



Shirpur Education Society's

R. C. Patel Institute of Technology, Shirpur

(An Autonomous Institute)

Course Structure and Syllabus

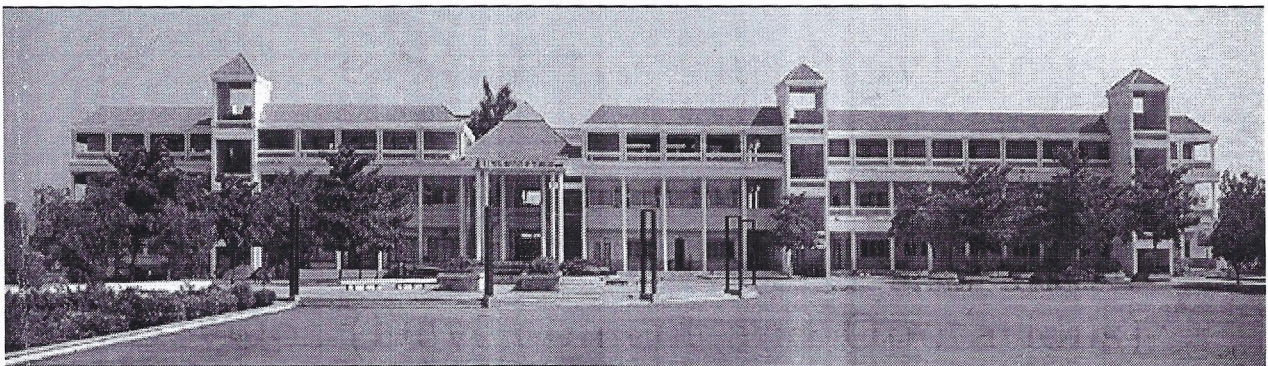
Honors Program

in

DevOps (Development and Operations)

Information Technology

With effect from Year 2025-26



Shahada Road, Near Nimzari Naka, Shirpur, Maharashtra 425405
Ph: 02563 259 802, Web: www.rcpit.ac.in

VISION & MISSION

Institute

Vision:

- To become a leading Institute in Technical education fostering innovation, research, ethical values, and sustainable development for the betterment of society

Mission:

To impart high quality Technical Education through:

- Innovative and Interactive learning process and high quality instructional programs.
- Fostering a scientific temper among students by means of a liaison with the Academia, Industries and Government.
- Preparing students from diverse backgrounds to have attitude for research and spirit of Professionalism.
- Inculcating in students a respect for fellow human beings and responsibility towards the society.

VISION & MISSION

Department of Information Technology

Vision

To develop competent Information Technology professionals through quality education and ethical values for sustainable societal growth.

Mission Statements

- **M1:** To impart quality education in Information Technology with a focus on practical skills and academic excellence.
- **M2:** To integrate emerging technologies such as Artificial Intelligence, Cloud Computing, Data Analytics, and Cybersecurity into the curriculum to stay aligned with technological advancements.
- **M3:** To cultivate effective communication, teamwork, and leadership skills for success in a global work environment.

Program Educational Objectives (PEOs)

- **PEO1:** Apply core Information Technology principles and modern technologies to design and implement effective solutions for real-world problems.
- **PEO2:** Demonstrate professional ethics, responsibility, and commitment to sustainable practices in the IT profession.
- **PEO3:** Uphold quality, innovation, and excellence in professional work consistent with global industry standards and continuous learning.

Program Specific Outcomes (PSOs)

- **PSO1** – Apply principles of computing, algorithms, and data structures to analyze and design efficient IT-based solutions.
- **PSO2** – Develop, test, and maintain software applications using modern tools, frameworks, and emerging technologies such as AI, Data Science, and DevOps.
- **PSO3** – Design, manage, and secure IT infrastructure while demonstrating effective teamwork, communication, and project management skills.

Honors Program in DevOps (Development and Operations) offered by Information Technology (w.e.f. 2025-26)													
Sr. No.	Course Category	Course Code	Course Title	Teaching Scheme		Evaluation Scheme					Total	Credit	
						Continuous Assessment (CA)							
				L	T	P	TA	Term Test 1 (TT1)	Term Test 2 (TT2)	Average of (TT1 & TT2)			ESE

#Any 1 Institute Professional Elective Course

Prepared by: 
Prof. N. R. Chaudhari

Checked by: 
Ms. A. Z. Ansari


Prof. Dr. D. R. Patil
BOS Chairman


Prof. S. P. Shukla
C.O.E.


Prof. Dr. P. J. Deore
Dean Academics & Dy. Director


Prof. Dr. J. B. Patil
Director

Semester - IV



Program: Information Technology	S.Y. B.Tech.	Semester: IV
Development Frameworks (RCP23IH1251)		

Prerequisite: : Knowledge of any programming language and Database Management System.

Course Objective(s): The objective of this course is to familiarize learners with different development frameworks. The course also introduces students to the principles and process of software engineering.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Select appropriate frameworks for application development.	L2	Understand
CO2	Apply software engineering principles for application development.	L3	Apply
CO3	Work effectively as a member of team.	L3	Apply



Development Frameworks (RCP23IH1251)

Course Contents

Unit-I Introduction to Software Engineering and Process Model: 08 Hrs.

Introduction to Software Engineering, Process framework, Software Development Life Cycle (SDLC), Process Models: Sequential, Incremental and Evolutionary models, Software Requirements - Functional and Non-Functional requirements, Software Requirements Specification (SRS) Introduction to Frameworks: Definition and characteristics of frameworks, Historical background and evolution of frameworks, Types of frameworks (e.g., web frameworks, application frameworks, testing frameworks).

Unit-II Fundamentals of Agile Process: 12 Hrs.

Concept of agility, Need of Agile software development, Agile Manifesto and Principles, Stakeholders and Challenges, Overview of Agile Development Models: Scrum, Extreme Programming, Feature Driven Development, Crystal, Kanban, and Lean Software Development, Methods, Values, Roles, Artifacts, Stakeholders, and challenges. Business benefits of software agility, ASD, DSD.

Introduction to Scrum: Agile Scrum Framework, Scrum Artifacts, Meetings, Activities and Roles, Scrum Team Simulation, Scrum Planning Principles, Product and Release Planning, sprinting: Planning, Execution, Review and Retrospective; User story definition and Characteristics, Acceptance tests and Verifying stories, Burn down chart, Daily scrum, Scrum Case Study.

Unit-III Introduction to Architectures: 10 Hrs.

Introduction to Model View Controller (MVC) Framework: History of MVC, Features of MVC, MVC Architecture, MVC Examples, Popular MVC Frameworks, Advantages and Drawbacks of MVC, 3-Tier Architecture Vs MVC Architecture.

The Reactive Manifesto: Introduction, Reactive Principles, Reactive Systems vs Reactive Programming

Clean architecture: Introduction, The Dependency Rule, A Typical Scenario.

Unit-IV SOLID Design principles: 10 Hrs.

Introduction, The Single Responsibility Principle, The Open- Closed Principle, The Liskov Substitution Principle, The Interface Segregation Principle, The Dependency Inversion Principle.

Reactive architecture: Introduction, Design Principles of Reactive Systems, commands and Events, Commands, Events, Messages, Commands Versus Events: An Example Destinations and Space Decoupling, Time Decoupling, The Role of Nonblocking Input/Output, Blocking Network I/O, Threads, and Concurrency, How Does Nonblocking I/O Work? Reactor Pattern and Event Loop, Anatomy of Reactive Applications.



Unit-V Core Technologies of Spring Framework:

10 Hrs.

Introduction to Object oriented programming concept, Spring–Environment Setup, Spring beans and its scopes, Spring bean lifecycle, how to create a bean using Factory Bean? How to create a bean using static Factory Bean? Best Practices of spring Framework, Spring Dependency Injection and Inversion of Controls, Spring Java Configuration vs XML configuration.

Unit-VI Spring Event Handling and Aspect Oriented Programming (AOP):

06 Hrs.

Event Handling in Spring, Custom Events in Spring, AOP Concepts, Types of AOP, AOP in Spring, AOP Spring Architecture, Framework Services for AOP, Using @AspectJStyle Annotations, AspectJ Integration, Spring - Transaction Management, Spring Web MVC Framework, Spring - Logging with Log4J. Spring Boot: Introduction to spring boot, spring boot Build systems, spring boot Code structure, Springs and dependency injection, spring boot Runners, Spring Boot – Application Properties

Text Books:

1. Iuliana Cosmina Rob Harrop Chris Schaefer Clarence Ho, “An In-Depth Guide to the Spring Framework and Its Tools”, 5th Edition, Apress, 2017.
2. Roger S Pressman, “Software Engineering: A Practitioner’s Approach”, 8th Edition, McGraw-Hill, 2015.
3. Ian Sommerville, “Software Engineering”, 9th Edition, Pearson Education, 2011.
4. Clement Escoffier , Ken Finnigan, “Reactive Systems in Java: Resilient, Event-Driven Architecture with Quarkus, 1st Edition, O’Reilly Media, 2021.
5. Craig Walls, “Spring Boot in Action”, 6th Edition, Manning, 2016.

Reference Books:

1. Ashish Sarin J. Sharma, “Getting Started with Spring Framework”, 2nd Edition, CreateSpace, 2012.
2. Rod Johnson et. al., “Professional Java Development with the Spring Framework”, John Wiley Sons, 2005.



Program: Information Technology	S.Y. B.Tech.	Semester: IV
Advanced Java Laboratory (RCP23IH1252L)		

Prerequisite: Structured programming using C, Object Oriented Programming using Java.

Course Objective(s): The objective of the course is to introduce and familiarize students with advanced concepts that go beyond Core Java – most importantly the APIs defined in Java 8. Through this course, students will delve into Java Collections, exploring the intricacies of managing and manipulating data structures efficiently. Understand how to apply design patterns to solve common software design problems and improve code quality, reusability, and scalability.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Develop reusable codes using generics.	L3	Apply
CO2	Use various APIs in Java for efficient application development.	L3	Apply
CO3	Use appropriate design patterns.	L3	Apply



Advanced Java Laboratory (RCP23IH1252L)

Course Contents

Unit-I Java Collections

08 Hrs.

Collections in Java, basic data structures, arrays and lists, stacks, and queues, sets and maps.

Generics: Basic generics, bounded type parameters, type inference, wildcards, type erasure.

Unit-II Java Reflection API

08 Hrs.

Modifiers and Security, Accessing Fields, Accessing Methods, Accessing Constructors, What About Arrays? Accessing Generic Type Information, Accessing Annotation Data, Dynamic Interface Adapters.

Unit-III Lambda Expression

12 Hrs.

Lambda expression fundamentals, Functional Interfaces, examples on Lambda Expressions, Block Lambda Expressions, Generic Functional Interfaces, Passing Lambda Expression as Arguments, Lambda Expression and Exceptions, Lambda Expression and variable Capture, Method References to static methods, Method references to Instance methods, Method references with Generics, Constructor References, Predefined Functional Interfaces, Comparing method references with lambda expressions.

Unit-IV The Stream API

06 Hrs.

Stream Basics, Stream Interfaces, How to Obtain a Stream, A Simple Stream Example, Reduction Operations, Using Parallel Streams, Mapping, Collecting, Iterators and Streams, Use an Iterator with a Stream, Use Spliterator.

Unit-V Annotations

12 Hrs.

Annotations Basics, specifying a retention policy, Obtaining Annotations at run time by use of Reflections, The AnnotatedElement Interface, using default values, Marker Annotations, Single member Annotations, The Built in Annotations, Type Annotations, Repeating Annotations, some Restrictions. Comparable and Comparator, Optional Class: Date/Time API: Date, Calendar, GregorianCalendar, TimeZone, SimpleTimeZone, Locale.

Unit-VI Introduction to Design Patterns

06 Hrs.

Creational: Singleton Pattern, Structural: Adapter Pattern, Behavioural: Observer Pattern.



List of Laboratory Experiments(At Least 10)

1. Creating JDBC application.
2. Implementation of different collection types (stacks, queues, vectors etc)
3. Creation of generic classes, methods
4. Use reflection API to examine or modify the behaviour of methods, classes, and interfaces at runtime.
5. Using streams API to implement program logic by composing functions and executing them in a data flow.
6. Demonstration of lambda expressions.
7. Implementation of Functional Interfaces, Comparable and Comparator.
8. Implementation of Optional Class, Date/Time API.
9. Implementation of Annotations.
10. Implementation of Singleton Design Patterns.
11. Implementation of Structural Design Patterns.
12. Implementation of Behavioral Design Patterns.

Text Books:

1. Anita Seth, B.L. Juneja, "JAVA: ONE STEP AHEAD", 1st Edition, Oxford University Press; (20 May 2017)
2. Patrick Niemeyer, Daniel Leuck, "Learning Java", 4th Edition, O'Reilly Media, Inc, June 2013

Reference Books:

1. Herbert Schildt, "Java: The Complete Reference", 9th edition, Aug 2014, McGraw Hill.
2. Uttam K. Roy, "Advanced Java Programming, Oxford University Press, 2015.
3. D.T. Editorial Services, "Java 8 Programming Black Book", Dream Tech Press, 2015.
4. Cay S. Horstmann, Gary Cornell, "Core Java™ 2: Volume II–Advanced Features" 9th Edition, Prentice Hall, PTR.



Semester - V



Program: Information Technology	T.Y. B.Tech.	Semester: V
DevOps (RCP23IH1301)		
DevOps Laboratory (RCP23IH1301L)		

Prerequisite:

1. Knowledge of Linux Operating system, installation and configuration of services and command line basics.
2. Basics of Computer Networks and Software
3. Software Development Life cycle.

Course Objective(s): The objective of this course is to understand the fundamentals of DevOps engineering and be fully proficient with DevOps terminologies, concepts, benefits, and deployment options to meet real world software development requirements.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply DevOps principles to meet software development requirements.	L3	Apply



DevOps (RCP23IH1301)

Course Contents

Unit-I Introduction to DevOps

04 Hrs.

Introduction, History of DevOps, DevOps Stakeholders, Goals, Important terminologies, DevOps Vs Agile, DevOps Tools, DevOps Lifecycle, Challenges with DevOps Implementation, Minimum Viable Product (MVP) Cross-functional Teams. Case studies: Traditional software development approaches and DevOps culture.

Unit-II Cloud Storage Solutions for Data Science

08 Hrs.

Version Control: Introduction, Overview of Version Control Systems, Role of Version Control System, Types of Control Systems and their Supporting Tools **Database Version Control:** Introduction, Need of database version control, Methods of database version control, Challenges and benefits of Database version control, Database version control tools **Security and Access Control in VCS:** Role-based access. Audit trails and commit signing

Unit-III Continuous Integration

08 Hrs.

Introduction, Definition and Purpose of CI/CD, Key Benefits and Challenges of CI, Development without CI vs. Development with CI, Tools for CI process , Introduction to Jenkins, Key features of Jenkins, Architecture of Jenkins, Jenkins in Agile and DevOps environments, Continuous Integration with Jenkins, Use Cases for Distributed Builds in Jenkins, Coding Standards and Best Practices in CI: Importance of coding standards, Code quality tools, Coding Standards and Best Practices in CI

Unit-IV Continuous Deployment

08 Hrs.

Introduction, Need of CD, Features and Benefits of continuous deployment, , Process of Continuous Deployment, Deployment Patterns, Continuous deployment tools , Continuous deployment vs. continuous delivery, Overview of Docker, Docker vs Virtual Machines, Architecture, Docker Containers, Docker Workflow, Anatomy of Docker Image, Role of Docker in the CI/CD Pipeline, Advantages of Docker, CD in monoliths vs. microservices, CD in legacy applications. Case studies: Netflix, Amazon, Google

Unit-V Continuous Testing

06 Hrs.

Introduction, Continuous Testing vs. Traditional Testing, the role of continuous testing in DevOps, Types of Continuous Testing, Best Practices and Challenges in Continuous Testing, Steps to implement a continuous testing strategy into DevOps pipeline, Tools for Continuous Testing Introduction to Selenium, Selenium Tool Suite, Selenium IDE, Selenium RC, Selenium WebDriver, Architecture of Selenium Webdriver, Differences between Selenium 2 and Selenium 3, Page Object Model (POM)



Unit-VI Continuous Management

05 Hrs.

Introduction, Key Aspects of Continuous Management, Benefits of Continuous Management in DevOps, Overview of Infrastructure as a code, Benefits of Infrastructure as Code, The Four Key Metrics, Three Core Practices for Infrastructure as Code, The Parts of an Infrastructure System, Infrastructure Platforms, Infrastructure Resources, Compute Resources, Storage Resources, Network Resources Puppet Architecture, The Puppet Server, Performance Optimizations, Ansible: Ansible Architecture, Ansible and Infrastructure Management, Local Infrastructure Development: Ansible and Vagrant.

DevOps Laboratory (RCP23IH1301L)

List of Laboratory Experiments

Suggested Experiments:(Any 10)

1. Set up a cloud environment for data analysis using a major cloud provider (AWS/Azure/GCP)
2. Implement data storage solutions using cloud-native storage services and databases
3. Design and deploy a data pipeline for batch processing of large datasets
4. Implement real-time data streaming and processing using cloud services
5. Build a serverless data processing workflow for specific analysis tasks
6. Train and deploy a machine learning model using cloud ML services
7. Create interactive dashboards and visualizations using cloud BI tools
8. Implement data security measures including encryption and access controls
9. Build a multi-region data analysis solution with redundancy
10. Design and implement a cost-optimized data analytics architecture
11. Implement monitoring and logging for a cloud-based data solution
12. Mini-project: End-to-end cloud data analysis solution for a specific domain (healthcare, finance, etc.)

Any other experiment based on syllabus may be included which would help the learner to understand topic/concept.



Practical examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

Text Books:

1. Marinescu, Dan C., "Cloud Computing: Theory and Practice," 3rd Edition, Morgan Kaufmann, 2023
2. Erl, Thomas, et al., "Cloud Computing Design Patterns," 2nd Edition, Prentice Hall, 2023
3. Kleppmann, Martin, "Designing Data-Intensive Applications in the Cloud," O'Reilly Media, 2022
4. Warden, Pete and Bradski, Gary, "Machine Learning in the Cloud: Build and Deploy ML Solutions with AWS, GCP, and Azure," O'Reilly Media, 2023

Reference Books:

1. Sarkar, Arshdeep and Bandyopadhyay, Arunava, "Hands-On Data Science on AWS," 2nd Edition, Packt Publishing, 2023
2. Kroonenburg, Noah, "Machine Learning Design Patterns for Cloud Platforms," O'Reilly Media, 2024
3. Kochhar, Prabhdeep Singh, "Data Science in the Cloud with Microsoft Azure Machine Learning and Python," Microsoft Press, 2023
4. Fregly, Chris and Barth, Antje, "Data Science on AWS: Implementing End-to-End, Continuous AI and Machine Learning Pipelines," 2nd Edition, O'Reilly Media, 2023
5. Valentin, Jonas and Patel, Janani, "Practical MLOps: Cloud Deployment and Automation for Machine Learning," O'Reilly Media, 2023

