Subject: Fundamentals of Computer Systems
Code: 18473
Institution: Escuela Politécnica Superior
Degree: Telecommunication Technologies and Services Engineering
Level: Graduate
Type: Core course
ECTS: 6

1. COURSE TITLE

Fundamentals of Computer Systems

1.1. Course number

18473

1.2. Course area

Computer Science

1.3. Course type

Core course

1.4. Course level

Undergraduate

1.5. Year

2º

1.6. Semester

2º

1.7. Credit allotment

6

1.8. Prerequisites

Fundamentals of Computer Systems belongs to the Subject *1.3:* Computer Science from the core course module of the Degree of Telecommunication Technologies and Services Engineering.

This area contains three related subjects: Programming 1, Programming 2 and Fundamentals of Computer Systems.

1.9. Minimum attendance requirement

There are two options: continuous assessment and non-continuous assessment. Students can decide on one option at the start of the course and meet the different assessment requirement set for each model.

CONTINUOUS ASSESSMENT METHOD WITH COMPULSORY CLASS ATTENDANCE
Attendance of at least 85% of face-to-face classes is compulsory.

NON-CONTINUOUS ASSESSMENT METHOD WITHOUT COMPULSORY CLASS ATTENDANCE
Attendance to face-to-face classes s recommended, but not compulsory.

1.10. Faculty data

Add @uam.es to all email addresses below.

Theory:

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1.11. Course objectives

FB2: Basic knowledge about computers and their programming, operating systems, data bases and engineering software.

The main objectives of this course are related to:

Fundamentals, description and use of computer systems. Introduction to operating systems: tasks and scheduling, I/O, concurrency, threads and semaphores. Introduction to data bases: basic SQL.

UNIT BY UNIT SPECIFIC OBJECTIVES	
TEMA 1.- Introduction to operating systems	
1.1.	General overview of the components of operating systems.
1.2.	Basic concepts developed along the units dealing with operating system.
1.3.	Why studying operating systems, kinds of problems and solutions.
1.4.	Operating systems: history.
1.5.	Operating systems: components.
TEMA 2.- Processes and threads	
2.1.	Concept of “process”.
2.2.	Design concepts associated to the execution control.
2.3.	“Threads” vs “processes”.
2.4.	Differences between “Threads” and “processes”.
2.5.	“Threads” as base for multithread systems.
2.6.	Scheduling: levels and algorithms.
TEMA 3.- Concurrency	
3.1.	Potential problems of concurrent task execution.
3.2.	Mutual exclusion in operating systems.
TEMA 4.- Memory management, virtual memory	
5.1.	Memory partitioning.
5.1.	Virtual memory: hardware and software implementation.
5.1.	Memory assignment to tasks and thrashing.
TEMA 5.- Input and Output, file management	

5.1.	Relations between hardware and virtual devices.
5.2.	Different mechanisms of interaction with different devices. Operating System consequences.
TEMA 6.- Introduction to Data Bases (DB) and its design	
6.1.	Basic concepts related to Data Bases.
6.2.	DB creation.
6.3.	Practical use of a DB Management System (DBMS).
6.4.	Basic DB structure design.
6.5.	Basic SQL writing and execution.
TEMA 7.- Relational Model	
7.1.	Formal and systematized design of DB.
7.2.	Properties of relational design.
7.3.	Query creation.

1.12. Course contents

1. Introduction to Operating Systems (OS)
- 1.1. Definition and need.
- 1.2. Evolution
- 1.3. Main achievements
- 1.4. System calls
- 1.5. Parts and Structure
- 1.6. Examples

2. Processes and threads
- 2.1. Process
- 2.2. Creation and end of process
- 2.3. Process description: control structures
- 2.4. Process control and execution mode
- 2.5. Threads vs. Processes, threads at kernel and user levels
- 2.6. Scheduling

3. Concurrency
- 3.1. Principles
- 3.2. Interaction among processes

3.3. Mutual exclusion
3.4. Semaphores
3.5. Deadlock
3.6. Deadlock example: Dining philosophers problem

4. Memory management
4.1. Requirements
4.2. Partitioning
4.3. Paging, segmentation and virtual memory principles
4.4. Virtual memory based on paging
4.5. Virtual memory based on segmentation
4.6. Design and implementation issues

5. Input and Output, file management
5.1. I/O in Operating Systems
5.2. I/O: Hardware and Software principles
5.3. Software for I/O
5.4. Structure and kinds of files
5.5. File access, file attributes
5.6. Directory structures and paths
5.7. File and directory implementation, shared files and disk space administration

6. Introduction to Data Bases (DB) and its design
6.1. Concepts and definitions
6.2. DB Management Systems (DBMS)
6.3. Introduction to SQL
6.4. Entity relationship model

7. Relational model
7.1. Relational diagrams
7.2. Funtional dependencies
7.3. Normal forms
7.4. Relational calculus

1.13. Course bibliography

Operating Systems:

1. Sistemas Operativos – Aspectos internos y principios de diseño, de W. Stallings. Ed: Prentice-Hall.
2. Sistemas Operativos Modernos, de A. Tanenbaum. Ed: Pearson Educación.
3. Sistemas Operativos, de G. Nutt. Ed: Pearson Educación.
4. Operating System Concepts. A. Silberschatz, P. Baer Galvin, G. Gagne. Ed: Limusa Wiley.

5. Sistemas Operativos – Una Visión Aplicada, de J. Carretero, F. García, P. De Miguel y F. Pérez. Ed: Mc. Graw-Hill.
6. Programación concurrente. Palma, José T. Ed: Thomson.
7. Sistemas operativos. Ejercicios resueltos. Casillas, Arantza. Ed: Pearson/Prentice Hall.
8. Fundamentos de Sistemas Operativos. Teoría y ejercicios resueltos. Candela, Santiago. Ed: Thomson.

Data Bases:

1. Fundamentos de sistemas de bases de datos (5ª edición). Ramez Elmasri, Shamkant Navathe. Pearson Addison Wesley, 2007. INF/681.31.65/ELM.
2. Database Management Systems (3rd edition). Raghu Ramakrishnan, Johannes Gehrke. McGraw-Hill, 2003. INF/C6160/RAM.
3. Database Systems: The Complete Book (2nd edition). Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom. Prentice Hall, 2008.
4. Fundamentos de diseño de bases de datos (5ª edición). Abraham Silberschatz. McGraw-Hill, 2007. INF/681.31.65/SIL.