

Savitribai Phule Pune University, Pune
Faculty of Commerce and Management

Batchelor of Computer Application
(BCA)

Revised Curriculum (2024 Pattern as per NEP-2020)
w.e.f from Academic Year 2026-27

TYBCA (Management) Semester V						
Course Type	Course	Course Code	Course Title	Credits		Hours / Week
				Theory	Practical	
Major Mandatory (10)	Major Mandatory 11	MJ-301-JP	Java Programming	4	-	4
	Major Mandatory 12	MJ-302-UIX	User Interface and User Experience (UI-UX) Design	4	-	4
	Major Mandatory 13	MJ-303-JPP	Computer Laboratory based on Java Programming	-	2	4
	Major Mandatory 14	MJ-304-UIXP	Computer Laboratory based on UI-UX Design	-	2	4
Major Elective	Major Elective 1	MJE-301-ECC	Essentials of Cloud Computing	2	-	2
Minor	Minor 4	MN-301-SE	Software Engineering	4	-	4
Vocational Skill Development Course (VSC)	Vocational Skill Development Course (VSC) (Practical)	VSC-301-ES	Entrepreneurship Essentials	-	2	4
Field Projects (FP)/ Community Engagement and Service corresponding to the Major (CEP)	Project	FP-301-MM	Project based on Major Mandatory	-	2	4
Total				14	8	

Semester V					
Semester No.	Course Code	Type of Course	Course Title	Credits	Hours/ Week
5	MJ-301-JP	Major Mandatory 11	Java Programming	4	4

Course Objectives	
1	To understand the fundamentals of Java programming, syntax, program structure, and features of Java.
2	To learn object-oriented programming concepts such as classes, objects, inheritance, polymorphism, abstraction, and interfaces.
3	To develop programming skills using packages, exception handling, multithreading, and other advanced Java concepts.
4	To apply collection framework concepts in Java applications.
5	To design GUI-based and event-driven applications using Swing & JDBC.

Course Outcome	
CO1	Explain the fundamentals of Java programming including syntax, program structure, data types, arrays, strings, and features of Java
CO2	Apply object-oriented programming concepts such as classes, objects, inheritance, polymorphism, abstraction, and interfaces in Java applications
CO3	Develop Java programs using packages, exception handling, multithreading, and other advanced Java programming concepts.
CO4	Implement collection framework concepts in Java applications for problem solving.
CO5	Design GUI-based and event-driven applications using Swing & JDBC components.

Unit	Title and Contents	No. of Lecture Hours
1	1.1 Introduction to Java 1.1.1. Why Java 1.1.2. Programming Paradigms 1.1.3. Java vs C/C++ 1.1.4. Features of Java 1.2 Basics of Java 1.2.1. Structure of Java Program 1.2.2. Tokens, Statements, Data Types 1.2.3. Variables, Constants, Operators, Type Casting 1.2.4. Execution Process, JVM & JDK Tools 1.2.5. Command Line Arguments 1.3 Arrays and Strings 1.3.1. Single & Multidimensional Arrays 1.3.2. String, StringBuffer & StringTokenizer 1.4 Packages and Wrapper Classes 1.4.1. java. lang and java.util Packages 1.4.2. Wrapper Classes (Integer, Float, Double, Character, Boolean,etc.)	9

2	2.1 Classes and Objects 2.1.1 Classes, Objects, and Constructors 2.1.2. Methods and Recursion 2.1.3. Method/Constructor Overloading 2.2 Java Keywords -new, this, static 2.3 Inheritance and Polymorphism 2.3.1 Inheritance and Types 2.3.2. Method Overriding 2.3.3. Dynamic Method Dispatch 2.3.4 super Keyword 2.4 Abstraction and Encapsulation 2.4.1 Abstraction 2.4.2 Encapsulation 2.4.3 Abstract Classes 2.4.4 Interfaces 2.5 Garbage Collector	9
3	3.1 Packages 3.1.1 Built-in and User-Defined Packages 3.1.2. Import Statements 3.1.3Access Modifiers 3.2 Exception Handling 3.2.1 Exception and Error 3.2.2 Built-in Exceptions 3.2.3 try, catch, throw, throws and finally 3.2.4 User Defined Exceptions 3.3 Multithreading 3.3.1 Introduction to Multithreading 3.3.2 Thread Life Cycle ,Methods 3.3.3 Synchronization 3.3.4 wait(), notify(), notifyAll() Methods	8
4.	4.1 Collection Framework 4.1.1 Introduction to Collection Framework 4.1.2 Interfaces: Collection, List, Set, Map 4.1.3 Navigation Interfaces: Enumeration, Iterator, ListIterator 4.1.4 List Interface and Classes: ArrayList, LinkedList, Vector 4.1.5 Set Interface and Classes: HashSet,LinkedHashSet,TreeSet 4.1.6. Map Interface and Classes: HashMap, LinkedHashMap, TreeMap	9

5.	5.1 Swing (JFC) 5.1.1 Introduction to Swing 5.1.2. Event Handling, Listeners & Adapter Classes 5.1.3. Swing Components – JFrame, JLabel, JTextField, JTextArea, JButton, JCheckBox, JRadioButton, JComboBox, JTable, JScrollPane, JTabbedPane 5.2 JDBC (Java Database Connectivity) 5.2.1 Introduction, Architecture & Drivers 5.2.2 JDBC Interfaces & Database Connectivity 5.2.3 CRUD Operations using JDBC	10
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Reference Material:

Reference Books

Sr. No.	Title of the Book	Author/s	Publication	Place
1	Programming with JAVA	E Balgurusamy	McGraw Hill Education	New Delhi, India
2	The Complete Reference – JAVA	Herbert Schildt	McGraw Hill	New York, USA
3	Head First Java	Kathy Sierra and Bert Bates,	O'Reilly Media	Sebastopol, California, USA
4	Java Programming and Object-Oriented Application Development	R.A. Johnson	Cengage Learning	Boston, Massachusetts, USA

Web Link:

1. <https://www.geeksforgeeks.org/java>
2. <https://www.tutorialspoint.com/java>
3. <https://www.w3schools.com/java>
4. <https://www.programiz.com/java>

Text Books:

1. Programming with Java – E. Balagurusamy
2. Java: The Complete Reference – Herbert Schildt
3. Programming in Java – Sachin Malhotra & Saurabh Choudhary
4. Java Programming – Yashavant Kanetkar, BPB Publications

MOOC Courses:

1. Programming in Java Indian Institute of Technology Kharagpur
2. Java Programming Masterclass, Udemy
3. Object Oriented Programming in Java, Coursera

Semester V					
Semester No.	Course Code	Type of Course	Course Title	Credits	Hours/Week
5	MJ-302-UIX	Major Mandatory (12)	User Interface and User Experience (UI-UX) Design	4	4

Course Objectives	
1	To introduce students to the fundamentals of User Interface (UI) and User Experience (UX) Design.
2	To develop understanding of user-centered design principles.
3	To familiarize students with wireframing, prototyping, and usability concepts.
4	To enable students to design effective and user-friendly digital interfaces.
5	To develop practical skills using modern UI/UX design tools.

Course Outcome	
CO1	Understand the fundamentals and importance of UI and UX Design.
CO2	Apply user-centred design principles in interface development.
CO3	Design wireframes, mockups, and prototypes for digital applications.
CO4	Evaluate usability and accessibility of user interfaces.
CO5	Develop basic UI/UX projects using industry-standard tools.

Unit	Title and Contents	No. of Lecture Hours
1	Unit 1 – Introduction to UI and UX Design: 1.1.1 Introduction to UI and UX 1.1.2 Difference between UI and UX 1.1.3 Rules and Skills of UI/UX 1.1.4 Fundamental Principles of UI/UX Design 1.1.5 Future Scope and Demand of UI/UX 1.1.6 Tools for UI/UX Design 1.1.7 Overview of Design Thinking	8
2	Unit 2 – UX Design and Research 2.1.1 Introduction to UX Design 2.1.2 User-Centered Design (UCD) 2.1.3 Mental Models 2.1.4 User Personas and Empathy Mapping 2.1.5 User Journey and User Flow 2.1.6 Content Organization Techniques 2.1.7 UX Research Methods 2.1.8 Surveys, Interviews, and Observation 2.1.9 Eye Tracking and Clickstream Analysis 2.1.10 Competitor Analysis	9
3	Unit 3 – Wireframing and Prototyping 3.1.1 Wireframing Concepts 3.1.2 Prototyping Techniques 3.1.3 Prototype Fidelity (Low/Medium/High) 3.1.4 Paper and Digital Prototypes 3.1.5 Mockups and Interactive Design 3.1.6 Information Architecture 3.1.7 Grid and Layout Systems 3.1.8 Navigation Design 3.1.9 Mobile and Responsive Design 3.1.10 Design Tools: Figma, Adobe XD, Sketch, Canva	10
4.	Unit IV- Visual Foundations of UI/UX 4.1.1 Typography and Color Theory 4.1.2 Layout and Grid Systems 4.1.3 Visual Hierarchy 4.1.4 Responsive Design 4.1.5 Accessibility Principles	9

5	Unit V- Evaluation Methods and Design Validation 5.1.1 Usability Heuristics 5.1.2 Usability Testing 5.1.3 A/B Testing and Heat maps 5.1.4 UX Laws and Design Validation 5.1.5 UI/UX Case Studies	9
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Reference Books

Reference Book				
Sr. No.	Title	Author	Publication	Year, Edition
1	A Project Guide to UX Design: For User Experience Designers in the Field or in the Making	Russ Unger, Carolyn Chandler	New Riders; 2	edition, 2012
2	The Design of Everyday Things	Don Norman	Basic Books; 2	edition, 2013
3	UI is Communication: How to Design Intuitive, User Centered Interfaces by Focusing on Effective Communication	Everett N. McKay	Morgan Kaufmann; Illustrated.	edition, 2013
4	Richard Helm and John Vlissides, Design Patterns: Elements of Reusable Object - Oriented Software	Dr. Erich Gamma, Ralph Johnson	Pearson	2008

Other Learning Material E- Resource:

- Figma Official Learning Resources – <https://www.figma.com/resources/learn-design/>
- Adobe XD Tutorials – <https://helpx.adobe.com/xd/tutorials.html>
- Google Material Design Guidelines – <https://material.io/design>
- Nielsen Norman Group (NNG) – <https://www.nngroup.com>
- Interaction Design Foundation – <https://www.interaction-design.org>
- Coursera UI/UX Design Courses – <https://www.coursera.org>
- UX Collective Articles – <https://uxdesign.cc>
- W3Schools Responsive Web Design – <https://www.w3schools.com>
- Hotjar Learning Resources – <https://www.hotjar.com>
- Canva Design School – <https://www.canva.com/designschool/>

Semester V					
Semester No.	Course Code	Type of Course	Course Title	Credits	Hours/ Week
5	MJ-303-JPP	Major Mandatory 13	Computer Laboratory based on Java Programming	2	4

Course Objectives	
1	To understand the fundamentals of Java programming, syntax, program structure, and features of Java.
2	To understand and implement object-oriented programming concepts using Java.
3	To develop programming skills using Packages, Exception Handling, and Multithreading concepts in Java.
4	To understand and implement Java Collection Framework concepts techniques for developing efficient Java applications.
5	To design GUI-based Java applications using Swing, event handling, and JDBC.

Course Outcome	
CO1	Write Java programs using fundamental data types, arrays, and string handling techniques.
CO2	Implement object-oriented programming concepts such as inheritance, polymorphism, abstraction, and interfaces in Java.
CO3	Apply packages, exception handling, and multithreading concepts to build robust Java applications.
CO4	Utilize Java Collection Framework classes to design efficient data-handling programs.
CO5	Design Java-based graphical user interface applications using Swing components, layouts, graphics, event handling, and JDBC connectivity..

Guidelines for Student Journal

The student shall perform each laboratory assignment and submit the same in the form of a journal. Journal shall have a Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Program Outputs, software and Hardware requirements, Date of Completion, Assessment grade/marks and signature of the instructor).

Guidelines for Assessment

The instructor shall carry out internal evaluation of laboratory assignments of 15 marks on a continuous basis throughout the semester. For each lab assignment, the instructor shall assign grade/marks based on parameters with appropriate weightage. Suggested parameters include-timely completion, performance, innovation, efficient codes, code documentation, punctuality and neatness of the write-up etc.

A pair of examiners shall conduct end semester examination of 35 marks in the form of practical examination based on journal assignments. Examiners shall ask questions about journal assignments and / or problem statement provided during practical examination to judge understanding of concepts by the students.

Lab Journal Format (for each practical) Practical No. & Title, Code, Output

Assignment No.	List of Assignments
1	Assignment 1 Write a program to convert the temperature (a) from Celsius to Fahrenheit and (b) from Fahrenheit to Celsius. (Hint: $F = (9C/5 + 32)$) Assignment 2 Write a program to swap value of two variables without using arithmetic operators and third variable. The marks obtained by a student in 5 different subjects are input through the keyboard. The student gets a division as per the following rules: Percentage above or equal to 75 – Honors Percentage above or equal to 60 – First Division Percentage between 50 and 59 – Second Division Percentage between 40 and 49 – Third Division Percentage less than 40 – Fail Assignment 3. Write a program to calculate the division obtained by the student. Assignment 4. Write a menu driven program in Java, which consists following option? · To find the second biggest using array, to smallest of N numbers using array Assignment 5 Create a package named Maths. Define class MathsOperations with static methods to find the maximum and minimum of three numbers. Create another package Stats. Define class StatsOperations with methods to find the average and median of three numbers. Use these methods in main to perform operations on three integers accepted using command line arguments.

2	Assignment 1: Class using constructor & method overloading with passing and returning objects from method. Assignment 2: Demonstration of new, this, static, keyword and finalize method. Assignment 3: Inheritance & polymorphism using super and final keywords. Assignment 4: Abstract class, interface & interface inheritance in java. Assignment 5: Create an interface for an Employee Management System to calculate salary for different employee types.
3	Assignment 1: User Defined Package and Access Specifiers Assignment 2: Exception Handling using try-catch-finally and User Defined Exception Assignment 3: Multithreading using Thread Class and Synchronization Assignment 4: Thread Communication using wait (), notify (), and notifyAll () Assignment 5 : Demonstration of Thread Life Cycle Methods
4.	Assignment 1: Write a Java program to store and display student names using ArrayList. Assignment 2: Write a program that shows the use of LinkedList class. Assignment 3: A college wants to develop a Student Management System to store and manage student records. The system should: 1. Store student details (Roll No, Name, Course). 2. Display all student records. Assignment 4: Write a program which shows the use of HashSet and Iterator. Assignment 5: Write a Java program to sort keys using TreeMap.
5.	Assignment 1: Write a Java program using Swing and JDBC to insert student records into MySQL database. Assignment 2: Write a program to demonstrate basic components like Label, TextField, TextArea, Button, Checkbox, and RadioButton in a single Frame. Assignment 3: Write Java program to create the following GUI using Swing Components. Assignment 4: Write a Java program using Swing and JDBC to search book details from library database. Assignment 5: Develop a Java Swing application for an Employee Management System with buttons: Add, Update, Delete, and Search employee records using JDBC

Reference Material:

Reference Books

Sr. No.	Title of the Book	Author/s	Publication	Place
1	Programming with JAVA	E Balgurusamy	McGraw Hill Education	New Delhi, India
2	The Complete Reference – JAVA	Herbert Schildt	McGraw Hill	New York, USA
3	Head First Java	Kathy Sierra and Bert Bates,	O'Reilly Media	Sebastopol, California, USA
4	Java Programming and Object-Oriented Application Development	R.A. Johnson	Cengage Learning	Boston, Massachusetts, USA

Web Link:

5. <https://www.geeksforgeeks.org/java>
6. <https://www.tutorialspoint.com/java>
7. <https://www.w3schools.com/java>
8. <https://www.programiz.com/java>

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7. Programming in Java – Sachin Malhotra & Saurabh Choudhary
8. Java Programming – Yashavant Kanetkar, BPB Publications

MOOC Courses:

4. Programming in Java Indian Institute of Technology Kharagpur
5. Java Programming Masterclass, Udemy
6. Object Oriented Programming in Java, Coursera

Semester V					
Semester No.	Course Code	Type of Course	Course Title	Credits	Hours/ Week
5	MJE-304-UIXP	Major Mandatory 14 (Practical)	Computer Laboratory based on UI-UX Design	2	4

Course Objectives	
1	To build a foundational understanding of UI/UX principles, design rules, and their evolving scope in technology and industry.
2	To train students in user-centered design methods — including persona mapping, empathy mapping, storyboarding, and scenario creation — for developing effective digital products.
3	To apply core visual design concepts such as Gestalt principles, color theory, typography, and accessibility guidelines to create intuitive, inclusive interfaces.
4	To develop hands-on proficiency in wireframing, prototyping, and responsive design using industry-standard tools (e.g., Figma, Adobe XD), grounded in real-world case studies and collaborative project work.

Course Outcome	
CO1	Outline the key stages of the UI/UX design process, from research and ideation to prototyping and testing.
CO2	Apply various visual design principles — including layout, color, typography, and iconography — to design elements.
CO3	Develop a consistent visual theme and style that aligns with a product's identity and user experience goals.
CO4	Design effective, engaging, and user-centered screen-based interfaces for digital products.

Guidelines for Instructor's Manual

The instructor shall frame at least 10 assignments. Instructor's manual consisting of University syllabus, conduction & Assessment guidelines is to be developed.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal.

Journal consists of Certificate, table of contents, and handwritten write-up for each assignment. Write-up shall include Title, Problem Statement, software and Hardware requirements, Date of Completion.

Program codes with sample output of all performed assignments are to be submitted as softcopy.

Use of DVD containing student's programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be retained with program prints.

Guidelines for Assessment

Continuous assessment of laboratory work is to be carried out based on overall performance of students. For each lab assignment, the instructor will assign grade/marks based on parameters such as timely completion, understanding, neatness etc. with appropriate

List of Assignments

1. Apply 5 fundamental UI/UX principles (consistency, feedback, simplicity, visibility, accessibility) to redesign a basic form
2. Create 2 personas for an e-commerce app in Figma.
3. Design a storyboard showing a student using a university portal.
4. Build an empathy map for a food delivery app user.
5. Create a homepage layout applying Gestalt principles, color theory, and typography.
6. Redesign a form page ensuring accessibility (contrast, font size, alt text).
7. Design a registration form in Adobe XD with clear microcopy (error messages, hints, button labels).
8. Redesign a news website homepage in Adobe XD considering visual impairments (high contrast mode, larger fonts, ARIA labels).
9. Create a navigation flow for a shopping app. like Home → Product → Cart → Payment → Confirmation.
10. Design a responsive layout for a news page.

Reference Books

Reference Book				
Sr. No.	Title	Author	Publication	Year, Edition
1	A Project Guide to UX Design: For User Experience Designers in the Field or in the Making	Russ Unger, Carolyn Chandler	New Riders; 2	edition, 2012
2	The Design of Everyday Things	Don Norman	Basic Books; 2	edition,

				2013
3	UI is Communication: How to Design Intuitive, User Centered Interfaces by Focusing on Effective Communication	Everett N. McKay	Morgan Kaufmann; Illustrated.	edition, 2013
4	Richard Helm and John Vlissides, Design Patterns: Elements of Reusable Object - Oriented Software	Dr. Erich Gamma, Ralph Johnson	Pearson	2008

Other Learning Material E- Resource:

- Figma Official Learning Resources – <https://www.figma.com/resources/learn-design/>
- Adobe XD Tutorials – <https://helpx.adobe.com/xd/tutorials.html>
- Google Material Design Guidelines – <https://material.io/design>
- Nielsen Norman Group (NNG) – <https://www.nngroup.com>
- Interaction Design Foundation – <https://www.interaction-design.org>
- Coursera UI/UX Design Courses – <https://www.coursera.org>
- UX Collective Articles – <https://uxdesign.cc>
- W3Schools Responsive Web Design – <https://www.w3schools.com>
- Hotjar Learning Resources – <https://www.hotjar.com>
- Canva Design School – <https://www.canva.com/designschool/>

Semester V					
Semester No.	Course Code	Type of Course	Course Title	Credits	Hours/ Week
5	MJE-301-ECC	Major Elective 1	Essentials of Cloud Computing	2	2

Course Objectives	
1	To introduce the basics of Cloud Computing and its Architecture.
2	To give Insights into Cloud Service Models and Deployment Models.
3	To provide knowledge on virtualization technologies.
4	To understand pricing and billing of different Cloud Platforms and Tools
5	To impart the knowledge on different Cloud Platforms.

Course Outcome	
CO1	Explain the fundamental concepts of Cloud Computing, Docker, and Containerization.
CO2	Analyze various Cloud Service Models (IaaS, PaaS, SaaS) and Deployment Models.
CO3	Apply virtualization concepts using hypervisors, virtual machines, VMware, Microsoft Hyper-V, and Open-Source Virtualization Managers.
CO4	Describe Cloud Storage methods and relate Cloud Computing to SOA, SLA management, and cloud bursting strategies.
CO5	Compare leading Cloud Platforms — AWS, GCP, and IBM Cloud — based on their features and services..

Unit	Title and Contents	No. of Lecture Hours
1	Introduction to Cloud Computing 1.1 Introduction to Cloud Computing 1.2 Cloud Computing vs. Cluster Computing vs. Grid Computing 1.3 Characteristics, Pros and Cons of Cloud 1.4 Introduction to Dockers 1.5 Introduction to Container	05
2	Cloud Service Models and Deployment Models 2.1 Cloud Service Models - IAAS, PAAS, SAAS & its Comparison 2.2 Cloud Deployment Models-Public, Private, Hybrid, Community 2.3 XAAS- Anything as a Service – Storage as a service, Network as a Service, Database as a Service	07

3	Virtualization 3.1. Introduction to Virtualization concept & Hypervisors 3.2. Core Types of Virtualization, Pros and Cons of Virtualization 3.3. Machine Image, Virtual Machine (VM) 3.4. Xen: Para virtualization, VMware: Full Virtualization 3.5. Microsoft Hyper-V 3.6. Open-Source Virtualization Manager	08
4.	Cloud Storage Economics & Management 4.1. Cloud Storage Types: Block, File, Object Storage 4.2. Web Services: SOAP and REST 4.3. Relating SOA and Cloud Computing. 4.4. Service Level Agreement (SLA), Billing, Pricing, and Support 4.5. Cloud Management Tools	05
5	Fundamentals of Cloud Platforms 5.1. Commercial cloud computing Infrastructures. 5.2. Amazon Web Services (AWS) 5.3. Google Cloud Platform (GCP) 5.4. Microsoft Azure (M. Azure) 5.5. Sales Force 5.6. IBM Cloud	05

Reference Material:

Sr. No.	Title of the Book	Author/s	Publication
1	Cloud Computing Concepts, Technology & Architecture	Thomas Erl, Zaigham Mahmood, and Ricardo Puttin	
2	Mastering Cloud Computing	Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi	McGraw Hill Education (India) Private Limited
3	Cloud Computing Web –Based Applications that change the way you work and Collaborate Online	Michael Miller	Pearson
4	Cloud Computing for Dummies	Judith Hurwitz, Robin Bloor, Marcia Kaufman, FernHalper	

Reference Books:

- Cloud Computing Bible by Barrie Sosinsky, Wiley India Pvt. Ltd,
- Cloud Computing: Automating the Virtualized Data Center
- Cloud Computing by Dr. Kumar Saurabh, Wiley–India
- Cloud computing: A practical approach by Anthony T. Velte, Tata McGraw-Hill

Other Learning Material E- Resource:

- <http://www.cloudcomputingpatterns.org/>
- <http://whatiscloud.com>
- www.w3schools.com

Semester V					
Semester No.	Course Code	Type of Course	Course Title	Credits	Hours/Week
5	MN-301-SE	Minor 4	Software Engineering	4	4

Course Objectives	
1	To understand the concept of software engineering and its relevance.
2	To understand Requirement Engineering concepts and prepare SRS documents using IEEE standards.
3	To understand Object Oriented concepts and to design static and dynamic UML diagrams.
4	To Understand basic concepts of software project management and software testing
5	To understand Agile Project Management concepts, Agile methodologies, tools, and team practices for effective software project development and management.

Course Outcome	
CO1	Understand fundamental concepts, principles, and relevance of Software Engineering in software development.
CO2	Understand software requirements and develop Software Requirement Specification (SRS) documents using IEEE standards.
CO3	Apply object oriented concepts, methods and UML diagrams with project specifications.
CO4	Understand Agile model , principles and role in software project development.
CO5	Apply software testing techniques in software development.

Unit	Title and Contents	No. of Lecture Hours
1	Introduction to Software Engineering 1.1 Software - Definition, Characteristics of software Types of Software - Application Software, System software 1.2 Software Engineering: Definition, Need 1.3 Software Development Life Cycle 1.4 SDLC Models: Waterfall Model, Prototype, Spiral, RAD (Rapid Application Development), JAD (Joint Application Development)	7

2	Requirement Engineering and SRS 2.1 Requirement: Definition Types of requirement: Functional and Non-functional 2.2. Requirement gathering techniques 2.3 Requirement Engineering 2.6 Software Requirement Specification (SRS) (IEEE format)	7
3	Requirements Modelling-UML 3.1. Object oriented concepts 3.2. Difference between SSAD and OOAD 3.3. Object Oriented Methodologies: Booch Methodology and Rumbaugh Methodology (OMT) 3.4. Introduction of Unified Modelling Language (UML) & Notations 3.5. UML Diagrams 3.5.1. Use case Diagram 3.5.2. Class Diagram 3.5.3. Object Diagram 3.5.4. Activity Diagram 3.5.5. Interaction Diagram: Sequence and Collaboration 3.5.6. Component and Deployment Diagram	16
4	Introduction to Agile 5.1 Introduction to Agile 5.2 Agile Life Cycle 5.3 Agile Manifesto 5.4. Agile Principles 5.5 Types of Agile 5.6. Agile Team Structure and Roles	6
5	Software Testing 5.1. Introduction to Software Testing: Definition, Need, Importance 5.2. Software Quality Concepts: 5.3. Software Defects and Failures 5.4. Testing Principles 5.5 Verification vs Validation 5.6. Testing Techniques: White box and Black box 5.7. System Testing Levels	9

Reference Material:

Reference Books

Sr. No.	Title of the Book	Author/s	Publication
1	Software Engineering : A Practitioner's Approach	Roger S. Pressman, McGraw hill	International Editions 2010(Seventh Edition)
2	Software Engineering	K. K. Aggarwal and Yogesh Singh	New Age International Publisher

3	Software Engineering	Pankaj Jalote	Wiley India Pvt. Ltd
4	The Unified Modelling Language User/Reference Guide	Grady Booch, James Rumbaugh	Pearson Education Inc
5	Software Engineering	Dr. Nasib Sing Gill	Khanna Book Publishing
6	Agile Project Management for Dummies	Mark C. Layton	O'Reilly Media

Other Learning Material E- Resource:

Websites:

<https://www.geeksforgeeks.org/software-engineering/software-engineering>

https://www.tutorialspoint.com/software_engineering/software_engineering_overview.htm

MOOCs / Online Courses:

- NPTEL Courses (Software Engineering, UML, Agile, Project Management)
- SWAYAM Platform
- Coursera (Software Engineering Specializations)
- NOC: Software Engineering, IIT Kharagpur Prof. Rajib Mall

Semester V					
Semester No.	Type of Course	Course Code	Course Title	Credits	Hours/Week
5	Vocational Skill Development Course(VSC)	VSC – 301-ES	Entrepreneurship Essentials	2	4

Course Objectives	
1	Develop entrepreneurial mind-set and attributes; entrepreneurial skill sets for venture creation and entrepreneurial leadership
2	Apply process of problem-opportunity identification and feasibility assessment through developing a macro perspective of the real market, industries, domains and customers while using design thinking principles to refine and pivot their venture idea.
3	Analyse Customer and Market segmentation, estimate Market size, develop and validate Customer Persona.
4	Initiate Solution design, Prototype for Proof of Concept.
5	Understand MVP development and validation techniques to determine Product-Market fit
6	Craft initial Business and Revenue models and understand basics of financial planning

Course Outcome	
CO1	Demonstrate an entrepreneurial mind-set and appreciate the concepts of entrepreneurship, cultivate essential attributes to become an entrepreneur or Intrapreneur and demonstrate skills such as problem solving, team building, creativity and leadership
CO2	Comprehend the process of problem-opportunity identification through design thinking, identify market potential and customers while developing a compelling value proposition solution
CO3	Build Prototype for Proof of Concept and validate MVP of their practice venture idea
CO4	Analyse and refine business models to ensure sustainability and profitability
CO5	Create a basic business plan and feasibility analysis to assess the financial viability of a venture
CO6	Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders

Unit	Title and Contents	No. of Lecture Hours
1 Entrepreneurs hip Fundamentals and Problem- Opportunity Identification	1.1 Meaning and concept, attributes and mind-set of entrepreneurial and intrapreneurial leadership, role models in each and their role in economic development. 1.2 Understanding and analysing the macro-Problem and Industry perspective, technological, socio economic and urbanization trends and their implication on new opportunities. 1.3 Aligning passion, identifying and defining problem using Design thinking principles. Analysing problem and validating with the potential customer.	10
2 Customer Discovery, Ideation and competition mapping	2.1 Understanding customer, customer segmentation, creating and validating customer personas. 2.2 Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition. Iterating problem-customer fit. 2.3 Examining ideation techniques and generating solution ideas. Competition and Industry trends mapping for assessing market sizing - initial opportunity.	10
3 Prototyping &Basics of Business Model	3.1 Developing Problem-solution fit in an iterative manner. Understanding prototyping and MVP. 3.2 Developing a feasibility prototype with differentiating value, features and benefits. Initial testing for proof-of-concept and iterate on the prototype. 3.3 Introduction to revenue model and its types, Lean approach and basics of financial management.	10

Reference Material:

Reference Books

Sr. No.	Title of the Book	Author/s	Publication	Place
1	Entrepreneurship (11th Edition)	Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha	McGraw Hill	New York
2	The Lean Startup: How Today's Entrepreneurs Use Continuous	Eric Ries	Crown Business	New York

	Innovation to Create Radically Successful Businesses			
3	Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers	Alexander Osterwalder & Yves Pigneur	John Wiley & Sons	Hoboken, New Jersey
4	Start with Why	Simon Sinek	Penguin Books Limited	London
5	Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation	Tim Brown	Harper Business	New York
6	The Dolphin and the Shark: Stories on Entrepreneurship	Namita Thapar	Penguin Books Limited	New Delhi
7	Effectuation: Elements of Entrepreneurial Expertise	Saras D. Sarasvathy	Elgar Publishing Ltd	Cheltenham, UK

This Course will be executed in collaboration with SPPU's Innovation, Incubation & Linkages and Wadhavani Foundation.

Semester V					
Semester No.	Course Code	Type of Course	Course Title	Credits	Hours/Week
5	FP-301-MM	Project	Project based on Major Mandatory	2	4

Course Objectives	
1	Enhance programming skills, software development methodologies and proficiency in relevant technologies/tools
2	Encourage creative thinking, increase problem solving and innovation in designing solutions that meet specified requirements and constraints
3	Improve presentation skills by effectively communicating project goals, methodologies, results and conclusions to peers, faculty, and potentially external stakeholders
4	Foster teamwork and collaborative skills through group-based project work, including division of tasks, coordination, and communication

Course Outcome	
CO1	Apply knowledge of software engineering principles and methodologies in designing and implementing the project
CO2	Demonstrate the ability to develop a functioning software application or solution that meets specified requirements and objectives
CO3	Design comprehensive documentation that includes project requirements, design specifications, implementation details, testing strategies, and user manuals
CO4	Create and Design innovative original software solutions that meet specific requirements and constraints, fostering creativity and problem-solving skills.

General Guidelines for Project:

1. Project Selection:

- Students can choose any specialization/technology or a combination for their project.
- Topics must align with industry trends and academic relevance.
- Consult with internal guides for topic approval and feasibility.

2. Project Execution:

- Follow the Software Development Life Cycle (SDLC) for systematic execution.
- Use appropriate tools and technologies for design, implementation, and testing.
- Ensure proper documentation, including diagrams, screenshots, and references.

3. Evaluation Criteria:

- Innovation and Problem Definition: 15%
- Implementation and Technical Complexity: 30%
- Resource Utilization and Security: 15%
- Performance and Optimization: 15%
- Documentation and Presentation: 25%

4. Timeline and Milestones:

- Week 1-2: Topic Selection & Approval
- Week 3-4: Literature Review & Requirement Analysis
- Week 5-8: Environment Setup & Initial Development
- Week 9-12: Implementation & Testing
- Week 13-15: Final Documentation & Presentation

5. Presentation:

- Regular interval presentations to review progress.
- Final presentation to peers, faculty, and external stakeholders.

6. Documentation: Follow a structured format with clear sections.

7. Presentation: Use visuals (diagrams, charts) to enhance understanding.

8. Ethical Considerations: Ensure compliance with ethical guidelines.

9. Teamwork: Collaborate effectively and divide tasks among team members.

10. Development (Java Programming/UI-UX)

Project Requirement Details	Details
Technology Stack Use frameworks like java,JDBC,SQL	Use Technology frameworks like Java, HTML,CSS,js
Database Implement SQL or MYSQL databases	Database Implement SQL databases

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