**Distributed Systems**

**Overview**

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| Level | 4 (Semester 7) |
| Duration | 4 weeks |
| Lectures | 2x40 minutes/week for 2 weeks |
| Practicals/tutorials | 5x2 hours/week for 3 weeks |

**Learning Outcomes**

1. Students will demonstrate mastery of core principles and concepts of distributed systems.
2. Students will develop the ability to think analytically and creatively about how to implement distributed systems and the ability to propose appropriate solutions by applying concepts and protocols.

**Syllabus**

1. Course Introduction
2. Client-Server model, Remote Method Invocation
3. Serialization, Callbacks, RMI Activation
4. Basic programming concepts of concurrently executing Threads
5. Thread concurrency, Race Conditions, Critical Sections, Mutual Exclusion, Synchronization (Monitor), Producer-Consumer pattern
6. Socket communication
7. Transaction Management, ACID Properties, Failure Situations, Serial Equivalence
8. Transaction Management, Concurrency Control (Shared Read Locks, Strict Two-Phase Locking)
9. Optimistic Concurrency Control
10. Nested Transactions, Commit Protocols, Locking in Nested Transactions
11. Distributed Commit Protocols
12. Distributed Commit Protocols, Failure Situations
13. Distributed Deadlocks, Deadlock prevention, detection and resolution, Coffman Conditions
14. Reliability and Availability, Fault Tolerance, Active and Passive Replication