SUBJECT TEACHING GUIDE

G677 - Advanced Operating Systems

Degree in Computer Systems Engineering

Academic year 2022-2023

1. IDENTIFYING DATA					
Degree	Degree in Computer Systems Engineering			Type and Year	Optional. Year 4
Faculty	Faculty of Sciences				
Discipline	Subject Area: Computer Engineering Mention in computer Engingeering				
Course unit title and code	G677 - Advanced Operating Systems				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Web	https://www.ce.unican.es/course/soa/				
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERÍA INFORMÁTICA Y ELECTRÓNICA
Name of lecturer	VALENTIN PUENTE VARONA
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Other lecturers	

3.1 LEARNING OUTCOMES
- Understand the fundamental design goals of an Operating Systems and how condition its implementation
- Understand how the Operating System performs the resource virtualization
- Understand how the Operating System enables concurrency
- Understand how the Operating System guarantees persistency

4. OBJECTIVES

The student should :
- Understand why they are necessary virtualization, concurrency and persistence in a modern operating system to achieve the desired functionality
- Understand abstractions by the operating system it provides such functionalities
- Know, in first approximation, the implementation of mechanisms that support

6. COURSE ORGANIZATION	
CONTENTS	
1	Topic 1. Introduction. Rationale and design goals in an operating system.
2	Topic 2 .- Virtualization. Part I Processes - Abstraction: processes and their API - Mechanism: Limited direct execution - Scheduling: Introduction - Scheduling: Multilevel queues with feedback - Scheduling: Proportional Share - Scheduling multiprocessor systems Part II: Memory - Abstraction: address space and memory API - Translation of addresses - Segmentation - Free space management in libc. - TLB - Pages: Small Tables - Beyond Physical memory: Mechanisms - Beyond Physical Memory: Policies
3	Unit 3. Thread Concurrency. Concurrency and threads, threads API, Locks, condition variables, semaphores, concurrency bugs, event-based concurrency
4	Topic 4.- Persistence - I / O Devices - Mechanical and solid state hard drives - Files and directories - File system and implementation - FFS and consistency - File systems with journaling, - Log-based file systems - data integrity and security
5	Lab
5.1	Lab 1- Introduction to the environement
5.2	Lab 2 - Introduction to xv6: system calls - Implementation of a system call in xv6
5.3	Lab 3 - Scheduling. - Implement a MLFQ scheduler in xv6
5.4	Lab 4 - Memory - Implement support for shared pages in xv6
5.5	Lab 5 - Concurrence - Implement thread support in xv6
5.6	Lab 6 - File systems - Optimize the handling of small files in the xv6 file system
6	Evaluation

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
T1: Midterm 1 Theory Follow-up Midterm 1 Theory	Written exam	No	Yes	5,00
P1: Laboratory Practices 1 Lab part 1	Written exam	No	Yes	35,00
T2: Final exam Theory	Written exam	Yes	Yes	45,00
P2: Laboratory practicals 2 Lab part 2	Written exam	Yes	Yes	15,00
TOTAL				100,00

Observations

It is a necessary and indispensable condition to deliver on time the laboratory practicals corresponding to the corresponding evaluation exams (P1 and P2). The practicals must be accessible to the teacher (through the pre-established mechanisms) at the time of the practical exams.

In order to pass the course, the average marks of the practical part (i.e., P1*0.7+P2*0.3) and the theoretical part (i.e., T1*0.1+T2*0.9) must be higher than 3.0.

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In order to pass the course, the average grade of the labs and theory exams must be higher than 3.0.

Observations for part-time students

In agreement with the teacher, and within the pre-established time limits, the work of the part-time students will be evaluated, by means of a practical-theoretical exam. Like the rest of the students, they are obliged to hand in the laboratory practices in order to be evaluated by means of this exam. The appropriate channels will be used to facilitate this delivery.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Operating Systems: Three Easy Pieces
Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau
Arpaci-Dusseau Books
March, 2015