

Java Multithreading Course Content

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Module 1: Introduction to Multithreading

- What is a Process and a Thread?
- Advantages and Disadvantages of Multithreading
- Life Cycle of a Thread
- Multitasking vs Multithreading vs Multiprocessing
- Java Thread Model and JVM thread scheduling

Practical: Print numbers from two threads simultaneously.

Module 2: Creating and Running Threads

- Thread class, Runnable, Callable, and Future
- Thread methods: start(), run(), join(), sleep(), yield(), interrupt()

Practical: Create and run threads using Thread and Runnable.

Module 3: Thread States and Life Cycle

- NEW, RUNNABLE, BLOCKED, WAITING, TIMED_WAITING, TERMINATED
- Daemon Threads

Practical: Program showing thread states.

Module 4: Thread Synchronization

- Race Conditions, Synchronized Methods and Blocks
- Object Locks vs Class Locks

Practical: Banking example with and without synchronization.

Module 5: Inter-Thread Communication

- wait(), notify(), notifyAll()
- Producer-Consumer problem
- Deadlock and Livelock

Practical: Producer-Consumer using wait/notify.

Module 6: Advanced Thread Control

- Thread priorities, Thread groups, ThreadLocal, volatile

Practical: Demonstrate ThreadLocal and volatile.

Module 7: Concurrency Utilities (java.util.concurrent)

- ExecutorService, Thread Pools, Callable, Future
- CountdownLatch, CyclicBarrier, Semaphore, Exchanger
- BlockingQueue, ReentrantLock, ReadWriteLock

Practical: Thread pool and Producer-Consumer using BlockingQueue.

Module 8: Parallel Programming and Best Practices

- Fork/Join Framework, Parallel Streams
- Thread-safe collections, Performance tuning

Practical: Parallel stream example and ConcurrentHashMap demo.

Module 9: Real-World Projects

- Multi-threaded file downloader
- Producer-consumer data pipeline
- Web server thread pool simulator
- Bank system with locks

Module 10: Interview and Certification Preparation

- Common Interview Questions
- Multithreading Design Patterns
- Common tricky scenarios

Recommended Learning Flow:

- Basics (Modules 1-3): 3-4 days
- Synchronization (Modules 4-5): 3-4 days
- Advanced Control (Modules 6-7): 4-5 days
- Parallelism and Projects (Modules 8-9): 5-7 days

- Interview Prep (Module 10): 2-3 days