, Jalgaon
An Autonomous Institute affiliated
to**

**Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon**



NEP-2020 Based CBCS

Program Structure and Course Objectives

of

MASTER OF COMPUTER APPLICATIONS (MCA)

(Syllabus with effect from 2024-25)

Syllabus Structure

KCES's Institute of Management and Research, Jalgaon								
An Autonomous Institute, Affiliated to KBC, North Maharashtra University, Jalgaon								
Course: MCA								
Academic Year: 2024-25								
Year	Sem	Type	Course Code	Title	L	P	Credit	Marks
First Year, SEMESTER – I, Level – 6.0								
I	I	DSC	MCA-DSC-511	Mathematical Foundations of Computer Science	4	--	4	100
			MCA-DSC-512	Computer Organization & Archi- tecture	4	--	4	100
			MCA-DSC-513	Python Programming	4	--	4	100
			MCA-DSC-514	Database Management System	4	--	4	100
			MCA-DSC-515	Lab on Python Programming	--	2	2	50
			MCA-DSC-516	Lab on Database Management System	--	2	2	50
		DSE	MCA-DSE-517(A)	Basics of Web Development	4	--	4	100
			MCA-DSE-517 (B)	Java Programming				
			MCA-DSE-518 (A)	Lab on Basics of Web Develop- ment	--	2	2	50
			MCA-DSE-518 (B)	Lab on Java Programming				
				Total Credits	20	06	26	650
First Year, SEMESTER – II, Level – 6.0								
I	II	DSC	MCA-DSC-521	Computer Networks	4	--	4	100
			MCA-DSC-522	Operating System Concepts	4	--	4	100
			MCA-DSC-523	Data Structures & Algorithms	4	--	4	100
			MCA-DSC-524	Lab on Linux Operating System	--	2	2	50
			MCA-DSC-525	Lab on Data Structures & Algo- rithms	--	2	2	50
		DSE	MCA-DSE-526 (A)	Advance Web Development-I	4	--	4	100
			MCA-DSE-526 (B)	Advance Java Programming-I				
			MCA-DSE-526 (C)	Machine Learning				
			MCA-DSE-527 (A)	Lab on Advance Web Develop- ment-I	--	2	2	50
			MCA-DSE-527 (B)	Lab on Advance Java Program- ming-I				
			MCA-DSE-527 (C)	Lab on Machine Learning				
		RM	MCA RM 528	RM – Research Methodology	4	--	4	100
				Total Credits	20	06	26	650
Total Credit : 52 Total Marks : 1300								

Year	Sem	Type	Course Code	Title	L	P	Credit	Marks
Second Year, SEMESTER – III, Level – 6.5								
II	III	DSC	MCA-DSC-631	Fundamentals of Cloud Technologies	2	--	2	50
			MCA-DSC-632	Software Engineering	4	--	4	100
			MCA-DSC-633	Lab on Software Engineering	--	2	2	50
		DSE	MCA-DSE-634 (A)	Advance Web Development-II	4	--	4	100
			MCA-DSE-634 (B)	Artificial Intelligence				
			MCA-DSE-635 (A)	Advance Java Programming-II	4	--	4	100
			MCA-DSE-635 (B)	Data Analytics				
			MCA-DSE-636 (A)	Lab on Advance Web Development-II	--	2	2	50
			MCA-DSE-636 (B)	Lab on Artificial Intelligence				
			MCA-DSE-637 (A)	Lab on Advance Java Programming-II	--	2	2	50
			MCA-DSE-637 (B)	Lab on Data Analytics				
		RP	MCA-RP-638	Minor Project (Research / S/W Development)	--	6	6	150
				Total Credits	14	12	26	650
Second Year, SEMESTER – IV, Level – 6.5								
		OJT	MCA-OJT-641	Full Time Industrial Training	--	12	12	300
		SEC	MCA-SEC-642	MOOCs - Online Certificate Courses	--	6	6	150
				Total Credits		18	18	450
Total Credit : 96 Total Marks : 2400								

PROGRAM STRUCTURE AND CREDIT DISTRIBUTION

Master of Computer Application (MCA)

Year 1 st , Sem-I, Level – 6.0					
Verticals	Course Code	Subject	Theory / Practical	Credit	Marks
Mandatory (DSC)	MCA-DSC-511	Mathematical Foundations of Computer Science	T	4	100
	MCA-DSC-512	Computer Organization & Architecture	T	4	100
	MCA-DSC-513	Python Programming	T	4	100
	MCA-DSC-514	Database Management System	T	4	100
	MCA-DSC-515	Lab on Python Programming	P	2	50
	MCA-DSC-516	Lab on Database Management System	P	2	50
Elective (DSE)	MCA-DSE-517(A)	Basics of Web Development	T	4	100
	MCA-DSE-517(B)	Java Programming			
	MCA-DSE-518 (A)	Lab on Basics of Web Development	P	2	50
	MCA-DSE-518 (B)	Lab on Java Programming			
Cumulative credits / Sem				26	650
Year 1 st , Sem – II, Level – 6.0					
Mandatory (DSC)	MCA-DSC-521	Computer Networks	T	4	100
	MCA-DSC-522	Operating System Concepts	T	4	100
	MCA-DSC-523	Data Structures & Algorithms	T	4	100
	MCA-DSC-524	Lab on Linux Operating System	P	2	50
	MCA-DSC-525	Lab on Data Structures & Algorithms	P	2	50
Elective (DSE)	MCA-DSE-526 (A)	Advance Web Development-I	T	4	100
	MCA-DSE-526 (B)	Advance Java Programming-I			
	MCA-DSE-526 (C)	Machine Learning			
	MCA-DSE-527 (A)	Lab on Advance Web Development-I	P	2	50
	MCA-DSE-527 (B)	Lab on Advance Java Programming-I			
	MCA-DSE-527 (C)	Lab on Machine Learning			
RM	MCA RM 528	RM – Research Methodology	T	4	100
Cumulative credits / Sem				26	650
Cumulative Credits for MCA I				52	1300
Exit option: PG Diploma in Computer Applications (after 3 Years UG Degree)					

Year 2 st , Sem-III, Level – 6.0					
Verticals	Course Code	Subject	Theory / Practical	Credit	Marks
Mandatory (DSC)	MCA-DSC-631	Fundamentals of Cloud Technologies	T	2	50
	MCA-DSC-632	Software Engineering	T	4	100
	MCA-DSC-633	Lab on Software Engineering	P	2	50
Elective (DSE)	MCA-DSE-634 (A)	Advance Web Development-II	T	4	100
	MCA-DSE-634 (B)	Artificial Intelligence			
	MCA-DSE-635 (A)	Advance Java Programming-II	T	4	100
	MCA-DSE-635 (B)	Data Analytics			
	MCA-DSE-636 (A)	Lab on Advance Web Development-II	P	2	50
	MCA-DSE-636 (B)	Lab on Artificial Intelligence			
	MCA-DSE-637 (A)	Lab on Advance Java Programming-II	P	2	50
	MCA-DSE-637 (B)	Lab on Data Analytics			
Research Project (RP)	MCA-RP-638	Minor Project (Research / S/W Development)	--	6	150
Cumulative credits / Sem				26	650
First Year, SEMESTER – II, Level – 6.0					
On Job Training (OJT)	MCA-OJT-641	Full Time Industrial Training	--	12	300
SEC	MCA-SEC-642	MOOCs - Online Certificate Courses	--	6	150
Cumulative credits / Sem				18	450
Cumulative Credits for MCA II				44	1100
2 Years 4 Semesters MCA Degree : Total Credit : 96 Total Marks : 2400					

KCES's Institute of Management and Research (Autonomous), Jalgaon

Faculty of Science and Technology, School of Computer Applications

M.C.A. (Master of Computer Application) Programme

SEMESTER: I

MCA-DSC-511: Mathematical Foundations of Computer Science

Course Title: Mathematical Foundations of Computer Science

Course Type: DSC

Course Code: MCA-DSC-511

Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to:

C01	Understand the permutation, combination and pigeonhole principle to solve real time problems.
C02	Able to formulate and solve recurrence relations problems.
C03	Analyse the behaviour of the data, model the data using statistical measures and represent it graphically on paper without using available computerized tools.
C04	Analyse the basic concepts of probability theory.
C05	Analyse the basic concepts of probability distribution, mass functions and Stochastic Processes.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	2	3	1	1	2	1	1	1	1	1	1	1
C02	2	3	1	1	2	1	1	1	1	1	1	1
C03	1	2	1	2	1	1	1	1	1	1	1	1
C04	1	2	1	2	1	1	1	1	1	1	1	1
C05	1	2	1	2	1	1	1	1	1	1	1	1

SEMESTER: I**MCA-DSC-512: Computer Organization & Architecture.**

Course Title: Computer Organization & Architecture.

Course Type: DSC

Course Code: MCA-DSC-512

Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to:

C01	Describe the fundamental organization of a computer system.
C02	Perform arithmetic operations in any number system Simplify the Boolean expression using K –Map and Tabulation techniques
C03	Use Boolean Simplification techniques to design a combinational hardware circuit Design and analysis of a given digital Combinational circuit and sequential circuits
C04	Understand the basics of instructions sets and their impact on processor design.
C05	Understanding of the addressing modes, instruction formats and program control statements.
C06	Understand the I/O interface, I/O operations and memory system.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	2	2	2	1	-	-	-	-	-	-	-
C02	3	2	1	2	2	-	-	-	-	-	-	-
C03	2	3	2	2	1	-	-	-	-	-	-	-
C04	3	2	-	-	2	-	-	-	-	-	-	-
C05	2	2	2	-	2	-	-	-	-	-	-	-
C06	2	1	2	1	2	-	-	-	-	-	-	-

MCA-DSC-513: Python Programming

Course Type: DSC

Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Write clear, efficient, and well-documented Python programs.
C02	Use Python's data structures such as lists, dictionaries, and sets effectively.
C03	Implement object-oriented programming concepts like classes, inheritance, and polymorphism in Python.
C04	Handle file operations and exceptions gracefully in Python programs.
C05	Connect to databases and perform CRUD operations using Python.

[illegible]

SEMESTER: I**MCA-DSC-514 Database Management System**

Course Title: Database Management System

Course Type: DSC

Course Code: MCA-DSC-514

Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Understand the fundamental concepts and terminology associated with database systems, including architecture, design, and various models.
C02	Design entity-relationship diagrams to the given problem to develop database application with appropriate fields and validations.
C03	Implement a database schema for a given problem domain.
C04	Formulate SQL queries to the given problem
C05	Understand and Apply normalization techniques to improve the database design to the given problem and build database for any problem

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	2	2	2	1	-	-	-	-	-	-	-
C02	3	2	2	1	1	-	-	-	-	-	-	-
C03	3	2	-	2	2	-	-	-	-	-	-	2
C04	3	2	2	2	2	-	-	-	-	-	-	2
C05	3	2	-	-	2	-	-	-	-	-	-	2
C06	3	3	2	2	2	-	-	-	-	-	-	2

SEMESTER: I

MCA-DSC-515: Lab on Python Programming

Course Title: Lab on Python Programming

Course Type: DSC

Course Code: MCA-DSC-515

Total Credits: 02

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Visualize and execute Python code confidently, using appropriate syntax and programming constructs.
C02	Design and apply algorithms and solve real-world problems using Python.
C03	Manipulate and analyze data using Python's data structures and perform file operations.
C04	Develop and demonstrate knowledge of object-oriented programming principles by creating and using classes, objects, and databases in Python programs.

SEMESTER: I

MCA-DSC-516: Lab on Database Management System

Course Title: Database Management System

Course Type: DSC

Course Code: MCA-DSC-516

Total Credits: 02

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Students get practical knowledge on designing and creating relational database systems
C02	Understand various advanced queries execution such as relational constraints, joins, set operations, aggregate functions.
C03	Use of various software to design and build ER Diagrams, UML, Flow chart for related database systems.
C04	Students will be able to design and implement database applications on their own.

SEMESTER: I
ELECTIVE COURSE

MCA-DSE-517(A): Basics of Web Development

Course Title: Basics of Web Development

Course Type: DSE

Course Code: MCA-DSE-517(A)

Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Understand the client-server architecture, HTML document structure, and process of rendering web pages over the Internet.
C02	Develop well-structured web pages using HTML elements, forms, and multimedia, and apply CSS for layout, and responsive design.
C03	Utilize CSS Grid, Flexbox, animations, transitions, and pre-processors like SASS to create responsive, visually appealing, and efficient web layouts.
C04	Apply the various JavaScript features such as DOM, and events to create interactive web content and provide a dynamic user experience.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	--	--	--	2	--	2	--	2	--	--
C02	--	3	3	--	3	--	--	--	3	--	--	3
C03	--	--	3	--	3	--	--	--	--	--	3	--
C04	3	--	--	3	--	--	3	--	--	--	--	--

SEMESTER: I
ELECTIVE COURSE

MCA-DSE-517 (B): Java Programming

Course Title: Java Programming
Course Code: MCA-DSE-517 (B)

Course Type: DSE
Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to –

C01	State fundamental concepts of object oriented programming using Java technology.
C02	Write class definition for different problems using OOPs concepts
C03	Illustrate abstract classes, inheritance and interfaces in Java applications
C04	Analyse the problem for designing classes, functions, packages for Java Applications
C05	Apply generic programming for small projects using collection class, files and databases
C06	Develop Small Java applications using required OOPs concepts of Core Java

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	2	2	2	1	1	1	1	2	2	1	1	1
C02	2	2	2	2	3	3	3	2	2	2	1	1
C03	2	2	2	1	1	1	2	2	2	1	1	1
C04	3	3	3	2	3	3	3	2	2	1	1	2
C05	2	2	2	2	2	2	1	1	1	1	2	2
C06	2	2	1	3	2	2	2	2	2	3	3	1

SEMESTER: I
ELECTIVE COURSE

MCA-DSE-518 (A): Lab on Basics of Web Development

Course Title: Lab on Web Development
Course Code: MCA-DSE-518 (A)

Course Type: DSE
Total Credits: 02

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Create well-structured HTML documents using <div>, , and semantic HTML5 elements like <header>, <nav>, and <section> for accessible layouts. They will build functional forms and embed multimedia content with proper fall-back support.
C02	Gain proficiency in CSS for styling webpages, utilizing properties, responsive units (e.g., px, em, %, vh), Flexbox for layouts, and animations. They will create theme able designs with CSS variables and compile modular CSS using SASS.
C03	Handle JavaScript functions, data types, and DOM manipulation, developing interactive applications such as calculators, quizzes, and dynamically updating content based on user input with event listeners.
C04	Design responsive, accessible web pages for various devices, applying both CSS units and JavaScript interactions to ensure a flexible, user-friendly experience.
C05	Integrate HTML, CSS, and JavaScript to build interactive, functional web pages, and use browser tools to debug and handle errors effectively across different browsers.

SEMESTER: I
ELECTIVE COURSE

CA-DSE-518 (B): Lab on Java Programming

Course Title: Lab on Java Programming

Course Type: DSE

Course Code: MCA-DSE-518 (B)

Total Credits: 02

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Write simple Java Programs with class definitions, basic Java structures and lambda expressions
C02	Represent the class hierarchy using inheritance, function overloading, function over-riding concepts for assigned problem
C03	Apply Abstract Classes, Interfaces and packages for developing Functional Models using
C04	Organise different Data Structures using generic programming
C05	Implement Different Collection Classes for some datasets
C06	Develop a project using all Core Java Concepts for given problem

SEMESTER: II
MCA-DSC-521: Computer Networks

Course Title: Computer Networks
Course Code: MCA-DSC-521

Course Type: DSC
Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Define different terminology and concepts of Computer Networks
C02	Understand the Layered architecture, functions of the OSI reference model
C03	Apply the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks.
C04	Analyze various algorithms of different protocols of the TCP/IP Model
C05	Evaluate datalink layer protocols and routing algorithms regarding their implementation and efficiency
C06	Develop codes using appropriate language for the algorithms using appropriate data structures

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	2	1	1	2	2	2	1	1	1	1	2	2
C02	2	2	3	2	2	2	2	3	3	3	2	2
C03	2	1	1	2	2	2	1	1	1	2	2	2
C04	3	2	3	3	3	3	2	3	3	3	2	2
C05	1	1	1	1	2	1	1	1	1	2	2	2
C06	2	2	2	3	3	2	2	2	3	3	2	2

SEMESTER: II**MCA-DSC-522: Operating System Concepts**

Course Title: Operating System Concepts
Course Code: MCA-DSC-522

Course Type: DSC
Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to:

C01	Understand Operating systems' fundamental concepts, functions, and structures.
C02	Manage processes, process scheduling, CPU scheduling, and deadlock handling.
C03	Grasp memory hierarchy, allocation techniques, paging, segmentation and virtual memory concepts.
C04	Study file concepts, access methods, directory disk structures, File sharing and mounting.
C05	Learn the history, features, and architecture of Linux, perform basic file operations, and write simple shell scripts and Linux Binutils, GNU C Compiler.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	1	3	3	2	2		2	2				
C02	2	2	1	1	1		3	3				
C03	3	2	2	3	3		2	2				
C04	2	1	2	3	2		1	2				
C05	2	3	1	2	2		1	1				

SEMESTER: II**MCA-DSC-523: Data Structures and Algorithms**

Course Title: Data Structures and Algorithms

Course Type: DSC

Course Code: MCA-DSC-523

Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Understand the concept of data structure, data representation, algorithm design and analysis.
C02	Learn and Apply different sorting, searching and hashing algorithms.
C03	Understand linked lists, stack and queue data structures, difference between static and dynamic data representation, and applications of stack and queue.
C04	Understand and Implement non-linear data structures trees and graphs, and their applications.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	2	2	2	2	1	2	2	1	1	2	1
C02	3	3	3	3	2	1	2	2	1	1	2	1
C03	3	3	3	3	3	1	2	2	1	1	2	1
C04	3	3	3	3	3	1	2	2	1	1	2	2

SEMESTER: II

MCA-DSC-524: Lab on Linux Operating System

Course Title: Lab on Linux Operating System

Course Type: DSC

Course Code: MCA-DSC-524

Total Credits: 02

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Understand Operating systems' fundamental concepts, functions, and structures.
C02	Learn basic Linux shell commands.
C03	Apply Linux commands to perform file and directory operations.
C04	Implement simple shell scripts and Linux Binutils, GNU C Compiler

SEMESTER: II

MCA-DSC-525: Lab on Data Structures and Algorithms

Course Title: Lab on Data Structures and Algorithms

Course Type: DSC

Course Code: MCA-DSC-525

Total Credits: 02

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Understand the concept of data structure, data representation, algorithm design and analysis.
C02	Apply and use different sorting, searching and hashing algorithms.
C03	Understand linked lists, stack and queue data structures, difference between static and dynamic data representation, and applications of stack and queue.
C04	Implement non-linear data structures trees and graphs, and their applications.

SEMESTER: II

ELECTIVE COURSE

MCA-DSE-526 (A): Advance Web Development-I

Course Title: Advance Web Development-I

Course Type: DSE

Course Code: MCA-DSE-526 (A)

Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Apply object-oriented programming principles, manage asynchronous operations using callbacks, promises, and async/await, and effectively debug code using error handling techniques and browser developer tools.
C02	Write simplified scripts to manipulate the DOM, create animations, and manage AJAX requests for dynamic content loading, enhancing the interactivity and responsiveness of web pages.
C03	Develop responsive and mobile-friendly web pages by leveraging Bootstrap's grid system, utilities, and customizable components, including integrating Flexbox and customizing themes using Sass.
C04	Set up an Angular development environment, create and manage Angular projects, and build modular applications using components, templates, and data-binding for scalable web applications.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	2	1	3	2	1	1	1	1	1	1
C02	1	3	2	1	3	1	1	1	1	2	1	1
C03	3	1	2	3	3	1	1	2	1	2	1	1
C04	3	3	3	1	3	1	2	2	1	1	2	1

SEMESTER: II

ELECTIVE COURSE

MCA-DSE-526 (B): Advance Java Programming

Course Title: Advance Java Programming

Course Type: DSE

Course Code: MCA-DSE-526 (B)

Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Describe the Concepts of components with respect to RMI, JavaBeans and EJB.
C02	Explain the advance java frameworks like Java Servlets, JSP, hibernate used in web applications
C03	Apply Strut and Hibernate in the dynamic web applications.
C04	Analyse the solutions applied with Java Streams and Collection classes
C05	Evaluate the Java Application based on JDBC and Files
C06	Develop small Applications using the advance Java Concepts RMI, Javabeans, JSP and Database Connectivity

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	1	1	1	2	2	1	2	2	2	1	1	1
C02	3	3	3	2	2	2	2	2	2	2	1	1
C03	1	1	2	2	2	1	2	2	2	1	1	1
C04	3	3	3	2	2	1	3	3	3	2	3	3
C05	1	1	1	2	2	3	2	2	2	2	2	2
C06	2	2	3	3	1	2	2	2	1	3	3	3

SEMESTER: II
ELECTIVE COURSE

MCA-DSE-526 (C): Machine Learning

Course Title: Machine Learning
Course Code: MCA-DSE-526 (C)

Course Type: DSE
Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Distinguish between, supervised, unsupervised and semi-supervised learning.
C02	Apply the apt machine learning strategy for any given problem.
C03	Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem.
C04	Design systems that uses the appropriate graph models of machine learning.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	3	2	2	2	2	1	2	1	1	-
C02	3	3	3	3	2	3	-	1	1	1	-	-
C03	3	2	3	2	2	3	2	2	-	2	-	1
C04	3	3	2	3	2	2	2	1	2	-	1	2
C05	3	3	3	3	2	2	2	1	2	1	-	-
C06	2	3	3	2	2	2	2	2	1	-	1	1

SEMESTER: II

ELECTIVE COURSE

MCA-DSE-527 (A): Lab on Advance Web Development-I

Course Title: Lab on Advance Web Development-I

Course Type: DSE

Course Code: MCA-DSE-527 (A)

Total Credits: 02

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Apply Object-Oriented Programming in JavaScript: Students will apply prototypal inheritance to create and extend objects, demonstrating their comprehension of object-oriented programming concepts by building and manipulating JavaScript objects.
C02	Implement jQuery for DOM Manipulation and AJAX: Students will analyze and utilize jQuery to manipulate the DOM, traverse elements, and handle events. They will synthesize AJAX requests to dynamically load and display content, enhancing webpage interactivity.
C03	Design and Develop Responsive Webpages using Bootstrap: Students will create responsive, mobile-friendly layouts using Bootstrap's grid system, Flexbox utilities, and components. They will evaluate and apply different layout strategies to ensure adaptability across devices and screen sizes.
C04	Customize and Apply Bootstrap Themes with Sass: Students will design and customize Bootstrap themes by using Sass variables and mixings, demonstrating creativity and problem-solving skills in personalizing web designs.
C05	Set Up and Develop Modular Angular Applications: Students will configure the Angular development environment, create and manage modular applications using Angular components and templates, demonstrating their ability to build scalable web applications aligned with modern web development standards.

SEMESTER: II

ELECTIVE COURSE

MCA-DSE-527 (B): Lab on Advance Java Programming-I

Course Title: Lab on Advance Java Programming-

Course Type: DSE

Course Code: MCA-DSE-527 (B)

Total Credits: 02

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Step-by-Step procedure for building the project from ground up by using IDE.
C02	Create dynamic web application to utilize the JavaBeans and EJBs reusable components
C03	Create web application using servlets, JSP, Strut and Hibernate technologies.

SEMESTER: II

ELECTIVE COURSE

MCA-DSE-527 (C): Lab on Machine Learning

Course Title: Lab on Machine Learning

Course Type: DSE

Course Code: MCA-DSE-527 (C)

Total Credits: 02

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Understand the implementation procedures for the machine learning algorithms.
C02	Design Java/Python programs for various Learning algorithms.
C03	Apply appropriate data sets to the Machine Learning algorithms.
C04	Identify and apply Machine Learning algorithms to solve real world problems.

SEMESTER: II**MCA-RM-528: Research Methodology**

Course Title: Research Methodology
Course Code: MCA-RM-528

Course Type: RM
Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to:

C01	Identify a suitable research approach for the intended research topic.
C02	Define the research problems, purpose, and objectives of the research.
C03	Conduct a systematic literature review on the research topic.
C04	Demonstrate scientific methods and processes of conducting quantitative and qualitative research.
C05	Apply appropriate research methodology for a research topic.
C06	Develop a research model best suitable for the selected research topic.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	1	2	3	2	3	2	2	2	2	3	2	1
C02	2	1	2	1	2	3	3	3	2	2	3	2
C03	3	2	1	2	2	2	1	2	2	3	3	1
C04	2	1	1	2	3	3	2	2	3	2	2	2
C05	1	2	2	2	3	2	2	3	3	2	1	2
C06	2	2	3	2	1	2	2	2	2	1	2	2

SEMESTER: III

MCA DSC 631 Fundamentals of Cloud Technologies

Course Title: Fundamentals of Cloud Technologies

Course Type: DSC

Course Code: MCA DSC 631

Total Credits: 02

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Explain the fundamental principles of cloud computing, including its history, architecture, and various deployment and service models.
C02	Apply concepts of virtualization, including VM provisioning, migration, and load balancing, to effectively manage cloud resources and optimize performance.
C03	Evaluate security concerns and compliance issues related to cloud computing, including the implementation of identity and access management (IAM) and best practices for cloud security.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	2	2	2	1	1	1	1	1	1	1	1	1
C02	1	2	3	2	3	1	1	1	1	1	1	1
C03	1	1	3	1	1	2	1	1	1	3	1	1

SEMESTER: III

MCA-DSC-632 Software Engineering

Course Title: Software Engineering

Course Type: DSC

Course Code: **MCA-DSC-632**

Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Explain and differentiate software engineering concepts and process models.
C02	Apply elicitation techniques and construct requirement and design models.
C03	Estimate project parameters and plan software projects effectively.
C04	Assess and manage risks, quality, and communication in software projects.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	2	2	2	2	1	1	2	1	1	1
C02	2	3	3	3	3	2	1	2	2	1	2	1
C03	2	2	2	2	3	2	2	3	2	2	2	2
C04	1	2	2	3	2	3	2	3	3	3	3	2

SEMESTER: III

MCA-DSC-633 Lab on Software Engineering

Course Title: Lab on Software Engineering

Course Type: DSC

Course Code: **MCA-DSC-633**

Total Credits: 02

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Identify and document project stakeholders, phases, and requirements for a variety of software projects.
C02	Analyze and compare different software development life cycle models, and create workflow and UML diagrams for system design.
C03	Estimate project size, cost, and schedule using standard techniques, and develop comprehensive project plans including WBS, risk registers, and procurement plans.
C04	Prepare and implement quality assurance and communication plans, design test cases, and report on project progress using appropriate tools and standards.

SEMESTER: III

ELECTIVE COURSE

MCA-DSE-634 (A) Advance Web Development-II

Course Title: Advance Web Development-II

Course Type: DSE

Course Code: MCA-DSE-634 (A)

Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Develop server-side applications using Node.js and Express.
C02	Design, implement, and secure RESTful APIs.
C03	Integrate backend services with databases.
C04	Build modern, interactive, and scalable front-end applications with React.js.
C05	Implement advanced state management and performance optimization techniques in React.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	1	-	1	3	2	1	2	1	1	1	-
C02	1	3	3	1	3	3	1	1	3	2	1	-
C03	3	3	3	3	3	1	1	2	1	-	1	-
C04	1	1	1	1	3	1	1	1	3	2	2	3
C05	1	2	1	1	3	1	2	1	1	1	1	3

SEMESTER: III

ELECTIVE COURSE

MCA-DSE-634 (B) Artificial Intelligence

Course Title: Artificial Intelligence

Course Type: DSE

Course Code: MCA-DSE-634 (B)

Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Explain the key concepts of AI, intelligent agents, and their environments and Apply uninformed and informed search algorithms.
C02	Compare and contrast different knowledge representation and probabilistic reasoning techniques.
C03	Construct deep learning models (e.g., CNNs, RNNs, Transformers) for practical applications
C04	Use NLP techniques and Large Language Models in real-world applications..
C05	Utilize various AI tools for education, development, and automation tasks.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	2	1	1	1	1	1	1	1	1	1	1
C02	3	2	2	2	1	1	1	1	1	1	1	1
C03	3	1	3	2	2	1	1	1	1	1	1	2
C04	3	2	3	3	2	1	1	1	1	2	1	2
C05	2	1	2	2	3	1	1	1	2	3	2	3

SEMESTER: III

ELECTIVE COURSE

CA-MCA-DSE-635 (A) Advance Java Programming - II

Course Title: Advance Java Programming - II

Course Type: DSE

Course Code: CA MCA-DSE-635 (A)

Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Use Spring Core features like IoC and DI to manage application components.
C02	Develop form-based applications using Spring MVC and JSP.
C03	Perform database operations using Spring Jdbc Template in a layered architecture
C04	Implement simple login systems and protect web resources using Spring Security basics.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	2	2	3	1	1	1	1	1	1	1
C02	3	2	2	2	2	1	1	1	1	1	1	1
C03	3	3	2	3	2	1	1	2	2	1	1	1
C04	3	3	3	2	3	1	1	2	2	1	1	1

SEMESTER: III

ELECTIVE COURSE

MCA-DSE-635 (B) Data Analytics

Course Title: Data Analytics
Course Code: MCA-DSE-635 (B)

Course Type: DSE
Total Credits: 04

Course Outcomes: At the end of the Course, the Student will be able to:

1. Understand data types, data analytics basics, and the data analytics life cycle.
2. Apply descriptive statistics and create visualizations using Python and BI tools.
3. Perform hypothesis testing and inferential statistics using Python or R.
4. Learn Big Data concepts, challenges, and tools like Hadoop and NoSQL.
5. Use Big Data frameworks and SPSS for practical data analysis tasks.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	2	2	1	1	1	2	1	1	1	1	1
C02	2	2	2	3	3	1	2	1	2	1	1	2
C03	3	3	2	3	2	1	2	1	1	1	1	2
C04	2	2	3	2	3	2	2	2	1	2	2	3
C05	2	2	3	3	3	1	2	2	2	2	2	3

SEMESTER: III

MCA-DSE-636 (A) Lab on Advance Web Development - II

Course Title: Lab on Advance Web Development - II

Course Type: DSE

Course Code: **MCA-DSE-636 (A)**

Total Credits: 02

Course Outcomes: By the end of the course, students will be able to –

C01	Create basic Node.js servers and handle asynchronous operations.
C02	Build RESTful APIs using Express.js and middleware.
C03	Connect Node.js applications to databases and implement CRUD operations.
C04	Develop React components with state management and event handling.
C05	Optimize React applications using hooks, routing, and state management tools.

SEMESTER: III

MCA-DSE-636 (B) Lab on Artificial Intelligence

Course Title: Lab on Artificial Intelligence

Course Type: DSE

Course Code: **MCA-DSE-636 (B)**

Total Credits: 02

Course Outcomes: At the end of the Course, the Student will be able to –

1.	
C01	implement and analyze classical AI algorithms such as BFS, DFS, A*, Bayesian Networks, and evaluate their performance in terms of time and space complexity.
C02	Design and apply deep learning models including CNNs, RNNs, and transformer-based architectures like BERT/GPT for tasks such as classification, translation, and sentiment analysis.
C03	Explore and critically evaluate modern AI tools for document creation, coding assistance, career enhancement, and data analysis, demonstrating their application in real-world scenarios.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	1	2	1	2	2	1	1	1	3	1	1	1
C02	1	2	2	2	2	1	2	1	3	1	1	1
C03	1	1	2	1	1	1	1	1	2	2	2	3

SEMESTER: III

CA-MCA-DSE-637 (A) Lab on Advance Java Programming - II

Course Title: Lab on Advance Java - II

Course Type: DSE

Course Code: **CA MCA-DSE-637 (A)**

Total Credits: 02

Course Outcomes: At the end of the Course, the Student will be able to –

C01	Use Spring Core features like IoC and DI to manage application components.
C02	Develop form-based applications using Spring MVC and JSP.
C03	Perform database operations using Spring JdbcTemplate in a layered architecture
C04	Implement simple login systems and protect web resources using Spring Security basics.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	2	2	3	1	1	1	1	1	1	1
C02	3	2	2	2	2	1	1	1	1	1	1	1
C03	3	3	2	3	2	1	1	2	2	1	1	1
C04	3	3	3	2	3	1	1	2	2	1	1	1

SEMESTER: III

MCA-DSE-637 (B) Lab on Data Analytics

Course Title: Data Analytics

Course Type: DSE

Course Code: MCA-DSE-637 (B)

Total Credits: 02

Course Outcomes: At the end of the Course, the Student will be able to:

1. Collect and work with different types of datasets.
2. Clean data and handle missing values effectively.
3. Perform statistical analysis and visualize data.
4. Apply dimensionality reduction and use big data tools like Hadoop and MongoDB.
5. Use Python and SPSS for data analysis and MongoDB for database operations.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	2	2	2	2	1	2	1	1	1	1	2
C02	2	2	2	3	2	1	2	1	1	1	1	1
C03	3	3	2	3	3	1	2	1	2	1	1	2
C04	2	3	3	2	3	2	2	2	1	2	2	3
C05	2	2	3	3	3	1	2	2	2	2	2	3

SEMESTER: III

MCA-RP-638

Minor Project (Research / S/W Development)

Course Title: Minor Project (Research / S/W Development)
Course Code: MCA-RP-638

Course Type: RP
Total Credits: 06

Course Outcomes:

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

C01	Design and implement a minor software project or conduct a research study on a computing-related problem.
C02	Demonstrate the ability to analyze requirements, design solutions, and evaluate outcomes in a project setting.
C03	Produce well-structured project documentation and present findings effectively.
C04	Work collaboratively in a team, demonstrating interpersonal and project management skills.

SEMESTER: IV

MCA-OJT-641

Full Time Industrial Training

Course Title: Full Time Industrial Training

Course Type: OJT

Course Code: MCA-OJT-641

Total Credits: 12

Course Outcomes:

At the end of the Course, the Student will be able to:

C01	Handle specialized technology and update themselves with latest changes in technological world with ability to communicate effectively.
C02	Be multi-skilled IT professional with good technical knowledge, management, leadership and entrepreneurship skills.
C03	Be able to identify, formulate and model problems and find engineering solution based on a systems approach.

SEMESTER: IV

MCA-SEC-642

Massive Open Online Courses

Course Title: Massive Open Online Courses
Course Code: MCA-SEC-642

Course Type: SEC
Total Credits: 06

Course Outcomes:

At the end of the Course, the Student will be able to:

C01	Use One-stop web and mobile based interactive e-content to learn subjects of self-interest beyond the core curriculum, provided in the form of Massive Open Online Courses.
C02	Develop ability of self-learning on high quality e-learning platforms to acquire up-to-date technical and professional skills
C03	Enhance skillset by selecting MOOC course for gaining additional knowledge by adapting the online learning environment.