*Ministry of Higher Education and Scientific Research*
*University of Mosul*
*College of Engineering*
*-Computer Engineering Department*
*Detailed Description of the Distributed Systems Course*

**Course: Distributed Systems Code: ENCO Class: Msc**

**Course Description:**

**Understanding the main characteristics of distributed systems and the various design choices required for building a distributed system, such as the architectural models varying from client/server to peer-to-peer, grid-computing; the communication models ranging from client-pull (RPC/RMI, Message Queuing, …) to server-push models (publish-subscribe, …); the synchronisation techniques based on the system clock, on the logical clock (timestamp) and the token ring; the standard middlewares such as RPC, RMI, CORBA and SOAP.**

**Textbook ( S ) :**

**1- Distributed Systems: Concepts and Design by G. Coulouris, J. Dollimore, and T. Kindberg.**

**2- Distributed Systems: Principles and Paradigms by A. S. Tanenbaum and M. V. Steen.**

**3- Distributed Computing: Concepts and Applications by M.L Liu.**

**Course Objectives :**

**The course aims at giving the students a broad foundation in the fundamental concepts of distributed systems accompanied by specific projects to develop the basic skills in network programming using RMI or RPC. It introduces the basic architectural models of distributed systems as well as the communication paradigms such as Publish/Subscribe, Message passing, Remote Procedure Call/ Remote Method Invocation, Message Queuing, etc. Besides, it presents various techniques of synchronisation. It aims to introduce distributed algorithms such as election, mutual exclusion, etc.**

**1.** CHARACTERIZATION OF DISTRIBUTED SYSTEMS **… 2 week**

1.1 Introduction
1.2 Examples of distributed systems
1.3 Trends in Distributed Systems
1.4 Focus on resource sharing
1.5 Challenges
1.6 Case study: The World Wide Web

**2.** SYSTEM MODELS **… 2 week**

2.1 Introduction
2.2 Physical models
2.3 Architectural models
2.4 Fundamental models

**3.** INTERPROCESS COMMUNICATION **….2 week**

3.1 Introduction
3.2 The API for the Internet protocols
3.3 External data representation and marshaling
3.4 Multicast communication 169
3.5 Network virtualisation: Overlay networks
3.6 Case study: MPI

**4.** REMOTE INVOCATION **… 2 week**

4.1 Introduction
4.2 Request-reply protocols
4.3 Remote procedure call
4.4 Remote method invocation
4.5 Case study: Java RMI

**5.** INDIRECT COMMUNICATION **… 2 week**

5.1 Introduction
5.2 Group communication
5.3 Publish-subscribe systems
5.4 Message queues
5.5 Shared Memory Approaches

**6.** TIME AND GLOBAL STATES **… 2 week**

6.1 Introduction
6.2 Clocks, events and process states
6.3 Synchronizing physical clocks
6.4 Logical time and logical clocks
6.5 Global states
6.6 Distributed debugging

**7.** COORDINATION AND AGREEMENT **… 2 week**

7.1 Introduction
7.2 Distributed Mutual Exclusion
7.3 Elections
7.4 Coordination and agreement in group communication 646
7.5 Consensus and related problems

**Final Exam** **….1 week**

**Examinations plan:**

40 % of the total marks is for the two semesters' examinations and works planned as follows:20 %= 15% (1st Semester Exam.) + 5 % (quizzes and home works)
10 % =java projects.
60% final exam.

**Scientific category of this course to ABET Criteria:**

- ☐ **College-level mathematics**
- ■ **Engineering topics**
- ☐ **General education**

**Prepared by :**
**Dr. Turkan Ahmed Khaleel**
**Email ID:** turkan@uomosul.edu.iq