|  |  |
| --- | --- |
| **K L Deemed to be University Department of CSE -- KLVZA Course Handout**  **2022-2023, ODD Sem** | |
| Course Title | : Advance Object Oriented Programming |
| Course Code | : 21CS2116AA , 21CS2116PA |
| L-T-P-S Structure | : 3-0-4-4 |
| Pre-requisite | : Principles of Programming Languages |
| Credits | : 6 |
| Course Coordinator | : |
| Team of Instructors | : |
| Teaching Associates | :-- |
| **Syllabus :**  **Design Patterns:** Introduction to design patterns, Structural, Creational & Behavioural patterns. Decorator, Bridge, adapter and facade patterns, Singleton, factory method, abstract factory patterns, observer, command, state, iterator, chain of responsibility patterns, dependency injection. **Clean Coding Techniques:** Introduction to code smells - bloaters, Object-oriented abusers, change preventers, dispensables and couplers. Refactoring techniques to remove the code smells. **Test Driven Development (TDD):** Introduction to TTD, Introduction to Unit Testing & JUnit.  **Generics & Collections Framework:** Introduction to generics, usage of generics with interfaces, building stacks, queues, and Priority Queues, applying the comparator, comparable, cloneable & iterator interfaces, Introduction to Sets and Maps and their Java API. Building BST, AVL trees and graphs-based algorithms. Graph visualization, traversal, DFS and BFS. Case studies related to trees and graphs.  **Multi-threading & Parallel programming:** Introduction to Multithreading and Parallel Programming, Thread Concepts & its States, Creating Tasks & Threads, Thread Classes, Thread Pools, Thread Synchronization & Locks, Cooperation among Threads, Case Study: Producer/Consumer, Blocking Queues, Semaphores, Deadlock Avoidance, Synchronized Collections & Parallel Programming.  **JDBC**: API, Components, Architecture (2 Tier & 3 Tier), Divers & Its Types, Packages for JDBC Connection, Steps to connect to Databases (PostgreSQL). **Servlets**: Overview, Life Cycle of Servlet, Attributes in Servlets, Interaction between Client & Servlet, Servlet demo Application development with Sessions, **JSP:** JSP & Advantages over servlets, Features, syntax, Life Cycle of JSP, Environmental Setup for JSP, Interaction between client, JSP & server, JSP demo Application Development, | |
| **Text Books :**   1. Eric Freeman, Elisabeth Robson, Bert Bates, Kathy Sierra, Head First Design Patterns, O'Reilly Media, Inc., October 2004. 2. Y Daniel Lian, Introduction to Java Programming, Pearson, 10th Edition, 2011. 3. Siahaan, V., Sianipar, R.H., Step by Step Database Programming, 2019, SPARTA Publishing. 4. Kathy Sierra, Bryan Basham, Bert Bates, Head First Servlets and JSP, O'Reilly Media, Inc., 2nd Edition, 2008. | |
| **Reference Books :**   1. Gamma, E., Helm, R., Johnson, R., Johnson, R. E., & Vlissides, J. (1995). Design patterns: elements of reusable object-oriented software. Pearson Deutschland GmbH. 2. Kent beck, (2002). Test-Driven Development – by Example. Pearson publication. 3. Naftalin, Maurice, and Philip Wadler. (2005). Generics and Collections in Java. O’reilly Media Inc. 4. Brian Goetz. (2006). Java Concurrency in Practice. Bible Inc. 5. Tittel, E., Dykes, L. (2011). XML For Dummies. Germany: Wiley. 6. Santosh Kumar K. , Kogent Solutions Inc., Santosh Kumar K. And Kogent Solutions Inc. (2008). JDBC, Servlets, And JSP Black Book. Dreamtech Press. | |
| **Web Links:**   1. <https://www.javatpoint.com/design-patterns-in-java> 2. <https://github.com/JuanCrg90/Clean-Code-Notes> 3. https://www.geeksforgeeks.org/dynamic-programming | |
| **MOOCS :**  1. <https://www.coursera.org/learn/design-patterns>  2. <https://www.coursera.org/learn/test-and-behavior-driven-development-tdd-bdd>  3. <https://www.coursera.org/learn/object-oriented-programming-with-java>  4. <https://www.coursera.org/learn/java-servlet-pages> | |
| **Course Rationale:** If we try to identify those contributions of Computer Science, which will be long lasting, surely one of these will be the refinement of the concept called Design Patterns with respect to object oriented programming. Design patterns help promote easier program changes and object reusability. Loosely coupled objects are easier to reuse and change. Through Test Driven Development, the early and frequent nature of the testing helps to catch defects early in the development cycle, preventing them from becoming endemic and expensive problems. Generics allow us to provide the type of Object that a collection can contain, so if you try to add any element of other type it throws compile time error. The Collection in Java is a framework that provides an architecture to store and manipulate the group of objects. The Combination of OOP with concurrency mechanisms like threads, the phrase "concurrent object-oriented programming" primarily refers to systems where objects themselves are a concurrency primitive, such as when objects are combined with the actor model. This study has led to the discovery of many important design patterns, Generics & Collection frameworks, Concurrent programming and JDBC, Servlet & JSP. The purpose of this course is to learn these concepts to devise and analyze new applications with respect to Object Oriented Programming by their own. | |
| **Course Objectives:** The objective of this course is to study paradigms and approaches used to apply the design patterns, TDD Techniques and develop applications with the concept of Generics & Concurrent programming and to appreciate the impact of Improved Object Oriented Programming in practice. | |

**COURSE OUTCOMES (COs):**

|  |  |  |  |
| --- | --- | --- | --- |
| **CO NO** | **Course Outcome (CO)** | **PO/PSO** | **Blooms Taxonomy Level (BTL)** |
| CO1 | Apply Design Patterns & Test-Driven Development with Clean coding Techniques. | PO1 | 3 |
| CO2 | Understand the Collections & Generics over Object-oriented Programming. | PO2,PO5 | 4 |
| CO3 | Apply the various Concurrent Programming methodologies in Object-oriented Programming | PO2,PO5 | 4 |
| CO4 | Develop the applications using JDBC, Servlets, JSP | PO2,PO5 | 4 |
| CO5 | Analyze the various design techniques to solve any real-world problems. | PO2,PO5 | 4 |

**COURSE OUTCOME INDICATORS (COIs):**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Outcome No.** | **Highest BTL** | **COI-1** | **COI-2** | **COI-3** | **COI-4** |
| CO1 | 3 | **Btl-1** Remembering the basic ideas of Coding and its  performance analysis | **Btl-2** Understanding the concepts of Design Patterns | **Btl-3**  Apply various Clean Coding Techniques and Test Driven Development Methodologies to augment the code |  |
| CO2 | 4 | **Btl-1** Remembering the concepts of basic data structures | **Btl-2** Understanding the concepts of Generics & Interfaces | **Btl-3**  Apply the concept of stacks and queues with respective to Generics and collections | **Btl-4**  Analyze the problems that can be solved by Sets and Maps and their Java API along with Trees. |
| CO3 | 4 | **Btl-1**  Remembering graph traversal algorithms: BFS, DFS | **Btl-2** Understanding dynamic programming and backtracking | **Btl-3**  Apply dynamic Programming to solve problems. | **Btl-4**  Analyze state space tree for the problems that can be solved by using backtracking method. |
| CO4 | 4 | **Btl-1** Remembering the basic concepts of multi-threading and parallel programming | **Btl-2**  Understanding the concepts of Threads & Its states. | **Btl-3**  Apply various multithreading mechanisms like pools, synchronizations, lock and semaphores along with deadlock avoidance. | **Btl-4**  Analyze the problems with Synchronized Collections & Parallel Programming. |
| CO5 | 4 |  |  |  | **Btl-4**  Student will be able to analyze and apply suitable design technique to implement given real world problems. |

**PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES (POs/PSOs)**

|  |  |
| --- | --- |
| **Po No.** | **Program Outcome** |
| PO1 | Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. |
| PO2 | Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences |
| PO3 | Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations |
| PO4 | Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline. |
| PO5 | Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations. |
| PO6 | The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. |
| PO7 | Environment and Sustainability:Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development |
| PO8 | Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice |
| PO9 | Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. |
| PO10 | Communication:Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions |
| PO11 | Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. |
| PO12 | Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change. |
| PSO1 | An ability to design and develop software projects as well as Analyze and test user requirements. |
| PSO2 | An Ability to gain working Knowledge on emerging software tools and technologies. |

# Lecture Course DELIVERY Plan:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sess. No.** | **CO** | **COI** | **Topic** | **Book No[CH No][Page No]** | **Teaching- Learning Methods** | **Evaluation Components** |
| 1 | CO1 | COI-1 | Course Handout, Introduction to design patterns. | T BOOK [1],CH  1 Page no  1-4, 5-13 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 2 | CO1 | COI-2 | Structural &Creational Patterns | Web Link [1] | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 3 | CO1 | COI-2 | Behavioural patterns | Web Link [1] | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 4 | CO1 | COI-2 | Decorator, Bridge, adapter and facade patterns | T BOOK [1],CH  12, Page no 501-545. | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 5 | CO1 | COI-2 | Singleton, factory method, abstract factory patterns and Observer patterns. | T BOOK [1],CH  5, Page no 170-188 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 6 | CO1 | COI-2 | State, iterator, chain of responsibility patterns and dependency injection. | T BOOK [2],CH  14, Page no 612-616 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 7 | CO1 | COI-3 | Clean Coding Techniques | Web Link [2] | Chalk, PPT, Talk | End Semester Exam,MOOCs Review,SEM-EXAM1 |
| 8 | CO1 | COI-3 | Test Driven  Development (TDD) | Web Link [2] | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 9 | CO2 | COI-1 | Introduction to Generics, usage of generics with interfaces. | T BOOK [1], CH 21, pages 708-719 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 10 | CO2 | COI-2 | Building stacks queues, and Priority Queues | T BOOK [1], CH 22, pages 748-751 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 11 | CO2 | COI-2 | Applying the comparator, comparable, cloneable & iterator interfaces | T BOOK [1], CH 22, pages 728-738 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 12 | CO2 | COI-3 | Introduction to Sets and Maps and their Java API | T BOOK [1], CH 22, pages 730-756 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 13 | CO2 | COI-3 | AVL Trees | T BOOK [1], CH 45 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 14 | CO2 | COI-3 | Graph based Algorithms | T BOOK [1], CH 27, pages 892-898 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 15 | CO2 | COI-3 | Graph Visualization | T BOOK [1], CH 27, pages 909-911 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 16 | CO2 | COI-3 | Traversal – DFS & BFS | T BOOK [1], CH 27, pages 911-916 | Chalk, PPT, Talk | End Semester Exam,MOOCs Review,SEM-EXAM1 |
| 17 | CO2 | COI-4 | Case Study related to trees | T BOOK [1], CH 27, pages 919-922 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 18 | CO2 | COI-4 | Case Study related to graph | T BOOK [1], CH 27, pages 923-938 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM1 |
| 19 | CO3 | COI-2 | Introduction to Dynamic Programming | Web link[3] | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM2 |
| 20 | CO3 | COI-2 | Optimal Binary search trees | T BOOK [1], CH 26, pages 858-881 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM2 |
| 21 | CO3 | COI-1 | Introduction to Multithreading and Parallel Programming | T BOOK [1], CH 29, pages 971-972 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM2 |
| 22 | CO3 | COI-2 | Thread Concepts & its States | T BOOK [1], CH 29, pages 972,1002 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM2 |
| 23 | CO3 | COI-3 | Creating Tasks & Threads, Thread Classes, Thread Pools. | T BOOK [1], CH 29, pages 972-983 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM2 |
| 24 | CO3 | COI-3 | Thread Synchronization & Locks | T BOOK [1], CH 29, pages 985-989 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM2 |
| 25 | CO3 | COI-3 | Cooperation among Threads, Case Study: Producer/Consumer | T BOOK [1], CH 29, pages 991-997 | Chalk, PPT, Talk | End Semester Exam,MOOCs Review,SEM-EXAM2 |
| 26 | CO3 | COI-3 | Blocking Queues, Semaphores, | T BOOK [1], CH 29, pages 998-1000 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM2 |
| 27 | CO3 | COI-3 | Deadlock Avoidance | T BOOK [1], CH 29, pages 1001 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM2 |
| 28 | CO3 | COI-4 | Synchronized Collections & Parallel Programming | T BOOK [1], CH 29, pages 1002-1004 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM2 |
| 29 | CO4 | COI-1 | JDBC - API, Component Architecture (2 Tier & 3 Tier) | T BOOK [1], CH 37, pages 1273-1286 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM2 |
| 30 | CO4 | COI-2 | Drivers & Its Types, Packages of JDBC Connections. | T BOOK [1], CH 38 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM2 |
| 31 | CO4 | COI-2 | Steps to connect to Databases (PostgreSQL). | T BOOK [1], CH 38 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM2 |
| 32 | CO4 | COI-3 | Overview & Life Cycle of Servlet | T BOOK [1], CH 39 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM2 |
| 33 | CO4 | COI-3 | Attributes in Servlets, Interaction between Client & Servlet | T BOOK [1], CH 39 | Chalk, PPT, Talk | End Semester Exam,MOOCs Review,SEM-EXAM2 |
| 34 | CO4 | COI-3 | Servlet demo Application development with Sessions | T BOOK [1], CH 39 | Chalk, PPT, Talk | End Semester Exam,SEM-EXAM2 |
| 35 | CO4 | COI-4 | JSP & Advantages over servlets, Features, syntax, Life Cycle of JSP, Environmental Setup for JSP. | T BOOK [1], CH 40 | Chalk, PPT, Talk | End Semester  Exam,SEM-EXAM2 |
| 36 | CO4 | COI-4 | Interaction between client, JSP & server, JSP demo Application Development | T BOOK [1], CH 40 | Chalk, PPT, Talk | End Semester  Exam,SEM-EXAM2 |

**Lecture Session wise Teaching – Learning Plan SESSION NUMBER** : 1

**Session Outcome: 1** Students will be able to understand the details of the course and able to understand the introduction of design patterns

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Explanation about course hand out. | 2 | PPT | --- NOT APPLICABLE  --- |
| 10 | Introduction to Design Patterns | 2 | PPT | --- NOT APPLICABLE  --- |
| 20 | Real time Example & Scenario Discussion | 2 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 2

**Session Outcome: 2** Students will be able to understand the concepts of Structural &Creational Patterns

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Structural Patterns | 2 | PPT | Immediate feedback |
| 10 | Creational Patterns | 2 | PPT | --- NOT APPLICABLE  --- |
| 20 | Builder patterns | 2 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 3

**Session Outcome: 3** Students will be able to find complexities of Behavioural patterns

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Behavioural patterns | 2 | PPT | Brain storming session |
| 10 | Chain of Responsibility Pattern and  Interpreter Pattern | 2 | PPT | --- NOT APPLICABLE  --- |
| 20 | Iterator Pattern and Mediator Pattern | 2 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 4

**Session Outcome: 4** Students will be able to apply Decorator, Bridge, adapter and facade patterns

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 20 | Decorator patterns | 2 | PPT | Immediate feedback |
| 10 | Bridge and adapter pattern | 2 | PPT | --- NOT APPLICABLE  --- |
| 10 | Façade pattern | 2 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 5

**Session Outcome: 5** Students will be able to apply Singleton, factory method, abstract factory patterns and Observer patterns.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 20 | Singleton and factory method | 2 | PPT | Brain storming session |
| 10 | Abstract factory patterns. | 2 | PPT | Think / Pair / Share |
| 10 | Observer patterns | 2 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 6

**Session Outcome: 6** Students will be able to understand State, iterator, chain of responsibility patterns and dependency injection.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE |
| 20 | State, iterator | 2 | PPT | --- NOT APPLICABLE  --- |
| 10 | Chain of responsibility patterns. | 2 | PPT | Case Study |
| 10 | Dependency injection. | 2 | PPT | Case Study |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 7

**Session Outcome: 7** Students will be able to apply Clean Coding Techniques

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 20 | Clean Coding Techniques introduction | 2 | PPT | Case Study |
| 10 | Source file structure | 2 | PPT | Case Study |
| 10 | Naming conventions | 2 | PPT | Peer review |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 8

**Session Outcome: 8** Students can be able to understand the Test Driven Development (TDD)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Introduction Test Driven  Development (TDD) | 2 | PPT | Debate |
| 10 | **Motto of TDD** | 2 | PPT | --- NOT APPLICABLE  --- |
| 10 | Practical examples on TDD | 3 | PPT | Quiz/Test Questions |
| 10 | Sorting numbers using Merge sort | 4 | Talk | --- NOT APPLICABLE  --- |
| 5 | Conclusion&Summary | 1 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 9

**Session Outcome: 9** Students will be able to apply Introduction to Generics, usage of generics with interfaces

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Introduction to Generics | 2 | PPT | Case Study |
| 20 | Usage of generics with interfaces | 2 | PPT | --- NOT APPLICABLE  --- |
| 10 | Sample programs | 3 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 10

**Session Outcome: 10** Students will be able to understand the concept of Building stacks queues, and Priority Queues

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Building stacks | 2 | PPT | Immediate feedback |
| 10 | Building queues | 2 | PPT | Immediate feedback |
| 20 | Priority Queues | 2 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 11

**Session Outcome: 1** Students will be able to apply the comparator, comparable, cloneable & iterator interfaces

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Comparator and comparable interfaces | 2 | PPT | Case Study |
| 10 | Cloneable interfaces | 2 | PPT | --- NOT APPLICABLE  --- |
| 20 | Iterator interfaces | 2 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 12

**Session Outcome: 12** Students will be able to understand Sets and Maps and their Java API

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Introduction to Sets | 2 | PPT | Case Study |
| 20 | Introduction to Maps | 2 | PPT | Quiz/Test Questions |
| 10 | Sets and Maps Java API | 2 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 13

**Session Outcome: 13** Students will be able to understand AVL Trees

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | AVL Trees introduction | 2 | PPT | Brain storming session |
| 20 | Rotations | 2 | PPT | --- NOT APPLICABLE  --- |
| 10 | Sample program on AVL trees | 3 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 14

**Session Outcome: 14** Students will be able to apply Graph based Algorithms

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Graph based Algorithms introduction | 2 | PPT | Case Study |
| 10 | Dijkstra’s algorithm | 3 | PPT | Case Study |
| 20 | Prims algorithm | 3 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 15

**Session Outcome: 15** Students will be able to analyze Graph Visualization

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Graph Visualization | 2 | PPT | Focused listing |
| 10 | Large scale Graph Visualization | 2 | PPT | --- NOT APPLICABLE  --- |
| 20 | Practical examples and solutions | 3 | PPT | One minute paper |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 16

**Session Outcome: 16** Students will be able to analyze Traversal – DFS & BFS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Graph traversals | 2 | PPT | Immediate feedback |
| 20 | BFS | 3 | PPT | --- NOT APPLICABLE  --- |
| 10 | DFS | 3 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 17

**Session Outcome: 17** Students will be able to perform Case Study related to trees

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Splay trees | 2 | PPT | Immediate feedback |
| 10 | Red black trees |  | PPT | --- NOT APPLICABLE |
| 20 | Other trees | 2 | PPT | Case Study |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 18

**Session Outcome: 18** Students will be able to understand a Case Study related to graphs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Types of graph | 2 | PPT | Immediate feedback |
| 10 | Floyd warshall algorithm | 3 | PPT | --- NOT APPLICABLE  --- |
| 20 | Java programs on graph | 4 | PPT | Immediate feedback |
| 5 | Conclusion & Summary | 1 | PPT | Immediate feedback |

**SESSION NUMBER** : 19

**Session Outcome: 19** Students will be able to understand the Dynamic Programming methodology.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 20 | Dynamic Programming- Principle of optimality, methodology. | 2 | PPT | Case Study |
| 10 | Differentiate Greedy method and Dynamic Programming | 2 | PPT | Immediate feedback |
| 10 | Differentiate Divide & Conquer and Dynamic Programming | 2 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 20

**Session Outcome: 20** Students will be able to conceptualize Optimal Binary search trees

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Optimal Binary search trees | 2 | PPT | Immediate feedback |
| 10 | Insertion and deletion | 2 | PPT | --- NOT APPLICABLE  --- |
| 20 | Generating OBST for the given set of identifiers | 3 | PPT | Immediate feedback |
| 5 | Conclusion & Summary | 1 | PPT | Immediate feedback |

**SESSION NUMBER** : 21

**Session Outcome: 21** Students will be able to apply Introduction to Multithreading and Parallel Programming

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Introduction to Multithreading | 2 | PPT | --- NOT APPLICABLE  --- |
| 10 | Multiprocessing vs. Multithreading | 2 | PPT | --- NOT APPLICABLE  --- |
| 20 | Parallel Programming | 2 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 22

**Session Outcome: 22** Students will be able to apply Thread Concepts & its States

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Thread Concepts | 2 | PPT | Immediate feedback |
| 10 | Thread States | 2 | PPT | --- NOT APPLICABLE  --- |
| 20 | Thread programs on java | 3 | PPT | Case Study |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 23

**Session Outcome: 23** Students will be able to Create Tasks & Threads, Thread Classes, Thread Pools.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Creating Tasks & Threads. | 2 | PPT | Immediate feedback |
| 10 | Thread Classes | 2 | PPT | --- NOT APPLICABLE  --- |
| 20 | Thread Pools. | 2 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 24

**Session Outcome: 24** Students will be able to understand Thread Synchronization & Locks

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Time(min)** | | **Topic** | | **BTL** | | **Teaching- Learning Methods** | | **Active Learning Methods** | |
| 5 | | Attendance/ Recap /Poll/Pop Question | | 1 | | Talk | | --- NOT APPLICABLE | |
| 10 | | Why Synchronization? | | 2 | | PPT | | Immediate feedback | |
| 10 | | Thread Synchronization | | 2 | | PPT | | --- NOT APPLICABLE  --- | |
| 20 | | Locks | | 2 | | PPT | | --- NOT APPLICABLE  --- | |
| 5 | | Conclusion & Summary | | 1 | | PPT | | --- NOT APPLICABLE  --- | |

**SESSION NUMBER** : 25

**Session Outcome: 25** : Students will be able to understand Cooperation among Threads

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Cooperation among Threads | 2 | PPT | Immediate feedback |
| 20 | Case Study: Producer/Consumer | 3 | PPT | Immediate feedback |
| 10 | Producer/Consumer java program | 4 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 26

**Session Outcome: 26** Students will be able to analyze Blocking Queues, Semaphores,

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Blocking Queues | 2 | PPT | Immediate feedback |
| 10 | Semaphores | 2 | PPT | --- NOT APPLICABLE |
| 20 | Semaphores program | 3 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 27

**Session Outcome: 27** Students will be able to analyze Deadlock Avoidance.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Deadlocks | 2 | PPT | Immediate feedback |
| 10 | Deadlock Avoidance | 2 | PPT | --- NOT APPLICABLE  --- |
| 20 | Mutual exclusion | 2 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 28

**Session Outcome: 28** Students will be able to analyze Synchronized Collections & Parallel Programming

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Synchronized Collections | 2 | PPT | Immediate feedback |
| 10 | Parallel Programming | 2 | PPT | --- NOT APPLICABLE  --- |
| 20 | Synchronized methods programs in java | 2 | PPT | --- NOT APPLICABLE  --- |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 29

**Session Outcome: 29** Students will be able to understand JDBC - API, Component Architecture (2 Tier & 3 Tier)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | JDBC introduction | 2 | PPT | Debate |
| 20 | JDBC - API | 2 | PPT | Immediate feedback |
| 10 | Component Architecture of JDBC(2 Tier & 3 Tier) | 2 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 30

**Session Outcome: 30** Students will be able to apply Drivers & Its Types, Packages of JDBC Connections.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 20 | Drivers. | 2 | PPT | --- NOT APPLICABLE  --- |
| 10 | Types of drivers | 2 | PPT | Immediate feedback |
| 10 | Packages of JDBC Connections. | 2 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 31

**Session Outcome: 31** Students will be able to understand Steps to connect to Databases (PostgreSQL)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | PostgreSQL | 2 | PPT | Immediate feedback |
| 20 | Steps to connect to Databases | 3 | PPT | --- NOT APPLICABLE  --- |
| 10 | Demo on JDBC connection | 4 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 32

**Session Outcome: 32** Students will be able to apply Overview & Life Cycle of Servlet

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Overview Servlet | 2 | PPT | Immediate feedback |
| 20 | Life Cycle of Servlet | 2 | PPT | --- NOT APPLICABLE  --- |
| 10 | Servlet program | 3 | PPT | Immediate feedback |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 33

**Session Outcome: 33** Students will be able to understand the classes Attributes in Servlets, Interaction between Client & Servlet

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning** | **Active Learning** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | **Methods** | **Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Attributes in Servlets | 2 | PPT | Immediate feedback |
| 20 | Interaction between Client & Servlet | 2 | PPT | --- NOT APPLICABLE  --- |
| 10 | Interaction between Client & Servlet demo | 3 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 34

**Session Outcome: 34** Students will be able to analyze Servlet demo Application development with Sessions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Servlet demo Application | 3 | PPT | --- NOT APPLICABLE  --- |
| 20 | Sessions | 2 | PPT | Immediate feedback |
| 10 | Cookies | 2 | PPT | Brain storming session |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 35

**Session Outcome: 35** Students will be able to analyze java server pages(JSP)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 10 | JSP & Advantages over servlets | 2 | PPT | Immediate feedback |
| 20 | Features, syntax, Life Cycle of JSP | 2 | PPT | --- NOT APPLICABLE  --- |
| 10 | Environmental Setup for JSP. | 3 | PPT | --- NOT APPLICABLE  --- |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 36

**Session Outcome: 36** Students will be able to analyze the Interaction between client, JSP & server, JSP demo Application Development

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/ Recap /Poll/Pop Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 10 | Interaction between client, JSP & server | 2 | PPT | Immediate feedback |
| 10 | JSP demo Application Development | 3 | PPT | Immediate feedback |
| 20 | Deploy the app. and analyze it | 4 | PPT | Immediate feedback |
| 5 | Conclusion & Summary | 1 | PPT | --- NOT APPLICABLE  --- |

**Tutorial Course DELIVERY Plan:** NO Delivery Plan Exists

# Tutorial Session wise Teaching – Learning Plan

No Session Plans Exists

# Practical Course DELIVERY Plan:

|  |  |  |
| --- | --- | --- |
| **Tutorial Session no** | **Topics** | **CO-Mapping** |
| 1 | Structural patterns | CO5 |
| 2 | Test driven development | CO5 |

|  |  |  |
| --- | --- | --- |
| 3 | Clean code technique | CO5 |
| 4 | Stacks and queues | CO5 |
| 5 | AVL Trees | CO5 |
| 6 | BFS, DFS | CO5 |
| 7 | Binary search trees | CO5 |
| 8 | Multithreading | CO5 |
| 9 | Deadlock | CO5 |
| 10 | JDBC connectivity | CO5 |
| 11 | Servlet | CO5 |
| 12 | JSP | CO5 |

**Practical Session wise Teaching – Learning Plan SESSION NUMBER** : 1

**Session Outcome: 1** Analyze programs on structural design patterns

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on structural patterns | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on creational patterns | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 2

**Session Outcome: 2** Analyze programs on test driven development

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Program on test driven development | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Program on test driven development | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 3

**Session Outcome: 3** Analyze programs on Clean code techniques

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on Clean code techniques | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on Clean code techniques | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 4

**Session Outcome: 4** Analyze programs on stacks and queues

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on stacks | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on queues | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 5

**Session Outcome: 5** Analyze programs on AVL Trees

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 50 | Programs on AVL Trees | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on heaps | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 6

**Session Outcome: 6** Analyze programs on BFS, DFS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on BFS | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on DFS | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 7

**Session Outcome: 1** Analyze programs on binary search trees

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | programs on binary search trees creation | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | programs on binary search trees deletion | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 8

**Session Outcome: 8** Analyze programs on multithreading

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on Multithreading | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on threads | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 9

**Session Outcome: 9** Analyze programs on deadlocks

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on deadlock avoidance | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on locking mechanism | 4 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 10

**Session Outcome: 10** Analyze programs on JDBC connectivity

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on JDBC connectivity | 4 | PPT | --- NOT APPLICABLE  --- |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 50 | Programs on client server communication | 4 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 12

**Session Outcome: 12** Analyze programs on servlets

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on servlets | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on attributes of servlet | 4 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 12

**Session Outcome: 12** Analyze programs on JSP

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on JSP | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on JSP | 4 | PPT | --- NOT APPLICABLE  --- |

# Skilling Course DELIVERY Plan:

|  |  |  |
| --- | --- | --- |
| **Skilling session no** | **Topics/Experiments** | **CO-Mapping** |
| 1 | Behavioral patterns | CO5 |
| 2 | Generics | CO5 |

|  |  |  |
| --- | --- | --- |
| **Skilling session no** | **Topics/Experiments** | **CO-Mapping** |
| 3 | Priority queues | CO5 |
| 4 | Comparable interfaces | CO5 |
| 5 | Sets and maps | CO5 |
| 6 | Graph algorithms | CO5 |
| 7 | Dynamic programming | CO5 |
| 8 | Threads | CO5 |
| 9 | Producer Consumer problem | CO5 |
| 10 | Semaphores | CO5 |
| 11 | Synchronized collections | CO5 |
| 12 | Drivers and packages of JDBC | CO5 |

**Skilling Session wise Teaching – Learning Plan SESSION NUMBER** : 1

**Session Outcome: 1** Analyze programs on behavioral patterns

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Behavioral patterns | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Decorative patterns | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 2

**Session Outcome: 2** Analyze programs on generics

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on generics | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Usage of generics with interfaces. | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 3

**Session Outcome: 3** Analyze programs on Priority queues

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on Priority queues | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on Priority queues | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 4

**Session Outcome: 4** Analyze programs on comparable interface

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on comparable interface | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on cloneable interface | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 5

**Session Outcome: 5** Analyze programs on sets and maps

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on sets | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on maps | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 6

**Session Outcome: 6** Analyze programs on graph algorithms

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on Dijkstra’s algorithm | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on Prims algorithm | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 7

**Session Outcome: 7** Analyze programs on Dynamic Programming

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on Dynamic Programming | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on Dynamic Programming | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 8

**Session Outcome: 8** Analyze programs on threads

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on thread creation | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on states of thread | 4 | PPT | --- NOT APPLICABLE  --- |

# SESSION NUMBER : 9

**Session Outcome: 9** Analyze programs on producer consumer problem

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on producer consumer problem | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on dining philosophers problem | 4 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 10

**Session Outcome: 10** Analyze programs on semaphores

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on semaphores | 4 | PPT | --- NOT APPLICABLE  --- |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 50 | Programs on blocking queues | 4 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 11

**Session Outcome: 11** Analyze programs on synchronized collections

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on synchronized collections | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on synchronized collections | 4 | PPT | --- NOT APPLICABLE  --- |

**SESSION NUMBER** : 12

**Session Outcome: 12** Analyze programs on drivers and packages of JDBC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time(min)** | **Topic** | **BTL** | **Teaching- Learning Methods** | **Active Learning Methods** |
| 5 | Attendance/Poll Question | 1 | Talk | --- NOT APPLICABLE  --- |
| 45 | Programs on drivers of JDBC | 4 | PPT | --- NOT APPLICABLE  --- |
| 50 | Programs on packages of JDBC | 4 | PPT | --- NOT APPLICABLE  --- |

# EVALUATION PLAN:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Evaluation Type** | **Evaluation Component** | **Weightage/Marks** | | **Assessment Dates** | **Duration (Hours)** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| **End Semester Summative Evaluation Total= 40**  **%** | **Skill Sem-End Exam** | Weightage | 10 |  | 90 |  |  |  |  | 10 |
| Max Marks | 50 |  |  |  |  | 50 |
| **End Semester Exam** | Weightage | 20 |  | 180 | 5 | 5 | 5 | 5 |  |
| Max Marks | 100 | 25 | 25 | 25 | 25 |  |
| **Lab End Semester Exam** | Weightage | 10 |  | 90 |  |  |  |  | 10 |
| Max Marks | 50 |  |  |  |  | 50 |
| **In Semester Formative Evaluation Total= 25**  **%** | **Skilling Continuous Evaluation** | Weightage | 10 |  | 120 |  |  |  |  | 10 |
| Max Marks | 50 |  |  |  |  | 50 |
| **Continuous Evaluation - Lab Exercise** | Weightage | 10 |  | 120 |  |  |  |  | 10 |
| Max Marks | 50 |  |  |  |  | 50 |
| **MOOCs Review** | Weightage | 5 |  | 120 | 1.25 | 1.25 | 1.25 | 1.25 | 5 |
| Max Marks | 40 | 10 | 10 | 10 | 10 |  |
| **In Semester Summative Evaluation Total= 35**  **%** | **Semester in Exam-I** | Weightage | 10 |  | 90 | 5 | 5 |  |  |  |
| Max Marks | 50 | 25 | 25 |  |  |  |
| **Semester in Exam-II** | Weightage | 10 |  | 90 |  |  | 5 | 5 |  |
| Max Marks | 50 |  |  | 25 | 25 |  |
| **Lab In Semester Exam** | Weightage | 15 |  | 90 |  |  |  |  | 15 |
| Max Marks | 50 |  |  |  |  | 50 |