GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	**DIPLOMA IN CM**
PROGRAMME CODE	**06**
COURSE TITLE	**JAVA PROGRAMMING**
COURSE CODE	**CM41205**
PREREQUISITE COURSE CODE & TITLE	**NA**
CLASS DECLARATION	**YES**

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM41205	JAVA PROGRAMMING	DSC	3	1	2	-	6	3	3 Hrs	70	30	100	40	25	10	25#	10	-	-	150

Total IKS Hrs for Term: 0 Hrs

Abbreviations: CL-Classroom Learning, **TL**-Tutorial Learning, **LL**-Laboratory Learning, **SLH**-Self Learning Hours, **NLH**-Notional Learning Hours, **FA** - Formative Assessment**, SA** -Summative assessment, **IKS** – Indian Knowledge System, **SLA**- Self Learning Assessment

Legends: @-Internal Assessment, # - External Assessment,***#** - Online Examination,**@$** - Internal Online Examination

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that course.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours**.
5. * Self-learning hours shall not be reflected in the Timetable.

6.* Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Java is a widely used, platform-independent, and open-source object-oriented programming language. With strong industry support and a rich ecosystem of free libraries, it underpins technologies like Advanced Java, JSP, and Android development. This course equips Computer Engineering and IT students with essential and advanced Java skills through hands-on practice, preparing them for real-world software development and boosting their employability.

III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1 - Apply object-oriented programming concepts by developing Java programs using classes and objects.
CO2 – Apply inheritance and interfaces in java to achieve code reusability
CO3 - Develop Java program implementing multithreading and exception handling.
CO4 - Implement event-driven programming in Java using appropriate event handling mechanisms.
CO5 - Develop client-server applications using Java network programming concepts.
CO6 – Implement Java applications using JDBC for effective database connectivity and management.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
SECTION-I				
UNIT-I BASICS OF JAVA (CL Hrs-6, Marks-11)				
1.	**TLO 1.1** Write programs to create classes and objects for the given problem. **TLO 1.2** Describe characteristics of the given java token. **TLO1.3** Write program to evaluate given expressions. **TLO 1.4** Write programs using relevant control structure to solve the given problem. **TLO 1.5** Develop programs using vectors and wrapper classes for the given problem. **TLO 1.6** Use constructors for the given programming problem	**1.1** Java features and the Java programming environment **1.2** Defining a class, creating object, accessing class members **1.3** Java tokens and data types, symbolic constant, scope of variable, typecasting, and different types of operators and expressions, decision making and looping statements **1.4** Arrays, strings, string buffer classes, vectors, wrapper classes **1.5** Constructors and methods, types of constructors, method and constructor overloading, nesting of methods, command line arguments, garbage collection, visibility control: public, private, protected, default, private protected.	Hands-on Demonstration Presentations	**CO1**
UNIT-II INHERITANCE,INTERFACE AND PACKAGES (CL Hrs-6, Marks-12)				
2	**TLO 2.1** Apply identified type of inheritance for the given programming problem. **TLO 2.2** Differentiate between overloading and overriding with the help of examples. **TLO 2.3** Develop program using interface. **TLO 2.4** Create user defined package for the given problem.	**2.1** Inheritance: concept of inheritance, types of Inheritance: single inheritance, multilevel inheritance, hierarchical inheritance, method overriding, final variables, final methods, use of super, abstract methods and classes **2.2** Interfaces: Define interface, implementing interface, accessing interface variables and methods, extending interfaces **2.3** Package: Define package, types of package, naming and creating package, accessing package, import statement, static import, adding class and interfaces to a package	Hands-on Demonstration Presentations	**CO2**
UNIT-III EXCEPTION HANDLING AND MULTITHREADING (CL Hrs-8, Marks-12)				
3	**TLO 3.1** Distinguish the errors and exceptions with example. **TLO 3.2** Develop program for handling the given exception. **TLO 3.3** Create threads to run multiple processes in a program. **TLO 3.4** Develop program using	**3.1** Errors and Exception: Types of errors and exceptions try and catch statement, throws and finally statement, built-in exceptions, throwing our own exception. **3.2** Multithreaded programming: creating a thread: By extending to thread class and	Hands-on Demonstration Presentations	**CO3**

	different thread life cycle methods.	by implementing runnable Interface, Life cycle of thread: Thread methods, thread exceptions, thread priority and methods, synchronization.		
SECTION-II				
UNIT- IV EVENT HANDLING USING AWT AND SWING COMPONENTS (CL Hrs-13, Marks-15)				
4	**TLO 4.1** Write steps to develop Graphical User Interface (GUI) using AWT components with frame for the given problem. **TLO4.2** Develop program using menu and dialog boxes for the given problem. **TLO 4.3** Write steps to develop Graphical user interface (GUI) using advanced swing components for the given problem. **TLO 4.4** Use delegation event model to develop event driven program for the given problem. **TLO 4.5** Use relevant AWT/ Swing component(s) to handle the given event.	**4.1** AWT:Component, Container, Window, Frame, Panel, Applet, use of AWT controls: Labels, Buttons, Checkbox, Checkboxgroup, Textfield, Textarea,List,Choice **4.2** Layout Managers: FlowLayout, BorderLayout,GridLayout,CardLayout, Menubars, Menus, Filedialog, Dialogbox **4.3** Swing: Swing features, AWT vs Swing, Swing components: Icons and Labels, TextField, ComboBox, Button, Checkbox, RadioButton , Tabbed Panes, Scroll Panes, Trees, Tables, Progress bar, Tooltip **4.4** Event Handling: Event delegation Model, MVC architecture **4.5** Event classes: ActionEvent, ItemEvent , KeyEvent, MouseEvent, TextEvent **4.6** Event Interfaces: ActionListener, ItemListener, KeyListener, MouseListener, MouseMotion, TextListener	Hands-on Demonstration Presentations	**CO4**
UNIT –V BASICS OF NETWORK PROGRAMMING(CL Hrs-6, Marks-12)				
5	**TLO 5.1** Describe the concepts of sockets in java. **TLO 5.2** Use networking classes to retrieve host details. **TLO 5.3** Develop program for Client/Server communication through TCP/IP Server sockets for the given problem	**5.1** Networking Basics : Client/Server , reserved Sockets , proxy servers , Internet Addressing **5.2** InetAddress : Factory Methods , Instance Methods **5.3** TCP/IP :Socket and Server Socket class **5.4** UDP: DatagramSocket, DatagramPacket class **5.5** URL Class **5.6** URLConnection class	Hands-on Demonstration Presentations	**CO5**
UNIT –VI INTERACTING WITH DATABASE (CL Hrs-6, Marks-8)				
6	**TLO 6.1** Choose relevant database connectivity methods. **TLO 6.2** Describe two tier and three tier architecture of JDBC. **TLO 6.3** Choose relevant type of JDBC driver for the specified environment. **TLO 6.4** Elaborate steps with	**6.1** Introduction to JDBC, ODBC **6.2** JDBC architecture: Two tier and three tier models **6.3** Types of JDBC drivers, Class Class , DriverManager class, Connection interface, Statement interface, PreparedStatement interface, ResultSet Interface	Hands-on Demonstration Presentations	**CO6**

	example to establish connectivity with the specified database.			

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/ TUTORIAL EXPERIENCES.

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
1.	**LLO 1.1** Implement conditional statements and control structures.	Demonstrate the use of conditional statements and control structures.	4	CO1
2.	**LLO 2.1** Implement the use of arrays and dynamic arrays using Vector to store and process data elements.	a) Write a program to demonstrate one-dimensional and two-dimensional array. b) Use Vector class to perform dynamic array operations.	2	CO1
3.	**LLO 3.1** Demonstrate the use of wrapper classes to convert primitive types to objects and vice versa for data encapsulation.	Convert primitive data types into objects and vice versa using wrapper classes like Integer, Double, etc.	2	CO1
4.	**LLO 4.1** Apply the concepts of single and multilevel inheritance to promote code reuse and logical hierarchy.	Implement single inheritance and multilevel inheritance with method overriding.	2	CO2
5.	**LLO 5.1** Implement interfaces to achieve abstraction and multiple inheritance in Java.	Write a program to implement interfaces and multiple inheritance using interfaces.	2	CO2
6.	**LLO 6.1** Use built-in and user-defined packages for modular, maintainable Java program development.	Demonstrate use of built-in packages (java.util, java.io, etc.) and create user-defined packages.	2	CO2
7.	**LLO 7.1** Implement robust exception handling using try, catch, finally, throw, and throws clauses to manage errors.	Implement try, catch, finally, throw, and throws for exception management.	2	CO3
8.	**LLO 8.1** Demonstrate multithreading using the Thread class and Runnable interface to achieve parallelism in Java applications.	Write a program to implement multithreading using Thread class and Runnable interface.	2	CO3
9.	**LLO 9.1** Design interactive graphical interfaces using AWT components to collect user input and display output.	a) Create a form using AWT components like TextField, Label, and Button. b) Write a program to implement Layout Manager.	2	CO4
10.	**LLO 10.1** Build advanced GUIs using Swing components. **LLO 10.2** Implement event-driven programming by handling user actions such as key presses, mouse	a) Implement swing component's JTree and JTable. b) Handle KeyEvent, MouseEvent, ActionEvent and TextEvent	4	CO4

	clicks, and button events in GUI applications.			
11.	**LLO 11.1** Implement Java networking using InetAddress, URL, Socket, and Datagram classes to facilitate client-server communication.	a)Retrieve hostname and IP using InetAddress. b)Demonstrate use of URL and URLConnection. c) Implement socket communication (TCP) and datagram (UDP).	2	CO5
12.	**LLO 12.1** Perform database operations including connection, insertion, update, deletion, and data retrieval using JDBC and ResultSet	a) Create a sample database and connect using JDBC. b) Perform Insert, Update, Delete operations. c) Retrieve data using ResultSet and demonstrate cursor navigation methods.	4	CO6
13.	ALL	Micro-project (Refer section V for micro project list)	-	ALL

Note: Out of the above suggestive LLOs –

1. '*' Marked Practical's (LLOs) are mandatory.
2. A judicial mix of LLOs is to be performed to achieve the desired outcomes

VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES/CASE STUDIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT

Suggestive Micro Project Topics:

a) Develop Online Voting System: Role-based login (admin/voter), vote casting and result generation with GUI and JDBC. Use exception handling for security.
b) Develop Fitness Tracker Application: Input daily workouts, calories burned, and track progress over time. GUI input, JDBC storage, background threads for stats.
c) Develop Simple Blog Platform: Post, edit, delete blog posts. Login with roles (admin/user), GUI editor, and data stored via JDBC. Add timestamp via threads.
d) Develop IoT Device Monitor Simulator: Simulate multiple smart devices using multithreading. Display statuses in real-time via GUI, with data fetched/sent via sockets.
e) Develop Smart To-Do List: Add, update, delete tasks. Use OOP for task management, GUI for interaction, JDBC for persistence, and threading for reminders.
f) Any other micro project as suggested by course teacher.

Assignments

Solve assignment covering all COs given by course teacher.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	a) Computer System with all necessary Peripherals and Internet connectivity. b) Computer with JDK1.8 or above, any IDE for Java Programming such as Eclipse, Jcreator, NetBeans,VScode . c) Databases like MySQL, Oracle, MS-Access or any other.	ALL

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
SECTION I								
1	I	Basics of JAVA	CO1	06	03	04	04	**11**
2	II	Inheritance, Interface and Packages	CO2	06	02	04	06	**12**
3	III	Exception Handling and Multithreading	CO3	08	02	04	06	**12**
SECTION II								
4	IV	Event Handling using AWT and Swing Components	CO4	13	05	04	06	**15**
5	V	Basics of Network Programming	CO5	06	02	04	06	**12**
6	VI	Interacting with database	CO6	06	02	02	04	**08**
Grand Total				**45**	**16**	**22**	**32**	**70**

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Lab performance, Assignment, Self-learning and Seminar/Presentation	Lab. Performance, viva voce

X. SUGGESTED COS- POS MATRIX FORM

Course Outcomes (Cos)	Programme Outcomes(Pos)							Programme Specific Outcomes *(PSOs)	
	PO-1 Basic and Discipline-Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO1	2	3	2	3	1	1	2	-	3
CO2	2	3	2	3	1	1	2	-	3
CO3	2	3	3	3	1	1	2	-	3
CO4	2	3	2	3	1	1	2	-	3
CO5	2	3	3	3	1	2	3	-	3
CO6	2	3	3	3	1	2	3	-	3

Legends:- High:03, **Medium:**02, **Low:**01, **No Mapping:** -
*PSOs are to be formulated at the institute level

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher
1	Schildt Herbert	Java Complete Reference	Mcgraw Hill Education, New Delhi . ISBN:9789339212094
2	E Balaguruswamy	Programming with JAVA	Mcgraw Hill Education (India) Private Limited, New Delhi . ISBN-13: 978-93-5134-320- 2
3	Holzner, Steven	Java 8 Programming Black Book	Dreamtech Press, New Delhi. ISBN: 978-93-5119-758-4

XII. LEARNING WEBSITES & PORTALS

1. https://www.javatpoint.com/java-tutorial
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_29 959473947367270000_shared/overview
3. https://www.javatpoint.com/java-tutorial
4. https://www.w3schools.com/java/
5. https://www.tutorialspoint.com/java

Name & Signature: **Mrs. Swati S. Sant** Lecturer in Computer Engineering	**Mrs. Sonali B. Gosavi** Lecturer in Computer Engineering
(Course Experts)	
Name & Signature: **Smt.Jyoti.R.Hange** (Programme Head)	Name & Signature: **Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	**DIPLOMA IN COMPUTER ENGINEERING**
PROGRAMME CODE	**06**
COURSE TITLE	**SOFTWARE ENGINEERING AND SOFTWARE TESTING**
COURSE CODE	**CM41206**
PREREQUISITE COURSE CODE & TITLE	**NA**
CLASS DECLARATION	**NO**

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration in Hrs.	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM41206	SOFTWARE ENGINEERING AND SOFTWARE TESTING	DSC	3	1	2	2	8	4	3	30	70*#	100	40	25	10	25@	10	25	10	175

Abbreviations: CL-Classroom Learning, **TL**-Tutorial Learning, **LL**-Laboratory Learning, **SLH**-Self Learning Hours, **NLH**-Notional Learning Hours, **FA** - Formative Assessment**, SA** -Summative assessment, **IKS** – Indian Knowledge System, **SLA**- Self Learning Assessment

Legends: @-Internal Assessment, # - External Assessment,***#** - Online Examination,**@$** - Internal Online Examination

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that course.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours**.
5. * Self-learning hours shall not be reflected in the Timetable.

6.* Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:.

This course on Software Engineering and Testing teaches students how software is developed, tested, and evaluated for release. It covers essential skills like error detection, test planning, and quality assessment—crucial for careers in software testing and development.

III. COURSE-LEVEL LEARNING OUTCOMES (CO's)

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1: Identify relevant software process models for software development.
CO2: Prepare software requirement specification and use UML Modeling for software design.
CO3: Estimate size and cost of Software Project.
CO4: Apply various software testing techniques.
CO5: Prepare test plan for an application
CO6: Identify bugs to create defect reports for an application.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
UNIT-I INTRODUCTION TO SOFTWARE ENGINEERING (CL Hrs-6, Marks-10)				
1.	**TLO 1.1:** Define Software and its characteristics. **TLO 1.2:** Identify and Demonstrate need Umbrella Activities. **TLO 1.3:** Analyze various process, methods and tools. **TLO 1.4:** Choose and apply domain specific life cycle model for software product development.	**1.1** Evolving role, characteristics and applications of software. **1.2** Software Engineering-A Layered Technology, A process framework. **1.3** Process Models- Waterfall model, Incremental Model RAD Model, Prototyping , Spiral Model, Concurrent Development Model, Component based Development. **1.4** Agile Process Models- Extreme Programming, Adaptive Software development, Scrum, Crystal. Dynamic System Development Method (DSDM), Agile Unified Process (AUP).	Hands-on Demonstration Presentations.	**CO1**
UNIT-II REQUIREMENT, DESIGN AND MODELING ENGINEERING (CL Hrs-08 Marks-12)				
2	**TLO 2.1:** Define Customer need –Requirement and state various tasks. **TLO 2.2:** Use various requirement gathering techniques. **TLO 2.3:** Use & Design use case for Requirement Elicitation. **TLO 2.4:** Validate Requirement and Build Analysis model (SRS). **TLO 2.5** Design UML Diagrams for software projects.	**2.1** Requirement Engineering Tasks-Inception, Elicitation, Elaboration, Negotiation, Specification, Validation. **2.2** Eliciting Requirements- Collaborative Requirements Gathering, Quality Function Deployment ,User Scenarios ,Elicitation Work Products. **2.3** Software Requirement Specification- Need of SRS, Template of SRS. **2.4** Design Concepts- Abstraction, Architecture, Patterns, Modularity, Information Hiding. UML Modeling- Data flow diagram, Class diagram, Sequence diagram, Use case diagram, Activity diagram , Deployment diagrams.	Hands-on Demonstration Presentations	**CO2**
UNIT-III SOFTWARE PROJECT MANAGEMENT , SCHEDULING AND QUALITY ASSURANCE (CL Hrs-09, Marks-12)				
3	**TLO 3.1:** Recognize the need of Software project Management. **TLO 3.2:** Apply various techniques for Estimation. **TLO 3.3:** Determine Size using Function-Point metric and Cost Estimation using COCOMO model. **TLO 3.4:** Design and implement RMMM Plan. **TLO 3.5:** Describe steps for Project .	**3.1** The Management Spectrum: The people, The product, The Process, The project. **3.2** Decomposition Techniques-LOC and FP based estimation, COCOMO model **3.3** Risk Management: Software risk, Risk Identification, RMMM(Risk Mitigation, Monitoring and Management) **3.4** Project Scheduling -Basic principles of scheduling. **3.5** Project Tracking- Timeline chart, Gantt chart.	Hands-on Demonstration Presentations	**CO3**

	TLO 3.6: Scheduling, and tracking. **TLO 3.7:** Describe Software Quality Assurance.	**3.6** Software Quality Assurance-The-ISO 9001 standard ,Six Sigma for Software Engineering.		
UNIT-IV BASICS OF SOFTWARE TESTING AND AUTOMATION TESTING (CL Hrs-06, Marks-12)				
4	**TLO 4.1:** Identify need of testing in software development. **TLO 4.2:** Analyze the quality of Software. **TLO 4.3:** Discover how to improve testing efficiency by automating your test. **TLO 4.4:** Test software using automated test tools.	**4.1** Software Testing-Objectives, Error and bug terminology. **4.2** The Fundamental Test Process **4.3** Quality Assurance and Quality Control, Testing, Verification and Validation. **4.4** Automation Testing : Introduction, Features of test tool, Guideline for selecting a tool ,Automation tools: JUnit,Selenium,Appium,JMeter, Jira,TestRail, Bugzilla, TestLink. Manual Vs Automation testing.	Hands-on Demonstration Presentations	**CO4**
UNIT V – TYPES OF TESTING (CL Hrs-10, Marks-16)				
5	**TLO 5.1:** Test software using different testing techniques. **TLO 5.2:** Test software for Acceptance testing. **TLO 5.3:** Test software for System Testing. **TLO 5.4:** Test software using Special Testing techniques.	**5.1** White box testing -Static testing , dynamic testing **5.2** Black box testing- Requirement based testing, Positive and Negative testing, Boundary value analysis, Decision tables, Equivalence partitioning, User documentation testing. **5.3** Integration testing- Top-Down and Bottom-Up integration, **5.4** Acceptance testing-Alpha and Beta Testing. **5.5** System Testing- Performance testing, Stress testing, Recovery testing, Compatibility testing, Security testing, and Usability testing. **5.6** Special Tests: Smoke and Sanity testing, **5.7** Regression testing, GUI testing, Client-Server testing.	Hands-on Demonstration Presentations	**CO5**
UNIT –VI TEST AND DEFECT MANAGEMENT (CL Hrs-06, Marks-10)				
6	**TLO 6.1:** Prepare test plan for given application. **TLO 6.2:** Describe Test management process. **TLO 6.3:** Find Defect using different techniques. **TLO 6.4:** Describe Defect Life cycle Prepare test plan for given application.	**6.1** Test Planning-Preparing a test plan, Scope management, Deciding test approach, Setting up criteria for testing, Identifying Responsibilities, Staffing, Training needs, Resource requirements, Test deliverables, Testing tasks. **6.2** Test Management: Choice of standards, Test infrastructure management, Test people management , integrating with product release. **6.3** Test Process: Baselining a test plan, Test case specification, Update of Traceability matrix. **6.4** Test Reporting: Recommending product release, Executing test cases, Collecting and analyzing metrics, Preparing test summary report.	Hands-on Demonstration Presentations	**CO6**

		6.5 Defect Management-Introduction, Defect classification, Defect management process. Defect life cycle, Defect template.		

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/ TUTORIAL EXPERIENCES.

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
1	**LLO 1.1:** Write the problem statement and create SRS.	Develop software project using any process model and create Software Requirement Specification.	4	CO1
2	**LLO 2.1:** Design Behavioral UML diagrams for the project.	Develop UML Behavioral Models for a Software Project Using Open Source Tools.	2	CO2
3	**LLO 3.1:** Design Structural UML diagrams for the project.	Develop UML Structural Models for a Software Project Using Open Source Tools	2	CO2
4	**LLO 4.1:** Estimate size of project using decomposition technique.	Estimate cost for assigned project using any decomposition technique.	4	CO3
5	**LLO 5.1:** Estimate effort, time, and cost of project using COCOMO approach.	Estimate the effort, time, and cost required to develop a software project using the Basic COCOMO model**.**	2	CO3
6	**LLO 6.1:** Monitor the progress of the project using timeline/Gantt chart.	Plan, visualize, and monitor the progress of a software project using Gantt and Timeline charts with project management tools.(eg. GanttProject, Google Sheets)	2	CO3
7	**LLO 7.1:** Write test cases for white box testing.	Write a program and design test cases for white box testing to the following control structures. 1) For… Loop 2) Switch…case 3) Do…While 4) If...else using JUnit automation tool.	4	CO5
8	**LLO 8.1** Design test cases for Black box testing.	Perform Black Box Testing for Web Application Using Selenium.	2	CO5
9	**LLO 9.1:** Design test cases for Regression testing.	Execute Regression Testing for Web Application Using Apache JMeter.	2	CO5
10	**LLO 10.1:** Design Test plan for any application.	Design Test Management and Execution Plan Using Jira/TestRail for any application.	2	CO6
11	**LLO 11.1:** Create defect report.	Prepare Test Case Execution Defect Report for Application (Bug Analysis and Tracking) using Jira/TestRail/ Bugzilla.	2	CO6
12	**LLO 12.1:** Use a different Automation Tool.	Implement a complete software testing lifecycle using open-source tools: Test Link, Selenium, and Bugzilla.	2	CO6

Note: Out of the above suggestive LLOs –

1. '*' Marked Practicals (LLOs) Are mandatory.
2. A judicial mix of LLOs is to be performed to achieve the desired outcomes

VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES/CASE STUDIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

Self-learning: Yes

Suggestive list of case studies for Self- learning:

1. Design a system for students to enroll in courses, demonstrating use-case diagrams and design patterns.
2. Create a design blueprint for managing orders, payments, and inventory using UML diagrams.
3. Visit any restaurant, collect requirements from the manager and prepare SRS document.
4. Visit your Institute library, Collect the functional requirements for a Library Management System and estimate cost and size of the project.
5. Visit any medical shop, gather information about purchasing and selling medicines, maintaining their inventory, generating sales invoices and generating reminders of expiry dates about medicines. Write the Functional and non-functional requirements for the medical shop management system.
6. Hospital Appointment and Record Management System : Execute Integration, Equivalence Partitioning, Security, Usability testing.
7. Hotel Booking and Management System: Execute Black-box, Integration, Positive/Negative, GUI Testing
8. Vehicle Service Center Management: A system that automates job card creation, inventory of spare parts, service tracking, and customer billing Write the Functional and non-functional requirements .
9. Attendance Management System for Educational Institutes: System to track attendance for students and staff using biometric or manual entry apply Estimation Techniques:i)Apply Function Point Analysis (FPA) II)Time/cost breakdown for each module.
10. Ride Booking App (like Ola/Uber):Perform usability,security,system and mobile app testing.
11. Online Movie ticket booking system: Perform Black-box, Equivalence Class, Load, Integration testing.Social Media Platform (e.g., posting, commenting, liking): perform System Testing, Boundary, Security, Usability.
12. Online Examination Portal:Execute Boundary Analysis, Stress, Performance, Alpha/Beta Testing
13. Real-time Chat Application (Client-Server Architecture): perform GUI, Compatibility, Client-Server, Performance Testing.

Activities

- Students are encouraged to use online tools to improve their learning, such as the e-Kumbh from AICTE and the virtual Labs from IIT.
- Students should be encouraged to participate in various coding competitions, such as hackathons, and online coding contests on websites like Hackerrank, Codechef etc.
- At the department level, encourage students to start a coding club
- Students are encouraged to register themselves in various MOOCs such as Infosys Springboard, Swayam etc. to further enhance their learning.

Note:

1. The above is suggestive list of case studies for SLA

2. The faculty must allocate any 1 case study to Individual/ group of student. Considering the students technical skills.

Assignment

Prepare a journal of practicals performed in the laboratory.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Hardware: Personal Computer (i3-i5,i7 preferable), RAM minimum 4 GB.	ALL
2	Operating System: Windows 7/Windows 8/Windows10/Linux or any other.	ALL
3	Suggested Free Open Source tools: a) StarUML, Modelio, SmartDraw. b) Gantt Project, Agantty, Project Libre. c) CF Engine Configuration Tool, Puppet Configuration Tool. d) Software Tools : Selenium or any other automation testing tool.	ALL

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

(Specification Table)

Sr. No	Unit	Unit Title	Aligned Cos	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction To Software Engineering	CO1	06	4	4	2	**10**
2	II	Requirement , Design And Modeling Engineering	CO2	08	2	4	6	**12**
3	III	Software Project Management ,Scheduling And Quality Assurance	CO3	09	2	4	6	**12**
4	IV	Basics Of Software Testing And Automation Testing	CO4	06	4	4	4	**10**
5	V	Types of Testing	CO5	10	4	4	6	**16**
6	VI	Test And Defect Management	CO6	06	2	4	4	**10**
		Grand Total		**45**	**14**	**24**	**32**	**70**

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Lab performance, Assignment and Seminar/Presentation	Lab. Performance, viva voce

X. SUGGESTED COS- POS MATRIX FORM

Course Outcomes (Cos)	Programme Outcomes(Pos)							Programme Specific Outcomes *(PSOs)	
	PO-1 Basic and Discipline-Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO1	2	3	2	2	1	1	2	-	3

CO2	2	3	2	3	1	1	2	-	3
CO3	2	3	2	2	1	1	2	-	3
CO4	2	3	3	3	1	1	2	-	3
CO5	2	3	3	3	1	1	2	-	3
CO6	2	3	3	3	1	1	2	-	3

Legends:- High:03, **Medium:**02, **Low:**01, **No Mapping:** --
*PSOs are to be formulated at the institute level

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher
1.	Roger S. Pressman & Bruce R. Maxim	Software Engineering: A practitioner's approach	McGraw Hill Higher Education, New Delhi, (Ninth Edition) ISBN 93-5532-504-5
2.	Srinivasan Desikan, Gopalaswamy Ramesh	Software Testing: Principles and Practices	PEARSON Publisher: Pearson India 2007, ISBN: 978-81-7758-121-8
3.	Ian Sommerville	Software Engineering	Addison and Wesley, ISBN 0-13-703515-2
4.	Naresh Chauhan	Software Testing: Principles and Practices	Oxford University Press Noida. ISBN: 9780198061847
5.	Ron Patton	Software Testing	Sams Publishing; 2nd edition, 2005 ISBN: 0672327988
6.	M. G. Limaye	Software Testing: Principles, Techniques and Tools	Tata McGraw Hill Education, New Delhi., 2009 ISBN 13: 9780070139909

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://nptel.ac.in/courses/106105087	All Practicals
2	www.tutorialspoint.com//software_engineering/	Software Engineering Tutorial
3	https://www.geeksforgeeks.org/software-testing-basics/	Software Testing Tutorial
4	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_au_th_013842970114113536282 69_shared/overview	Software Engineering and Testing Courses
5	https://www.sei.cmu.edu/	Software Engineering Institute
6	https://app.diagrams.net/	Software Design -DFDs, Class Diagrams, Use Case Diagrams

Name & Signature: **Smt. Sheetal J. Siraskar** Lecturer in Computer Engg.	**Smt. Snehal S. Ingavale** Lecturer in Computer Engg
(Course Experts)	
Name & Signature: **Smt.J.R.Hange** (Programme Head)	Name & Signature: **Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENTPOLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	**DIPLOMA IN CM**
PROGRAMME CODE	**06**
COURSE TITLE	**CAPSTONE PROJECT**
COURSE CODE	**CM41207**
PREREQUISITE COURSE CODE & TITLE	**ACQUIRED 60 CREDITS**, INCLUDING ALL FIRST YEAR COURSE CREDITS.
CLASS DECLARATION COURSE	YES

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM41207	**CAPSTONE PROJECT**	**INP**	**--**	**--**	**--**	**4**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**50**	**20**	**50#**	**20**	**--**	**100**

Total IKS Hrs for Term: 0 Hrs

Abbreviations: CL-Classroom Learning, **TL**-Tutorial Learning, **LL**-Laboratory Learning, **SLH**-Self Learning Hours, **NLH**-Notional Learning Hours, **FA** - Formative Assessment**, SA** -Summative Assessment, **IKS** – Indian Knowledge System, **SLA**- Self Learning Assessment

Legends: @-Internal Assessment, **#** - External Assessment, ***#** - Online Examination, **@$** - Internal Online Examination

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing the minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that Course.
2. If a candidate does not secure the minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit the SLA work.
3. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours**.
5. * Self-learning hours shall not be reflected in the Timetable.
6. * Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Project work at the institute level serves as a vital bridge between theoretical learning and practical application. It offers students a valuable platform to apply the concepts, knowledge, and technical skills acquired in classrooms and laboratories to address real-world problems—ranging from well-defined tasks to complex, open-ended challenges. This experiential learning approach fosters a deeper understanding of engineering and technological principles by encouraging students to design, develop, and implement solutions in realistic contexts.

The course is strategically designed to integrate interdisciplinary knowledge gained throughout the diploma program, thereby enhancing students' ability to approach problems holistically. Furthermore, it plays a crucial role in nurturing essential professional competencies such as critical thinking, problem-solving, creativity, teamwork, project planning, and innovation.

In alignment with industry and societal expectations, students are encouraged to undertake projects that go beyond conventional solutions and aim to provide impactful, sustainable outcomes. By engaging in

such projects, students not only reinforce their technical capabilities but also improve their employability by developing a mindset geared towards innovation, collaboration, and continuous improvement.

III. INDUSTRY EXPECTED OUTCOME

This course is designed to enable students to develop the industry-relevant competency of:

Effectively executing innovative solutions to real-world problems through collaborative teamwork, adhering to defined timelines, and delivering a well-documented project report.

IV. COURSE-LEVEL LEARNING OUTCOMES (CO'S)

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1: Identify real-world field problems relevant to the project work conducted at the institute.
CO2: Analyse the feasibility and viability of the project by conducting data collection and experiments, as well as evaluating required resources, costs, and support.
CO3: Apply technical knowledge and engineering skills to develop effective solutions for real-life or industrial problems.
CO4: Evaluate the proposed project work's ethical considerations and societal impacts.
CO5: Create a comprehensive project report and present the methodology and results within the institute.
CO6: Demonstrate the project outcomes, findings, and achievements effectively through presentations and exhibits.

V. GENERAL GUIDELINES FOR PROJECT WORK

a) Project Selection and Scope

- The project must align with the field of engineering or technology. Interdisciplinary projects are permitted if expected to deliver outcomes aligned with industry relevance or societal needs.

Indicative Project Focus Areas:

i) Web & Application Development (Python/Java/Android)

- Voice-Controlled Home Assistant application
- Digital Notice Board using Android
- Weather Forecasting Application
- Agricultural and Rural Engineering Solutions
- Complaint Management System
- Learning Platform
- Event Management system
- Blog Application
- Mental Health Counselling Website

ii) Computer Hardware and Networking

- Traffic Light Control System using Microcontroller
- Electronic Voting Machine Simulation
- Password-Based Door Lock System

iii) IoT & Robotics Automation (Arduino/Raspberry)

- Home Automation system
- Smart Dustbin with Ultrasonic Sensor
- Automatic Street Light Controller

- IoT-based Smart Parking System
- Voice-Controlled Robot Car
- Gesture-Controlled Robotic Arm
- Fire Fighting Robot

iv) Cybersecurity using software tools

- OTP-based Login System
- Secure File Transfer over network
- Intrusion Detection System
- Two-Factor Authentication (2FA) System
- File Encryption and Decryption Tool
- Phishing Website Detection Tool

v) Artificial Intelligence and Machine Learning

- Face Recognition Attendance System
- AI-based Personal Assistant (Voice Command)
- Market Basket Analysis
- Student Performance Prediction
- Tic-Tac-Toe Game
  Maze Solver Agent
- Disease Prediction System (e.g., Diabetes, Heart Disease)
- Stock Price Trend Prediction

- Students should select projects that match their skills, knowledge and interests. Faculty should support students in identifying suitable topics.
- Study-based (theoretical-only) projects are **not encouraged**. Projects should involve practical implementation.
  - Project diary
  - Final demonstration
  - Assessment based on institutional RUBRICs
  -

i) National Relevance

Projects should ideally address national thrust areas such as:

- Environmental Sustainability
- Digitization and Smart Technologies
- Industrial and Process Automation
- Renewable Energy Systems
- Socio-technical Solutions for Community Development

VI. COURSE IMPLEMENTATION STAGES

1. Orientation Session

A Project Orientation Session shall be conducted during the last week of the fourth term by the Portfolio In-charge faculty. This session will brief students on:

- Project objectives.
- Scope and expected deliverables
- Guidelines for execution and assessment
- Faculty and institutional support

2. Mapping of Students and Faculty Mentors

Students will be organized into teams and assigned faculty mentors based on the following criteria:

- Alignment of student interests
- Faculty expertise
- Team size and project scope.

3. Problem Identification and Finalisation

Students are required to:

- Conduct a field survey or exploratory study under faculty supervision
- Identify a real-world, relevant, and feasible problem
- present the idea to a group of faculty members for approval
- This activity should commence in the final week of the 4th semester and be completed by the first week of the 5th semester.

A dedicated week is allotted for collecting detailed project requirements, including:

- Estimation of human resources
- Identification of technical (hardware/software) needs
- Feasibility study and cost analysis

Outcome: Students must present their findings to the faculty mentor for approval.

5. Project Planning

Students must prepare a comprehensive project plan covering:

- Task allocation and resource planning
- Time frame and cost estimation
- Team member responsibilities
- Selection of an appropriate development model (e.g., Waterfall, Agile, Spiral)

Deliverables: A clear roadmap including timelines, milestones, and expected outcomes.

6. Project Proposal Submission

The finalized project proposal must be submitted in **soft copy format** and should include:

- Project title and objectives
- Detailed requirement analysis
- Project plan and execution strategy
- Expected deliverables and outcomes
- Development model and tools to be used

7. Project Development, Testing & Report Preparation

Under the continuous guidance of faculty mentors, students shall:

- Develop the project according to the approved plan
- Maintain project documentation throughout the development lifecycle
- Prepare a detailed final report that includes:
  - System design and architecture
  - Implementation details
  - Testing procedures and results
  - Challenges encountered and solutions adopted
  - Final outcomes and evaluation metrics.

8. Project Demonstration

Students must present their project in two stages:

- **Preliminary Demonstration:** A progress review shown to the faculty guide during the development phase.
- **Final Demonstration:** A complete presentation of the working model or application during the End Semester Examination (ESE).

VII. DETAILED WEEKWISE TIMELINE FOR THE COURSE IMPLEMENTATION STAGES:

Week	Activity	Responsibilities
Week 1	**Orientation Session** (Last week of 4th Term)	Portfolio In-charge Faculty: Brief students on project objectives, scope, deliverables, guidelines, execution, and assessment.
Week 2	**Mapping of Students and Faculty Mentors**	Portfolio In-charge Faculty: Organize students into teams based on interests, faculty expertise, team size, and project scope.
Week 3-4	**Problem Identification and Finalisation**	Students: Carry out a field survey or exploratory study under faculty supervision, identify a relevant real-world problem, finalise the issue, and submit a synopsis for faculty approval.
Week 5	**Requirement Gathering**	Students: Collect detailed project requirements (human resources, technical needs, feasibility study, and cost analysis).
Week 6	**Requirements Gathering Presentation**	Students: Present findings to the faculty mentor for approval.
Week 7	**Project Planning**	Students: Prepare a project plan including task allocation, resource planning, timeline, budget, development model, and deliverables. Faculty Mentor: Review plan.
Week 8	**Project Proposal Submission**	Students: Submit final project proposal (title, objectives, requirements, plan, tools, outcomes). Faculty Mentor: Review and approve.

Week	Activity	Responsibilities
Week 9-12	**Project Development, Testing & Report Preparation**	Students: Begin project development according to the plan. Maintain documentation. Test and iterate. Prepare final report (design, implementation, testing results).
Week 13	**Preliminary Demonstration**	Students: Present a progress review to the faculty mentor.
Week 14	**Project Finalisation & Report Completion**	Students: Finalise development. Prepare a detailed project report with system design, testing results, challenges, and outcomes.
According to the Examination Schedule	**Final Demonstration (End Semester Examination)**	Students: Conduct final demonstration of the working model/application during the ESE. Faculty: Evaluate the project based on the demonstration and report.

VIII. CRITERIA FOR ASSESSMENT/EVALUATION OF PROJECT WORK

A. Formative Assessment (FA) Criteria

The evaluation of students during the fifth semester for Progressive Assessment (PA), totalling **50 marks**, will be carried out based on the following criteria:

Category	Week(s)	Assessment Criteria	Max Marks	Performance Description (Rubric Scale: 1 to 5)	Group Enrollment Nos.	Group Marks
i) Team Assessment (30 Marks)	Week 3-4	Project Selection & Problem Definition	5	2 – Lacks clarity and relevance 3 – Relevant and defined 4 - Clearly defined and suitable 5 – Innovative and impactful		
	Week 5	Literature Review & Data Collection	5	1 – Insufficient or irrelevant sources 2 – Limited data with unclear relevance 3 – Adequate review with relevant data 4 – Structured, relevant data 5 – Comprehensive and critically evaluated sources		

	Week 6	Project Design / Concept & Execution	10	1–2 Design is poorly structured; minimal or no execution 3–4 Weak concept, unclear goals, and limited execution 5–6 Basic concept with moderate execution; design may lack innovation or clarity 7–8 Solid, functional design with good planning and consistent execution 9–10 Creative, technically sound design with excellent planning and thorough execution		
	Week 7	Progress as per Action Plan / Milestones	5	1 – No measurable progress 2 – Progress is significantly behind schedule 3 – Moderate progress; some tasks completed 4 – Mostly on schedule with minor delays 5 – Fully on schedule and meeting milestones		
	Week 8	Quality & Presentation of Project Report	5	1 – Poorly organized and unclear 2 – Disorganized with formatting issues 3 – Fair structure and readability 4 – Well-organized and readable 5 – Professionally formatted and well-written report		

Category	Week(s)	Assessment Criteria	Max Marks	Performance Description (Rubric Scale: 1 to 5)	Individual Enrollment Nos.	Individual Marks
ii) Individual Assessment (20 Marks)	Week 2–13 (Ongoing)	Individual Contribution to the Team	10	1 -2 Rarely involved or shows minimal effort 3 -4 Occasionally contributes with limited involvement 4 –5 Participates adequately 6 – 7 Active and dependable team member 8 –10 Consistently proactive, often leads initiatives		
	Week 2–13 (Ongoing)	Subject Knowledge & Understanding	10	1–2 Very limited understanding of subject concepts; unable to answer questions 3–4 Basic awareness but with significant gaps in understanding 5–6 Fair knowledge of concepts; can answer general questions correctly 7–8 Good understanding of a subject; explains concepts clearly and applies them logically 9–10 Excellent grasp; demonstrates deep insight, applies concepts to real-world/project scenarios		
Total			**50**			

i) Total Formative Assessment (FA) Marks

Sr. No.	Assessment Criteria	Marks
1	Team Assessment	30
2	Individual Assessment	20
Total		**50**

Note: The Total **Formative Assessment (FA) Marks** for the individual student.

B. Summative Assessment Criteria

*The summative assessment for students in the Fifth Semester **SA-PR** will carry a total of **50 marks** and shall be conducted by the faculty. Appropriate rubrics may be developed by the faculty for evaluation.*

Course Name :		**Course Code :**	
Student Name :		**Enrollment Number :**	
Project Batch Number:		**Division :**	
Faculty Guide Name:		**Term :**	

Sr. No.	Week	Assessment Criteria	Max Marks	Performance Description (Score Range)	Marks
1	According to the Examination Schedule	**Knowledge and Skill Set Developed**	10	**1–2**: Minimal knowledge gained	
				3–4: Basic understanding with limited skills	
				5–6: Moderate knowledge and practical exposure	
				7–8: Sound knowledge and good skill application	
				9–10: Excellent grasp and skill mastery with advanced application	
2	According to the Examination Schedule	**Quality and Potential of the Project**	10	**1–2**: Poor quality, unclear purpose	
				3–4: Basic functionality with low impact	
				5–6: Adequate quality with moderate potential	
				7–8: High-quality, practical utility	
				9–10: Exceptional quality and strong potential for real-world implementation	

3	According to the Examination Schedule	**Creativity, Innovation, and Teamwork**	10	**1–2**: Lacks originality, poor collaboration	
				3–4: Limited creativity and uneven teamwork	
				5–6: Shows creativity and fair teamwork	
				7–8: Innovative and well-coordinated efforts	
				9–10: Highly original ideas with exemplary team synergy	
4	According to the Examination Schedule	**Project Design, Development, Execution**	10	**1–2**: Poor design and implementation	
				3–4: Basic structure with several gaps	
				5–6: Functional design and moderate execution	
				7–8: Well-planned and executed efficiently	
				9–10: Robust, optimized design with flawless execution	
5	According to the Examination Schedule	**Project Presentation**	10	**1–2**: Disorganized and unclear	
				3–4: Lacks confidence and structure	
				5–6: Acceptable delivery with room for improvement	
				7–8: Clear, engaging, and well-structured	
				9–10: Highly professional, confident, and impactful presentation	

Note: The above rubric will be used as the summative assessment framework for evaluating individual student performance.

IX. SUGGESTED COS- POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes(POs)							Programme Specific Outcomes (PSOs)	
	PO1 -Basic and Discipline-Specific Knowledge	PO2- Problem analysis	PO3- Design/ Development of Solutions	PO-4 Engineering Tools, Experimentation and Testing	PO-5 Engineering Practices for Society, Sustainability, and Environment	PO-6 Project Management	PO-7 Lifelong Learning	PSO-1	PSO-2
CO1	2	2	--	--	2	2	2	--	--
CO2	2	3	2	2	--	3	2	2	2
CO3	3	3	3	3	2	2	2	3	3
CO4	--	--	--	--	3	2	2	--	--
CO5	2	2	2	2	--	3	2	--	--
CO6	2	2	2	2	2	3	3	--	--

X. TYPOGRAPHICAL GUIDELINES FOR PROJECT REPORT WRITING:

After the completion of the project work, each student is required to submit a project report. The report should adhere to the following structure and formatting guidelines:

A. STRUCTURE OF THE REPORT

The project report must include the following sections in the given order:

1. **Cover Page** – As per *Annexure I*.
2. **Title Page** – As per *Annexure I*.
3. **Certificate** – As per *Annexure II*.
4. **Acknowledgment** – A brief section in which the student may express gratitude to individuals and organizations who supported the project. As per *Annexure III*.
5. **Abstract** – A one-page summary outlining the objective of the project and the methodology adopted. As per *Annexure IV*.
6. **Table of Contents** – Prepared as per general guidelines. As per *Annexure V*.
7. **List of Figures-**The **purpose of the List of Figures** in a project report is to provide a clear and organized index of all visual representations used throughout the document. As per *Annexure VI*
8. **List of Tables -**The **purpose of the List of Tables** in a project report is to provide a structured overview of all tabular data included in the document. As per *Annexure VI*
9. **Project Description** –
   - Divided into chapters or sections.
   - Each chapter should comprehensively describe a specific phase or component of the project.
   - Include properly labelled diagrams, tables, and flowcharts wherever applicable.
10. **Conclusion** – Summarizes findings and outcomes of the project work.
11. **References** –
    - Begin two spaces below the heading "**REFERENCES**", aligned to the left.
    - Use **single spacing** within entries and list in **alphabetical order**.

- References must be cited in the text using **square brackets [ ]**, numbered according to their first appearance.
- Include author name(s), publication year, and other relevant details.

B. REPORT SPECIFICATIONS

1. **Binding**: Hard-bound only
2. **Cover Color**: Black with gold-embossed text (as per *Annexure 1*)
3. **Number of Copies**: Five – One per student and one departmental copy

Paper Size: A4 (portrait orientation)

4. **Margins**:
   - Top: 1 inch
   - Bottom: 1 inch
   - Right: 1 inch
   - Left: 1.5 inches
5. **Font Style**: Times New Roman
6. **Font Sizes**:
   - **Chapter Titles:** 16-point**, Bold, Uppercase**
   - **Headings:** 14-point, **Bold**
   - **Body Text:** 12-point, **Regular**
7. **Line Spacing**: 1.5 throughout the report
8. **Page Numbering**: Bottom center in the format “Page X of N”

Annexure-I

GOVERNMENT POLYTECHNIC, PUNE

(An Autonomous Institute of the Government of Maharashtra)

DEPARTMENT OF COMPUTER ENGINEERING

PROJECT REPORT

ON

"[TITLE OF THE PROJECT IN CAPITAL LETTERS]"

Submitted By

Student name 1 (enrollment no.)
Student name 2 (enrollment no.)
Student name 3 (enrollment no.)
Student name 4 (enrollment no.)

UNDER THE GUIDANCE OF

[Guide's Full Name]
(Designation, e.g., Lecturer, Department of Computer Engineering)

Submitted in Partial Fulfilment

of

The Requirements for the Award of the Diploma in

COMPUTER ENGINEERING

ACADEMIC YEAR: 20__–20__

GOVERNMENT POLYTECHNIC, PUNE, Ganeshkhind Road, Shivajinagar, Pune – 411016

Annexure-II

GOVERNMENT POLYTECHNIC, PUNE

(An Autonomous Institute of the Government of Maharashtra)

DEPARTMENT OF COMPUTER ENGINEERING

CERTIFICATE

This is to certify that

1)Name of Student	Enrollment Number
2)Name of Student	Enrollment Number
3)Name of Student	Enrollment Number
4)Name of Student	Enrollment Number

has completed the necessary project work and prepared the bonafide report on

"PROJECT TITLE"

in a satisfactory manner as a partial fulfillment of the requirements for the

DIPLOMA IN

COMPUTER ENGINEERING

FOR THE ACADEMIC YEAR

20__- 20__

(H.O.D) **(Principal)**

(Internal Guide) **(External Examiner)**

Annexure-III

Acknowledgment

(Sample Format)

We would like to express our sincere gratitude to all those who supported and guided us throughout the successful completion of this project.

We are especially thankful to **[Guide's Name]**, our project guide, for their constant encouragement, valuable suggestions, and constructive feedback during the entire duration of this project work.

We would also like to thank **[Head of Department's Name]**, Head of the Department of **[Branch Name]**, Government Polytechnic, Pune, for providing us with the necessary infrastructure and support.

We are deeply grateful to **[Principal's Name]**, Principal, Government Polytechnic, Pune, for providing us with this valuable opportunity and for fostering an academic environment conducive to learning and innovation.

Our heartfelt thanks go to all the faculty members and technical staff of the **[Department Name]** for their help in various ways during this project.

We also wish to acknowledge the support of our classmates, friends, and family members who encouraged and motivated us throughout the journey.

Lastly, we are thankful to the **Government Polytechnic, Pune**, for allowing us to work on this project as a part of our academic curriculum.

Student name 1 (enrollment no.)
Student name 2 (enrollment no.)
Student name 3 (enrollment no.)
Student name 4 (enrollment no.)

Annexure-IV

Abstract

The abstract serves as a one-page comprehensive summary that encapsulates the core aspects of the project. It begins by clearly stating the primary objective or goal of the work, providing the reader with an understanding of the problem being addressed or the purpose behind the study. Following this, the abstract outlines the methodology employed, detailing the approach, techniques, tools, and processes used to achieve the project's objectives. This section may also briefly touch on the scope of the work, key findings, and any conclusions or implications derived from the results. The abstract offers a concise yet informative overview, enabling readers to quickly grasp the essence and significance of the project without delving into the full report.

Annexure-V

Table of Contents

Annexure-VI

List of Figures

List of Tables

Annexure-VII
PROJECT DAIRY

Course code :		**Course Name :**	
Student Name :		**Enrollment Number :**	
Project Batch Number:		**Division :**	
Faculty Guide Name:		**Term :**	

Date	Enrollment Numbers of Present Students	Work Assigned/Corrections Suggested	Faculty Remarks	Faculty Signature

Signature of Faculty **Signature of HOD**

Name & Signature:

Smt. Jyoti P Dandale
Lecturer in Computer Engineering

Shri. S.B. Kulkarni
Lecturer in Mechanical Engineering
(Course Expert)

Dr. N. G. Kulkarni
HoD in Mechanical Engineering

Name & Signature:

Smt. Jyoti R. Hange
(Programme Head)

Name & Signature:

Shri. S.B. Kulkarni
(CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE
'120– NEP' SCHEME

PROGRAMME	**DIPLOMA IN CM/IT**
PROGRAMME CODE	**06/07**
COURSETITLE	**MOBILE APPLICATION DEVELOPMENT**
COURSECODE	**CM51203**
PREREQUISITE COURSECODE &TITLE	**NA**
CLASS DECLARATION	**YES**

I. LEARNING&ASSESSMENTSCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL &TSL Practical				Based on SL		Total Marks
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max		Max	Min	Max	Min	Max	Min	Max	Min	
CM51203	MOBILE APPLICATION DEVELOPMENT	SEC	2	-	4	2	8	4	-	-	-	-	-	50	20	50#	20	50	20	150

Abbreviations:CL-Classroom Learning, **TL**-Tutorial Learning,**LL**-Laboratory Learning,**SLH**-Self Learning Hours,**NLH**-Notional Learning Hours, **FA** - Formative Assessment**, SA** -Summative assessment,**SLA**- Self Learning Assessment

Legends:@-Internal Assessment,**#**-External Assessment,***#**-Online Examination,**@$**-Internal Online Examination

Note: FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that semester.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course,then the candidate shall be declared as **'Fail'** and will have to repeat and resubmit SLA work.
3. **Notional learning hours** fifth semester are**(CL+LL+TL+SL)hrs.*15Weeks**
4. **1 credit** is equivalent to **30 Notional hours**.
5. *Self-learning hours shall not be reflected in the Timetable.
6. *Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

The use of mobile phones and Android apps is growing every day. As mobile apps grow in popularity for communication, entertainment, education, and shopping, there is high demand for app developers. This course covers the necessary concepts which are required for creating Android applications, key concepts and tools. Students will be able to design and build their own applications, laying a strong foundation for mobile development.

III. COURSE-LEVELLEARNINGOUTCOMES(CO'S)

Students will be able to achieve &demonstrate the following CO's on completion of course-based learning

CO1**:** Describe features of Android operating system.
CO2: Setup and configure the Android development environment.
CO3: Design user-friendly graphical interfaces.
CO4 : Build Android applications using standard UI components.
CO5: Develop Android applications with integrated database functionality.
CO6: Deploy Android application.

IV.THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes(TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant Cos
SECTION -I				
UNIT I-INTRODUCTION TO ANDROID OPERATING SYSTEM(CL Hrs-04)				
1	**TLO1.1**: Compare various android versions. **TLO** 1.2: Explain the need of Android Operating System. **TLO 1.3**: Describe android architecture with its features. **TLO 1.4** List the tools and softwares required for developing android application. **TLO 1.5** List Android OS Feature	**1.1** Introduction to Android Operating System, Android Ecosystem, Android versions. **1.2** Android versus iOS, Need of Android. **1.3** Android Architecture **1.4** Tools and software required for developing android application. Flutter for Android Developers. **1.5** Features Of Android.	Classroom Learning Collaborative Learning Program development tools	**CO1**
UNIT II-INSTALLATION AND CONFIGURATION OF ANDROID ENVIRONMENT (CL HRS-4)				
2	**TLO 2.1**: Explain steps to install Java JDK, Android SDK **TLO2.2:**Describe Virtual Devices(AVDs), Emulators **TLO2.3:** Differentiate between JVM and DVM. **TLO2.3**Explain various Android Terminologies	**2.1** Java JDK, Android SDK installation. **2.2** Android Development Tools(ADT), Android Virtual Devices(AVDs), Emulators,Dalvik Virtual Machine. **2.3** Difference between JVM and DVM. **2.4** Terminologies in Android: Android Run Time(ART) ,Over The Air(OTA),Global Positioning System(GPS),Google Cloud Messaging(GCM).	Classroom Learning Collaborative Learning Program development tools.	**CO2**
UNIT III- FUNDAMENTALS OF UI COMPONENTS AND LAYOUTS (CL HRS-4)				

3	**TLO3**.1:Describe android directory Structure . **TLO3**.2:Identify various screen Components. **TLO3**.3:Design GUI using various layouts.	**3.1** Control Flow, Directory Structure **3.2** Components of a screen, Fundamental UI design **3.3** Introduction to Layout and types of Layout: Constraint layout, Linear Layout, Frame Layout, Relative Layout, Table Layout.	Classroom Learning Collaborative Learning Program development tools.	**CO3**
SECTION-II				
UNIT IV-DESIGNING USER INTERFACE (CL HRS-6)				
4	**TLO 4.1**: Describe GUI Components to develop user interface for the given Android. **TLO 4.2** Use CustomToastAlert message, Time and Date Picker functionality. **TLO 4.3** Describe different views and its types	**4.1** Text View, Edit Text. Button, image button ,toggle button , Checkbox, Radio button, Radio button Group, Progress bar, Scrollbars, List. **4.2** Custom Toast Alert message, Time and Date Picker **4.3** Introduction to views and its types: List view, Grid view, Image view, Scroll view	Classroom Learning Collaborative Learning Program development tools.	**CO4**
UNIT V -ACTIVITY, MULTIMEDIA AND DATABASES (CL HRS-8)				
5	**TLO5**.1:Define Intent and List the types of intent. **TLO5.2**:Describe various Android Components **TLO5.3**:Implement various multimedia APIs **TLO5.4**:Perform different database transactions.	**5.1** Intent, its types and Intent Filter. **5.2** Activity Lifecycle, Broadcast Receiver ,Content Provider, Service Lifecycle, Fragments **5.3** Play audio and video ,Bluetooth, Camera ,Sensors, text to speech and speech to text, SMS Telephony SQLite Database, necessity of SQLite, Creation and connection of the database, extracting values from cursors and Transactions.	Classroom Learning Collaborative Learning Program development tools.	**CO5**
UNIT VI- SECURITY AND APPLICATION DEPLOYMENT (CL HRS-4)				
6	**TLO 6.1**:Describe the Android Security Model . **TLO 6.2**:Deploy android application.	**6.1** Understanding the Android Security Model, declaring and using Permissions, understanding and using Custom Permission. **6.2** Application Deployment: Creating small application, signing of application and steps of deploying app on Google Play Store.	Classroom Learning Collaborative Learning Program development tools	**CO6**

V.LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/TUTORIAL EXPERIENCES.

Sr.No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/Practical Titles/Tutorial Titles	Number of hrs.	Relevant Cos
1	**LLO 1.1**: Study different operating systems and compare them with Android Operating System.	Compare various operating systems with Android OS.	2	**CO1**
2	**LLO 2.1:** Install and configure the Java Development Kit (JDK) **LLO 2.2:** Install and configure the Android Studio, Android SDK, and create an Android Virtual Device (AVD) for testing and development of Android applications.	*****Install and configure Java Development Kit (JDK), android SDK with android virtual device	2	**CO2**
3	**LLO3.1**:Develop Android app screens using LinearLayout. **LLO 3.2**: Develop Android app screens using Absolute Layout.	*a) Develop an Android app to create two different layouts using **LinearLayout**: • One with a vertical orientation(e.g.,a form with multiple fields). • One with a horizontal orientation (e.g.,a row of buttons). b) Create a screen where a button and text are placed at specific (x,y)coordinates using **AbsoluteLayout**.	4	**CO3**
4	**LLO4.1**Develop Android app screens using FrameLayout. **LLO4.2 1:** Develop Android app screens using RelativeLayout and TableLayout to arrange UI components.	*a)Create a layout where an ImageView and a TextView are stacked using **FrameLayout**. The ImageView should be at the background,and the TextView should be centered on top of it. b) Design and implement user interfaces in an Android application using RelativeLayout and TableLayout to arrange UI components.	4	**CO3**
5	**LLO 5.1:** Implement basic input and display components in an Android application using TextView, EditText. **LLO 5.2:** Use AutoCompleteTextView to interact with user input.	*a)Develop an Android app that uses TextView and EditText to get and display text from the user. b) Implement AutoComplete TextView in an Android application to provide user-friendly input suggestions based on partial user input.	4	**CO4**
6	**LLO6.1:** Use different types of buttons in Android application. **LLO 6.2** Develop an Android	*a) Develop an Android application that uses Button, ImageButton to perform actions based on user interactions.	4	**CO4**

	app that uses a ToggleButton to perform actions.	b) Develop an Android application that uses a ToggleButton to switch between two states(on/off)and perform actions based on the user's selection.		
7	**LLO7.1** Develop an Android app that uses a CheckBox	*a) Develop an Android application to implement CheckBox.	2	**CO4**
8	**LLO 8.1** Use an Android app that allows users to make multiple selections using RadioButton, and RadioGroup	)Develop a program to implement RadioButton and RadioGroup	2	**CO4**
9	**LLO 9.1:**. Implement ProgressBar control to show the status of the task.	*Develop an Android app that uses a Progress Bar to show the status of a task file uploading or downloading.	2	**CO4**
10	**LLO 10.1 :** Build an Android app that displays items in lists and grids.	*Develop a program to implement List View, Grid View.	4	**CO4**
11	**LLO 11.1**Implement ImageView and ScrollView .	Develop a program to Image View and Scroll View.	2	**CO4**
12	**LLO 12.1** : Develop an Android app that uses a CustomToastAlert ,Date and Time Picker.	Develop a program to implement CustomToastAlert and Date and Time Picker.	2	**CO4**
13	**LLO 13.1**: Implement activity lifecycle.	Develop a program to implement activity lifecycle.	2	**CO5**
14	**LLO 14.1:**Demonstrate the use of explicit intents.	* Develop an Android app that uses explicit intents to switch between activities and interact with external components.	2	**CO5**
15	**LLO 15.1:** Implement implicit intent to perform certain actions.	*Develop an Android app that uses implicit intents to perform actions like opening a web page, sending an email.	2	**CO5**
16	**LLO 16.1:** Develop an Android app that responds to specific intents	Design an app that responds to specific intents by configuring intent filters in the AndroidManifest.xml. (For eg, set up the app to handle shared text from other applications).	2	**CO5**
17	**LLO 17.1:** Develop an Android app using device's camera.	* Develop an Android app to capture image using device's camera.	2	**CO5**
18	**LLO 18.1:**Develop an Android app that uses horizontal and vertical fragments.	* Develop an Android app to implement horizontal and vertical fragments.	2	**CO5**
19	**LLO 19.1:** Develop an Android app that uses Broadcast receiver.	* Develop an Android app that receives and reacts to broadcast messages using Broadcast Receiver.	2	**CO5**
20	**LLO 20.1:** Develop an Android app that adds and	*Develop an Android application that performs basic database operations insert,	4	**CO5**

	deletes records in a local SQLite database.	delete, search and update using SQLite to manage structured data.		
21	**LLO 21.1:** Develop an Android app that sends SMS messages using user input and proper permissions.	*Develop an Android application that uses SMS functionality to send text messages by handling necessary permissions and using appropriate APIs.	2	**CO5**
22	**LLO 22.1:** Develop an Android app that enables Bluetooth functionality.	* Develop an Android app that enables Bluetooth connectivity, allowing devices to discover and connect with each other.	2	**CO5**
23	**LLO 23.1:** * Develop an Android app for Text and speech input and output	* Develop an Android app that converts user-inputted text into speech using the Text To Speech API.	2	**CO5**
24	**LLO 24.1:** * Develop an Android app for GPS Application	* Develop an Android app that uses location services and checks for permissions.	2	**CO6**
		TOTAL	**60**	

Note: Out of the aboves Suggestive LLOs–

1.'*'Marked Practicals(LLOs)Are mandatory.

2. A judicial mix of LLOs is to be performed to achieve the desired outcomes,

Self-Learning YES

VI.SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIESFORSPECIFICLEARNING/SKILLS DEVELOPMENT (SELF-LEARNING Following are some suggestive topics for Self-learning):

1. **Mobile Banking App Prototype**-Simulate features like user login, balance check,mini statement, and fund transfer.
2. **Attendance Tracking App**-Mark student or employee attendance,view monthly reports,and generate summary.
3. **E-commerce Android App**-Users can browse products,add to cart,and place dummy orders.
4. **Health Tracking System**-Tracksteps,water intake,calories,and daily work out routines.
5. **Library Management System**-Students can view available books,issue/return books,and manage due dates.
6. **Student Management System**-Manage student details,course info,fees status,and performance.
7. **Employee Management System**-Store employee details,track leaves,attendance, and salaries.
8. **Product Inventory System**-Add,update, delete products and monitor stock levels.
9. **Hotel Management System**-Room booking, check-in/check-out, food ordering and bill generation.
10. **Bus Reservation Management System**-Book bus tickets,view schedules,and track bus locations.
11. **Travel Agency Management App**-Tour packages display,customer bookings,and feedback system.
12. **Bank Management System**-Manage account info,deposits, withdrawal ,and customer data.
13. **Airline Management System**-Search flights, book tickets and check seat availability.

14. **Blood Bank Management System**-View available blood types ,request blood and donor registration.
15. **Hospital Management System**-Patient registration,doctor appointments,and medical history tracking.
16. **Payroll Management System**-Calculate salary,deductions,and generate salary slips for employees.
17. **Hostel Management System**-Room allotment,student details, and mess bill management.
18. **Movie Ticket Reservation System**-Select movie,seat,and timing simulate ticket booking process.
19. **Electricity Bill Management System**-Calculate and display monthly usage and billpayment simulation.
20. **Insurance Management System**-Manage insurance policies,claims,and userdetails.
21. **ATM Management System**-Simulate ATM functionalities like PIN validation,cash withdrawal, and balance check.
22. **Patient Health Record System**-Record vitals,medication,reports,and schedule follow-up visits.
23. **Online Book store Management App**-Browse books,place dummy orders,manage reviews, and inventory.
24. **Car Rental Management System**-Browse cars,book rental,check availability,and view history.
25. **Student Grade Database App**-Input student marks,calculate grades,and generate report cards.

Activities

- Students are encouraged to use online tools to improve their learning, such as the e-Kumbh from AICTE and the virtual Labs from IIT.
- Students should be encouraged to participate in various coding competitions, such as hackathons, and online coding contests on websites like Hackerrank, Codechef etc.
- At the department level, encourage students to start a coding club
- Students are encouraged to register themselves in various MOOCs such as Infosys Springboard, Swayam etc. to further enhance their learning.

Note:

1. The above is suggestive list of case studies for SLA

2. The faculty must allocate any other case study to individual student. Considering the students technical skills.

Assignment

Prepare a journal of practicals performed in the laboratory.

VII.LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1.	Computer System with minimum 8GBRAM,256SSD installed with Windows10 onwards.	ALL
2.	Any compatible open source Android IDE(like-Android Studio ,Eclipse, Visual Studio with Xamarin with SQLite / Firebase database compatibility)	ALL COs

VIII.SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS &ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Android Operating System	CO1	04	--	--	--	--
2	II	Installation and configuration of Android Environment	CO2	04	--	--	--	--
3	III	Fundamentals of UI Components and Layouts	CO3	04	--	--	--	--
4	IV	Designing User Interface	CO4	06	--	--	--	--
5	V	Activity, Multimedia and Databases	CO5	08	--	--	--	--
6	VI	Security and Application Deployment	CO6	04	--	--	--	--

IX.ASSESSMENT METHODOLOGIES /TOOLS

Formative assessment (AssessmentforLearning)	Summative Assessment (AssessmentofLearning)
Lab performance, Assignment,Self-learning, and Seminar/Presentation	Lab Performance ,viva voce

X.SUGGESTED COS-POS MATRIXFORM

Course Outcomes(Cos)	Programme Outcomes(Pos)							Programme Specific Outcomes *(PSOs)	
	PO-1 Basic and Discipline-Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO1	2	3	1	2	1	1	2	-	2
CO2	1	3	2	3	1	1	2	-	2
CO3	1	3	2	3	1	1	2	-	2
CO4	1	3	3	3	1	1	2	-	2

CO5	1	3	3	3	1	1	2	-	3
CO6	1	3	2	3	1	1	2	-	3

XI.SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher
1	Prasanna Kumar Dixit	ANDROID	Vikas Publications,First Edition,2014 ISBN NO :- 9789325977884
2	John Hortan	Android Programming for Beginners	Packet Publication, First Edition ISBNNO:-2015978-1-78588-326-2
3	Pradeep Kothari	Android Application Development	Kogent Learning Solutions ISBN: 9789351194095
4	Maclean David , Komatineni Satya,Allen Grant	ProAndroid5	Apress Publications,2015,ISBN:978-1-4302-4680-0

XII.LEARNING WEBSITES & PORTALS

1.https://www.tutorialspoint.com/android
2.https://www.tutorialspoint.com/android/android_advanced_tutorial.pdf
3.https://developer.android.com/training/data-storage/sqlite
4.https://developer.android.com/guide/topics/permissions/overview

Name & Signature:

Mrs.Vaishali S. Pawar
Lecturer in Computer Engineering

Mrs.Reshma J.Chavan
Lecturer in Computer Engineering

Ms.Poonam C. Fafat
Lecturer in Information Technology

(Course Experts)

Name & Signature:

Smt.Jyoti R.Hange
(Programme Head)
Computer Engineering

Name & Signature:

Shri. S.B. Kulkarni
(CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	**DIPLOMA IN CM**
PROGRAMME CODE	**06**
COURSE TITLE	**SERVER-SIDE SCRIPTING USING JSP (ELECTIVE)**
COURSE CODE	**CM51204**
PREREQUISITE COURSE CODE & TITLE	**NA**
CLASS DECLARATION COURSE	**YES**

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM51204	SERVER SIDE SCRIPTING USING JSP	DSE	4	-	2	2	8	4	3	30	70	100	40	25	10	25#	10	25	10	175

Total IKS Hrs for Term: 0 Hrs

Abbreviations: CL-Classroom Learning, **TL**-Tutorial Learning, **LL**-Laboratory Learning, **SLH**-Self Learning Hours, **NLH**-Notional Learning Hours, **FA** - Formative Assessment**, SA** -Summative assessment, **IKS** – Indian Knowledge System, **SLA**- Self Learning Assessment

Legends: @-Internal Assessment, # - External Assessment,***#** - Online Examination,**@$** - Internal Online Examination

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that course.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours**.
5. * Self-learning hours shall not be reflected in the Timetable.
6. * Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

This Course aims at providing Java Server Page as an important scripting technology for computer engineering diploma graduates to develop dynamic and platform independent web-based applications. JSP is widely used server side scripting technology as it allows designing web – based applications using java APIs, JDBC APIs,XML and AJAX. It also aims at providing the security measures to be implemented in web application programming.

III. COURSE- OUTCOMES (CO'S)

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1: Handle HTTP requests and responses using Servlets.
CO2: Design simple JSP pages using various JSP elements.
CO3: Design and develop dynamic JSP applications
CO4: Implement custom tags, JSTL, filters, and listeners in JSP.
CO5: Implement security best practices in JSP-based applications
CO6: Deploy web applications

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
SECTION I				
UNIT- I. WEB PROGRAMMING ENVIRONMENT CL Hrs-06, Marks-09)				
1	**TLO1.1** Select use of Servlet or JSP for the given problem. **TLO1.2** Maintain HTTP sessions **TLO1.3** Use Servlet for request and response	**1.1** Servlet and JSP overview: Servlet Life cycle, Servlet Classes,Threading Models, JSP life-cycle. **1.2** Overview of the Hypertext Transfer Protocol(HTTP): The HTTP Specification, HTTP Request-Response Model, HTTP sessions. **1.3** The Servlet API, The Javax.Servlet Package, Reading Servlet Parameters, Reading Initialization Parameter	Classroom Learning	**CO1**
UNIT-II FUNDAMENTAL OF JSP (CL Hrs-12, Marks-12)				
2	**TLO2.1.**Explain component of jsp **TLO2.2.**Use of Expression and scriplet **TLO2.3.** Design page using JSP elements and declarations for the given problem. **TLO2.4** Use relevant page directive(s) to create page instructions for the given problem.	**2.1** Overview of JSP, JSP Syntax and Semantics: Components of JSP page, JSP Development Model, and complete example **2.2** Expressions and Scriptlets:Expression and Scriptlet Handling by the JSP Container,Implicit Objects and the JSP Environment,Initialization Parameters. **2.3** Declarations:What Is a Declaration? Primary Uses for Declarations ,Variable Declarations, Method Definitions, Overriding jspInit and jspDestroy, Access to Implicit Objects , Inner Classes **2.4** Request Dispatching:-Anatomy of Request Processing,Including Other Resources ,The include Directive ,The <jsp:include> Action	Classroom Learning	**CO2**
UNIT- III SESSION AND THREAD MANAGEMENT AND DATABASE ACCESS(CL Hrs-12, Marks-14)				
3	**TLO3.1:**Use relevant session API to manage the session **TLO 3.2:** Write statements to perform primitive database operations using JDBC	**3.1** Session and Thread Management:Session Tracking ,Hidden Fields ,URL Rewriting , Cookies,The Session API,Destroying Sessions. **3.2** Database Access:Overview of JDBC, Basic JDBC Operations, Essential JDBC Classes , JDBC Drivers, Connecting to a Database , The Statement Interfaces, PreparedStatement, CallableStatement , ResultSet	Classroom Learning	**CO3**
SECTION II				
UNIT –IV JSP TAG EXTENSIONS AND FILTER (CL Hrs-12 Marks-13)				

4	**TLO 4.1:** Select relevant custom tags to design web page for the given problem. **TLO 4.2:** Develop business logic using expression language for the given situation **TLO 4.3**: Use the relevant JSP Filter to solve the given problem different types of listerner.	**4.1** Custom Tags: Introduction and how it works, Developing Your First Custom Tag, How Tag Handlers Work, Tag Libraries, The Tag Handler API,The Tag Handler Life Cycle. **4.2**Expression Language ,The JSP Standard Tag Library(JSTL), Tag Extensions, Tag Files, and JSP Fragments. **4.3** Filters and Event Listener: Filter overview, Developing and deploying a Filter,Writing and configuring filters, Logging, Authentication, Data Transformation with filters, Application, Session, and Request Listeners, Lifecycle events and attribute listeners.	Classroom Learning/ Collaborative Learning	**CO4**
UNIT V –SECURE ASYNCHRONOUS WEB APPLICATIONS USING JSP, AJAX, AND XML (CL Hrs-10, Marks-12)				
5	**TLO 5.1**: Send and receive structured data formats such as JSON and XML **TLO 5.2:** Implement asynchronous client-server communication **TLO 5.3:** Implement secure authentication and authorization mechanisms	**5.1** XML:XML Overview,Generating an XML Response ,Transforming XML into HTML,Transforming XML into a Device-Dependent Format,Processing XML Data **5.2** JSP with AJAX:AJAX Overview, Integrating AJAX for asynchronous communication,Sending and receiving JSON/XML from JSP, Buliding responsive UI's with patial page update. **5.3** JSP Security: Input validation and output encoding (preventing XSS),Authentication & Authorization using sessions and filters, Secure session handlingand invalidation, CSRF Protection using token, Secure Cookies handling.	Classroom Learning/ Collaborative Learning	**CO5**
UNIT VI –TESTING AND DEPLOYING WEB APPLICATION (CL Hrs-08, Marks-10)				
6	**TLO 6.1:** Test and Debug the Web application model **TLO 6.2:** Deploying Web application.	**6.1** JSP Testing and Debugging: Building a Mental Model,Testing in Isolation,Debugging Tools,Testing JSP Pages,Using Development Tools and Servers **6.2** Deploying Web Applications: The Web Application Environment, The Deployment Descriptor—web.xml, Sample Deployment Descriptor.	Classroom Learning Collaborative Learning	**CO6**

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/ TUTORIAL EXPERIENCES

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
1	**LLO 1.1:** Install and configure a web server and database tool **LLO 1.2:**Demonstrate handling of HTTP requests and responses **LLO 1.3:** Develop JSP programs using core JSP elements	*Install Web Server and database tool *Write a program for demonstration of HTTP request and response using Servlet. *Develop a program to demonstrate use of all basic elements of JSP (Any 4 programs)	2	CO1
2	**LLO 2.1:** Write and execute simple JSP programs. **LLO 2.2:** Develop a JSP program using request dispatching	* Develop a complete JSP page demonstrating all components (declaration, directive, scriptlet, and expression). *Write a JSP program using expressions to perform simple arithmetic operations.	2	CO2
3	**LLO 3.1**: Use declaration blocks in JSP **LLO 3.2**: Implement request forwarding	*Write a JSP program that declares and uses variables in the declaration block. *Write a JSP program demonstrating include directive (<%@ include ... %>). Create a JSP program using jsp:include action to include a secondary page. *Develop a program to demonstrate request forwarding using RequestDispatcher	4	CO2
4	**LLO 4.1:** Establish a connection between a Java application and a relational database	*Write program to Create,insert,delete and search a records using JDBC	2	CO3
5	**LLO 5.1**: Develop JSP programs to implement session management **LLO 5.2**: Demonstrate session handling	*Write a JSP programs for session management using Session tracking. *Write a JSP programs for session management using: URL re-writing, Hidden Form Field.	4	CO3
6	**LLO 6.1:** Develop and implement custom JSP tags **LLO 6.2:** Create reusable and modular tag libraries	*Develop a simple custom tag to print a welcome message using a Tag Handler class. *Create a custom tag that accepts attributes and performs basic operations (e.g., sum of two numbers).	2	CO4
7	**LLO 7.1:** Use JSTL core tags **LLO 7.2:** Design modular JSP fragments	*Create a JSP page using JSTL core tags (<c:out>, <c:if>, <c:forEach>) for dynamic output. *Develop a JSP fragment and include it in another JSP using <jsp:invoke> and <jsp:attribute>.	4	CO4
8	**LLO 8.1:** Develop and configure log filters **LLO 8.2:** Implement a filter to perform authentication check	*Write a filter to log request and response details. *Develop a filter to perform authentication check (e.g., block access if session is invalid).	4	CO4

9	**LLO 9.1:** Generate structured XML output	*Generate an XML response from a JSP page.	2	CO5
10	**LLO 10.1**: Develop dynamic and responsive user interfaces with partial page updates for enhanced user experience.	*Create a simple AJAX-enabled JSP web page to fetch data without reloading the page and Send and receive JSON using AJAX from JSP	2	CO5
11	**LLO 11.1:** Implement input validation and output encoding to prevent Cross-Site Scripting (XSS) attacks in JSP	*Develop a JSP page that validates input and encodes output to prevent XSS.	2	CO5
12	**LLO 12.1:**Deploy web pages	*Deploy web pages in web server.	2	CO6

Note: Out of the above suggestive LLOs –

1. '*' Marked Practicals (LLOs) Are mandatory.
2. A judicial mix of LLOs is to be performed to achieve the desired outcomes

VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

Self-Learning Activity:- Yes

To design and develop a dynamic web application that allows users to browse, search, and purchase books using JSP, Servlets, JDBC, and AJAX.

Suggestive List of Self Learning:

1. Design an online feedback system that stores and displays responses using JSP and JDBC.
2. Build a hotel room booking interface with AJAX-based availability check and JSP session tracking.
3. Develop a secure job application portal using JSP with input validation, file upload, and JSTL tags.
4. Implement a secure login system using JSP with role-based access.
5. Design an online quiz portal that uses custom tags and EL to handle question rendering and scoring.
6. Develop a shopping cart application using session management and request dispatching in JSP.
7. Build a complaint management system that logs complaints and filters user roles using listeners.
8. Create a blogging platform with user sessions, filters for spam prevention, and AJAX for live comment updates.
9. Implement an employee attendance system using JSP, JDBC, and XML reporting features.
10. Design a real-time notification dashboard using JSP and AJAX with session and filter management.
11. Design a student registration portal using JSP with form validation and session tracking.
12. Develop a login system with role-based access using sessions and filters.
13. Create a feedback collection system that stores responses in a database using JDBC.
14. Build a simple shopping cart using JSP session tracking and hidden form fields.
15. Develop an employee attendance tracker with real-time clock and AJAX updates.
16. Create a custom tag library for displaying user greetings and formatting dates.
17. Develop a quiz application that shows questions and tracks score using sessions.
18. Design an online calculator using JSP scriptlets and Expression Language.
19. Build a user profile management system with file upload and image display.

Activities

- Students are encouraged to use online tools to improve their learning, such as the e-Kumbh from AICTE and the virtual Labs from IIT.
- Students should be encouraged to participate in various coding competitions, such as hackathons, and online coding contests on websites like Hackerrank, Codechef etc.
- At the department level, encourage students to start a coding club
- Students are encouraged to register themselves in various MOOCs such as Infosys Springboard, Swayam etc. to further enhance their learning.

Note:

1. The above is suggestive list of case studies for SLA

2. The faculty must allocate any case study to individual/group of student. Considering the students technical skills.

Assignment

Prepare a journal of practicals performed in the laboratory.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	1) Personal Computer Intel Pentium Onwards Minimum 2GB RAM. 500Gbyte HDD) installed with Windows 8 onwards.	ALL
2	1) Any open source Web Server 2) Notepad	ALL

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
SECTION I								
1	I	**WEB PROGRAMMING ENVIRONMENT**	CO1	06	04	03	02	**09**
2	II	**FUNDAMENTAL OF JSP**	CO2	12	02	04	06	**12**
3	III	**SESSION AND THREAD MANAGEMENT AND DATABASE ACCESS**	CO3	12	02	06	06	**14**
SECTION II								
4	IV	**JSP TAG EXTENSIONS AND FILTER**	CO4	12	02	04	07	**13**
5	V	**SECURE ASYNCHRONOUS WEB APPLICATIONS USING JSP, AJAX, AND XML**	CO5	10	02	04	06	**12**
6	VI	**TESTING AND DEPLOYING WEB APPLICATION**	CO6	08	02	04	04	**10**
Grand Total				**60**	**14**	**25**	**31**	**70**

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Lab performance, Assignment, Self-learning, and Seminar/Presentation	Lab. Performance, viva voce

X. SUGGESTED COS- POS MATRIX FORM

Course Outcomes (Cos)	Programme Outcomes(Pos)							Programme Specific Outcomes *(PSOs)	
	PO-1 Basic and Discipline-Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO1	2	3	2	3	1	1	2		2
CO2	1	3	2	3	1	1	2		2
CO3	2	3	2	3	1	1	2		2
CO4	2	3	3	3	1	1	2		2
CO5	1	2	2	2	3	2	2		2
CO6	1	3	2	3	2	1	2		2

Legends:- High:03, **Medium:**02, **Low:**01, **No Mapping:** -
*PSOs are to be formulated at the institute level

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher
1	The Complete Reference JSP	Phil Hanna	**Publisher:** McGraw-Hill Education **Edition:** 2nd Edition (Covers JSP 2.0) **ISBN:** 978-0072224377
2	Head First Servlets and JSP	Bryan Basham, Kathy Sierra, Bert Bates	**Publisher:** O'Reilly Media **Edition:** 2nd Edition (Covers JSP 2.0 and Servlets 2.4) **ISBN:** 978-0596516680
3	Java Server Programming	Dreamtech Software Team	**Publisher:** Dreamtech Press **Edition:** J2EE 1.4 Edition (Platinum Edition) **ISBN-10:** 817722624X

XII. LEARNING WEBSITES & PORTALS

1. http://www.nptel.ac.in
2. https://docs.oracle.com/javaee/7/tutorial/servlets.htm
3. https://www.udemy.com/
4. https://www.coursera.org/

Name & Signature:	
Mrs. Bharati M. Purohit Lecturer in Computer Engineering	**Mrs. Archana S Paike** Lecturer in Computer Engineering
(Course Experts)	
Name & Signature: **Smt.J.R.Hange** (Programme Head)	Name & Signature: **Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	**DIPLOMA IN CM**
PROGRAMME CODE	**06**
COURSE TITLE	**CYBER SECURITY(ELECTIVE)**
COURSE CODE	**CM51205**
PREREQUISITE COURSE CODE & TITLE	**NA**
CLASS DECLARATION COURSE	**YES**

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM51205	CYBER SECURITY	DSC	4	-	2	2	8	4	3	30	70	100	40	25	10	25#	10	25	10	175

Abbreviations: CL-Classroom Learning, **TL**-Tutorial Learning, **LL**-Laboratory Learning, **SLH**-Self Learning Hours, **NLH**-Notional Learning Hours, **FA** - Formative Assessment**, SA** -Summative assessment, **IKS** – Indian Knowledge System, **SLA**- Self Learning Assessment

Legends: @-Internal Assessment, **#** - External Assessment,***#** - Online Examination,**@$** - Internal Online Examination

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that course.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours**.
5. * Self-learning hours shall not be reflected in the Timetable.
6. * Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

This course is aimed at providing students with a conceptual understanding of Cyber Security, with respect to threats, vulnerabilities, and security measures. It aims to provide in-depth knowledge of security architecture, risk management, the role of various protocols in secure communication, and strategies for mitigating cyberattacks in diverse environments.

III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1: Identify various software threats and attacks.
CO2: Apply cryptographic algorithms to maintain Computer Security.
CO3: Apply dats protection techniques to secure sensitive information
CO4: Analyze different types of cyber offences.
CO5: Describe cybercrime issues on wireless and mobile devices.
CO6: Apply cyber law for a given type of cyber issues.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
		SECTION I		
		UNIT- I. INTRODUCTION TO COMPUTER SECURITY (CL HRS-08, MARKS-10)		
1	**TLO1.1.** Explain the importance of given pillars of computer security. **TLO1.2.** Explain the characteristics of given type of threat. **TLO1.3** Explain types of attacks related with security. **TLO1.4** Explain types of social engineering.	**1.1** Foundations of Computer Security: Definition and Need of computer security, Security basics: Confidentiality, Integrity, Availability, Accountability, Nonrepudiation, Reliability, Authentication. **1.2** Threat to Security:Viruses, Phases of Viruses, Types of Viruses, Dealing with Viruses, Worms, Trojan horse, Intruders, Insiders, Ransomware. **1.3** Type of attacks:Active and Passive attacks, Denial of service, DDOS, backdoors and trapdoors, sniffing, phishing, spoofing, man in the middle, replay, TCP/IP Hacking, encryption attacks. **1.4** Social Engineering: Social Engineering, Types of social engineering.	Classroom Learning Collaborative Learning Program development tools	**CO1**
		UNIT- II. CRYPTOGRAPHY (CL HRS-12, MARKS-15)		
2	**TLO2.1:** Define terms related to cryptography **TLO 2.2:** Encrypt/Decrypt the given text using different Substitution /transposition techniques. **TLO 2.3:** Describe various encryption algorithms. **TLO 2.4**: Explain Hashing.	**2.2** Introduction:Plain Text and Cipher Text, Cryptography, Cryptanalysis, Cryptology, Encryption, Decryption. **2.3** Substitution techniques:Caesar's cipher, mono alphabetic, poly alphabetic, Vigenère cipher **2.4** Transposition techniques: Rail fence technique, simple columnar, Vernam Cipher (One-Time Pad) **2.5** Hashing: Definition, Hashing Algorithms: MD-5, SHA **2.6** Symmetric and Asymmetric cryptography: Introduction to Symmetric encryption, DES (Data encryption Standard) algorithm, Asymmetric key cryptography: Digital Signature, RSA Algorithm, Diffie-Hellman Algorithm.	Classroom Learning Collaborative Learning Program development tools.	**CO2**
		UNIT-III. USER AUTHENTICATION & ACCESS CONTROL (CL HRS-10, MARKS-10)		

3	**TLO3.1** Explain how to construct good/strong password) **TLO3.2** Explain the given method of Biometric**.** **TLO3.3** Explain Authentication and Authorization with example. **TLO3.4** Describe the features of given access control policy. **TLO3.5** Explain Authentication Protocol with example**.**	**3.1** Identification and Authentication: User name & Password, Guessing password, Password Attacks-Piggybacking, Shoulder surfing, Dumpster diving **3.2** Biometrics: finger prints, hand prints, Retina, patterns, voice patterns, signature and writing patterns, keystrokes. **3.3** Access controls: Definition, Authentication, Authorization, Policies: DAC, MAC, RBAC **3.4** Authentication Protocol: Kerberos.	Classroom Learning Collaborative Learning Program development tools.	**CO3**
	SECTION II			
	UNIT –IV FUNDAMENTALS OF CYBER SECURITY (CL Hrs-10 Marks-15)			
4	**TLO4.1** Define the term cybercrime and explain its origin. **TLO4.2** Differentiate between cybercrime and information security. **TLO4.3** Identify the types of cybercriminals and classify cybercrimes. **TLO4.4** Explain how cybercriminals plan and execute attacks.	**4.1** Cybercrime and Its Foundations: Definition and Origins of the Word, Cybercrime and Information Security, who are Cybercriminals? **4.2** Types of Cybercrimes: Financial crime, Forgery, Web Defacement, Data Diddling, Email frauds, Hacking, Tempering, Spamming, Phishing, Spoofing, Pharming, DoS Attacks, Spyware, Botnet **4.3** Planning and Execution of Cyber Offenses: Categories of cybercrime, How Criminals Plan the Attacks, Social engineering, Cyberstalking, Cybercafé and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cybercrime and Cloud Computing. **4.4** Ethical Hacking: What is ethical hacking? Importance of ethical Hacking.Types of Ethical Hacking, Types of Ethical Hackers.	Classroom Learning Collaborative Learning Program development tools.	**CO4**
	UNIT V – CYBERCRIME – MOBILE AND WIRELESS DEVICES (CL Hrs-10 Marks-10)			
	TLO5.1 Describe the evolution and trends of mobile and wireless devices in cybercrime. **TLO5.2** attacks in mobile computing environments. **TLO5.3** Explain	**5.1** Introduction: Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices. **5.2** Technical Threat Vectors: Registry Settings for Mobile Devices,	Classroom Learning Collaborative Learning Program development	**CO5**

5	organizational security strategies and policies in the mobile era.	Authentication Service Security, Attacks on Mobile/Cell Phones. **5.3** Organizational Security Measures: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era.	tools.	
UNIT VI – LEGAL PERSPECTIVES ON CYBERCRIMES AND CYBERSECURITY (CL Hrs-10, Marks-10)				
6	**TLO 6.1**: Understand the importance and scope of cyber laws. **TLO 6.2:** Describe the key features of the Indian IT Act 2000. **TLO 6.3:** Explain digital signatures and their legal importance **TLO 6.4:** Identify the punishments and legal actions applicable to cybercrimes in India.	**6.1** Digital Signatures**:** Meaning and Working of Digital Signatures, Legal Validity of Digital Signatures, Digital Signature Certificates, Public Key Infrastructure (PKI). **6.2** Importance of Cyber Laws: Need of Cyber Laws in India, Role of Cyber Laws in Daily Life, Types of Cyber Laws – Civil and Criminal, Overview of Cybercrime Offenses. **6.3** Overview of the Indian IT Act: Introduction to IT Act 2000, IT Act 2008, IT Act 2023, Objectives and Purpose, Legal Recognition of Electronic Records and Digital Transactions, Roles of Certifying Authority and Adjudicating Officers.	Classroom Learning Collaborative Learning Program development tools.	**CO6**

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/ TUTORIAL EXPERIENCES.

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles /Tutorial Titles	Number of hrs.	Relevant Cos
1	**LLO 1.1:** Investigate network traffic for cyberattacks	* Capture and analyze traffic using Wireshark to identify patterns of DoS/DDoS, phishing, or scanning attacks	2	CO1
2	**LLO 2.1:** Explore Substitution/Transposition Technique	* Write a program to implement any Substitution/Transposition Technique	2	CO2
3	**LLO 3.1**: Explore various Encryption/Decryption techniques using Tool	* Perform various Encryption/Decryption techniques using Cryptographic Tool	2	CO2
4	**LLO 4.1:** Perform keylogger detection and mitigation	* Install a basic keylogger and apply anti-keylogger tools to detect and remove it	2	CO3
5	**LLO 5.1:** Perform password attacks ethically	* Use tools like John the Ripper or Hydra to perform and defend against password-based attacks.	4	CO3

6	**LLO 6.1:** Analyze steganographic content	* Use tools like Steghide or OpenStego to hide and extract secret data in images	4	CO4
7	**LLO 7.1:** Analyze mobile device vulnerabilities	* Use MobSF (Mobile Security Framework) to scan and analyze an Android APK for vulnerabilities.	2	CO5
8	**LLO 8.1:** Apply Mobile security tool	*Use Mobile security tool.	2	CO5
9	**LLO 9.1:** Analyze an email header	*Trace the origin of Email using any tool(e.g.emailTrackerPro)	2	CO5
10	**LLO 10.1:** Set up a simple firewall	* Implement and test rules on Windows Firewall	2	CO5
11	**LLO 11.1:** Demonstrate digital signature validation	* Create and verify a document using a digital signature and certificate authority.	2	CO6
12	**LLO 12.1:** Examine legal frameworks and case laws	* Study and present a real-world cybercrime case prosecuted under the IT Act.	4	CO6

Note: Out of the above suggestive LLOs –

1. '*' Marked Practicals (LLOs) Are mandatory.
2. A judicial mix of LLOs is to be performed to achieve the desired outcomes

SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

Self-Learning YES

Suggestive list of Self-Learning

1. Simulate a phishing email campaign using ethical hacking tools and propose mitigation techniques.
2. Analyze a real-world cybercrime case filed under the Indian IT Act and present findings.
3. Create and validate a document using digital signature tools and discuss its legal implications.
4. Set up and test a basic firewall configuration using iptables or Windows Defender Firewall.
5. Use Wireshark to capture and analyze traffic related to malware, phishing, or DoS attacks.
6. Create a report on the impact of a recent ransomware or identity theft attack.

Activities

- Students are encouraged to use online tools to improve their learning, such as the e-Kumbh from AICTE and the virtual Labs from IIT.
- Students should be encouraged to participate in various coding competitions, such as hackathons, and online coding contests on websites like Hackerrank, Codechef etc.
- At the department level, encourage students to start a coding club
- Students are encouraged to register themselves in various MOOCs such as Infosys Springboard, Swayam etc. to further enhance their learning.

Note:

1. The above is suggestive list of case studies for SLA

2. The faculty can allocate any other case study to individual student. Considering the students technical skills.

Assignment

Prepare a journal of practicals performed in the laboratory.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	1) Personal Computer Intel Pentium Onwards Minimum 2GB RAM. 500Gbyte HDD installed with Windows 8 onwards.	ALL
2	Tools/Software: Wireshark, MobSF, John the Ripper, Steghide/OpenStego, VirtualBox	1,2,3,4,5,6,7,8, 9,10,11,12

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (specification table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
SECTION I								
1	**I**	**INTRODUCTION TO COMPUTER SECURITY**	CO1	08	02	04	04	**10**
2	**II**	**CRYPTOGRAPHY**	CO2	12	03	06	06	**15**
3	**III**	**USER AUTHENTICATION & ACCESS CONTROL**	CO3	10	02	04	04	**10**
SECTION II								
4	**IV**	**FUNDAMENTALS OF CYBERSECURITY**	CO4	10	05	06	04	**15**
5	**V**	**CYBERCRIME – MOBILE AND WIRELESS DEVICES**	CO5	10	02	04	04	**10**
6	**VI**	**LEGAL PERSPECTIVES ON CYBERCRIMES AND CYBERSECURITY**	CO6	10	02	04	04	**10**
Grand Total				**60**	**16**	**28**	**26**	**70**

IX. ASSESMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Lab performance, Assignment, Self-learning, and Seminar/Presentation	Lab. Performance, viva voce

X. SUGGESTED COS- POS MATRIX FORM

Course Outcomes (Cos)	Programme Outcomes(Pos)							Programme Specific Outcomes *(PSOs)	
	PO-1 Basic and Discipline-Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO1	2	3	2	2	2	1	2	-	1
CO2	2	3	3	3	2	1	2	-	2
CO3	2	3	2	3	2	1	2	-	2
CO4	2	3	2	2	3	2	2	-	1
CO5	2	3	2	2	3	2	2	-	2
CO6	1	2	3	2	3	2	2	-	1

Legends:- High:03, **Medium:**02, **Low:**01, **No Mapping:** -
*PSOs are to be formulated at the institute level

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher
1	Sunit Belapure & Nina Godbole	Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives	Wiley India Pvt Ltd, 2013, ISBN: 978-81-265-2179-1
2	Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla	Introduction to Information Security and Cyber Laws	Dreamtech Press, 2015, ISBN: 978-9351194736
3	Principles of computer security Security+and Beyond	Wm.Arthur Conklin Dwayne Williams Gregory B. White Roger L.Davis Chuck Cothren	McGraw Hill Technology Education International Edition2005 • ISBN-13: 978-0072255096 • ISBN-10: 0072255099
4	Cryptography and Network Security Third Edition	Atul Kahate	McGraw Hill Education, New Delhi • ISBN 13: 978-1-25-902988-2

XII. LEARNING WEBSITES & PORTALS

1. http://www.nptel.ac.in
2. https://www.geeksforgeeks.org/cyber-security-tutorial
3. https://www.geeksforgeeks.org/cryptography-and-its-types
4. https://www.geeksforgeeks.org/information-technology-act-2000-india

5. https://www.w3schools.com/cybersecurity/cybersecurity_prenetration_testing.php
6. S. Kami Makki, Peter Reiher, Kia Makki, Niki Pissinou, Shamila Makki, "Mobile and Wireless Network Security and Privacy", Springer, ISBN 978-0-387-71057-0, 09-Aug2007

Name & Signature: **Mrs. Nanda R. Wagh** Lecturer in Computer Engineering	**Mrs. Sayali P. Ambavane** Lecturer in Computer Engineering
(Course Experts)	
Name & Signature: **Smt.J.R.Hange** (Programme Head)	Name & Signature: **Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	**DIPLOMA IN CM**
PROGRAMME CODE	**06**
COURSE TITLE	**ADVANCED DATABASE MANAGEMENT SYSTEM (ELECTIVE)**
COURSE CODE	**CM51206**
PREREQUISITE COURSE CODE & TITLE	**CM41201 (RELATIONAL DATABSE MANAGEMENT SYSTEM)**
CLASS DECLARATION	**YES**

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM51206	ADVANCED DATABASE MANAGEMENT SYSTEM	DSC	4	-	2	2	8	4	3	30	70	100	40	25	10	25#	10	25	10	175

Total IKS Hrs for Term: 0 Hrs

Abbreviations: CL-Classroom Learning, **TL**-Tutorial Learning, **LL**-Laboratory Learning, **SLH**-Self Learning Hours, **NLH**-Notional Learning Hours, **FA** - Formative Assessment**, SA** -Summative assessment, **IKS** – Indian Knowledge System, **SLA**- Self Learning Assessment

Legends: @-Internal Assessment, # - External Assessment,***#** - Online Examination,**@$** - Internal Online Examination

Note:

1. **FA-TH** represents an average of two class tests of 30 marks each conducted during the semester.
2. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that Course.
3. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
4. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
5. **1 credit** is equivalent to **30 Notional hours**.
6. * Self-learning hours shall not be reflected in the Timetable.
7. * Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Advanced database management systems contain comprehensive contents on various concepts related to database systems, database design and management. Broadly it discusses about parallel and distributed database systems, database transactions, big data management and advances in database data. The student will get a detailed introduction about database administration and management. This course includes study of structured and unstructured database like MongoDB, SQL and XML for data management. The concept big data is used in today's information driven business world for managing big data. After learning this subject student will be able to use ADBMS as a backend for developing database.

III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned competency:

CO1: Analyze various database architectures.
CO2: Design object-based databases and XML data models
CO3: Execute data using fundamental and advanced MongoDB commands.
CO4: Apply core concepts of data warehousing for effective data storage, retrieval, and analysis.
CO5: Manage big data
CO6: Apply principles of data administration and security, and evaluate emerging trends in database technologies.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
SECTION I				
UNIT I: DATABASE SYSTEM ARCHITECTURE (CL Hrs-10, Marks-12)				
1	**TLO 1.1** Describe the given client-server Database Model. **TLO 1.2** Apply parallel and distributed database techniques in given situation **TLO 1.3** Differentiate between Parallel and Distributed Databases.	**1.1** Database System Architectures: Centralized and Client-Server Architectures, Three– tier Architecture, Server System Architecture, Parallel System, Distributed System, Network Types. **1.2** Parallel Databases: I/O Parallelism, Inter-query and Intra-query Parallelism, Interoperation and Intra-operational Parallelism, Design of Parallel Systems. **1.3** Distributed Databases: Homogeneous and Heterogeneous databases, Distributed DBMS architectures, Storing data in distributed DBMS, Distributed catalog	Classroom Learning Collaborative Learning Program development tools	**CO1**
UNIT II : OBJECT ORIENTED DATABASE AND XML (CL Hrs-10, Marks-12)				
2	**TLO 2.1** Create the given object-based database using SQL **TLO 2.2** Write given SQL queries using Table Inheritance **TLO 2.3** Write given SQL queries using Array and Multiset. **TLO 2.4** Implement SQL queries to refer the given	**2.1** Object Based Databases Overview: Complex data types, Structured types and inheritance in SQL, Table inheritance, Array and multiset types in SQL, Object identity (OI) and reference types in SQL **2.2** XML: Introduction, structure of XML data, XML document schema Xpath, XQuery: FLOWER Expressions, Joins,	Classroom Learning Collaborative Learning Program development tools.	**CO2**

	object using object identity. **TLO 2.5** Write XML queries on given data.	NestedQueries, Sorting Functions, Functions and types.		
UNIT III: ADVANCED DATABASE TECHNIQUE(CL Hrs-10, Marks-11)				
3	**TLO 3.1:** Differentiate structured and Unstructured Data. **TLO 3.2** Use NoSQL database to solve given queries. **TLO 3.3:** Use MongoDB to solve given queries.. **TLO 3.4:** Write query to execute find() function on given data. **TLO 3.5** Implement basic operations performed on MongoDB shell on given data. **TLO 3.6** Write query using aggregate() method on given data.	**3.1** Structured versus unstructured data **3.2** NoSQL using MongoDB: Introduction to MongoDB Shell, Running the MongoDB shell, MongoDB client, Basic operations with MongoDB shell, Basic Data Types, Arrays, Embedded Documents **3.3** Querying with MongoDB: find() function, specifying which keys to return, query criteria, OR queries, Types specific querying **3.4** Aggregation: Aggregation Pipeline, Aggregation using Map reduce, Single purpose aggregation	Classroom Learning Collaborative Learning Program development tools.	**CO3**
SECTION II				
UNIT IV: DATA WAREHOUSE AND OLAP (CL Hrs-10 Marks-11)				
4	**TLO 4.1** Explain architecture of data warehouse . **TLO 4.2** Explain use of spatial databases in a given situation. **TLO 4.3** Write queries using OLAP	**4.1** Introduction to Decision support, Data Warehousing, Data Warehouse Architecture, Creating and maintaining a warehouse **4.2** OLAP: Multidimensional data model, OLAP Queries, Database design for OLAP, Implementation techniques for OLAP: Bitmap Indexes, Join Indexes, Views and decision support, Top N queries, Online aggregation, View Materialization: Issues.	Classroom Learning Collaborative Learning Program development tools.	**CO4**
UNIT V: BIG DATA MANAGEMENT (CL Hrs-12, Marks-14)				
5	**TLO 5.1**: Analyze the given situation for the use of Big data. **TLO 5.2** Describe the given architecture and components of Hadoop. **TLO 5.3** Explain use of cloudera in given situation. **TLO 5.4** Explain DBaaS	**5.1** Integration with Big Data **5.2** Hadoop: Building Blocks and Components, Hadoop architecture, HBase, HIVE, Solid-State Drive **5.3** Cloudera, Oracle cloud **5.4** Database-as-a-Service (DBaaS)- Amazon RDS, Google Cloud SQL, Microsoft Azure SQL, Hybrid and Multi-cloud Database Architectures, Dynamo – a structured storage system,	Classroom Learning Collaborative Learning Program development tools.	**CO5**

		Hadoop Distributed File System, MapReduce framework, HIVE		
UNIT VI: DATA ADMINISTRATION, SECURITY AND RECENT TRENDS (CL Hrs-8, Marks-10)				
6	**TLO 6.1** Explain security issues and architecture **TLO 6.2** Explain database auditing models **TLO 6.3** Explain modern databases	**6.1** Security issues faced by enterprises, Security architecture, Operating system security principles, Administration of users, Profiles, password policies, privileges and roles **6.2** Database application security models, Database auditing models, Database integrity Auditing, Application data auditing, Practices of database auditing **6.3** Introduction to Modern Database Architectures-Serverless Databases, NewSQL Databases	Classroom Learning Collaborative Learning Program development tools.	**CO6**

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/ TUTORIAL EXPERIENCES

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
1.	**LLO 1.1:** Install MangoDB and MySQL	Install and configure Database System(MySQL,MongoDB)	2	CO1
2.	**LLO 2.1**: Write code using XML	*Create database using XML attributes and Elements.	2	CO2
3.	**LLO 3.1:** Write query based on Flower and XQuery	*Implement queries based on FLOWER expressions and joins using XQuery.	2	CO2
4.	**LLO 4.1:** Write nested Query using Xquery	*Implement queries based on Nested queries and sorting of results using XQuery	2	CO2
5.	**LLO 5.1:** Write query using function using XQuery	*Implement queries based on functions and types using XQuery	2	CO2
6.	**LLO 6.1:** Write query in SQL,	*Execute queries using structured type in SQL	2	CO2
7.	**LLO 7.1:** Write queries using inheritance	*Execute queries using type inheritance and table inheritance in SQL	2	CO2
8.	**LLO 8.1:** Write queries based on array in SQL	*Implement queries using Array and Multiset types in SQL	2	CO3
9.	**LLO 9.1:** Write queries on basic operations in MangoDB	* Design and Develop MongoDB	2	CO3

		Queries using basic operations		
10.	**LLO 10.1:** Write queries on aggression and find() function in MangoDB	• A. Implement aggregation Queries using MongoDB • B. Implement MongoDB Queries Using find() function	2	CO3
11.	**LLO 11.1:** Write queries on aggression in MongoDB through MapReduce	* Implement aggregation Queries in MongoDB through MapReduce	2	CO3
12.	**LLO 12.1:** Write queries on OLAP	*Implement OLAP queries using Slice, Dice, Drill-down/Up, Pivot	2	CO4
13.	**LLO 13.1:** Work on different cloud databases	*Setting up a cloud database on AWS, GCP, or Azure	2	CO5
14.	**LLO 14.1:** Configure cloud databases	Configuring a database for web application hosting	2	CO5
15.	**LLO 15.1:**Write NewSQL databases	*Implement basic queries using NewSQL Databases	2	CO6

Note: Out of the above suggestive LLOs –

1. '*' Marked Practicals (LLOs) Are mandatory.
2. A judicial mix of LLOs is to be performed to achieve the desired outcomes

VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

Suggestive List of case studies for Self Learning:

1. Library Management with Fine Calculation using SQL
2. Healthcare Patient Record System using SQL
3. Real-Time Chat Application Database Design using MangoDB
4. Data Warehouse for Sales Analytic
5. Big Data Analytics with Hive & Hadoop

Activities

- Students are encouraged to use online tools to improve their learning, such as the e-Kumbh from AICTE and the virtual Labs from IIT.
- Students should be encouraged to participate in various coding competitions, such as hackathons, and online coding contests on websites like Hackerrank, Codechef etc.
- At the department level, encourage students to start a coding club
- Students are encouraged to register themselves in various MOOCs such as Infosys Springboard, Swayam etc. to further enhance their learning.

Note:

1. The above is suggestive list of case studies for SLA

2. The faculty must allocate any other case study to individual student. Considering the students technical skills.

Assignment

Prepare a journal of practicals performed in the laboratory.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer System with all necessary Peripherals and Internet connectivity.	ALL
2	SQL/Oracle and MangoDB Software	ALL

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
SECTION I								
1	**I**	**DATABASE SYSTEM ARCHITECTURE**	CO1	10	04	06	02	12
2	**II**	**OBJECT-ORIENTED DATABASE AND XML**	CO2	10	04	04	04	12
3	**III**	**ADVANCED DATABASE TECHNIQUE**	CO3	10	03	04	04	11
SECTION II								
4	**IV**	**ADVANCE DATABASE TECHNIQUES**	CO4	10	03	04	04	11
5	**V**	**BIG DATA MANAGEMENT**	CO5	12	04	06	04	14
6	**VI**	**DATA ADMINISTRATION, SECURITY AND RECENT TRENDS**	CO6	8	04	04	02	10
		Grand Total		**60**	**23**	**28**	**20**	**70**

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Lab performance, Assignment, Self-learning, and Seminar/Presentation	Lab. Performance, viva voce

X. SUGGESTED COS- POS MATRIX FORM

	Programme Outcomes(Pos)	Programme Specific Outcomes *(PSOs)

COURSE TITLE: ADVANCED DATABASE MANAGEMENT SYSTEM COURSE CODE:CM51206

Course Outcomes (Cos)	PO-1 Basic and Discipline-Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO1	3	2	3	3	3	2	3	-	2
CO2	2	3	3	2	2	3	3	-	3
CO3	3	3	2	3	2	2	3	-	3
CO4	2	3	2	3	2	3	3	-	3
CO5	2	2	3	3	2	2	3	-	3
CO6	3	3	3	3	2	2	3	-	2

Legends:- High:03, **Medium:**02, **Low:**01, **No Mapping:** -
*PSOs are to be formulated at the institute level

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr. No	Author	Title	Publisher
1	Korth Henery	Database Management Systems Application	Kogent Learning Solutions Inc.Dreamtech Press 2014, ISBN-978-93-5119-476-7
2	R. Elmasri, S.B. Navathe	Fundamentals of Database Systems.	Addison-Wesley, 2011
3	Korth Henery	Database System Concepts	Tata McGraw Hill Education, 6th Edition, ISBN-13:978-93-329-0
4	Vaswani Vikram	Complete Reference: Mysql	McGraw Hill Education, ISBN-13: 9780070586840

XII. LEARNING WEBSITES & PORTALS

1. https://www.tutorialspoint.com
2. https://www.w3schools.com
3. http://db.ucsd.edu/static/cse132b-sp01/oql.htm
4. https://docs.mongodb.com/manual/tutorial/install-mongodb-on-windows/

Name & Signature:

Smt.Jyoti P.Dandale
Lecturer in Computer Engineering

Smt. Bhagyashri R. Amrutkar
Lecturer in Computer Engineering

(Course Experts)

Name & Signature:

Smt.J.R.Hange
(Programme Head)

Name & Signature:

Shri. S.B. Kulkarni
(CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE
'120 – NEP' SCHEME

PROGRAMME	**DIPLOMA IN CM**
PROGRAMME CODE	**06**
COURSE TITLE	**CLOUD COMPUTING(ELECTIVE)**
COURSE CODE	**CM51207**
PREREQUISITE COURSE CODE & TITLE	**NA**
CLASS DECLARATION	**YES**

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM51207	CLOUD COMPUTING		4	-	2	-	6	3	3	30	70	100	40	25	10	25#	10	-	-	150

Total IKS Hrs for Term: 0 Hrs
Abbreviations: CL-Classroom Learning, **TL**-Tutorial Learning, **LL**-Laboratory Learning, **SLH**-Self Learning Hours, **NLH**-Notional Learning Hours, **FA** - Formative Assessment**, SA** -Summative assessment, **IKS** – Indian Knowledge System, **SLA**- Self Learning Assessment
Legends: @-Internal Assessment, **#** - External Assessment,***#** - Online Examination,**@$** - Internal Online Examination

Note:
FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that course.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours**.
5. Self-learning hours shall not be reflected in the Timetable.
6. Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Cloud computing has evolved as a very important computing model, which enables information, software, and many other important resources to be provisioned over the network as services in an on-demand manner. This course covers various basic aspects of cloud computing such as cloud types, security in cloud, storage in cloud, cloud monitoring and management, etc. This enables students to create and maintain cloud-based services which will also enable them to implement virtualization, and implement security in cloud services.

III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning.

CO1: Describe the basic concepts of cloud computing
CO2: Classify various Cloud Service Models
CO3: Implement Cloud Service and resource management mechanisms
CO4: Maintain Storage system in the cloud

CO5: Apply Cloud Security Measures
CO6: develop applications using Open Source and Commercial Clouds.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
		SECTION I		
		UNIT- I. CLOUD COMPUTING FUNDAMENTALS (CL Hrs-10, Marks-12)		
1	**TLO1.1** Explain the properties and characteristics of Cloud Computing. **TLO1.2** Explain various layers and types of Cloud. **TLO1.3** Identify the challenges and risks related to various aspects such as Security and Privacy. **TLO1.4** Explain the evolution of cloud computing and virtualization.	**1.1** Cloud Computing in a Nutshell **1.2** Roots of Cloud Computing: From Mainframes to Clouds, SOA, Web Services, Web 2.0, and Mashups, Grid Computing, Utility Computing, Hardware Virtualization, Virtual Appliances and the Open Virtualization Format, Autonomic Computing **1.3** Layers and Types of Clouds: Infrastructure as a Service, Platform as a Service, Software as a Service, Deployment Models **1.4** Properties and Characteristics of a Cloud computing **1.5** Challenges and Risks: Security, Privacy, and Trust, Data Lock-In and Standardization, Availability, Fault-Tolerance, and Disaster Recovery, Resource Management and Energy-Efficiency	Classroom Learning, Collaborative Learning, Program development tools.	**CO1**
		UNIT-II CLOUD ARCHITECTURE(CL Hrs-12, Marks-12)		
2	**TLO2.1** Explain the given component of cloud computing Architecture **TLO2.2** Compare various cloud computing model . **TLO2.3** Illustrate the services offered by various cloud computing models **TLO2.4** Compare various Cloud deployment models	**2.1** Cloud computing architecture: basic components – front-end platform, back-end platform, networking, cloud-based delivery **2.2** Cloud Infrastructure Management: Features, Cloud computing stack **2.3** Cloud Service Models: 2.3.1 Infrastructure as a Service (IaaS) 2.3.2 Platform as a Service (PaaS) 2.3.3 Software as a Service (SaaS) 2.4 Cloud Deployment Models: Public, Private, Community, Hybrid	Classroom Learning, Collaborative Learning, Program development tools.	**CO2**
		UNIT- III SERVICE MANAGEMENT AND RESOURCE MANAGEMENT IN CLOUD COMPUTING (CL Hrs-08, Marks-11)		

3	**TLO 3.1:** Outline Cloud Service Management procedure **TLO 3.2:** Explain Economics for Cloud Service Management **TLO 3.3:** Explain Policies and mechanisms for cloud resource management	**3.1** Service Level Agreement (SLA): Life-cycle of SLA, Types of SLA, SLA management in Cloud **3.2** Cloud economics **3.3** Cloud Resource Managemen: Policies and mechanism for resource management: Admission control, capacity allocation, Load balancing, energy optimization, QoS (Quality of Service) guarantees	Classroom Learning, Collaborative Learning, Program development tools.	**CO3**
SECTION II				
UNIT –IV CLOUD DATA MANAGEMENT (CL Hrs-8 Marks-10)				
4	**TLO 4.1:** Outline Data Management in Cloud Computing. **TLO 4.2:** Relate Database and Data Stores in Cloud. **TLO 4.3**.Explain Large Scale Data Processing.	**4.1** Data Management in Cloud Computing: Introduction, Need of Data Management **4.2** Looking at Data, Scalability & Cloud Services **4.3** Database & Data Stores in Cloud Large Scale Data Processing	Classroom Learning, Collaborative Learning, Program development tools.	**CO4**
UNIT V – OPEN SOURCE AND COMMERCIAL CLOUDS (CL Hrs-10, Marks-12)				
5	**TLO 5.1** Explain need of Cloud Security **TLO 5.2:** Compare various Cloud security Methods **TLO 5.3:** Interpret Access Management.	**5.1** Need and importance of Cloud Security **5.2** Methods of Providing Cloud Security **5.3** Infrastructure Security: Methods, Case study **5.4** Data security and Storage: Methods, Case study 5.5 Identity and Access Management: Access Control, Trust, Reputation, Risk	Classroom Learning, Collaborative Learning, Program development tools.	**CO5**
UNIT V – OPEN SOURCE AND COMMERCIAL CLOUDS (CL Hrs-12, Marks-13)				
6	**TLO 6.1**:Compare Open source and Commercial Cloud platforms **TLO 6.2**:Demonstrate various Open Source Cloud Platforms **TLO 6.3**:Outline existing commercial cloud platforms. **TLO 6.4**:Illustrate Cloud Service Providers in Market	**6.1** Cloud Platforms **6.2** Open Source Clouds Platform: Characteristics, Existing Open source cloud platforms **6.3** Commercial Clouds Platforms: 6.3.1 Characteristics 6.3.2 Existing commercial cloud platforms: **6.4** Major Cloud Service Providers in Market: Google Cloud Platform (GCP), Amazon AWS, Microsoft Azure	Classroom Learning, Collaborative Learning, Program development tools.	**CO6**

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/ TUTORIAL EXPERIENCES.

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
1	**LLO 1.1:** Study Cloud architecture	*Study of any cloud architecture and it's service provider.	2	CO1
2	**LLO 2.1:** Google Docs	*Use Google Docs to make spreadsheets and notes	2	CO1
3	**LLO 3.1**: Networking in Cloud	*Create/Delete Virtual Machines using VMware: Virtual Private Cloud.	2	CO2
4	**LLO 4.1:** Platform as a service	*Implement Storage services on Cloud using OpenStack	4	CO2
5	**LLO 5.1:** Cloud Monitoring and Management	*Use OpenStack for File Management and Monitor cloud using Nagios Tool.	4	CO3, CO4
6	**LLO 6.1:** Cloud Security	*Create and Host Simple Web Application on Microsoft AZURE/Google cloud/Any Cloud platform	4	CO3
7	**LLO 7.1:** GCP Console.	*Install and configure Cloud SDK. - Billing in GCP.	4	CO4
8	**LLO 8.1:** Cloud Open-Source Tools	*Configure server using Microsoft Azure to secure it.	2	CO4
9	**LLO 9.1:** GCP Compute Engine	*Running a basic Apache web server under GCP. - Deploy basic App over the web server.	2	CO5
10	**LLO 10.1:** GCP Storage	*Implement Identity Management and access Management using Open Stack.	2	CO5, CO6
11	**LLO 11.1:** Configure server for security**.**	*Configure Server using any open source tool.	2	CO6
12	**LLO 12.1:** Openstack Compute Service.	*Lauch a virtual machine (instance) on Openstack.	2	CO6
13	All	Microproject.	-	ALL

Note: Out of the above suggestive LLOs –

1. '*' Marked Practicals (LLOs) are mandatory.
2. A judicial mix of LLOs is to be performed to achieve the desired outcomes

VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/ SKILLS DEVELOPMENT (SELF-LEARNING)

Suggested list of Microproject:

1. Discover Various Open Source and Commercial Cloud Platforms
2. Apply Cloud Platform for given problem statement
3. Create and Maintain Virtual Machines over Open Source Cloud
4. Choose cloud security measures to prevent data leak through SQL injection
5. Make use of Cloud Platform- as- Service to build a simple web application
6. Deploy a simple web application over open source cloud

Assignment

Prepare a journal of practicals performed in the laboratory.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Any PC with Standard Configuration.	ALL
2	Cloud Open Source Tools	ALL

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
SECTION I								
1	I	Cloud Computing Fundamentals	CO1	10	6	4	2	**12**
2	II	Cloud Architecture	CO2	12	4	4	4	**12**
3	III	Service Management and Resource Management in Cloud Computing	CO3	08	4	4	3	**11**
SECTION II								
4	IV	Cloud Data Management	CO4	08	4	4	2	**10**
5	V	Cloud Security	CO5	10	4	4	4	**12**
6	VI	Open Source and Commercial Clouds	CO6	12	2	3	8	**13**
		Grand Total		**60**	**24**	**23**	**23**	**70**

VII. ASSESMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Lab performance, Assignment, Self-learning, and Seminar/Presentation	Lab. Performance, viva voce Demo, Micro projects, Certifications.

VIII. SUGGESTED COS- POS MATRIX FORM

Course Outcomes (Cos)	Programme Outcomes(Pos)							Programme Specific Outcomes *(PSOs)	
	PO-1 Basic and Discipline-Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO1	3	2	1	1	1	2	2		2
CO2	2	3	1	2	1	2	2		2
CO3	2	3	3	3	1	2	2		2
CO4	2	3	3	3	1	2	2		1
CO5	2	3	2	2	3	2	2		1
CO6	2	3	3	3	2	2	3		3

Legends:- High:03, **Medium:**02, **Low:**01, **No Mapping:** -
*PSOs are to be formulated at the institute level

IX. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher
1	Cloud Computing	Dr. Kumar Saurabh	Wiley Publication
2	Cloud computing principles and paradigms	Rajkumar Buyya	Wiley Publication
3	Enterprise Cloud Computing	Gautam Shroff	Cambridge
4	Cloud Computing	Shailendra Singh	Oxford University Press, ISBN:9780199477388

X. LEARNING WEBSITES & PORTALS

1. http://www.nptel.ac.in/courses/106105167/1
2. http://www.technopedia.com/definition /2/cloud-computing
3. http://onlinelibrary.wiley.com/doi/book/10.1002/9780470940105

Name & Signature: **Dr. S.B.Nikam** Lecturer in Computer Engineering	 **Mrs. Shobha A. Ade** Lecturer in Computer Engineering
(Course Experts)	
Name & Signature: **Smt.J.R.Hange** (Programme Head)	Name & Signature: **Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	**DIPLOMA IN CM**
PROGRAMME CODE	**06**
COURSE TITLE	**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(ELECTIVE)**
COURSE CODE	**CM51208**
PREREQUISITE COURSE CODE & TITLE	**NA**
CLASS DECLARATION	**YES**

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM51208	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	SEC	4	-	2	-	6	3	3	30	70	100	40	25	10	25#	10	-	-	150

Total IKS Hrs for Term: 0 Hrs

Abbreviations: CL-Classroom Learning, **TL**-Tutorial Learning, **LL**-Laboratory Learning, **SLH**-Self Learning Hours, **NLH**-Notional Learning Hours, **FA** - Formative Assessment**, SA** -Summative assessment, **IKS** – Indian Knowledge System, **SLA**- Self Learning Assessment

Legends: @-Internal Assessment, # - External Assessment,***#** - Online Examination,**@$** - Internal Online Examination

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that course.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
1. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
3. **1 credit** is equivalent to **30 Notional hours**.
4. * Self-learning hours shall not be reflected in the Timetable.

6.* Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Artificial Intelligence (AI) is a big field. AI and ML are inherently interdisciplinary, drawing from computer science, statistics, mathematics, ethics, psychology, and domain-specific knowledge. Incorporating AI/ML education also promotes understanding of ethical concerns such as bias, privacy, surveillance, and fairness in algorithmic decision-making. This course will cover the basic of AI and ML and its architecture, Life cycle of Machine Learning, different searching techniques. AI as the study of agents that receive percepts from the environment and perform actions.

III. COURSE-LEVEL LEARNING OUTCOMES (CO's)

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1: Describe the foundational concepts of Artificial Intelligence.
CO2: Apply AI methods for knowledge representation to make informed decisions
CO3: Classify data by performing predictive analysis using various regression techniques.
CO4: Analyze structured, semi-structured, and unstructured data in Machine Learning.
CO5: Create data model for Machine Learning Algorithms.
CO6: Describe the foundational concepts of Neural Networks and Deep Learning.

THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
		SECTION -I		
		UNIT-I INTRODUCTION TO ARTIFICIAL INTELLIGENCE (CL- 8 , Marks- 8)		
1.	**TLO 1.1** Describe the different terminologies of AI. **TLO 1.2** Analyze the types of AI agent. **TLO 1.3** Explain the process of turing test in AI.	**1.1** Basic Definition and Terminology: Foundation and Evaluation of AI, Scope of AI, Overview of AI Problems Components of AI Types of AI, Application of AI, **1.2** Intelligent Agent in AI: Types of AI agent, Concept of Rationality, Nature of Environment Structure of agents, Turning Test in AI **1.3** Authenticate Datasets for AI Applications:- Image, Audio, Text	Hands-on Demonstration Presentations	**CO1**
		UNIT-II KNOWLEDGE AND REASONING IN AI (CL-10 , Marks-12)		
2	**TLO 2.1** Describe the architecture of Knowledge -based agent in AI. **TLO 2.2** Explain forward and backward chaining in AI. **TLO 2.3** Explain the different types of Reasoning in AI. **TLO 2.4** Apply Bayes' theorem for probabilistic reasoning.	**2.1** Knowledge- Based Agent in Artificial intelligence: Architecture, Approaches to designing a knowledge-based agent, Techniques of knowledge representation, Propositional logic, Rules of Inference, First-Order Logic, Forward Chaining & Backward Chaining in AI **2.2** Reasoning in Artificial intelligence: Definition of Reasoning, Types of Reasoning, Probabilistic reasoning in AI, Uncertainty, Causes of Uncertainty, Need of probabilistic reasoning in AI, Bayes' Theorem.	Hands-on Demonstration Presentations	**CO2**
		UNIT- III CLASSIFICATION AND REGRESSION (CL-12 , Marks-15)		
	TLO 3.1 Differentiate between AI and ML. **TLO 3.2** Explain different phases of Machine Learning Life Cycle.	**3.1** Linear Regression: Assessing performance of Regression – Error measures, Overfitting and Underfitting, Catalysts for Overfitting **3.2** Multiple Linear Regression: Multiple Linear regression equation, Implementation of multiple linear regression		

3	. **TLO 3.3** Describe the different types of classification given problem. **TLO 3.4** Describe the assessing performance of Regression. **TLO 3.5** differentiate between overfitting and under fitting. **TLO 3.6** Describe VC dimensions.	**3.3** Metrics for Regression: Mean Squared Error(MSE), Root Mean Squared Error (RMSE), Mean Absolute Error (MAE) **3.4** Logistic Regression: Binary and Multiclass Classification, Assessing Classification Performance, Handling more than two classes, Multiclass Classification: One vs One, One vs Rest **3.5** Metrics for Classification: Confusion Matrix, F1 Score, Accuracy, Precision, RecallS	Hands-on Demonstration Presentations	**CO3**
SECTION II				
UNIT –IV SUPERVISED LEARNING (CL-10 , Marks-10)				
4	**TLO 4.1** Differentiate characteristics of Supervised and Unsupervised Learning. **TLO 4.2** Explain supervised machine learning algorithm.	**4.1** Types of Learning: Supervised, Unsupervised, Semi- Supervised Learning **4.2** Supervised Learning: Learning a Class From Examples, Introduction of different types of Supervised Machine Learning Algorithms: Gradient Boosting Machines (XGBoost) , Decision Tree, Random Forest , Rough set, fuzzy set, K – Nearest Neighbors.	Hands-on Demonstration Presentations	**CO4**
UNIT –V UNSUPERVISED LEARNING (CL-10, Marks-15)				
5	**TLO 5.1** Explain different Unsupervised machine learning algorithm. **TLO 5.2** Test the validity of Datasets by applying the Cross-Validation	**5.2** Unsupervised Learning: Introduction of different types of Unsupervised Learning Algorithm: K-means clustering, Hierarchical Clustering, Principal Component Analysis (PCA), Apriori Algorithm. **5.3** Model evaluation: Introduction of Cross validation, benefits of cross-validation, Positive & Negative class cross-validation	Hands-on Demonstration Presentations	**CO5**
UNIT -VI INTRODUCTION TO NEURAL NETWORKS AND DEEP LEARNING (CL-10 , Marks-10)				
6	**TLO 6.1** Explain architecture of CNN . **TLO 6.2** Explain architecture of RNN. **TLO 6.3** Demonstrate use of VGG and YOLO **TLO 6.4** Demonstrate ChatGPT,Google Gemini,Craiyon,DALLE	**6.1** Introduction to neural networks and deep learning **6.2** Architectures of Convolutional Neural Networks (CNNs) **6.3** Architectures of Recurrent Neural Networks (RNNs). **6.4** VGG Model, YOLO model. **6.5** Tools: ChatGPT, Google Gemini, Craiyon, DALL·E	Hands-on Demonstration Presentations	**CO6**

4 LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/ TUTORIAL EXPERIENCES.

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
1	**LLO 1.1** Analyze different datasets with respect to its use.	* Explore different dataset finders e.g. Google Dataset Search, Kaggle	2	CO2
2	**LLO 2.1** Develop program based on training and testing datasets.	* Write program in python to split any dataset train and tests sets	2	CO2
3	**LLO 3.1** Apply data cleaning process on given dataset.	* Apply data cleaning process on any two datasets. 1:http://archive.ics.uci.edu/ml/ 2: www.kdnuggets.com/datasets/)	2	CO2
4	**LLO 4.1** Develop program for Simple Linear Regression.	* Write program to implement Simple Linear Regression using Python	2	CO3
5	**LLO 5.1** Implement Multiple Linear Regression in Python.	* Write program to implement Multiple Linear Regression using Python	2	CO3
6	**LLO 6.1** Implement program for confusion matrix.	* Write program to create confusion matrix to calculate different measures to quantify the quality of the model	2	CO3
7	**LLO 7.1** Implement Supervised Learning.	* Write a program to implement supervised algorithm: a. Gradient Boosting Machines (XGBoost) b. Random forest c. Rough Set	4	CO4
8	**LLO 8.1** Develop program on Unsupervised Learning.	* Write a program to implement Unsupervised algorithm: a. PCA b. Apriori algorithm	4	CO5
9	**LLO 9.1** Implement cross validation in python.	* Write program to calculate cross validation score for any Dataset like IRIS	2	CO5
10	**LLO 10.1** Demonstrate use of ChatGPT	* Write a short story, code snippet, or summarize a topic using ChatGPT .	2	CO6
11	**LLO 11.1** Demonstrate use of Craiyon	* Generate an AI image from text using Craiyon or DALL·E.	2	CO6
12	**LLO 12.1** Analyze different datasets with respect to its use.	* Practice various data mining techniques using open source tools.	2	CO4,CO5, ,CO6
13	ALL	Microproject	2	All CO's

Note: Out of the above suggestive LLOs –

1. '*' Marked Practicals (LLOs) Are mandatory.
2. A judicial mix of LLOs is to be performed to achieve the desired outcomes

5 SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

Activities

- Students are encouraged to use online tools to improve their learning, such as the e-Kumbh from AICTE and the virtual Labs from IIT.
- Students should be encouraged to participate in various coding competitions, such as hackathons, and online coding contests on websites like Hackerrank, Codechef etc.
- At the institution level, encourage students to start a coding club.

Suggestive Microproject List

- Spam Email Detector
- Handwritten Digit Recognition
- Stock Price Prediction
- Face Detection System

Note :

- The above is just a suggestive list of microprojects and assignments; faculty must prepare their bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate a judicial mix of tasks, considering the weaknesses and/or strengths of the student in acquiring the desired skills.
- If a micro project is assigned, it is expected to be completed as a group activity.

Assignment

Prepare a journal of practicals performed in the laboratory.

6 LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Open source data mining tools/Programming languages (e.g. Python, WEKA tool, Tableau, R Programming Environment, ChatGPT , Craiyon or DALL·E)	ALL
2	Open Source DATA SETS(Eg.Kaggal)	ALL

7 SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
SECTION-I								
1	I	**INTRODUCTION TO ARTIFICAIL INTELLIGENCE**	CO1	8	4	4	-	08
2	II	**KNOWLEDGE AND REASONING IN AI**	CO2	10	3	3	6	12
3	III	**CLASSIFICATION AND REGRESSION**	CO3	12	3	3	9	15

SECTION-II								
4	IV	**SUPERVISED LEARNING**	CO4	10	2	2	6	10
5	V	**UNSUPERVISED LEARNING**	CO5	10	3	3	9	15
6	VI	**INTRODUCTION TO NEURAL NETWORKS AND DEEP LEARNING**	CO6	10	2	2	6	10
Grand Total				**60**	**17**	**17**	**36**	**70**

8 ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Lab performance, Assignment, Self-learning and Seminar/Presentation	Lab. Performance, viva voce

9 SUGGESTED COS- POS MATRIX FORM

Course Outcomes (Cos)	Programme Outcomes(Pos)							Programme Specific Outcomes *(PSOs)	
	PO-1 Basic and Discipline-Specific Knowledge	**PO-2 Problem Analysis**	**PO-3 Design/ Development of Solutions**	**PO-4 Engineering Tools**	**PO-5 Engineering Practices for Society, Sustainability and Environment**	**PO-6 Project Management**	**PO-7 Life Long Learning**	**PSO-1**	**PSO-2**
CO1	3	3	1	2	1	1	3	-	3
CO2	3	3	2	2	1	1	3	-	3
CO3	3	3	3	3	1	1	3	-	3
CO4	3	3	3	3	1	2	3	-	3
CO5	3	3	3	3	2	2	3	-	3
CO6	3	3	2	3	1	2	3	-	3

Legends:- High:03, **Medium:**02, **Low:**01, **No Mapping:** -
*PSOs are to be formulated at the institute level

10 SUGGESTED LEARNING MATERIALS/BOOKS

Sr. No	Author	Title	Publisher
1	Stuart Russell and Peter Norvig, Editors	Artificial Intelligence A modern Approach Third edition	Pearson Education, Inc ISBN-13: 978-0-13-604259-4
2	Dipanjan Sarkar Raghav Bali Tushar Sharma	Practical Machine Learning with Python A Problem-Solver's Guide to Building Real-World IntelligentSystems	Apress publication ISBN-13 (pbk): 978-1-4842-3206-4 ISBN-13 (electronic): 978-1-4842-3207-1

3	Andreas C. Müller & Sarah Guido	Introduction to Machine Learning with Python	O'Reilly Media, Inc ISBN: 9781449369415
4	Manaramjan Pradhan, U Dinesh Kumar	Machine Learning using Python	Wiley india ISBN: 978-81-265-7990-7

XI. LEARNING WEBSITES & PORTALS

a) https://www.pdfdrive.com/machine-learning-for-absolute-beginners-e188007429.html

b) https://www.geeksforgeeks.org/ml-fuzzy-clustering/

c) https://www.pdfdrive.com/machine-learning-step-by-step-guide-to-implement-machine-learning-algorithms-with-python-d158324853.html

d) https://pub.towardsai.net/best-datasets-for-machine-learning-data-science-computer-vision-nlp-ai-c9541058cf4f (for data set)

e) https://www.educba.com/turing-test-in-ai/?source=leftnav

f) https://machinelearningmastery.com/machine-learning-in-python-step-by-step/

Name & Signature:		
Smt.J.R.Hange (HoD Computer Engineering)	**Smt. L. S. Korade** Lecturer in Computer Engineering **(Course Experts)**	**Smt. H. S. Pawar** Lecturer in Computer Engineering
Name & Signature: **Smt.J.R.Hange** (Programme Head)	Name & Signature: **Shri. S.B. Kulkarni** (CDC In-charge)	

GOVERNMENT POLYTECHNIC, PUNE

'120– NEP' SCHEME

PROGRAMME	**DIPLOMA IN CM**
PROGRAMME CODE	**06**
COURSE TITLE	**PROGRAMMING USING PHP (ELECTIVE)**
COURSE CODE	**CM51209**
PREREQUISITE COURSE CODE & TITLE	**CM21205 WEB DESIGNING USING HTML**
CLASS DECLARATION COURSE	**YES**

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL&TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM51209	PROGRAMMING USING PHP	DSC	4	-	2	-	6	3	3 Hrs	30	70	100	40	25	10	25#	10	-	-	150

Abbreviations: **CL**-Classroom Learning, **TL**-Tutorial Learning, **LL**-Laboratory Learning, **SLH**-Self Learning Hours, **NLH**-Notional Learning Hours, **FA**-Formative Assessment**, SA**-Summative Assessment, **IKS**– Indian Knowledge System, **SLA**-Self Learning Assessment

Legends:@-Internal Assessment, **#**-External Assessment,***#**-Online Examination,**@$**-Internal Online Examination

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment -Practical) of any course, then the candidate shall be declared as **'Detained'** in that course.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course ,then the candidate shall be declared as **'fail'**and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are **(CL+LL+TL+SL) hrs.*15 Weeks**
4. **1credit** is equivalent to **30 Notional hours**.
5. *Self-learning hours shall not be reflected in the Time table.
6. *Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

PHP programming is a valuable skill for web development due to its simplicity, versatility, and wide community support. It's a free and open-source language, making it accessible and cost-effective. PHP is also known for its easy-to-understand syntax, facilitating rapid development and learning. Its compatibility with various operating systems and web servers further enhances its utility.

III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1: Develop basic PHP scripts.
CO2: Handle form data and user inputs.
CO3: Connect and manipulate data in MySQL databases.
CO4: Implement simple web applications with CRUD operations.
CO5: Implement sessions and cookies management for user tracking and authentication
CO6:Apply error handling and debugging techniques

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
		SECTION-I		
		UNIT-I INTRODUCTION TO PHP (CLHrs-08,Marks-8)		
1	**TLO1.1**Write simple PHP program to solve the given expression. **TLO1.2**Use relevant decision making control statement to solve given problem. **TLO1.3** Solve the given iterative problem using loop statements**.**	**1.1** History and feature of PHP **1.2** PHP vs. other scripting languages **1.3** Installation and configuration (XAMPP/WAMP) **1.4** PHP syntax, variables, data types, constants, Expressions. **1.5** Operators and control structures- if, if-else, nested if-else, switch, loops-for, for-each, do-while, while.	Hands-on Demonstration Presentations	**CO1**
		UNIT-II FUNCTIONS AND ARRAYS (CLHrs-12,Marks-12)		
2	**TLO2.1** Manipulate the given type of array to get desired results. **TLO2.2** Apply implode, explode functions on the given array**.** **TLO2.3**Apply the given string functions on the character array**.** .	**2.1** Function and its types:Built-in and user-defined functions, Variable function and anonymous function. **2.2** Parameter passing and return values **2.3** Arrays: Indexed, Associative, Multidimensional **2.4** Array functions: sort, explode, implode,and array flip. **2.5** Operations on string and string functions:str_word_count(),strlen(),strrev(),strops(),str_replace(),strtoupper(),strtolower(),strcmp() **2.6** Basic Graphics Concepts: Creating Images, image with text, scaling images, creation of PDF document.	Hands-on Demonstration Presentations	**CO2**
		UNIT-III OBJECT ORIENTED CONCEPTS AND FORM HANDLING (CLHrs-10,Marks-15)		
3	**TLO3.1**Use the relevant form controls to get users input. **TLO3.2** Design web pages using multiple Forms for the given problems. **TLO3.3**Apply the given validation rules on forms**.**	**3.1** Creating Classes and Objects **3.2** Constructor and Destructor **3.3** Inheritance, Overloading and Overriding, Cloning Objects. **3.4** Introspection and Serialization. **3.5** Crating a webpage using GUI Components, Browser Role -GET andPOST methods, Server role **3.6** Form controls: text box, text area, radio button, check box, list, buttons **3.7** working with multiple forms: - a web page having many forms - a form having multiple submit buttons	Hands-on Demonstration Presentations	**CO3**

		3.8 Input validation and sanitization. **3.9** Uploading files with forms.		
SECTION-II				
UNIT-IV Working with Databases (MySQL) (CLHrs-08, Marks-10)				
4	**TLO 4.1:** Create database for the given problem using PHP scripts. **TLO 4.2** Insert data in the given database using PHP scripts. **TLO 4. 3** Apply searching and filtering operations on given data.	**4.1** Introduction to MySQL- Create a database. **4.2** PHP-MySQL connectivity -MySQLi and PDO (PHP Data Objects) **4.3** Performing CRUD operations **4.4** Displaying data in tabular format. **4.5** Searching and filtering data.	Hands-on Demonstration Presentations	CO4
UNIT–V Session Management and File Handling (CLHrs-12, Marks-13)				
5	**TLO 5.1** Set/modify/delete cookies using cookies attributes. **TLO 5.2** Manage the given session using session variables**.**	**5.1** Introduction to Cookies and Sessions, $_SESSION and $_COOKIE usage, Attributes of cookies **5.2** Operations on Cookies: create, modify, delete cookies **5.3** Operations on Session: start sessions, get session variables, destroy session **5.4** File operations: create, read, write, delete **5.5** Uploading files securely. **5.6** Sending mails.	Hands-on Demonstration Presentations	**CO5**
UNIT–VI Web Application Development and Security (CLHrs-10, Marks-12)				
6	**TLO 6.1** Develop a mini project using PHP scripts**.** **TLO 6.2**Apply error handling and debugging techniques to PHP scripts	**6.1.** Application Development: Login Page with database connectivity **6.2.** Error handling and debugging **6.3.** Basic security: SQL injection, Basics of XSS attacks **6.4.** Introduction to MVC Framework, Components and Working principle.	Hands-on Demonstration Presentations	**CO6**

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/TUTORIAL EXPERIENCES.

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/Practical Titles /Tutorial Titles	Number of hrs.	Relevant Cos
1	**LLO 1.1:** setup PHP environment **LLO 1.2** Write a simple program using PHP.	1. Installation and configuration (XAMPP/WAMP) 2. Write a PHP program to display 'Hello, World!'	02	CO1
2	**LLO 2.1:**Write a simple PHP program using expressions and operators **LLO 2.2:** Develop a program using control statement.	1. Write a PHP program using variables and operators. 2. Write a PHP program using control structures.	02	CO1
3	**LLO 3.1** Write a simple PHP program using functions.	1. Write a PHP program using string functions. 2. Write a PHP Program using user-defined functions.	02	CO2
4	**LLO 4.1**. Develop a program to using different types of arrays.	Write a PHP program using array functions. (Implode, Explode, and sort)	02	CO2
5	**LLO 5.1.** Develop a program to using different types of arrays	Write a PHP program using array functions. (Implode, Explode, and sort)	02	CO2
6	**LLO 6.1** Develop PHP program using graphics concepts.	Write a PHP program using graphics concepts.	02	CO2
7	**LLO 7.1** Develop a program to use OOP concepts and form handling	1. Write a PHP program using OOP concepts 2. Design a PHP form using different form controls.	02	CO3
8	**LLO 8.1:** Develop a PHP script using MySQL database.	Create a PHP script to connect to a MySQL database.	02	CO4
9	**LLO 9.1:** Program using Database Operations.	Write a PHP program to perform CRUD operations on database.	02	CO4
10	**LLO 10.1:** Apply the concept of cookies and sessions.	Write a PHP program to 1. set cookies and read it 2. Demonstrate session management.	04	CO5
11	**LLO 11.1:** Program to send and receive mail.	Write a PHP program for sending and receiving plain text message. (E-mail).	02	CO5
12	**LLO 12.1:** Application Development	1. Develop an application for student record system. 2. Error handling and debugging	02	CO6
13	**Micro project**	Develop a micro project.	04	ALL

Note: out of the above suggestive LLOs–

1. '*'Marked Practical's (LLOs)are mandatory.
2. A judicial mix of LLOs is to be performed to achieve the desired outcomes.

VI. SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

Suggestive list of micro-project:

1. Student Record Management System
2. Online Feedback System
3. Simple Blog or News Portal
4. Event Registration System
5. To-do list application
6. Basic calculator
7. Contact form and email validation
8. Simple blog system(no database)
9. Unit converter for measurements like temperature, length or weight
10. Simple user registration and login system
11. Simple poll/survey system
12. Simple E-commerce cart
13. Simple social media feed system
14. Issue(bugs) tracking system in project
15. Basic API development for simple application like book catalog or a weather service.

Assignment

Prepare a journal of practical performed in the laboratory.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	a) Computer System with all necessary Peripherals and Internet connectivity. b)Linux like any Operating system Software c)Any Browser(Any General Purpose Computer available in the Institute)	ALL

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
SECTION I								
1	I	Introduction to PHP	CO1	08	04	02	02	**08**
2	II	Functions and Arrays	CO2	12	04	04	04	**12**
3	III	Object Oriented concepts and Form Handling	CO3	10	05	04	06	**15**
SECTION II								
4	IV	Working with Databases (MySQL)	CO4	08	02	04	04	**10**
5	V	Session Management and File Handling	CO5	10	03	06	04	**13**

6	VI	Web Application Development and Security	CO6	12	04	04	04	**12**
			Grand Total	**60**	**22**	**24**	**24**	**70**

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	**Summative Assessment (Assessment of Learning)**
Lab performance ,Assignment, Self-learning and Seminar/Presentation	Lab .Performance, viva voce

X. SUGGESTED COS-POS MATRIX FORM

Course Outcomes (Cos)	**Programme Outcomes(Pos)**							**Programme Specific Outcomes *(PSOs)**	
	PO-1 Basic and Discipline-Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society ,Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO1	2	3	2	3	1	1	2		2
CO2	2	3	2	3	2	1	2		2
CO3	2	3	2	3	1	1	2		3
CO4	2	3	3	3	1	1	2		3
CO5	2	3	2	3	2	1	2		3
CO6	2	3	3	3	2	1	2		3

Legends:-High:03, **Medium:**02,**Low:**01, **No Mapping:** -
*PSOs are to be formulated at the institute level

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr. No	**Author**	**Title**	**Publisher**
1	Rasmus Lerdorf, Kevin. T and Peter M.	Programming PHP	O'Reilly, USA, ISBN – 978-1-449-39277-2, 2013
2	Holzner, Steven	The Complete reference PHP (Third Edition Covers PHP)	McGraw Hill, New Delhi, ISBN 9780070223622, 2008
3	McGrath, Mike	PHP and MySQL	McGraw Hill, New Delhi, ISBN- 13: 978-1259029431
4	Vikram Vaswani.	PHP: A Beginner's Guide	McGraw Hill Education **ISBN-10:**0074632728 **ISBN-13:**978-0074632727

XII. LEARNING WEBSITES & PORTALS

1.https://www.w3schools.com/php/
2.https://www.codecademy.com/catalog/language/php

3.https://www.php.net/manual/en/index.php

Name&Signature:	
Smt.Usha C. Khake Lecturer in Computer Engineering	**Smt.PriyaK.Zade** Lecturer in Computer Engineering
(CourseExperts)	
Name&Signature: **Smt.J.R.Hange** (Programme Head)	Name&Signature: **Shri. S.B. Kulkarni** (CDCIn-charge)