

KCES's Institute of Management and Research, Jalgaon
An Autonomous Institute, Affiliated to KBC, North Maharashtra University, Jalgaon

Course: MCA(Integrated)

Academic Year: 2026-27

Class	Sem	Type	Course Code	Title	L	P	Credit	Marks			
MCA(Integrated) – Third Year, SEMESTER – V, Level – 5.5											
TY	V	DSC	IMCA-DSC-351	Advanced Java Programming	2	--	2	50			
		DSC	IMCA-DSC-352	Lab on Advanced Java Programming	--	2	2	50			
		DSC	IMCA-DSC-353	Python Programming	4	--	4	100			
		DSC	IMCA-DSC-354	Lab on Python Programming	--	2	2	50			
		DSE	IMCA-DSE-355(A)	Digital Image Processing-I	2	--	2	50			
			IMCA-DSE-355(B)	Data Analytics-I							
		DSE	IMCA-DSE-356(A)	Lab on Digital Image Processing-I	--	2	2	50			
			IMCA-DSE-356(B)	Lab on Data Analytics-I							
		Minor	IMCA-MIN-357	Software Project Management	4	--	4	100			
		VSC	IMCA-VSC-358	Web Technology-IV		2	2	50			
		FP /CEP	IMCA-FP-359	Field Project	--	2	2	50			
Total Credits										22	550
MCA(Integrated) – Third Year, SEMESTER – VI, Level – 5.5											
TY	VI	DSC	IMCA-DSC-361	Mobile Application development	2	--	2	50			
		DSC	IMCA-DSC-362	Lab on Mobile Application development	--	2	2	50			
		DSC	IMCA-DSC-363	Cloud Computing	4	--	4	100			
		DSC	IMCA-DSC-364	Lab on Cloud Computing	--	2	2	50			
		DSE	IMCA-DSE-365(A)	Digital Image Processing-II	2	--	2	50			
			IMCA-DSE-365(B)	Data Analytics-II							
		DSE	IMCA-DSE-366(A)	Lab on Digital Image Processing-II	--	2	2	50			
			IMCA-DSE-366(B)	Lab on Data Analytics-II							
		Minor	IMCA-MIN-367	Advanced Software Project Management	4	--	4	100			
		OJT	IMCA-OJT-368	Industrial Training	--	4	4	100			
		Total Credits									

SEMESTER: V

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

SEMESTER: V

IMCA-DSC-351 Advanced Java Programming

Course Title: Advanced Java Programming

Course Type: DSC

Course Code: IMCA-DSC-351

Total Credits: 02

Lectures: Tutorials: Practical: 2:0:0

CIE Marks: 20

Lecture Hours: 24 Hours

ESE Marks: 30

Course Description:

This course provides an understanding of advanced Java technologies such as Collection Framework, JDBC, Servlets, JSP, JavaBeans, and Enterprise JavaBeans (EJB). It emphasizes the design and development of interactive, database-oriented, and enterprise web applications using Java.

Course Objectives:

1. Understand the concepts, hierarchy, and implementation of the Java Collection Framework using List, Set, Queue, and Map interfaces.
2. Apply JDBC techniques to establish database connectivity and perform CRUD operations in Java applications.
3. Develop dynamic web applications using Servlets and Java Server Pages (JSP) with request handling and session management.
4. Utilize JSP scripting elements, directives, actions, and Expression Language (EL) to create interactive web pages.
5. Examine the concepts of JavaBeans and Enterprise JavaBeans (EJB), including bean properties, methods, architecture, and types of EJB used in enterprise applications.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓			✓		✓	✓

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

CO1	Apply the concepts of the Java Collection Framework and use List, Set, Queue, and Map interfaces with iterators for efficient data handling and manipulation.
CO2	Implement JDBC techniques to establish database connectivity, execute SQL statements, manage transactions, and perform CRUD operations in Java applications.
CO3	Develop dynamic web applications using Servlets and JSP by handling client requests, session management, JSP directives, actions, and Expression Language (EL).
CO4	Analyze JavaBeans and Enterprise JavaBeans (EJB) concepts, including bean properties, methods, EJB architecture, and different types of enterprise beans for enterprise application development.

SN	Contents of Module	Hrs	COs
1.	UNIT I – Collection Framework 1.1 Introduction to Collection Framework and Hierarchy\ 1.2 List Interface: ArrayList, LinkedList, Vector, Stack 1.3 Set Interface: HashSet, LinkedHashSet, TreeSet 1.4 Queue Interface: PriorityQueue, Deque	6	CO1

	1.5 Map Interface: HashMap, LinkedHashMap, TreeMap 1.6 Iterator and ListIterator with enhanced for-loop patterns 1.7 Mini-Task: Implement a Student Record Manager using ArrayList + HashMap with sorted display		
2.	UNIT II – JDBC (Java Database Connectivity) 2.1 JDBC Architecture, Drivers (Type 1–4) 2.2 Statement, PreparedStatement, CallableStatement 2.3 ResultSet handling and metadata 2.4 Transaction management: commit, rollback, savepoints 2.5 CRUD operations with proper exception handling and resource closure 2.6 Mini-Task: Build a Product Inventory data-access layer using PreparedStatement + transaction	6	CO2
3.	UNIT III – Servlets, JSP and MVC Pattern 3.1 Servlet Life Cycle, handling GET/POST, ServletConfig and ServletContext 3.2 Session Management: HttpSession, cookies, URL rewriting 3.3 Introduction to MVC design pattern in web applications 3.4 JSP Life Cycle, Scripting Elements, Directives, Actions 3.5 Expression Language (EL) and JSTL core tags 3.6 Form validation and error-page handling 3.7 Mini-Task: Build a login and registration module using Servlet-JSP MVC with session security	6	CO3
4.	UNIT IV – JavaBeans and EJB 4.1 JavaBeans: Properties, Getter/Setter methods, Advantages of JavaBeans 4.2 EJB Architecture: Overview and relevance in microservices era 4.3 Types of EJB: Session Beans (Stateless, Stateful), Entity Beans, Message-Driven Beans	6	CO4

REFERENCE BOOKS:

1. Cay Horstmann & Gary Cornell – Core Java Volume 1: Fundamentals, 12th Edition, Pearson (2022).
2. Cay Horstmann – Core Java Volume 2: Advanced Features, 12th Edition, Pearson (2022).
3. Herbert Schildt – Java: The Complete Reference, 13th Edition, McGraw-Hill (2024).
4. Kathy Sierra & Bert Bates – Head First Java, 3rd Edition, O'Reilly (2022).
5. Arun Gupta – Jakarta EE Cookbook, 2nd Edition, Packt Publishing (2021) – for EJB and enterprise patterns.
6. Baeldung Java Guides – baeldung.com (continuously updated online reference for JDBC, Servlets, Spring basics).

Video References

Type	Title / Series	Creator / Channel	Platform	URL / Access
Video	Java Collections Framework – Full Course	Telusko (Navin Reddy)	YouTube	youtube.com/@Telusko
Video	JDBC Tutorial for Beginners (2024)	Amigoscode	YouTube	youtube.com/@amigoscode
Video	Java Servlets & JSP – Build Java EE (JEE) App	Chad Darby / Udemy	Udemy	udemy.com (search: Chad Darby Java EE)
Video	Java 21 New Features – Full Walkthrough	Marco Codes	YouTube	youtube.com/@MarcoCodesJava

Video	NPTEL – Programming in Java (IIT Kharagpur)	Prof. Debasis Samanta, IIT KGP	NPTEL/Swayam	swayam.gov.in
Audio/Podcast	Inside Java Podcast	Oracle Java Team	Podcast	inside.java/podcast
Audio/Podcast	Java Off-Heap Podcast	Bob Paulin & Freddy Guime	Spotify / Web	javaoffheap.com

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	-
C02	3	3	3	2	3	1	2	1	1	1	1	-
C03	3	3	3	2	3	1	2	1	2	1	2	1
C04	3	2	3	1	3	1	2	1	1	1	1	1

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (20)	✓	✓	✓	✓	✓	
End Semester Examination (30)	✓	✓	✓	✓	✓	

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

SEMESTER: V

IMCA-DSC-352 Lab On Advanced Java Programming

Course Title: Lab On Advanced Java Programming

Course Type: DSC

Course Code: IMCA-DSC-352

Total Credits: 02

Lectures: Tutorials: Practical: 0:0:2

CIE Marks: 20

Lecture Hours: 24 Hours

ESE Marks: 30

Course Description:

This course provides in-depth knowledge of advanced Java programming concepts used in developing enterprise and web-based applications. It covers the Java Collection Framework, including Array List, Linked List, Stack, Queue, Set, and Map interfaces for efficient data handling. The course also introduces JDBC for database connectivity and performing CRUD operations using SQL queries in Java applications.

Course Objectives:

1. Understand the concepts, hierarchy, and implementation of the Java Collection Framework using List, Set, Queue, and Map interfaces.
2. Apply JDBC techniques to establish database connectivity and perform CRUD operations in Java applications.
3. Develop dynamic web applications using Servlets and Java Server Pages (JSP) with request handling and session management.
4. Utilize JSP scripting elements, directives, actions, and Expression Language (EL) to create interactive web pages.
5. Examine the concepts of JavaBeans and Enterprise JavaBeans (EJB), including bean properties, methods, architecture, and types of EJB used in enterprise applications.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓			✓		✓	✓

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

C01	Apply the concepts of the Java Collection Framework and use List, Set, Queue, and Map interfaces with iterators for efficient data handling and manipulation.
C02	Implement JDBC techniques to establish database connectivity, execute SQL statements, manage transactions, and perform CRUD operations in Java applications.
C03	Develop dynamic web applications using Servlets and JSP by handling client requests, session management, JSP directives, actions, and Expression Language (EL).
C04	Analyze JavaBeans and Enterprise JavaBeans (EJB) concepts, including bean properties, methods, EJB architecture, and different types of enterprise beans for enterprise application development.

Practical Assignments:

SNO.	Practical Assignments
1	Perform basic ArrayList and LinkedList operations: add, remove, search, sort with Comparable/Comparator.
2	Implement Stack operations (Stack class) and Queue operations (PriorityQueue) with real-world use cases.
3	Store, display, and perform set operations using HashSet and Tree Set; demonstrate iteration order differences.
4	Perform basic operations on HashMap and TreeMap; implement a word-frequency counter application.

5	Write a Java program to insert records into a database table using either Statement or PreparedStatement class.
6	Write a Java program to update and delete records in a database table using JDBC.
7	Write a Java program to retrieve and display records from a database table using ResultSet.
8	Write a Servlet program to perform addition of two numbers entered by the user.
9	Write a JSP program to accept user input through HTML form and display it.
10	Write a JavaBean program to store and display student information.

REFERENCE BOOKS:

1. Cay Horstmann & Gary Cornell – Core Java Volume 1: Fundamentals, 12th Edition, Pearson (2022).
2. Cay Horstmann – Core Java Volume 2: Advanced Features, 12th Edition, Pearson (2022).
3. Herbert Schildt – Java: The Complete Reference, 13th Edition, McGraw-Hill (2024).
4. Kathy Sierra & Bert Bates – Head First Java, 3rd Edition, O'Reilly (2022).
5. Arun Gupta – Jakarta EE Cookbook, 2nd Edition, Packt Publishing (2021) – for EJB and enterprise patterns.
6. Baeldung Java Guides – baeldung.com (continuously updated online reference for JDBC, Servlets, Spring basics).

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Video	Java Collections Framework – Full Course	Telusko (Navin Reddy)	YouTube	youtube.com/@Telusko
Video	JDBC Tutorial for Beginners (2024)	Amigoscode	YouTube	youtube.com/@amigoscode
Video	Java Servlets & JSP – Build Java EE (JEE) App	Chad Darby / Udemy	Udemy	udemy.com (search: Chad Darby Java EE)
Video	Java 21 New Features – Full Walkthrough	Marco Codes	YouTube	youtube.com/@MarcoCodesJava
Video	NPTEL – Programming in Java (IIT Kharagpur)	Prof. Debasis Samanta, IIT KGP	NPTEL/Swayam	swayam.gov.in
Audio/Podcast	Inside Java Podcast	Oracle Java Team	Podcast	inside.java/podcast
Audio/Podcast	Java Off-Heap Podcast	Bob Paulin & Freddy Guime	Spotify / Web	javaoffheap.com

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	-
C02	3	3	3	2	3	1	2	1	1	1	1	-
C03	3	3	3	2	3	1	2	1	2	1	2	1
C04	3	2	3	1	3	1	2	1	1	1	1	1

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (20)	✓	✓	✓	✓	✓	
End Semester Examination (30)	✓	✓	✓	✓	✓	

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

SEMESTER: V

IMCA-DSC-353 Python Programming

Course Title: Python Programming

Course Type: DSC

Course Code: IMCA-DSC-353

Total Credits: 04

Lectures: Tutorials: Practical: 4:0:0

CIE Marks: 40

Lecture Hours: 48

ESE Marks: 60

Course Description:

This course introduces the fundamentals of Python programming and its applications in modern software development. The course covers core programming concepts such as variables, operators, control structures, functions, modules, data structures, file handling, and exception handling using Python. It also provides an understanding of object-oriented programming concepts including classes, objects, inheritance, and polymorphism. Further, the course introduces database connectivity using SQLite and Python for performing basic database operations. The course is designed to develop problem-solving abilities, programming skills, and practical application development using Python.

Course Objectives:

1. To learn the fundamental concepts of Python programming including syntax, data types, operators, and program structure.
2. To learn and understand decision-making statements, looping constructs, and string handling techniques in Python programming.
3. To learn and apply functions, modules, packages, and various data structures for developing modular Python programs.
4. To learn file handling and exception handling techniques for developing reliable and efficient Python applications.
5. To learn object-oriented programming concepts and database connectivity using Python for developing database-driven applications.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	--	--	✓	--	✓	✓

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

C01	Understand the fundamentals of Python programming, syntax, data types, and operators.
C02	Learn and Apply decision-making, looping, and string handling techniques in Python.
C03	Understand and Implement data structures and functions in Python programming.
C04	Understand and Apply Python modules, packages, file handling, and exception handling techniques.
C05	Understand and Implement object-oriented programming concepts using Python.
C06	Learn and Develop database applications using Python and SQLite.

<i>SN</i>	<i>Contents of Module</i>	<i>Hrs</i>	<i>COs</i>
1.	UNIT – I Fundamentals of Python Programming 1.1 Introduction to Python 1.2 Features of Python 1.3 Applications of Python 1.4 Installation and Python Environment Setup 1.5 Python Interpreter 1.6 Python Syntax and Program Structure 1.7 Data Types 1.8 Variables 1.9 Comments 1.10 Input and Output Operations 1.11 Operators and Expressions	08	C01
2.	UNIT –II Decision Making, Looping and Strings 2.1 Control Structures 2.1.1 Conditional Statements (if, if-else, nested if) 2.1.2 Looping Statements (for, while) 2.1.3 break and continue Statements 2.2 Strings in Python 2.2.1 Creating Strings 2.2.2 Indexing and Slicing Strings 2.2.3 String Operations 2.2.4 Common String Methods 2.2.5 String Formatting	08	C02
3.	UNIT –III Data Structures and Functions 3.1 Data Structures 3.1.1 Lists 3.1.2 Tuples 3.1.3 Sets 3.1.4 Dictionaries 3.1.5 Operations on Lists, Sets and Dictionaries 3.2 Functions 3.2.1 Introduction to Functions 3.2.2 Function Definition 3.2.3 Function Calling and Return Statement 3.2.4 Types of Arguments 3.2.5 Scope of Variables 3.2.6 Lambda Functions 3.2.7 map(), filter(), and zip() Functions	08	C03
4.	UNIT –IV Modules, Packages and File Handling, 4.1 Modules and Packages 4.1.1 Introduction to Modules 4.1.2 Built-in Modules 4.1.3 User-defined Modules 4.1.4 Importing Modules 4.1.5 Introduction to Packages 4.2 File Handling 4.2.1 Introduction to File Handling 4.2.2 File Operations 4.2.3 Reading and Writing Files using the <i>with</i> Statement 4.3 Exception Handling 4.3.1 Understanding Errors and Exceptions 4.3.2 try, except, else, and finally Clauses	08	C04

5.	UNIT –V Object Oriented Programming using Python 5.1 Introduction to Object-Oriented Programming (OOP) 5.2 Features of OOP 5.3 Classes and Objects 5.4 Constructors 5.5 Inheritance 5.5.1 Single Inheritance 5.5.2 Multiple Inheritance 5.5.3 Multilevel Inheritance 5.5.4 Hierarchical Inheritance 5.6 Polymorphism 5.6.1 Method Overloading 5.6.2 Method Overriding 5.7 Encapsulation and Data Hiding	08	C05
6.	UNIT – VI Database Connectivity using Python 6.1 Introduction to Database and DBMS 6.2 Introduction to SQLite Database 6.3 Connecting Python with SQLite 6.4 Creating Tables using Python 6.5 Basic Database Operations 6.5.1 Insert Records 6.5.2 Update Records 6.5.3 Delete Records 6.5.4 Select Records	08	C06

REFERENCE BOOKS:

1. Introduction to Python Programming and Data Structures (Global Edition), Y. Daniel Liang, Pearson, 3rd Edition, 2026, ISBN: 978-1292424125.
2. The Quick Python Book, Naomi Ceder, Manning Publications, 4th Edition, 2025, ISBN: 978-1633436336.
3. **Object-Oriented Programming in Python**, Michael H. Goldwasser & David Letscher, Pearson, 2024 Edition, ISBN: 978-0134461233.
4. <https://docs.python.org/3/tutorial/>
5. <https://www.youtube.com/watch?v=uQrJ0TkZlc>
6. <https://www.geeksforgeeks.org/python/python-programming-language-tutorial/>
7. <https://www.youtube.com/watch?v=pd-0G0MigUA>

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	-	2	-	1	-	1	-	-	-
C02	3	3	2	1	2	-	1	-	1	-	-	-
C03	3	3	2	2	3	-	2	1	1	-	1	1
C04	2	3	2	2	3	1	2	1	1	1	1	-
C05	2	3	3	1	3	-	2	1	1	-	1	1
C06	2	3	3	2	3	1	2	1	1	1	1	2

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
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Continuous Internal Evaluation. (40)	✓	✓	✓	✓	X	X
End Semester Examination (60)	✓	✓	✓	✓	X	X

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

SEMESTER: V

IMCA-DSC-354 Lab on Python Programming

Course Title: Lab on Python Programming

Course Type: DSC

Course Code: IMCA-DSC-354

Total Credits: 02

Lectures: Tutorials: Practical: 0:0:02

CIE Marks: 20

Lecture Hours: 24 hours

ESE Marks: 30

Course Description:

This course introduces the fundamental concepts of Python programming through hands-on practical implementation. The course covers Python syntax, variables, operators, control structures, functions, data structures, object-oriented programming concepts, file handling, exception handling, and modules. Students will develop problem-solving skills by writing and executing Python programs for real-world applications

Course Objectives:

1. To understand the fundamentals of Python programming and control structures.
2. To develop problem-solving skills using functions, loops, data structures, and modules.
3. To implement object-oriented programming concepts using Python.
4. To apply file handling, exception handling, and modular programming techniques in Python applications.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	--	--	✓	--	✓	✓

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

C01	Visualize and execute Python programs using variables, operators, input/output operations, and control structures.
C02	Develop Python programs using functions, loops, data structures, and custom modules for problem solving.
C03	Apply object-oriented programming concepts such as classes, objects, inheritance, and polymorphism in Python applications.
C04	Design and implement Python applications using file handling and exception handling techniques for efficient execution.

Sr. No.	Practical List
1	Write a python program to check whether given number is palindrome or not.
2	Write a Python program to create a list and a tuple, each containing 10 integers. The program should perform the following operations on both the list and the tuple: • Display the list and the tuple. • Find and display the length of each. • Find and display the largest and smallest elements. • Calculate and display the sum and average of the elements.
3	Write a Python program using functions to check whether given number is even or odd.
4	Write a Python program to create a custom module named number.py with functions to: • Find the square of a number.

	Find the cube of a number. Import the module and display the results.
5	Write a Python program to create a text file, write data into it, and read the contents of the file.
6	Write a Python program to handle division by zero exception. Accept two numbers from the user and perform division using try and except blocks.
7	Write a Python program using OOP concepts to create a student management system. - Create a class Student with attributes: roll number, name, and marks. - Create methods to: - Accept student details. - Display student details. - Calculate total and average marks.
8	Create a python program using single level inheritance with a Person class (name, age) and a Student class (roll_no, course), including methods get_details() and display_details().
9	a) Create a class Calculator with an add() method to demonstrate method overloading using different numbers of arguments. b) Write a Python program to demonstrate method overriding using inheritance.

REFERENCE BOOKS:

1. Python Crash Course – Eric Matthes, No Starch Press, 3rd Edition, 2023.
2. Python Programming, Ritika Mehra, Cengage India, 1st Edition, 2026, ISBN: 978-9366602967.
3. <https://www.youtube.com/watch?v=rfscVS0vtbw>
4. <https://docs.python.org/3/tutorial/introduction.html>

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	2	-	1	-	1	-	-	-
CO2	3	3	2	2	3	-	2	-	1	-	1	1
CO3	2	3	3	1	3	-	2	1	1	-	1	1
CO4	2	3	2	2	3	1	2	1	1	1	1	-

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (20)	✓	✓	✓	✓	x	x
End Semester Examination (30)	✓	✓	✓	✓	x	x

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

SEMESTER: V

IMCA-DSE-355(A)-Digital Image Processing-I

Course Title: Digital Image Processing-I

Course Type: DSE

Course Code: IMCA-DSE-355(A)

Total Credits: 2

Lectures: Tutorials: Practical: 2:0:0

CIE Marks: 20

Lecture Hours:24

ESE Marks: 30

Course Description:

This course introduces the fundamental concepts of Digital Image Processing (DIP) and Computer Vision. It covers image acquisition, sampling, quantization, image enhancement, transformation techniques, filtering, image restoration methods, and color image processing. The course emphasizes both spatial and frequency domain processing techniques used in modern image analysis applications. Students gain theoretical knowledge and practical understanding of digital image processing methods applied in medical imaging, remote sensing, multimedia systems, computer vision, and pattern recognition.

Course Objectives:

1. Understand the fundamentals of digital image processing, image acquisition, image representation, and digital image processing systems.
2. Explain image sampling, quantization, image transforms, and enhancement techniques in spatial and frequency domains.
3. Analyze image degradation models and apply appropriate image restoration techniques.
4. Explore color image processing, image segmentation, and the applications of digital image processing in real-world domains.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	✓		✓		✓	✓

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

CO1	Explain the fundamentals of digital image processing, image formation, image acquisition, image types, image models, sampling, quantization, and pixel relationships.
CO2	Apply image transformation and enhancement techniques, including Fourier Transform, DCT, DWT, histogram processing, and spatial and frequency domain filtering.
CO3	Analyze image degradation models and implement image restoration techniques such as inverse filtering, least mean square filtering, and constrained least squares restoration.
CO4	Explain color image processing, color models, image segmentation techniques, and evaluate their applications in medical imaging, remote sensing, multimedia systems, and pattern recognition.

SN	Contents of Module	Hrs	COs
1.	UNIT - I: Introduction to Digital Image Processing 1. 1 Definition of Image 1. 2 Generation of Image 1. 3 Types of Images (Binary, Grayscale, Color, Multispectral, Hyperspectral)	6	CO1

	1. 4 Steps in Digital Image Processing 1. 5 Components of Digital Image Processing Systems 1. 6 Applications of Digital Image Processing 1. 7 Advantages and Disadvantages of Digital Image Processing		
2.	UNIT – II: Digital Image Fundamentals 2. 1 Elements of Visual Perception 2. 2 Image Sensing and Acquisition 2. 3 Image Model 2. 4 Image Sampling and Quantization 2. 5 Basic Relationships between Pixels	4	CO2
3.	UNIT – III: Image Transforms 3. 1 Need for Image Transforms 3. 2 2-D FFT and Properties 3. 3 Properties of Fourier Transform 3. 4 Walsh Transform 3. 5 Hadamard Transform 3. 6 Discrete Cosine Transform (DCT) 3. 7 Discrete Wavelet Transform (DWT) 3. 8 Applications of Image Transforms	6	CO3
4.	UNIT – IV: Image Enhancement Spatial Domain: 4. 1 Point Processing Operations 4. 2 Gray Level Transformation 4. 3 Histogram Processing and Equalization 4. 4 Local or Neighborhood Operations 4. 5 Median Filtering 4. 6 Sharpening Filters Frequency Domain: 4. 7 Frequency Domain Filtering 4. 8 Low-Pass Filters 4. 9 High-Pass Filters 4. 10 Homomorphic Filtering 4. 11 Comparison of Spatial and Frequency Domain Methods	8	CO4

REFERENCE BOOKS:

1. **Digital Image Processing & Computer Vision** — Dr. Anu Tank, Scientific Publishers, 2026.
2. **Image Processing & Computer Vision Master Class with Python** — Sandipan Dey, BPB Publications, 2023.
3. **Digital Image Processing (4th Edition)** — Rafael C. Gonzalez, Richard E. Woods, Pearson Education, 2018. ISBN-13: 9780137351312

Mapping of Course Outcomes to Program Outcomes:

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

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
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Continuous Internal Evaluation. (20)	✓	✓	✓	✓	✓	✓
End Semester Examination (30)	✓	✓	✓	✓	✓	✓

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated). PROGRAMME BATCH 2024-27

SEMESTER: V

IMCA-DSE-355(B) Data Analytics-I

Course Title: Data Analytics-I

Course Type: DSE

Course Code: IMCA-DSE-355(B)

Total Credits: 02

Lectures: Tutorials: Practical: 2:0:0

CIE Marks: 20

Lecture Hours: 24 Hours

ESE Marks: 30

Course Description:

This course introduces the fundamental concepts of data analytics and the use of R programming for data analysis. Students will learn the basic techniques of data collection, data preparation, descriptive statistical analysis, and data visualization. The course also provides an overview of machine learning concepts and the use of Microsoft Excel for data cleaning and analysis. Emphasis is placed on developing analytical thinking and practical skills required to analyze and interpret data for informed decision-making.

Course Objectives:

1. To understand the basic concepts, applications, and tools of data analytics and data science.
2. To learn the fundamentals of R programming, including data types, operators, control structures, and basic data manipulation.
3. To apply basic statistical methods and visualization techniques to analyze and present data effectively using R.
4. To gain an introductory understanding of machine learning concepts and utilize Excel for data preparation, cleaning, and basic analytical tasks.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	✓	-	✓	-	✓	-

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

C01	Understand the fundamentals of data analytics and use basic R programming constructs.
C02	Collect , clean, and prepare datasets using R for analysis.
C03	Perform basic statistical analysis and create charts for data visualization using R.
C04	Describe the fundamentals of machine learning and use Excel tools for basic data analysis.

SN	Contents of Module	Hrs	COs
1.	UNIT – I: Analytics Fundamentals 1.1 Introduction to Data Analytics and Data Science 1.1.1 Introduction to Data Analytics 1.1.2 Introduction to Data Science 1.2 Types and Applications of Data Analytics 1.2.1 Types of Data Analytics 1.2.2 Applications of Data Analytics 1.3 Overview of Data Analytics Tools 1.3.1 R 1.3.2 Python 1.3.3 SQL 1.3.4 Excel 1.4 Introduction to R Programming 1.4.1 Introduction to R 1.4.2 R Environment and Packages	6	C01

	1.4.3 Basic Syntax 1.4.4 Variables and Data Types 1.4.5 Operators 1.4.6 Input / Output Functions 1.5 Control Structures in R 1.5.1 Decision Making Statements (if, if-else) 1.5.2 Loops (for, while)		
2.	UNIT II: Data Collection and Data Preparation 2.1 Data Collection and Sources 2.1.1 Data Collection 2.1.2 Sources of Data 2.2 Data Quality and Cleaning 2.2.1 Data Quality 2.2.2 Handling Missing Data 2.2.3 Data Cleaning 2.3 Data Science Project Life Cycle 2.3.1 Phases of the Data Science Project Life Cycle 2.4 Introduction to Data Mining 2.4.1 Concept of Data Mining 2.5 Data Handling in R 2.5.1 Data Import and Export in R 2.5.2 Basic Data Manipulation in R	6	C02
3.	UNIT III: Descriptive Statistics and Data Visualization 3.1 Measures of Central Tendency 3.1.1 Mean 3.1.2 Median 3.1.3 Mode 3.2 Measures of Dispersion 3.2.1 Range 3.2.2 Variance 3.2.3 Standard Deviation 3.3 Statistical Analysis in R 3.3.1 Summary Statistics in R 3.3.2 Correlation 3.4 Data Visualization in R 3.4.1 Bar Chart 3.4.2 Pie Chart 3.4.3 Histogram 3.4.4 Box Plot 3.4.5 Line Chart 3.4.6 Scatter Plot	6	C03
4.	UNIT IV: Introduction to Machine Learning and Excel for Analytics 4.1 Introduction to Artificial Intelligence 4.1.1 Concept of Artificial Intelligence 4.2 Introduction to Machine Learning 4.2.1 Introduction to Machine Learning 4.2.2 Types of Machine Learning 4.2.3 Decision Trees (Basic Concept) 4.3 Excel for Data Analytics 4.3.1 Sorting and Filtering 4.3.2 Conditional Formatting 4.3.3 IF Function 4.3.4 Data Validation 4.3.5 Working with CSV Files 4.3.6 Data Cleaning	6	C04

REFERENCE BOOKS

1. R Programming for Data Science – Roger D. Peng.
2. An Introduction to Statistical Learning – Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani.

3. Microsoft Excel Data Analysis and Business Modeling – Wayne L. Winston.
4. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach, and Vipin Kumar.

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	-	2	-	-	-	-	-
C02	2	3	2	2	3	-	2	-	-	-	-	-
C03	2	2	2	3	3	-	2	-	2	-	-	-
C04	2	2	3	2	3	-	2	2	-	-	-	2

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (40)		✓	✓	✓	✓	✓
End Semester Examination (60)		✓	✓	✓	✓	✓

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

SEMESTER: V

IMCA-DSE-356(A)-Lab on Digital Image Processing-I

Course Title: Lab on Digital Image Processing-I

Course Type: DSE

Course Code: IMCA-DSE-356(A)

Total Credits: 2

Lectures: Tutorials: Practical: 2:0:0

CIE Marks: 20

Lecture Hours:24

ESE Marks: 30

Course Description:

This course introduces the fundamental concepts of Digital Image Processing (DIP) and Computer Vision. It covers image acquisition, sampling, quantization, image enhancement, transformation techniques, filtering, and image restoration methods. The course emphasizes both spatial and frequency domain processing techniques used in modern image analysis applications. Students will gain theoretical knowledge and practical understanding of digital image processing methods applied in medical imaging, remote sensing, multimedia systems, computer vision, and pattern recognition.

Course Objectives:

1. Understand the basic concepts, fundamentals, and components of Digital Image Processing systems.
2. Study image acquisition, sampling, quantization, image models, and pixel relationships.
3. Learn various image transformation techniques used for image analysis and processing.
4. Understand and apply spatial and frequency domain image enhancement techniques.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	✓		✓		✓	✓

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

CO1	Explain the fundamentals, steps, components, applications, and basic concepts of Digital Image Processing systems.
CO2	Understand image sensing, acquisition, image models, sampling, quantization, and relationships between pixels.
CO3	Apply image transformation techniques such as FFT, Walsh, Hadamard, DCT, and DWT for image analysis.
CO4	Analyze and implement image enhancement techniques in spatial and frequency domains, including filtering methods.

Sr. No.	Practical Title
1	Write a Program to read a digital image. Split and display image into 4 quadrants (up, down, right, and left).
2	Implementation of Relationships between Pixels.
3	Implementation of Image Transformations.
4	Implementation of Image Transformations using FFT, DCT, and DWT.
5	Contrast Stretching, Histogram Plotting, and Histogram Equalization.

6	Simulation and Display of an Image, Negative of Binary and Grayscale Image.
7	Display of FFT (1-D and 2-D) of an Image.
8	Implementation of Image Smoothing Filters using Mean and Median Filters.
9	Implementation of Image Sharpening and Edge Detection using Gradient Filters.
10	Implementation of Frequency Domain Filtering Techniques (Low-Pass and High-Pass Filters).
11	Implementation of Image Intensity Slicing for Image Enhancement.
12	Comparative Study of Spatial and Frequency Domain Image Enhancement Techniques.

REFERENCE BOOKS:

1. **Digital Image Processing & Computer Vision** — Dr. Anu Tank, Scientific Publishers, 2026.
2. **Image Processing & Computer Vision Master Class with Python** — Sandipan Dey, BPB Publications, 2023.
3. **Digital Image Processing (4th Edition)** — Rafael C. Gonzalez, Richard E. Woods, Pearson Education, 2018. ISBN-13: 9780137351312

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
CO1	3	2	1	-	1	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-	-
CO3	3	3	3	2	2	-	1	-	-	-	-	-
CO4	3	3	3	2	2	-	1	-	-	-	-	-

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (20)	✓	✓	✓	✓		
End Semester Examination (30)	✓	✓	✓	✓	✓	✓

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated). PROGRAMME BATCH 2024-27

SEMESTER: V

IMCA-DSE-356(B) Lab on Data Analytics-I

Course Title: Lab on Data Analytics-I

Course Type: DSE

Course Code: IMCA-DSE-356(B)

Total Credits: 02

Lectures: Tutorials: Practical: 0:0:2

CIE Marks: 20

Lecture Hours: 24 Hours

ESE Marks: 30

Course Description:

This practical course provides hands-on training in R programming and Excel for Data Analytics. It covers R programming fundamentals, data import and export, data cleaning, handling missing values, descriptive statistics, correlation analysis, and data visualization using various charts. The course also introduces essential Excel tools for data organization, cleaning, and analysis, enabling students to perform basic data analytics tasks effectively.

Course Objectives:

1. Understand and apply the fundamentals of R programming, including variables, data types, operators, decision-making, and looping constructs.
2. Import, clean, manipulate, and preprocess datasets from CSV and Excel files using R and Excel.
3. Perform statistical analysis by computing descriptive statistics, handling missing values, assessing data quality, and conducting correlation analysis.
4. Create meaningful data visualizations and use Excel analytical features to effectively analyze and present data for informed decision-making.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	-	✓	✓	-	-	✓

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

C01	Demonstrate proficiency in the R programming environment by implementing basic programming concepts, including variables, data types, operators, decision-making, and looping constructs.
C02	Import , export, clean, and manipulate datasets, handle missing values, and assess data quality using R and Excel.
C03	Apply descriptive statistical techniques and correlation analysis to summarize and interpret data effectively.
C04	Create and interpret basic and advanced data visualizations in R and utilize Excel tools to communicate data-driven insights effectively.

Sr. No.	Practical Title
1	Study of R Environment and Installation of R & RStudio
2	Implementation of Variables, Data Types, Operators, and Input/Output Functions in R
3	Implementation of Decision Making and Looping Statements in R
4	Importing and exporting data using CSV and Excel files.
5	Selecting, filtering, sorting, updating, and summarizing datasets.
6	Identifying data quality issues, removing duplicates, handling inconsistent data, and cleaning datasets.
7	Detecting, removing, and replacing missing values using appropriate techniques.
8	Calculation of mean, median, mode, range, variance, standard deviation

9	Finding and interpreting correlation between two or more variables.
10	Data Visualization Using R – Basic Charts (Bar Charts, Pie Charts, and Histograms).
11	Data Visualization Using R – Advanced Charts (Box Plots, Line Charts, and Scatter Plots)
12	Sorting and Filtering, Conditional Formatting, IF Function, Data Validation, Working with CSV files, and Data Cleaning.

REFERENCE BOOKS

1. R Programming for Data Science – Roger D. Peng.
2. An Introduction to Statistical Learning – Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani.
3. Microsoft Excel Data Analysis and Business Modeling – Wayne L. Winston.
4. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach, and Vipin Kumar.

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	-	-	-	-	-
C02	2	3	2	2	3	-	2	-	-	-	-	-
C03	2	2	2	3	3	-	2	-	2	-	-	-
C04	2	2	3	2	3	-	2	2	-	-	-	2

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (40)		✓	✓	✓	✓	✓
End Semester Examination (60)			✓	✓	✓	✓

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

SEMESTER: V

IMCA-MIN-357 Software Project Management

Course Title: Software Project Management

Course Type: Minor

Course Code: IMCA-MIN-357

Total Credits: 04

Lectures: Tutorials: Practical: 4:0:0

CIE Marks: 40

Lecture Hours: 48 Hours

ESE Marks: 60

Course Description:

This course introduces the concepts, principles, tools and methodologies used in software project management. It covers software project planning, scheduling, estimation, risk management, quality assurance, Agile methodologies, project monitoring and software team management. The course also focuses on practical project management approaches used in modern software industries

Course Objectives:

1. To understand the principles and practices of software project management.
2. To learn project planning, scheduling and software estimation techniques.
3. To understand risk management and software quality assurance concepts.
4. To study Agile methodologies, Scrum framework and project monitoring techniques.
5. To develop software project management, leadership and communication skills.
6. To apply modern project management tools and professional practices in software industries.

Teaching/ Evaluation Pedagogy

Chalk& Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	✓	✓	✓	✓	✓	✓

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

CO1	Understand software project management concepts, SDLC models and project planning techniques.
CO2	Apply software estimation, scheduling and resource allocation methods for software projects.
CO3	Analyze software risks, quality assurance techniques and project performance metrics.
CO4	Understand project execution processes, team coordination, communication, and leadership practices in software projects.
CO5	Use project management tools, communication techniques and documentation practices effectively.
CO6	Demonstrate leadership, teamwork and professional ethics in software project environments.

SN	Contents of Module	Hrs	COs
1.	UNIT – I: Introduction to Software Project Management and Planning 1.1 Fundamentals of Project Management 1.2 Characteristics of Software Projects 1.3 Software Development Life Cycle (SDLC) 1.4 Software Development Models 1.4.1 Waterfall Model 1.4.2 Spiral Model	08	CO1

	1.4.3 Incremental Model 1.4.4 Agile Model 1.5 Role and Responsibilities of Project Manager 1.6 Project Stakeholders 1.7 Project Organization Structures 1.8 Feasibility Study 1.9 Requirement Analysis 1.10 Scope Management 1.11 Activity: Draft a 1-page project charter for a given problem statement.		
2.	UNIT – II: Project Estimation and Scheduling 2.1 Project Estimation Techniques 2.2 Work Breakdown Structure (WBS) 2.3 Project Scheduling Techniques 2.4 Gantt Charts 2.5 Program Evaluation and Review Technique (PERT) 2.6 Critical Path Method (CPM) 2.7 Resource Allocation 2.8 Software Cost Estimation Techniques 2.9 COCOMO Model 2.10 Function Point Analysis with a worked example 2.11 Software Project Documentation 2.12 Activity: Create a 10-Task Gantt Chart with Dependencies using MS Project / ProjectLibre or Equivalent Tool.	08	C02
3.	UNIT – III: Risk Management and Software Quality Assurance 3.1 Risk Identification 3.2 Risk Analysis (Qualitative and Quantitative) 3.3 Risk Mitigation Strategies 3.4 Software Quality Assurance (SQA) 3.5 Software Testing Fundamentals 3.6 Verification 3.7 Validation 3.8 Configuration Management 3.9 Change Management 3.10 Software Reliability MTTF, failure rate 3.11 Software Quality Standards ISO 9001, CMMI levels overview	08	C03
4.	UNIT – IV: Software Project Execution and Teamwork 4.1 Project Execution Process 4.2 Roles and Responsibilities of Project Team Members 4.3 Team Formation and Team Development 4.4 Communication in Software Projects 4.5 Coordination and Collaboration Techniques 4.6 Meetings and Progress Reviews 4.7 Time Management and Task Prioritization 4.8 Problem Solving and Decision Making in Projects 4.9 Basics of Team Motivation and Leadership	08	C04
5.	UNIT – V: Project Monitoring and Documentation 5.1 Project Tracking Techniques 5.2 Project Monitoring Techniques 5.3 Earned Value Management (EVM) 5.4 Software Project Metrics 5.5 Performance Measurement Techniques 5.6 Team Communication Management 5.7 Conflict Resolution 5.8 Documentation Standards 5.9 Project Reporting 5.10 Activity: Track a Mock Project using GitHub Projects and Calculate EVM Metrics using Sample Project Data.	08	C05

6.	UNIT – VI: Software Team Management and Professional Practices 6.1 Leadership Skills 6.2 Team Building Techniques 6.3 Software Ethics 6.4 Professional Responsibilities 6.5 Client Interaction 6.6 Communication Skills 6.7 Software Contracts 6.8 Entrepreneurship in Software Industry 6.9 Case Studies on Real-World Software Projects 6.10 Capstone: Student Teams Submit a Full Project Plan (WBS + Gantt + Risk Register + EVM Baseline)	08	C06
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REFERENCE BOOKS

1. Hughes, Bob & Cotterell, Mike. Software Project Management (6th Edition). McGraw-Hill Education, 2017. ISBN: 978-0077098346.
2. Sommerville, Ian. Software Engineering (10th Edition). Pearson Education, 2015. ISBN: 978-0133943030.
3. Schwaber, Ken. Agile Project Management with Scrum. Microsoft Press, 2004. ISBN: 978-0735619937.
4. Project Management Institute (PMI). A Guide to the Project Management Body of Knowledge (PMBOK® Guide) (7th Edition). PMI, 2021. ISBN: 978-1628256642.
5. Royce, Walker. Software Project Management: A Unified Framework. Addison-Wesley Professional, 1998. ISBN: 978-0201309584.
6. Stellman, Andrew & Greene, Jennifer. Head First Agile. O'Reilly Media, 2017. ISBN: 978-1491921272.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	3	2	1	2	-	1	2	1	-	1	-
C02	3	3	2	2	3	-	1	2	1	-	1	-
C03	2	3	2	3	2	1	1	2	1	1	1	-
C04	2	2	3	1	3	1	1	2	2	1	2	1
C05	2	2	2	2	3	1	1	3	3	1	2	1
C06	1	1	2	1	2	3	2	3	3	3	3	2

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (40)	✓	✓	✓	✓		
End Semester Examination (60)			✓	✓		

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-28

SEMESTER: V

IMCA-VSC-358 Web Technology - IV

Course Title: Web Technology-IV

Course Type: VSC

Course Code: IMCA-VSC-358

Total Credits: 02

Lectures: Tutorials: Practical: 0:0:02

CIE Marks: 20

Lecture Hours: 24 hours

ESE Marks: 30

Course Description:

This course provides a practical introduction of Microservices Architecture, Docker, and Kubernetes through hands-on practice. This course covers containerization, Docker image creation, networking, Docker Compose, microservices communication, and Kubernetes deployment. By the end of the course, participants will be able to build, deploy, and manage containerized microservices applications using Docker and Kubernetes.

Course Objectives:

The objective of this course is to help learners understand Microservices, Docker, and Kubernetes. Participants will learn how to create, containerize, deploy, and manage applications using Docker and Kubernetes. They will also learn how different microservices communicate with each other and gain practical experience through hands-on projects and real-world examples.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	✓	--	✓	--	✓	✓

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

CO1	Explain the fundamentals of Microservices Architecture and containerization.
CO2	Create, build, and manage Docker images, containers, networks, and volumes.
CO3	Develop and deploy containerized applications using Docker and Docker Compose.
CO4	Implement an end-to-end microservices application deployment using Docker and Kubernetes.

Practical Assignments:

Sr. No	Program List
1	Study of Microservices Architecture and Its Components
2	Installation and Configuration of Docker Desktop on Windows
3	Exploring Basic Docker Commands and Container Management
4	Creating Custom Docker Images Using Dockerfile
5	Dockerizing a Simple Node.js Web Application
6	Working with Docker Volumes and Docker Networking
7	Deploying Multi-Container Applications Using Docker Compose
8	Designing and Implementing a Simple Microservices Application
9	Implementing Communication Between Microservices Using REST APIs
10	Installation and Setup of Kubernetes (kubectl and Minikube) and Managing Pods

REFERENCE BOOKS

1. Newman, S. *Building Microservices: Designing Fine-Grained Systems*, 2nd Edition, O'Reilly Media, 2021.
2. Poulton, N. *Docker Deep Dive*, Independently Published, Latest Edition.

3. Burns, B., Beda, J., and Hightower, K. *Kubernetes: Up and Running*, 3rd Edition, O'Reilly Media, 2022.
4. Richardson, C. *Microservices Patterns: With Examples in Java*, Manning Publications, 2018.
5. Turnbull, J. *The Docker Book: Containerization is the New Virtualization*, Latest Edition.
6. Luksa, M. *Kubernetes in Action*, 2nd Edition, Manning Publications, 2025.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P11	P012
C01	2	3	2	2	3	2	2	2	3	2	2	3
C02	1	2	3	1	2	2	3	3	1	2	2	3
C03	2	3	1	1	2	2	1	2	3	1	1	2

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (20)	✓	✓	--	✓	✓	✓
End Semester Examination (30)	✓	✓	--	✓	✓	✓

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-28

SEMESTER: V

IMCA-FP-359 Field Project

Course Title: Field Project

Course Code: IMCA-FP-359

Practical Hours: 24 Hours

Course Type: FP

Total Credits: 02

CIE Marks: 20

ESE Marks: 30

Course Description:

This course focuses on the analysis, design, development, and implementation of real-world IT solutions based on the field study conducted in IMCA-FP-238. Students gain practical exposure to software development, system analysis, testing, and documentation through hands-on project work.

Course Objectives:

1. To analyze existing IT systems and identify real-world problems.
2. To design and develop software-based solutions using suitable technologies.
3. To apply system design, database, and programming concepts in project implementation.
4. To develop practical skills in testing, documentation and presentation.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	✓	✓	✓	✓	✓	✓

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

C01	Analyze real-world IT problems and gather system requirements effectively.
C02	Design system models, databases, and user interfaces for software applications.
C03	Develop and implement functional IT solutions using appropriate tools and technologies.
C04	Perform testing, prepare project documentation, and present the implemented system professionally.

Contents of Module

Project Work

- Can be done individually or in a group of two students.
- Students must study and analyze the existing system and develop their own proposed system.

System Development

Students should perform:

- Requirement Analysis
- System Design (DFD, ERD, Database Design)
- Coding and Implementation
- Testing and Validation

Technologies

Projects may be developed using: (Not limited)

- Python, Java, .NET , ANDROID
- HTML, CSS, JavaScript
- MySQL or other databases

Documentation

The report should include:

- Introduction
- Objectives
- Proposed System
- Methodology
- Implementation (Code)
- Testing and Results
- Conclusion and Future Scope

Presentation & Viva

- Live demonstration of the system/application is required.
- Viva Voce will be conducted at the end of the semester.

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	1	1	2	2	1	2	1
C02	3	2	3	2	3	1	1	2	2	1	2	1
C03	3	3	3	2	3	1	2	2	2	1	2	2
C04	2	2	2	3	2	2	2	2	3	2	3	1

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (20)			✓	✓	✓	✓
End Semester Examination (30)			✓	✓	✓	✓

SMESTER: VI

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

SEMESTER: VI

IMCA-DSC-361 Mobile Application development

Course Title: Mobile Application development

Course Type: DSC

Course Code: IMCA-DSC-361

Total Credits: 2

Lectures: Tutorials: Practical: 2:0:0

CIE Marks: 20

Lecture Hours:24

ESE Marks: 30

Course Description:

This course introduces the fundamentals of Mobile Application Development using the Android platform. Students will learn Android architecture, user interface design, activities, intents, layouts, database handling with SQLite and Firebase, multimedia features, API integration, and basic security concepts. The course also includes practical laboratory work and mini-project development for hands-on experience in designing and developing Android applications.

Course Objectives:

1. Understand the fundamentals of mobile computing, Android architecture, Android Studio environment, and application lifecycle management.
2. Design and develop interactive Android user interfaces using layouts, views, intents, fragments, and event handling techniques.
3. Implement advanced mobile application features such as RecyclerView, multimedia handling, notifications, shared preferences, API integration, and basic security concepts.
4. Develop database-driven Android applications using SQLite and different mobile data storage techniques for efficient data management.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	✓	✓	✓	✓	✓	✓

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

C01	Understand the fundamentals of mobile computing, mobile operating systems, Android architecture, and the Android application development environment.
C02	Design and Develop Android user interfaces using layouts, UI components, activities, intents, fragments, and event handling techniques.
C03	Implement advanced mobile application features such as RecyclerView, multimedia handling, notifications, shared preferences, API integration, and application security basics.
C04	Develop database-driven mobile applications using SQLite and Firebase by performing CRUD operations, managing data storage, and connecting mobile apps with databases.

SN	Contents of Module	Hrs	COs
1.	Unit I: Introduction to Mobile Application Development 1.1 Introduction to Mobile Computing 1.2 Mobile Operating Systems: Android and iOS Overview 1.3 Architecture of Android Operating System	4	C01

	1.4 Android Studio IDE and SDK Setup 1.5 Android Application Structure 1.6 Activities and Activity Lifecycle 1.7 Introduction to Emulator and Physical Device Deployment		
2.	UNIT –II User Interface Design and App Components 2.1 XML Layouts and UI Components 2.2 Views and ViewGroups 2.3 TextView, EditText, Button, and ImageView 2.4 Intents and Intent Filters 2.5 Menus and Toast Messages 2.6 Event Handling in Android 2.7 Fragments and Navigation Basics	6	C02
3.	Unit III: Advanced Features in Mobile Applications 3.1 RecyclerView and ListView 3.2 Dialog Boxes and Notifications 3.3 Multimedia in Android 3.4 Shared Preferences 3.5 Permissions and Security Basics 3.6 Introduction to APIs and JSON Parsing 3.7 Publishing Basics of Mobile Applications	6	C03
4.	Unit IV: Database Handling in Mobile Applications 4.1 Introduction to Mobile Databases 4.1.1 Need of Databases in Mobile Applications 4.1.2 Types of Mobile Databases 4.1.3 Advantages of Local Data Storage 4.2 SQLite Database Fundamentals 4.2.1 Introduction to SQLite 4.2.2 Creating Database and Tables 4.2.3 Data Types in SQLite 4.2.4 Basic SQL Commands 4.3 CRUD Operations in SQLite 4.3.1 Insert Records 4.3.2 Read/View Records 4.3.3 Update Records 4.3.4 Delete Records 4.4 Data Storage Techniques 4.4.1 Shared Preferences 4.4.2 File Storage Basics 4.4.3 Internal Storage 4.4.4 External Storage	8	C04

REFERENCE BOOKS:

1. Android Programming: The Big Nerd Ranch Guide: Bill Phillips, Chris Stewart & Kristin Marsicano, Big Nerd Ranch Publication, ISBN: 978-0137645540
2. Head First Android Development: Dawn Griffiths & David Griffiths, O'Reilly Media, ISBN: 978-1492076524
3. Professional Android: Reto Meier, Wrox (John Wiley & Sons), ISBN: 978-1118102273
4. Android Application Development For Dummies: Donn Felker, Wiley Publishing, ISBN: 978-1118190188
5. Beginning Android Application Development: Wei-Meng Lee, Wiley India (John Wiley & Sons), ISBN: 978-8126552555

Mapping of Course Outcomes to Program Outcomes:

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

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (20)	✓	✓	✓	✓	✓	✓
End Semester Examination (30)	✓	✓	✓	✓	✓	✓

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-28

SEMESTER: VI

IMCA-DSC-362 Lab on Mobile Application development

Course Title: Lab on Mobile Application development

Course Type: DSC

Course Code: IMCA-DSC-362

Total Credits: 02

Lectures: Tutorials: Practical: 0:0:2

CIE Marks: 20

Lecture Hours: 24 Hours

ESE Marks: 50

Course Description:

This course introduces students to the fundamentals of Android Application Development using Android Studio. It covers the design of graphical user interfaces, event handling, activity lifecycle, intents, menus, dialogs, shared preferences, and basic application development concepts. Through practical exercises, students will learn to build simple Android applications using various UI controls and Android components.

Course Objectives:

1. To understand the basics of Android application development environment and Android Studio.
2. To design user interfaces using Android UI controls such as TextView, EditText, Button, ImageView, Radio Button, and CheckBox.
3. To implement event handling and user interaction in Android applications.
4. To develop applications using Activities and Intents.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	✓	✓	✓	✓	✓	✓

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

C01	Develop basic Android applications using Android Studio and UI components.
C02	Design interactive mobile application user interfaces using layouts, activities, intents, and event handling.
C03	Implement event handling mechanisms for buttons, radio buttons, and check boxes
C04	Develop Android applications for arithmetic operations and user interactions.

SN	Practical List
1.	Create a simple Android application to display "Hello World" using a Toast Message.
2.	Design a user interface using TextView, EditText, Button, and ImageView controls.
3.	Implement event handling for Button controls and display messages using Toast.
4.	Implement event handling for Radio Buttons and Check Boxes to capture user selections.
5.	Create a simple calculator application to perform basic arithmetic operations (Addition, Subtraction, Multiplication, and Division).
6.	Develop an application to demonstrate the Activity Lifecycle methods and display lifecycle state changes using Toast messages.
7.	Create an application using Explicit Intent to navigate between two activities.

8	Develop an application using Explicit Intent to pass and display data between activities.
9	Create an application using Implicit Intent to open a website in a web browser based on the URL entered in an EditText control.
10	Design an application using Menus, Alert Dialogs, and Shared Preferences to store and retrieve simple user information.

REFERENCE BOOKS:

1. Android Programming: The Big Nerd Ranch Guide: Bill Phillips, Chris Stewart & Kristin Marsicano, Big Nerd Ranch Publication, ISBN: 978-0137645540
2. Head First Android Development: Dawn Griffiths & David Griffiths, O'Reilly Media, ISBN: 978-1492076524
3. Professional Android: Reto Meier, Wrox (John Wiley & Sons), ISBN: 978-1118102273
4. Android Application Development For Dummies: Donn Felker, Wiley Publishing, ISBN: 978-1118190188
5. Android Studio 4.0 Development Essentials – Java Edition: Neil Smyth, Payload Media, ISBN: 978-1951442374

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	2	-	1	-	1	-	-	-
CO2	2	2	3	1	3	-	1	-	2	1	1	1
CO3	2	3	2	2	3	-	1	1	2	-	1	1
CO4	3	3	3	2	3	1	1	1	2	1	1	2

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (20)	✓	✓	✓	✓	✓	✓
End Semester Examination (30)	✓	✓	✓	✓	✓	✓

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FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

SEMESTER: VI

IMCA-DSC-363 Cloud Computing

Course Title: Cloud Computing

Course Code: IMCA-DSC-363

Lectures: Tutorials: Practical: 4:0:0

Lecture Hours: 48 hours

Course Type: DSC

Total Credits: 04

CIE Marks: 40

ESE Marks: 60

Course Description:

This course introduces the fundamentals of Cloud Computing, including cloud architecture, virtualization, storage, security, and cloud services. It covers major cloud platforms, deployment models, and modern technologies such as Docker, Kubernetes, and serverless computing. The course provides both theoretical and practical understanding of cloud-based systems and applications.

Course Objectives:

1. To understand the fundamental concepts, architecture, and service models of Cloud Computing.
2. To learn virtualization techniques and cloud infrastructure management.
3. To explore cloud storage, cloud services, APIs, and distributed systems.
4. To understand cloud security, privacy, risk management, and performance monitoring.
5. To gain knowledge of modern cloud platforms and advanced technologies such as Docker, Kubernetes, DevOps, and serverless computing.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	✓	✓	✓		✓	

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

C01	Explain cloud computing fundamentals, service models (IaaS/PaaS/SaaS), and deployment models with real-world vendor examples.
C02	Describe virtualisation types, hypervisors, VM management, and cloud infrastructure components including load balancing.
C03	Explain cloud storage types, distributed file systems, cloud databases, SLAs, and web service APIs.
C04	Analyse cloud security challenges, apply IAM concepts, Zero-Trust model, and outline backup and disaster recovery strategies.
C05	Apply cloud platforms, migration techniques, microservices, IoT, and cost optimization practices in cloud computing.
C06	Describe containerisation (Docker/Kubernetes), serverless computing, DevOps in cloud.

SN	Contents of Module	Hrs	COs
1.	UNIT –I Introduction to Cloud Computing 1.1 Introduction, Characteristics, Benefits, Evolution of Cloud Computing 1.2 Distributed Systems and Utility Computing 1.3 Cloud Architecture, Cloud Service Models: IaaS, PaaS, SaaS (with vendor example) 1.4 Deployment Models: Public, Private, Hybrid, Community Cloud 1.5 Advantages, Limitations and Applications of Cloud Computing	07	C01

2.	UNIT –II Virtualization and Cloud Infrastructure 2.1 Concept and Types of Virtualization, Hypervisors (Type 1 and 2) 2.2 Virtual Machines, Server, Storage, and Network Virtualization 2.3 Virtual Machine Management and Migration (live migration concept) 2.4 Data Center Concepts, Cloud Infrastructure Components 2.5 Resource Provisioning, Scheduling and Load Balancing strategies 2.6 Introduction to Software-Defined Networking (SDN)	09	C02
3.	UNIT –III Cloud Storage and Services 3.1 Cloud Storage: Object Storage (S3), Block Storage (EBS), File Storage (EFS) 3.2 Distributed File Systems, Cloud Databases (RDS, DynamoDB, Cosmos DB) 3.3 Web Services and REST APIs, Service-Oriented Architecture (SOA) 3.4 Service Level Agreement, metrics, uptime calculation	08	C03
4.	UNIT –IV Cloud Security and Management 4.1 Cloud Security Issues and Challenges 4.2 Data Security, Privacy and Compliance (GDPR, IT Act 2000 mention) 4.3 Identity and Access Management(IAM): roles, policies, MFA 4.4 Zero-Trust Security Model 4.5 Authentication and Authorization; Security Standards and Protocols 4.6 Backup and Disaster Recovery; Risk Management 4.7 Monitoring, Logging and Performance Management (CloudWatch/ Azure Monitor)	08	C04
5.	UNIT –V Cloud Platforms and Applications 1.1 Introduction to AWS: core Services (EC2, S3, RDS, Lambda, IAM) 1.2 Introduction to Microsoft Azure: Virtual Machines, Blob Storage, Azure Functions 1.3 Introduction to Google Cloud Platform (GCP): Compute Engine, Cloud storage 1.4 Cloud Migration Concepts; Microservices and Internet of Things (IoT) in Cloud 1.5 Cloud Cost Management and FinOps: budgets, cost explorer, rightsizing	08	C05
6.	UNIT –VI Advance Cloud Computing 6.1 Cloud automation, Containerization basics 6.2 Introduction to Docker and Kubernetes 6.3 DevOps in Cloud: CI/CD pipelines 6.4 Serverless Computing : Function-as-a-Service (AWS Lambda, Azure Functions) 6.5 Edge Computing Basics and Multi-Cloud Concepts	08	C06

REFERENCE BOOKS:

1. Rajkumar Buyya, Christian Vecchiola & S. Thamarai Selvi – Mastering Cloud Computing: Foundations and Applications Programming, Morgan Kaufmann / Elsevier (2013); supplement with AWS/Azure official docs for current services.
2. Kai Hwang, Geoffrey Fox & Jack Dongarra – Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Morgan Kaufmann (2012).
3. Thomas Erl, Ricardo Puttini & Zaigham Mahmood – Cloud Computing: Concepts, Technology & Architecture, Prentice Hall (2013).
4. Nane Kratzke & Raimund Pirchner – Cloud Native: Using Containers, Functions, and Data to Build Next-Generation Applications, O'Reilly (2022).
5. Randall Hunt – AWS Certified Cloud Practitioner Study Guide (CLF-C02), 2nd Edition, Sybex / Wiley (2023) – maps to CLF-C02 exam.
6. Microsoft Learn – Azure Fundamentals AZ-900 Learning Path (free, always updated) – learn.microsoft.com.
7. AWS Skill Builder – AWS Cloud Practitioner Essentials (free, official) – explore.skillbuilder.aws.
8. Google Cloud Skills Boost – Cloud Digital Leader Learning Path (free) – cloudskillsboost.google.

Video References

Type	Title / Series	Creator / Channel	Platform	URL / Access
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Video	AWS Certified Cloud Practitioner (CLF-C02) – Full Course (2024)	freeCodeCamp / Andrew Brown (ExamPro)	YouTube	youtube.com/@freecodecamp
Video	Azure AZ-900 Fundamentals Full Course (2024)	Adam Marczak – Azure for Everyone	YouTube	youtube.com/@AdamMarczakAzure
Video	Google Cloud Digital Leader Certification Course (2024)	Antoni Tzavelas (Google Cloud)	YouTube	youtube.com/c/GoogleCloudTech
Video	Kubernetes and Docker – Full DevOps Course (2024)	TechWorld with Nana	YouTube	youtube.com/@TechWorldwithNana
Video	NPTEL – Cloud Computing (IIT Kharagpur)	Prof. Soumya Kanti Ghosh, IIT KGP	NPTEL/Swayam	swayam.gov.in
Video	Terraform for Beginners – Infrastructure as Code	Sanjeev Thiagarajan (FreeCodeCamp)	YouTube	youtube.com/@freecodecamp
Audio/Podcast	AWS Podcast – Official Amazon Web Services Podcast	AWS Team	Podcast / Spotify	aws.amazon.com/podcasts/aws-podcast
Audio/Podcast	Cloud Security Podcast	Anton Chuvakin & Timothy Peacock (Google)	Podcast / Spotify	cloudsecuritypodcast.tv
Audio/Podcast	The Cloudcast – Weekly Cloud Computing Podcast	Aaron Delp & Brian Gracely	Podcast / Spotify	thecloudcast.net

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	2
C02	3	3	2	1	2	1	1	2	1	1	1	2
C03	2	3	3	1	2	1	1	1	1	1	1	2
C04	2	2	2	1	2	3	2	1	1	3	1	2
C05	2	2	3	1	3	1	2	2	2	2	2	2
C06	2	2	3	1	3	1	2	2	1	1	1	2

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (40)	✓	✓	✓	✓	✓	
End Semester Examination (60)	✓	✓	✓	✓	✓	

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FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

SEMESTER: VI

IMCA-DSC-364 Lab on Cloud Computing

Course Title: Lab on Cloud Computing

Course Type: DSC

Course Code: IMCA-DSC-364

Total Credits: 02

Lectures: Tutorials: Practical: 0:0:2

CIE Marks: 20

Lecture Hours: 24 Hours

ESE Marks: 30

Course Description:

This course introduces the fundamental concepts of Cloud Computing, including cloud architecture, service models, virtualization, and cloud security. Students gain hands-on experience with cloud storage, Ubuntu Linux, GitHub, Docker, and virtual machines while exploring collaborative cloud applications. The course also covers emerging technologies such as Edge Computing, IoT, Serverless Computing, and Kubernetes through practical demonstrations and industry case studies.

Course Objectives:

1. To understand the fundamentals of Cloud Computing and its service models.
2. To develop practical skills in virtualization, Linux, GitHub, and Docker.
3. To learn cloud storage, collaboration tools, and cloud security practices.
4. To explore emerging cloud technologies and their industrial applications.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓		✓			✓	✓

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

C01	Explain the fundamentals of Cloud Computing, cloud architecture, and service models.
C02	Use cloud-based tools, virtual machines, Linux, GitHub, and Docker for basic cloud tasks.
C03	Apply cloud security practices and utilize cloud storage and collaboration services effectively.
C04	Describe emerging cloud technologies and analyze their industrial applications.

SN	Practical List
1.	Study the basics of Cloud Computing, Cloud Architecture, and Service Models (IaaS, PaaS, SaaS) using real-life cloud applications.
2.	Create and manage files using Google Drive, Google Docs, Google Sheets, and Google Forms.
3.	Install Oracle VirtualBox and create a Virtual Machine.
4.	Install Ubuntu Linux on VirtualBox and perform basic file management, user management, and software installation.
5.	Create a GitHub account and host a simple static website using GitHub Pages.
6.	Install Docker Desktop and run basic Docker containers using simple Docker commands.
7.	Perform cloud security tasks using Google Account Security, including Password Management, Two-Step Verification, and Security Check-up.
8.	Compare Google Drive, Microsoft OneDrive, and Dropbox based on storage, file sharing, and collaboration features.

9.	Study Edge Computing, IoT, Serverless Computing, and Kubernetes through online demonstrations and educational videos.
10.	Study industrial applications of Cloud Computing through case studies of Google, Amazon, Netflix, Microsoft Azure, and other cloud-based services.

REFERENCE BOOKS:

1. Creating Google Documets, Sheets, and Slides-Basics Tutorial:
<https://www.youtube.com/watch?v=y5MpZa5fWeU>
2. <https://support.google.com/docs/answer/6281888>
3. Installing VirtualBox and Creating a New Virtual Machine:
<https://www.youtube.com/watch?v=RIYc1wvMfuY>
4. Install Ubuntu 20.04 LTS on VirtualBox in Windows 10:
<https://www.youtube.com/watch?v=x5MhydiWmc>
5. How to deploy a Static Website to Github Pages-https://www.youtube.com/watch?v=AD-3nVI3-_U
6. Docker Tutorial-<https://www.youtube.com/watch?v=DQdB7wFEygo>
7. Two Step Verification for Google Account- <https://www.youtube.com/watch?v=XcggWXRAitE>
8. <https://www.cloudwards.net/dropbox-vs-google-drive-vs-onedrive/>

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	1	-	2	-	-	-	-	-
CO2	2	2	2	2	3	-	2	1	1	-	1	-
CO3	2	2	2	1	3	3	2	1	2	2	2	-
CO4	2	2	3	1	2	1	3	2	1	2	1	2

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (20)	✓	✓	✓	✓		✓
End Semester Examination (30)	✓	✓	✓	✓		✓

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FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

SEMESTER: VI

IMCA-DSE-365(A)-Digital Image Processing-II

Course Title: Digital Image Processing-II

Course Type: DSE

Course Code: IMCA-DSE-365(A)

Total Credits: 2

Lectures: Tutorials: Practical: 2:0:0

CIE Marks: 20

Lecture Hours: 24

ESE Marks: 30

Course Description:

This course introduces advanced concepts of Digital Image Processing with emphasis on color image processing, image compression, mathematical morphology, and image segmentation. Students will study various color models, color transformations, image enhancement techniques, compression algorithms, morphological operations, and segmentation methods used in digital image analysis. The course provides both theoretical knowledge and practical understanding of image processing techniques applicable to medical imaging, multimedia systems, remote sensing, pattern recognition, and industrial inspection.

Course Objectives:

1. Understand the fundamentals of color image processing, including color models, color transformations, and color image enhancement techniques.
2. Learn the principles of image compression, redundancy reduction, coding techniques, and JPEG/JPEG2000 standards.
3. Apply mathematical morphology operations for image analysis and preprocessing.
4. Understand and implement various image segmentation techniques for digital image analysis and applications.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓			✓		✓	✓

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

CO1	Demonstrate color image processing using various color models, color transformations, enhancement methods, pseudo-color processing, full-color processing, and color-based image segmentation.
CO2	Explain the fundamentals of image compression, redundancy reduction, fidelity criteria, and various lossless and lossy compression techniques including Huffman coding, Arithmetic coding, Predictive coding, Transform-based compression, and JPEG/JPEG2000 standards.
CO3	Apply mathematical morphology operations such as erosion, dilation, opening, closing, hit-or-miss transformation, boundary extraction, region filling, connected component analysis, thinning, and thickening for image analysis.
CO4	Analyze and implement image segmentation techniques including thresholding, edge-based, region-based, watershed, and morphological segmentation methods, and evaluate their applications in digital image processing.

SN	Contents of Module	Hrs	COs
1.	UNIT – I: Color Image Processing 1.1 Color Fundamentals 1.2 Color Models: RGB, CMY/CMYK, HSI/HSV, YCbCr 1.3 Color Transformations 1.4 Color Image Enhancement 1.5 Pseudo Color Processing 1.6 Full Color Processing 1.7 Color-Based Image Segmentation	6	CO1

	1.8 Applications of Color Image Processing		
2.	UNIT – II: Image Compression 2.1 Fundamentals of Image Compression 2.2 Redundancy in Images 2.3 Compression Models 2.4 Fidelity Criteria 2.5 Lossless Compression Techniques 2.6 Huffman Coding 2.7 Arithmetic Coding 2.8 Predictive Coding 2.9 Transform-Based Compression 2.10 JPEG and JPEG2000 Standards	6	C02
3.	UNIT – III: Morphological Image Processing 3.1 Introduction to Mathematical Morphology 3.2 Structuring Elements 3.3 Erosion and Dilation 3.4 Opening and Closing 3.5 Hit-or-Miss Transformation 3.6 Boundary Extraction 3.7 Region Filling 3.8 Connected Component Analysis 3.9 Thinning and Thickening 3.10 Morphological Applications	6	C03
4.	UNIT – IV: Image Segmentation 4.1 Fundamentals of Image Segmentation 4.2 Edge-Based Segmentation 4.3 Thresholding Techniques 4.4 Region-Based Segmentation 4.5 Region Growing 4.6 Region Splitting and Merging 4.7 Watershed Segmentation 4.8 Morphological Segmentation 4.9 Segmentation Performance Evaluation 4.10 Applications of Image Segmentation	6	C04

REFERENCE BOOKS:

1. **Digital Image Processing & Computer Vision** — Dr. Anu Tank, Scientific Publishers, 2026.
2. **Image Processing & Computer Vision Master Class with Python** — Sandipan Dey, BPB Publications, 2023.
3. **Digital Image Processing (4th Edition)** — Rafael C. Gonzalez, Richard E. Woods, Pearson Education, 2018. ISBN-13: 9780137351312

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	1	2	–	1	–	–	–	–	–
C02	3	3	2	2	3	–	1	–	–	–	–	–
C03	3	3	3	2	3	–	1	–	–	–	1	–
C04	3	3	3	3	3	–	1	–	1	–	1	–

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (20)	✓	✓	✓	✓		
End Semester Examination (30)	✓	✓	✓	✓	✓	✓

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FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

IMCA-DSE-365(B) Data Analytics-II

Course Title: Data Analytics-II

Course Code: IMCA-DSE-365(B)

Lectures: Tutorials: Practical: 2:0:0

Lecture Hours: 24 Hours

Course Type: DSE

Total Credits: 02

CIE Marks: 20

ESE Marks: 30

Course Description:

This course introduces students to the fundamentals of Exploratory Data Analysis (EDA) and Business Intelligence (BI) using industry-standard tools and techniques. Students learn how to collect, inspect, clean, transform, and visualize data to extract meaningful insights for decision-making. The course covers the use of Python (NumPy, Pandas, and Matplotlib) for basic data analysis, Power BI for interactive reporting and dashboard development, and Tableau for effective data visualization and storytelling. Through hands-on practical exercises and real-world datasets, students develop the skills required to analyze data, create interactive dashboards, and communicate analytical findings effectively. The course provides a strong foundation for further studies in data analytics, business intelligence, and data science.

Course Objectives:

1. Understand the fundamentals of Exploratory Data Analysis (EDA) and the role of data visualization in decision-making.
2. Apply Python libraries such as NumPy and Pandas to perform basic data analysis and data preprocessing.
3. Develop interactive reports and dashboards using Power BI and Tableau for effective data visualization.
4. Analyze datasets and communicate business insights through visualizations and dashboards to support informed decision-making.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	✓		✓		✓	-

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

CO1	Understand the fundamentals of Exploratory Data Analysis (EDA) and perform basic data analysis using Python libraries such as NumPy and Pandas.
CO2	Clean, transform, and visualize data using Power BI to create basic interactive reports and dashboards.
CO3	Create charts, dashboards, and simple data stories using Tableau for effective data visualization.
CO4	Analyze datasets, interpret business insights, and develop interactive dashboards using Python, Power BI, or Tableau to support decision-making.

SN	Contents of Module	Hrs	COs
	UNIT – I: Fundamentals of EDA Using Python		
	1.1 Introduction to Data Analytics		
	1.2 Introduction to Exploratory Data Analysis (EDA)		
	1.3 Importance of EDA		
	1.4 Applications of EDA		
	1.5 Types of EDA		
	1.5.1 Univariate Analysis		
	1.5.2 Bivariate Analysis		
	1.6 Introduction to Python for Data Analytics		
	1.7 Python Libraries for Data Analytics		
	1.7.1 NumPy		
	1.7.2 Pandas		
	1.7.3 Matplotlib		
		6	CO1

	1.8 Working with Data Frames 1.9 Data Inspection Techniques 1.9.1 head() 1.9.2 tail() 1.9.3 info() 1.9.4 describe() 1.9.5 isna() 1.9.6 drop_duplicates() 1.10 Basic Data Visualization 1.10.1 Bar Chart 1.10.2 Line Chart 1.10.3 Pie Chart 1.10.4 Histogram 1.10.5 Scatter Plot		
2.	UNIT – II: Power BI for Data Analysis 2.1 Introduction to Power BI 2.2 Power BI Desktop Interface 2.3 Importing Data 2.3.1 Importing Excel Files 2.3.2 Importing CSV Files 2.4 Data Cleaning using Power Query Editor 2.5 Handling Missing Values 2.6 Handling Duplicate Records 2.7 Data Transformation 2.7.1 Filtering Data 2.7.2 Sorting Data 2.7.3 Splitting Columns 2.8 Creating Visualizations 2.8.1 Bar Chart 2.8.2 Pie Chart 2.8.3 Line Chart 2.9 Using Filters and Slicers 2.10 Introduction to Dashboards	6	CO2
3.	UNIT – III: Tableau Fundamentals 3.1 Introduction to Tableau 3.2 Tableau Interface and Workspace 3.3 Connecting Tableau to Data Sources 3.3.1 Excel Files 3.3.2 CSV Files 3.4 Data Sorting 3.5 Data Filtering 3.6 Creating Visualizations 3.6.1 Bar Chart 3.6.2 Line Chart 3.6.3 Pie Chart 3.6.4 Scatter Plot 3.6.5 Tree Map 3.7 Creating Dashboards 3.8 Basic Data Storytelling	6	CO3
4.	UNIT – IV: Dashboard Design and Business Analytics 4.1 Principles of Effective Dashboard Design 4.2 Interactive Dashboards in Power BI 4.3 Interactive Dashboards in Tableau 4.4 Publishing Dashboards 4.5 Sharing Dashboards 4.6 Business Intelligence Concepts 4.7 Data Interpretation 4.8 Decision Making	6	CO4

REFERENCE BOOKS

1. **Wes McKinney**, *Python for Data Analysis*, 3rd Edition, O'Reilly Media, 2022
2. **Cole Nussbaumer Knaflitz**, *Storytelling with Data: A Data Visualization Guide for Business Professionals*, Wiley, 2015.
3. **Joshua N. Milligan**, *Learning Tableau 2022*, 5th Edition, Packt Publishing, 2022.
4. **Foster Provost and Tom Fawcett**, *Data Science for Business*, 2nd Edition, O'Reilly Media, 2023.

Mapping of Course Outcomes to Program Outcomes:

C0/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	2	1	2	3	-	2	-	-	-	-	-
C02	1	2	3	2	3	-	1	-	2	-	-	-
C03	-	1	2	2	3	-	1	-	3	-	1	-
C04	2	3	3	3	3	-	2	1	2	1	2	1

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (20)		✓	✓	✓	✓	✓
End Semester Examination (30)		✓	✓	✓	✓	✓

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

SEMESTER: VI

IMCA-DSE-366(A) - Lab on Digital Image Processing -II

Course Title: - Lab on Digital Image Processing-II

Course Type: DSE

Course Code: IMCA-DSE-366 (A)

Total Credits: 2

Lectures: Tutorials: Practical: 0:0:2

CIE Marks: 20

Lecture Hours: 24 Hours

ESE Marks: 30

Course Description:

This laboratory course provides practical implementation of advanced Digital Image Processing techniques with emphasis on color image processing, image compression, morphological image processing, and image segmentation. Students will implement algorithms related to color models, color transformations, image enhancement, compression techniques, morphological operations, and segmentation methods using appropriate software tools. The course enables students to develop programming skills for solving real-world image processing problems in multimedia, medical imaging, remote sensing, and industrial applications.

Course Objectives:

1. Implement color image processing techniques using different color models, transformations, and enhancement methods.
2. Develop programs for image compression using coding techniques and compression standards.
3. Apply mathematical morphology operations for image preprocessing and analysis.
4. Implement image segmentation techniques for extracting meaningful information from digital images.

Teaching/ Evaluation Pedagogy

Chalk& Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	✓		✓		✓	✓

Course Outcomes:

C01	Implement color image processing techniques including color models, color transformations, color enhancement, pseudo-color processing, and color-based segmentation.
C02	Develop image compression programs using Huffman coding, arithmetic coding, predictive coding, transform-based compression, and JPEG/JPEG2000 concepts.
C03	Apply mathematical morphology operations such as erosion, dilation, opening, closing, boundary extraction, region filling, connected component analysis, thinning, and thickening.
C04	Implement image segmentation techniques including thresholding, edge-based, region-based, watershed, and morphological segmentation, and evaluate segmentation performance.

Sr. No.	Practical List
1	Write a program to study different color models such as RGB, CMY/CMYK, HSI/HSV, and YCbCr and perform color transformations.
2	Write a program for color image enhancement using contrast adjustment and histogram equalization.
3	Write a program to perform pseudo-color processing and full-color image processing.
4	Write a program for color-based image segmentation.
5	Write a program to implement Huffman coding for image compression.
6	Write a program to implement Arithmetic Coding and Predictive Coding for image compression.
7	Write a program to implement Transform-Based Compression using JPEG/JPEG2000 concepts.
8	Write a program to perform morphological operations such as erosion, dilation, opening, and closing.
9	Write a program for boundary extraction, region filling, connected component analysis, thinning, and thickening.
10	Write a program to implement edge-based image segmentation techniques.

11	Write a program to perform image segmentation using thresholding, region growing, and watershed segmentation techniques.
12	Write a program to evaluate and compare different image segmentation techniques.

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	1	2	-	-	-	-	-	-	-
C02	3	3	2	2	2	-	1	-	-	-	-	-
C03	3	3	3	2	3	-	1	-	-	-	-	-
C04	3	3	3	2	3	-	1	-	-	-	-	-

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (20)	✓	✓	✓	✓		
End Semester Examination (30)	✓	✓	✓	✓	✓	✓

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FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

SEMESTER: VI

IMCA-DSC-366(B) Lab on Data Analytics-II

Course Title: Lab on Data Analytics-II

Course Code: IMCA-DSC-366(B)

Lectures: Tutorials: Practical: 0:0:2

Lecture Hours: 24 Hours

Course Type: DSC

Total Credits: 02

CIE Marks: 20

ESE Marks: 30

Course Description:

This practical course introduces students to Python for data analytics, Power BI, and Tableau. It covers data analysis using NumPy and Pandas, data cleaning and preprocessing, data visualization with Python, and the development of interactive reports and dashboards using Power BI and Tableau for effective data analysis and storytelling.

Course Objectives:

1. Understand and apply Python programming libraries such as NumPy and Pandas for data analysis and preprocessing.
2. Perform data cleaning, exploratory data analysis, and create visualizations using Python.
3. Develop interactive reports and dashboards using Power BI by importing, transforming, and visualizing data.
4. Design effective visualizations and dashboards in Tableau to communicate insights through data storytelling.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	-	-	✓	-	-	✓

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

C01	Apply Python libraries such as NumPy and Pandas to perform data analysis, manipulation, and preprocessing.
C02	Conduct exploratory data analysis, clean datasets, and create meaningful visualizations using Python.
C03	Develop interactive reports and dashboards in Power BI by importing, transforming, and visualizing data.
C04	Design effective visualizations and dashboards in Tableau and communicate data-driven insights using storytelling techniques.

Sr. No.	Practical Title
1	Installation of Python, introduction to data analytics libraries, and basic array operations and statistical calculations using NumPy.
2	Creating, accessing, and manipulating DataFrames using Pandas.
3	Performing data inspection using <code>head()</code> , <code>tail()</code> , <code>info()</code> , <code>describe()</code> , <code>isna()</code> , and <code>drop_duplicates()</code> functions.
4	Handling missing values, duplicate records, and preparing datasets for analysis.
5	Creating Bar Chart, Line Chart, Pie Chart, Histogram, and Scatter Plot using Matplotlib.
6	Exploring Power BI Desktop interface and importing data from Excel and CSV files.
7	Removing duplicates, handling missing values, filtering, sorting, and splitting columns.
8	Developing Bar Charts, Pie Charts, and Line Charts using Power BI.

9	Applying filters and slicers to build interactive dashboards.
10	Exploring Tableau interface and connecting Tableau with Excel and CSV datasets.
11	Creating Bar Charts, Line Charts, Pie Charts, Scatter Plots, and Tree Maps.
12	Designing dashboards and presenting insights using Tableau storytelling techniques.

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	3	-	1	-	-	-	-	-
C02	3	3	2	3	3	-	1	-	2	-	-	-
C03	2	2	3	2	3	-	1	2	3	-	1	1
C04	2	2	3	3	3	-	1	2	3	-	2	2

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (20)	✓	✓	✓	✓	-	✓
End Semester Examination (30)			✓	✓	✓	✓

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

SEMESTER: VI

IMCA-MIN-367 Advanced Software Project Management

Course Title: Advanced Software Project Management

Course Code: IMCA-MIN-367

Lectures: Tutorials: Practical: 4:0:0

Lecture Hours: 48

Course Type: Minor

Total Credits: 4 Credit

CIE Marks: 40

ESE Marks: 60

Course Description:

This course introduces core Agile methodologies (Scrum, Kanban, Lean, XP) and equips students to contribute to software teams from day one. Balancing theory with hands-on practice, it covers Agile planning, DevOps integration, and scaling frameworks alongside practical simulations of Sprint cycles, daily stand-ups, and Jira/Trello workflow management. The curriculum is enriched with real-world Indian IT case studies (Infosys, TCS, Zoho) and explores modern Agile applications in the fast-growing domains of AI/ML and Data Science.

Course Objectives:

1. To introduce the fundamental concepts, principles, and values of Agile software development.
2. To develop an understanding of Scrum, Kanban, Lean, and Extreme Programming (XP) frameworks.
3. To enable students to apply Agile planning, estimation, and project management techniques.
4. To familiarize students with Agile tools, team collaboration, and workflow management practices.
5. To introduce Agile testing, DevOps, and continuous integration concepts for software quality improvement.
6. To provide knowledge of Agile scaling frameworks and their applications in modern software development.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	✓	✓	✓	-	✓	-

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

C01	Explain Agile fundamentals, the Manifesto, 12 Principles, XP practices, and situational applicability of different frameworks.
C02	Apply Scrum roles, events, artifacts, user story writing, and backlog prioritisation in a team setting.
C03	Execute Agile project planning, release planning, burndown tracking, and risk management in a simulated Sprint.
C04	Use Lean-Kanban principles and at least one Agile tool (Jira or Trello) to manage a real task backlog.
C05	Apply Agile testing (TDD), CI/CD basics, and Agile metrics to monitor and improve software quality.
C06	Analyze scaling frameworks (SAFe, LeSS) and apply Agile thinking to AI/ML, Data Science, and cloud-native projects.

SN	Contents of Module	Hrs	COs
1.	UNIT I – Foundations of Agile Methodologies	08	C01

	1.1 History and Evolution of Agile; Traditional vs Agile Development 1.2 Agile Manifesto and 12 Principles 1.3 Agile Lifecycle and Benefits 1.4 Agile and Lean Software Development Fundamentals 1.5 Agile Mindset and Cultural Transformation 1.6 Introduction to XP and its 12 Practices 1.7 Emerging Trends in Agile (Agile at scale, remote Agile)		
2.	UNIT II – Scrum Framework and Agile Planning 2.1 Scrum Roles: Product Owner, Scrum Master, Development Team 2.2 Scrum Events: Sprint Planning, Daily Scrum, Sprint Review, Sprint Retrospective 2.3 Scrum Artifacts: Product Backlog, Sprint Backlog, Increment 2.4 Agile Requirements and User Stories (INVEST criteria) 2.5 Backlog Management and Prioritisation (MoSCoW, WSJF) 2.6 Definition of Ready (DoR) and Definition of Done (DoD) 2.7 Agile Estimation: Story Points, Planning Poker, T-Shirt Sizing 2.8 Activity: Write 5 user stories for a given product and prioritise using MoSCoW	08	CO2
3.	UNIT III – Agile Project Management and Simulated Sprint 3.1 Agile Project Planning, Release Planning 3.2 Tracking: Burndown Charts and Burnup Charts 3.3 Agile Risk Management and Architecture Fundamentals 3.4 Writing Effective User Stories (INVEST); Managing Technical Debt 3.5 Team Collaboration, Communication, and Refactoring	08	CO3
4	UNIT IV – Lean, Kanban and Agile Tools 4.1 Lean Software Development Principles; Agile vs Lean vs Kanban 4.2 Kanban Framework, Core Practices, Kanban Boards, WIP Limits 4.3 Task Management and Workflow Visualisation 4.4 Jira: creating projects, managing sprints, epics, and velocity reports (ENHANCED) 4.5 Trello: board setup, card workflows, automation (ENHANCED) 4.6 Azure DevOps: pipelines overview and board integration	08	CO4
5	UNIT V – Agile Quality, DevOps and CI/CD 5.1 Agile Testing Principles; Test-Driven Development (TDD) with examples 5.2 Continuous Integration (CI): basics, GitHub Actions intro 5.3 Continuous Delivery and Deployment (CI/CD) pipeline overview 5.4 Introduction to DevOps culture and toolchain (Docker mention, cross-reference VSC357) 5.5 Agile Metrics: Velocity, Cycle Time, Lead Time, Defect Density 5.6 Quality Assurance in Agile: acceptance testing, exploratory testing	08	CO5
6	UNIT VI – Scaling Agile and Industry Applications 6.1 Scaling Agile for Large Projects: SAFe and LeSS Frameworks 6.2 Agile Governance and Compliance 6.3 Agile in Cloud and Microservices Development 6.4 Agile in AI and Machine Learning Projects (Sprint-based ML iteration) 6.5 Agile in Data Science Projects (CRISP-DM vs Agile) 6.6 Indian IT Industry Case Studies: TCS, Infosys, Zoho Agile adoption stories 6.7 Future Trends in Agile, DevOps and AI-Driven Project Management : (DevSecOps, Platform Engineering, GitOps and Infrastructure as Code, AI in Agile Development, Predictive Project Analytics, Enterprise Agility)	08	CO6

REFERENCE BOOKS

1. Learning Agile: Understanding Scrum, XP, Lean, and Kanban, Andrew Stellman and Jennifer Greene, 1st Edition, O'Reilly Media, 2014, ISBN: 978-1449331924.
2. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim, Jez Humble, Patrick Debois, John Willis, and Nicole Forsgren, 2nd Edition, IT Revolution Press, 2021, ISBN: 978-1950508402.
3. Agile, DevOps & CI/CD: Unified Guide for Faster Software Delivery, Dr. C. R. Chandrasekaran, 1st Edition, Wiley India, 2024, ISBN: 978-9357463218.
4. Practical DataOps: Delivering Agile Data Science at Scale, Harvinder Atwal, 1st Edition, Apress, 2020, ISBN: 978-1484251034.

Digital References

1. Atlassian Agile Coach – <https://www.atlassian.com/agile>
2. Microsoft Learn DevOps – <https://learn.microsoft.com/en-us/devops/>
3. Scrum Guide – <https://scrumguides.org/scrum-guide.html>
4. Google Career Certificates – *Key Foundations of Agile & Scrum Project Management* <https://www.youtube.com/watch?v=WDAQq5vCMME>
5. Intellipaat – *DevOps Full Course (2025) / DevOps Course FREE* <https://www.youtube.com/watch?v=saWZQr0RMpw>
6. NPTEL Software Engineering Video Directory, IIT Kharagpur (Course ID: 106105182). URL: <https://nptel.ac.in/courses/106105182>
7. NPTEL Software Project Management Video Directory, IIT Kharagpur (Course ID: 106105218). URL: <https://nptel.ac.in/courses/106105218>

Mapping of Course Outcomes to Program Outcomes:

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

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (20)	✓	✓	✓	✓	✓	-
End Semester Examination (30)	✓	✓	✓	✓	✓	-

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

FACULTY OF SCIENCE AND TECHNOLOGY, School of Computer Application

M.C.A. (Integrated) PROGRAMME BATCH 2024-29

SEMESTER: VI

IMCA-OJT-368 Industrial Training

Course Title: Industrial Training

Course Code: IMCA-OJT-368

Practical: 120 hrs

Course Type: OJT

Total Credits: 04

CIE Marks: 40

ESE Marks: 60

Course Description:

On-the-Job Training (OJT) provides practical exposure to professional IT environments. It helps students develop technical skills in programming, web technologies, databases, and networking along with communication, teamwork, problem-solving, and adaptability skills. Through real-world experience, students understand workplace culture, professional responsibilities, and emerging technologies in the IT industry. OJT enhances confidence, employability, and career readiness by allowing students to apply theoretical knowledge in actual job conditions. The OJT conducted in collaboration with industry should be of 120 hours.

Course Objectives:

1. To provide practical exposure in software development, web technologies, databases, and networking through OJT.
2. To develop communication, teamwork, problem-solving, and professional skills in IT environments.
3. To familiarize students with workplace culture, organizational structure, and professional ethics in the IT industry.
4. To enhance confidence, creativity, and decision-making through hands-on learning experiences.
5. To introduce students to various career opportunities and emerging trends in computer applications.
6. To apply theoretical knowledge of computer applications in real-world professional settings.

Teaching/ Evaluation Pedagogy

Chalk & Talk	ICT Tools	Group Discussion	Case Study	Guest Session	Survey	Assignment	Lab
✓	✓	✓	✓	✓	✓	✓	✓

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

C01	Apply programming, database, and computer application concepts to real-world IT tasks and projects.
C02	Understand workplace culture, professional ethics, and responsibilities in IT and software industries.
C03	Use modern software tools, technologies, and emerging IT applications effectively.
C04	Develop problem-solving and analytical skills for handling practical computing challenges.
C05	Work effectively in teams to design, develop , and complete collaborative IT projects.
C06	Improve technical, communication, and professional skills for higher studies and career opportunities in computer applications.

Contents of Module

Process of Implementation

- Appointment of OJT Internal guides from faculty members.

- Students are required to complete the OJT on a full-time basis during the vacation period after the Semester 5 examinations.
- The OJT must be completed within 25 days, with a minimum of 6 working hours per day.

Suggested Areas for OJT

Note: The list is suggestive in nature and may include other relevant areas related to Computer Applications and IT industries.

- Information Technology (IT), IT Enabled Services and Electronics
- Agricultural Fields
- Digitization and Emerging Technologies (AI, ML, IoT, AR/VR, Deep Learning)
- Banking, Financial Services and Insurance
- Commerce and Small-Scale Industries
- Retail and Consumer Goods
- Logistics, Automotive and Capital Goods
- Healthcare and Life Science
- Education
- Communication and Media
- Tourism and Hospitality
- Sports, Wellness and Physical Education
- Trade and Agriculture
- Handcraft, Art, Design and Music
- Sustainable Development
- Humanitarian, Public Policy and Legal Services

OJT Required Documents

1. Submit Joining Letter
2. Resume
3. Maintain Daily Attendance Sheet
4. Obtain OJT Evaluation Report
5. Collect OJT Completion Certificate
6. Prepare and Submit OJT Report
7. Submit OJT Feedback Form

Project Report Format

Cover Page Contents

- Title of the Report: *On-the-Job Training Report*
- Name of the Student
- Program and Semester
- Name of the Organization/Company
- Department/Division of Training
- Duration of Training (Start Date to End Date)
- Date of Submission
- Name of Institute

Detailed Documentation Format

1. Certificate
2. Declaration by Student
3. Introduction
4. Company/Organization Overview
5. Objectives of OJT Training
6. Work Performed During Training
7. Software Tools and Technologies Used

8. Skills Developed
9. Projects/Tasks Completed (screen shots)
10. Challenges Faced
11. Solutions/Results
12. Conclusion
13. Future Scope
14. Appendices

- Appendix I – OJT Undertaking
- Appendix II – Resume
- Appendix III – Joining/Confirmation Letter
- Appendix IV – Daily Work Log/Attendance
- Appendix V – OJT Completion Certificate

14. References

Mode of Evaluation

The evaluation of OJT will be based on practical performance, technical skills, project work, and professional conduct. The assessment will be conducted in the ratio of 60:40 for External and Internal Evaluation. Students will complete OJT under the guidance of an industry supervisor and faculty guide.

Evaluation Components

External Evaluation (60%)

Maintain Daily Attendance Sheet: 10 M

Obtain OJT Evaluation Report: 10 M

Collect OJT Completion Certificate: 10 M

Students must submit the OJT report and appear for Viva-Voce/Presentation: 30 M

Internal Evaluation (40%)

Evaluation by the faculty guide based on:

- Quality of OJT report: 20 M
- Presentation and Viva-Voce: 20 M

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	3	2	2	3	1	1	2	1	1	2	1
C02	1	1	1	1	1	3	2	2	2	3	2	1
C03	2	2	3	2	3	1	2	2	1	1	2	2
C04	3	3	3	2	2	1	2	1	1	1	2	2
C05	2	1	2	1	2	1	1	3	2	1	3	1
C06	2	1	1	1	2	2	3	2	3	2	2	2

Assessment Pattern

Bloom's Category	Remember	Understand	Apply	Analyze	Evaluate	Create
Continuous Internal Evaluation. (20)	✓	✓	✓	✓	✓	✓

End Semester Examination (30)	✓	✓	✓	✓	✓	✓
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