



University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur



Syllabus for B.Tech Admission Batch 2022

Subject Name: Advanced Programming (OOP)

Credit: 3

Lecture Hours: 36

Subject Code: PCCCS405

Semester: 4

Familiarity with data structures, and introduction to programming.

Learning Outcomes of the course (i.e., statements on students' understanding and skills at the end of the course the student shall have):
Essential:

1. Understanding the build system: IDE, tools for testing, debugging, profiling, and source code management.
2. Students are able to demonstrate proficiency in object-oriented programming.
3. Identify and abstract the programming task involved for a given programming problem.
4. Learning and using language libraries for building large programs.
5. Ability to apply defensive programming techniques (e.g., assertions, exceptions).

Desirable/Advanced:

1. Ability to implement basic event-driven programming.
2. Understanding of the fundamentals of parallel programming.
3. Understanding of the basics of cloud computing.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1.	Familiarity with the programming environment	Understanding the build system, IDE, debugging, profiling and source code management. Introduction to various programming paradigms, advantages of OOP, comparison of OOP with Procedural Paradigm	International Academia: https://drive.google.com/file/d/10z00dMd26WjiPThhCercGbsi6u3ciE62/view?usp=drive_link https://drive.google.com/file/d/1k3qrfDL9p5_UJR_iP2mt6c6AzwmByNtf/view?usp=sharing AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used.	3	Familiarity with terminal/command prompt, using git commands and github to pull/ commit/ push/ merge code, writing, compiling and running simple programs, debugging by setting breakpoints
2.	Basic principles of the object-oriented development process	Introduction to Object-Oriented Paradigm: Data encapsulation, modularity, code reuse, identifying classes, attributes, methods and objects, class relationships	International Academia: https://drive.google.com/file/d/1Rc1KOzkVRHqLEWApFBplwz7s8IwsyFlf/view?usp=sharing https://drive.google.com/file/d/1e8g7D6nuMwEruToXtNDbh68vx2VKUrgS/view?usp=sharing AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used.	4	Importing pre-written classes using the this keyword, calling and defining methods, writing and instantiating classes, setter/getter methods, instance variables, returning values, debugging using print function, containment and association, scope and parameter passing

3.	Advanced features of OOP	Polymorphism, Inheritance, abstract classes & Interfaces, copying and cloning objects, Wrapper class, Stream, I/O operations	International Academia: International Standards Mapping (MIT Open Courseware): String: immutability, BufferedReader, StringBuilder (https://ocw.mit.edu/ans7870/6/6.005/s16/classes/09-immutability/) Polymorphism : Methods : Overloading and overriding Methods, overloading constructors https://ocw.mit.edu/courses/6-088-introduction-to-c-memory-management-and-c-object-oriented-programming-january-iap-2010/67b1aec3f2867734ec0fb33034c8b5c8/MIT6_088IAP10_lec05.pdf AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used.	8	Parameter polymorphism, method resolution, declared v/s actual type, partially and fully overriding methods, calling superclass constructor from child class constructor, protected fields and methods, using an abstract parent class v/s an interface with default and abstract methods, object equality check, object comparison (Comparable/Comparator interface), Cloneable interface/copy constructor
4.	Access modifiers, Exceptions & Multithreading	Access modifiers, packages, Java APIs, Exception handling, Java Thread Programming	International Academia: https://drive.google.com/file/d/1yFNf2IBXgy6ch47hR6TGHzzdvCPfVm8p/view?usp=sharing AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used.	6	Exception handling using try/catch block, nesting try/catch blocks, throw and throws keywords, rethrowing exceptions, handling checked exception, user defined exceptions. Thread Synchronization and Thread Communication

5.	Collection Framework	Language supported libraries for handling advanced data structures.	International Academia: https://drive.google.com/file/d/1kbRGF396sQPdQbA4w-N81EIKU_bdGgFs/view?usp=sharing AICTE-prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used.	4	Time complexity analysis, Java collection framework (or Boost libraries), sorting objects, iterating over objects
6.	Modeling and Design patterns	Basic modeling techniques – e.g. Class diagram, sequence diagram, use case diagrams, etc. Introduction to design patterns: iterator, singleton, flyweight, adapter, strategy, template, prototype, factory, façade, decorator, composite, proxy, chain of responsibility, observer, state) Model View Controller	International Academia: https://drive.google.com/file/d/1DQVPfhmcyKog-PryPdZ-bxufUC7D0Cfl/view?usp=sharing AICTE-prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used.	4	UML modeling.
7.	Basic Android Programming & UI Design	Android Components – Activity, Services, Content Provider, Broadcast Receiver; Simple UI Design, Applet and Swing	International Academia: (https://online.stanford.edu/courses/cs108-object-oriented-systems-design) AICTE-prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform,. Android Studio will be used.	7	Android app making, stand alone and web app development.

Suggested text books:

1. Herbert Schildt, Java: The Complete Reference, 11st edition
2. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston. Object-Oriented Analysis and Design with Applications.
3. E. Balaguruswami, Programming with Java, 6th edition
4. Barry A. Burd and John Mueller, Android Application Development All-in-One For Dummies

Suggested reference books / Online resources:

- J. Rumbaugh et al. The Unified Modeling Language Reference Manual.
- P. Van Roy and S. Haridi. Concepts, Techniques, and Models of Computer Programming.
- Horton, I. (2005). Ivor Horton's Beginning Java 2. John Wiley & Sons.
- <https://missing.csail.mit.edu/>
- <https://www.baeldung.com/junit>
- <https://www.tutorialspoint.com/junit/index.htm>

For UML tools, open source tools may be used (e.g. www.starUML.io, argouml.tigris.org/)

**Submitted by Prof. Amartya Mukherjee, Prof. Subhadip Chandra, Prof. Subhajit Adhikari, Prof. Anindita Das Bhattacharjee, Dept. of CSE(AIML), CSE, BSH, IEM, Kolkata, Salt Lake Campus*