**Detailed Syllabus Lecture-wise Breakup**

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| **Course Code** | 20B12CS334 | **Semester ODD** | | **Semester: 5th Session:** 2023 - 2024  **Month from:** July **to** Dec 2023 | |
| **Course Name** | **Object Oriented Analysis and Design Using JAVA** | | | | |
| **Credits** | 3-0-0 | | **Contact Hours** | | 3 |

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| **Faculty (Names)** | **Coordinator(s)** | Dr. Raju Pal (J128) and Prof. Sandeep Kumar Singh (J62) |
| **Teacher(s) (Alphabetically)** | Dr. Raju Pal (J128) and Prof. Sandeep Kumar Singh (J62) |

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| **COURSE OUTCOMES** | | **COGNITIVE LEVELS** |
| **C333-1.1** | Illustrate Object-Oriented Design and convert it to its code using  JAVA Programming language. | Understand Level (C2) |
| **C333-1.2** | Dissect the requirements to identify the potential use cases, classes and objects in the system. | Analyze Level (C4) |
| **C333-1.3** | Build UML diagrams such as class diagram, object diagram for  structural modelling and state chart diagram, sequence diagrams for behavioral modelling. | Apply Level (C3) |
| **C333-1.4** | Create solutions to solve real world problems. using object- oriented analysis and design principles. | Apply Level (C3) |
| **C333-1.5** | Estimate the complexity of object-oriented designs using several metrics. | Evaluate Level (C5) |

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| **Module No.** | **Title of the Module** | **Topics in the Module** | **No. of Lectures for the module** |
| **1.** | Introduction to Principles of Object-Oriented Analysis and Design | Programming Paradigms, Introduction to Object Oriented Paradigm, Principles of Object Orientation, Software Complexity: Benefits and Understanding the challenges OOAD can address, Overview of Software Development Life Cycle (SDLC**)** & Rational Unified Process (RUP), Object-Oriented Requirements Elicitation & Analysis and Systems Behavior, Quality Attributes, ~~Software Architect and Design Roles in Industry, Conceptual and Technical Designs, Competing Qualities and Trade-offs, Record, Organize, and Refine Components,~~ Abstract Data Types, Specifying ADTs, Concrete State Space and Concrete Invariant, Axioms, Designing an ADT ,Implementing ADTs ,Example like  ADT List , ADT Sorted List  etc | 5 |
| **2.** | Object Oriented Analysis | Identifying Classes and Objects, Responsibilities, Relationships in problem domain, Object Model, Methods of Class Identification, Listing nouns and Verbs, Synonyms, Attributes and Methods | 8 |

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| **3.** | Structural modeling and its implementation in JAVA | UML structure: Overview of static and dynamic UML diagrams, Modeling System Behavior with use case diagram and notations, From Use Cases to Functional Requirements, Elements of object and class diagram with notations: object, class, link, association, multiplicity, link attributes, association end names, association classes, qualified association, association ends, N-ray association, aggregation and composition, generalization, abstract class.  Objects and Classes in JAVA, implementing various relationships in JAVA- Association, Inheritance, generalization, Abstraction in Java, Method Overriding and Overloading, Object Roles, Class Types, Implementing Polymorphism, Extensibility and UML, Generalization with Interfaces and Packages in Java | 15 |
| **4.** | Behavioral modeling | Sequence & Collaboration diagram with notations, Object Collaborations, Interaction Diagrams, State Diagram - Event ,Change Event, Signal Event, Call Event, Time Event , States, Transition & Conditions, Transition, Guard Condition, Action, State Diagrams, One shot State Diagram, Creating State Diagram, State Diagram Behavior, Activity, Do-activity, Entry Activity, Exit Activity, Nested State Diagram, Nested States, Signal Generalization, Concurrency, Activity and Swim lane diagram, ~~Elements of Component and deployment Diagram Object Constraint Language(OCL)~~ | 4 |
| **5.** | Design Principles | SOLID principles, Cohesion, Coupling, techniques for good Object-Oriented design, separation of concerns, information hiding, and conceptual integrity | 6 |
| **6.** | OO Design Metrics | Understanding and Analyzing Software Design Metrics for Object Oriented Software. | 4 |
| **Total number of Lectures** | | | **42** |
| **Evaluation Criteria**  **Components Maximum Marks**  T1 20  T2 20  End Semester Examination 35  TA 25 [Attendance (10) + Assignment/Quiz/Mini-project (15)]  **Total 100** | | | |

**Project based learning:** Each student in a group of 3-4 have to work on a mini-project, in which they will identify a real-life problem and develop the solution by applying their knowledge of object-oriented approach. The project implementation should be in JAVA preferably along with well documentation on different aspects of the software. This enhances the understanding of students towards different concepts of object-oriented approach and also helps them during their employability.

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| **Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format) | |
| **Text Books:** | |
| **1.** | Object Oriented Modeling And Design With UML 2nd Edition by MICHAEL BLAHA and JAMES RUMBAUGH, PEARSON INDIA 2013 |
| **2.** | UML 2 AND THE UNIFIED PROCESS: Practical Object-oriented Analysis and Design 2nd Editon by Jim Arlow, Pearson 2015 |
| **3.** | The Object-Oriented Thought Process: ObjectOr Thought Process by Matt Weisfeld 2013 |
| **4.** | Java: The Complete Reference, Eleventh Edition by Herbert Schildt , 2019 |
| **5.** | Core Java Volume I--Fundamentals (Core Series) 11th Edition, by Cay S. Horstmann, 2018 |
| **Reference Books:** | |
| **1.** | Head First Object-Oriented Analysis and Design A Brain Friendly Guide to OOA&D By Brett McLaughlin, Gary Pollice, David West 2011 |
| **2.** | An Introduction to Programming and Object-Oriented Design with Java by Frederick A. Hosch Jaime Nino 2009 |
| **3.** | OBJECT-ORIENTED ANALYSIS AND DESIGN With applications Third EDITION Grady Booch Rational Santa Clara, California 2009 |
| **4.** | Object Oriented Analysis and Design Andrew Haigh 2001 |
| **5.** | UML and C++ A practical approach to OO Development, 1997 |