Mansoura University

Faculty of Computers and Information Sciences

Course Specifications of

Distributed Systems – CS412P

University: Mansoura University   **Faculty**: Computer and Information Sciences

Program on which the course is given: Computer Science

Department offering the course: Department of Computer Science

Academic year/ Level: Fourth Year

Date of specification approval:

A- Basic Information

Title :   Distributed Systems   **Code:**   **CS412P**
Hours :   4   **Lecture :**   2   **Tutorial :0**   **Practical :2**

B- Professional Information

1- Overall Aims of the Course

This course aims to present the basic concepts and techniques of Distributed Systems. It enables the students to understand the basic concepts, development models and algorithms of distributed systems and its differences from centralized systems. This course overviews the basic middleware types and their roles as extension for the operating systems to enable distribution of computations over computer networks, mobile networks and Internet. In addition, the course introduces some recent advanced distributed file systems, algorithms and paradigms such as Web Services and Map-Reduce. Students completing the course should know the fundamentals of programming different distributed systems including Distributed Object Computing, Message Passing, Web Services, … etc.

2- Intended Learning Outcomes of the course (ILOs)

By completing this course successfully, the student will be able to:

a- Knowledge and Understanding

a1 Essential facts, concepts, principles and theories relating to computing and information and computer applications as appropriate to the program of study.

a2 Modeling and design of computer-based systems bearing in mind the trade-offs.

a3 Tools, practices and methodologies used in the specification, design, implementation and evaluation of computer software systems.

a4 Criteria and specifications appropriate to specific problems, and plan strategies for their solution.

a5 Essential facts, concepts, principles and theories relating to computing and information and computer applications as appropriate to the program of study.

a6 The current and underlying technologies that support computer processing and inter-computer communication.

a7 Principals of generating tests which investigate the functionality of computer programs and computer systems and evaluating their results.

a10 Current developments in computing and information research. Use

a13 high-level programming languages.

a16 Know and understand the principles and techniques of a number of application areas informed by the research directions of the subject, such as artificial intelligence, natural language processing, data mining, databases and computer graphics.

a18 Understand the fundamental topics in Computer Science, including hardware and software architectures, software engineering principles and methodologies, operating systems, compilers, parallel and distributed computing, systems and software

a19 Select advanced topics to provide a deeper understanding of some aspects of the subject, such as hardware systems design, object-oriented analysis and design, and artificial intelligence, and parallel and concurrent computing

b- Intellectual Skills

b1. Analyze computing problems and provide solutions related to the design and construction of computing systems.

b2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline.

b3 Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution.

b4. Analyze, propose and evaluate alternative computer systems and processes taking into account limitations, and quality constraints.

b5.   Make ideas, proposals and designs using rational and reasoned arguments for presentation of computing systems.

b6.   Evaluate the results of tests to investigate the functionality of computer systems.

b7   Achieve judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact.

b11   Perform comparisons between (algorithms, methods, techniques...etc).

b14   Summarize the proposed solutions and their results.

b18.   Solve computer science problems with pressing commercial or industrial constraints.

b19.   Generate an innovative design to solve a problem containing a range of commercial and industrial constraints.

c- Professional and Practical Skills c1 Operate computing equipment, recognizing its logical and physical properties, capabilities and limitations.

c4   Apply computing information retrieval skills in computing community environment and industry.

c5   Develop a range of fundamental research skills, through the use of online resources, technical repositories and library-based material.

d- General and Transferable Skills d1 Demonstrate the ability to make use of a range of learning resources and to manage one's own learning. d2 Demonstrate skills in group working, team management, time management and organizational skills.

3- Contents

No	Course Content	Lecture	Practical	Total
1	Introduction to basic concepts of Distributed Systems and Middleware and their challenges, characteristics, types, ... etc.	2	1	3
2	Computational and architectural models of Distributed systems.	2	1	3
3	Overview of *RPC/RMI* model's architecture and its use as a Direct Communication Middleware	1	2	3
4	Overview of *Publish-Subscribe* model's architecture and its use as Indirect Communication Middleware	1	2	3
5	Basic concepts of Distributed File Systems, with an overview of GFS and HDFS as case studies.	2	1	3
6	Applying distributed algorithms using Map-Reduce Parallel Model on distributed systems.	1	2	3
7	Overview of using Wireless Sensor Networks in distributed systems	1	1	2

8	The basic principles and characteristics of Mobile and Ubiquitous Computing and applying them as distributed systems using technologies such as Web services.	2	2	4
Total Hours		**24**	**24**	**48**

4- Assessment Schedule

Assessment Method	No.	Description	Week No.	Weight (%)
Short Assignments	1	Lab Practicals + Short Reports	1-6,8-12	10
Short Written Exams	2	Midterm Exam	7	10
Long Assignment	3	Small Project	5-12	10
Oral Exam	4	Oral questions	10	10
Long Written Exams	5	Final Exam	14	60
Total				**100**

5- List of references

5.1 Course Notes - Course slides (handed
to the students).

5.2 Reference Books (Text Books)
- "Distributed Systems: Concepts and Design", George F. Coulouris, et al. 4th Ed., 2011.
- "Distributed Systems: Principles and Paradigms", Andrew S. Tanenbaum, Maarten van Steen. 2nd Ed., 2016.
- "Distributed Computing: Principles, Algorithms, and Systems", Ajay D. Kshemkalyani, Mukesh Singhal, 1st Ed, 2011.
- "Hadoop: The Definitive Guide: Storage and Analysis at Internet Scale", Tom White, 4th Ed., 2015.

6- Facilities Required for Teaching and Learning -
Data show.
- PCs Lab

Course Content/ILO Matrix

Course Contents	a1	a2	a3	a4	a5	a6	a7	a10	a13	a16	a18	a19	b1	b2	b3	b4	b5	b6	b7	b11	b14	b18	b19	c1	c4	c5	d1	d2
1-Introduction to basic concepts of Distributed Systems and Middleware and their challenges, characteristics, types, ... etc.	•			•	•						•			•						•								
2- Computational and architectural models of Distributed systems.	•	•		•	•	•					•			•		•			•	•							•	
3- Overview of *RPC/RMI* model architecture and its use as a Direct Communication Middleware	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•	•	•	•	•	•
4- Overview of *Publish-Subscribe* model and its use as Indirect Communication Middleware	•	•	•		•	•	•	•	•	•	•	•	•	•	•		•	•			•	•	•	•	•	•	•	•
5- Basic concepts of Distributed File Systems, with an overview of GFS and HDFS as case studies.	•	•	•	•	•						•			•		•			•		•					•		
6- Applying distributed algorithms using Map-Reduce Parallel Model on distributed systems.	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•			•	•	•	•	•	•	•	•
7- Overview of using Wireless Sensor Networks in distributed systems	•				•	•					•			•							•					•		
8- The basic principles and characteristics of Mobile and Ubiquitous Computing and applying them as distributed systems using technologies such as Web services.	•	•		•	•	•	•	•	•	•	•	•				•	•	•	•			•		•	•	•	•	•

Learning Method/ILO Matrix

Course Contents	a1	a2	a3	a4	a5	a6	a7	a10	a13	a16	a18	a19	b1	b2	b3	b4	b5	b6	b7	b11	b14	b18	b19	c1	c4	c5	d1	d2
Lectures	•			•	•	•			•	•	•		•								•	•						
Tutorials		•	•	•			•		•		•	•			•	•	•	•	•		•	•	•	•	•	•	•	•

Assessment Methods/ILO Matrix

Assignment	a1	a2	a3	a4	a5	a6	a7	a10	a13	a16	a18	a19	b1	b2	b3	b4	b5	b6	b7	b11	b14	b18	b19	c1	c4	c5	d1	d2
Short Assignments		•	•	•			•		•		•	•									•	•		•	•	•	•	
Long Assignment		•	•	•			•		•		•	•				•	•	•	•		•	•	•	•	•	•	•	•
Short Written Exam	•			•	•	•			•	•			•	•							•	•						
Oral exam	•			•	•	•			•	•			•	•							•	•						
Long Written Exam	•			•	•	•			•	•					•	•	•				•	•						

Course Coordinator: Dr. Mohammed Alrahmawy
Head of Department: Dr. Samir Elmogy
Date   :   2016- 2017