



Universitat de Lleida

DEGREE CURRICULUM

OPERATING SYSTEMS

Coordination: SOLSONA TEHAS, FRANCESC XAVIER

Academic year 2023-24

Subject's general information

Subject name	OPERATING SYSTEMS		
Code	102012		
Semester	1st Q(SEMESTER) CONTINUED EVALUATION		
Typology	Degree	Course	Character
	Bachelor's Degree in Computer Engineering	2	COMPULSORY
	Double bachelor's degree: Degree in Computer Engineering and Degree in Business Administration and Management	3	COMPULSORY
	Master's Degree in Informatics Engineering		COMPLEMENTARY TRAINING
Modality	Attendance-based		
Course number of credits (ECTS)	9		
Type of activity, credits, and groups	Activity type	PRALAB	TEORIA
	Number of credits	3.6	5.4
	Number of groups	3	2
Coordination	SOLSONA TEHAS, FRANCESC XAVIER		
Department	COMPUTER ENGINEERING AND DIGITAL DESIGN		
Important information on data processing	Consult this link for more information.		
Language	Castellà/Català		
Distribution of credits	Sergi Lopez Sorribas 2.7 + 2.7 Francesc Solsona Tehas 2.7 + 3.6 Valentí Pardo Casanovas 3.6 + 3.6 Fernando Cores Prado 2.7		

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CORES PRADO, FERNANDO	fernando.cores@udl.cat	2,7	
LÓPEZ SORRIBES, SERGI	sergi.lopez@udl.cat	5,4	
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SOLSONA TEHAS, FRANCESC XAVIER	francesc.solsona@udl.cat	6,3	

Learning objectives

- To determine the functional characteristics and design of the elements that make up an operating system (OS).
- Analyze the importance of each module that make up an operating system.
- To identify the different services provided by the operating system to users and applications.
- Efficient use of services provided by the OS for the design and development of computer applications.
- Critically analyze the characteristics and functioning of the policies that make up an operating system.
- Applying the techniques described to other problems.
- Critically compare the different mechanisms of memory management.

Competences

Cross-disciplinary competences:

- **EPS1.** Capacity to solve problems and prepare and defence arguments inside the area of studies.
- **EPS6.** Capacity of analysis and synthesis.
- **EPS9.** Capacity for unidisciplinary and multidisciplinary teamwork.

Specific competences:

- **GII-CRI2.** Capacity to plan, conceive, deploy and direct projects, services and computer systems in all the fields, leading his set up and his continuous improvement and evaluation his economic and social impact.
- **GII-CRI5.** Knowledge, manage and maintain systems, services and computer applications.
- **GII-CRI10.** Knowledge of the characteristics, functionalities and structures of the operating systems and design and implement applications based in their services.

Subject contents

THEORY

Part I. Introduction to Operating Systems.

1. Introduction

1. Concept of Operating System
2. Objectives
3. History of the operating systems
4. Types of operating systems

2. Estructure of the Operating System

1. Components of the operating system
2. Services of the operating system
3. Calls and programs of the system
4. Case study: UNIX / LINUX.

Part II. Scheduling of Processes.

3. Managing and communicating processes

1. Concept of process
 1. States of the processes
 2. Process Control Bloc (PCB)
2. Threads of execution
3. Communication between processes
4. Types of comunication
5. Case study: Managing processes in UNIX.
6. Case study: Communicating by pipes

4. Scheduling of the CPU

1. Basic concepts
2. Tipes of schedulers
3. Performance metrics
4. Scheduling algorithms
5. Mulilevel queues

5. Deadlock

1. Characterization of the deadlock
2. Coffman conditions
3. Deadlock techniques
 1. Prevenció
 2. Evitació

3. Detection and Recovery

Part III. Managing of Memory

6. Managing of Memory

1. Basic principles
2. Assigning contiguous Memory
 1. Nude Machine
 2. Resident Monitor
 3. Multiple Partitions
3. Assigning non contiguous Memory
 1. Pagination
 2. Segmentation
4. Combined systems
 1. Paged segmentation
 2. Segmented pagination

7. Virtual Memory

1. Introduction
2. Demand paging
3. Effective Access Time
4. Frames allocation algorithms
5. Pages replacement algorithms
6. Thrashing

PRACTICES

Part IV. Services of the Unix/Linux Operating System

8. Scripting.

1. Introduction
2. Syntax of Bash
3. Programming with Bash

Methodology

The development of the course consists of:

1. Theory and proposal and problems resolution in large-sized class groups (LG), and
2. Problems and Practices of Linux C and Bash in middle group (MG) classes in the laboratory.

The evaluation of the Theory and the problems will be done in two partial exams. There will be 2 practices, one in each partial. The evaluation of the practices will be carried out through the delivery of the requested practices, in groups formed by a maximum of two students. In both partial exams there will be a practice question.

Attendance and participation in class is considered very important.

Development plan

See "Pla Docent 22-23.pdf" in the Recursos folder

Evaluation

Activitat d'Avaluació	Weight	Minimum Note	with Group	Mandatory
1 st Exam	45%	NO	NO	YES
2 nd Exam	45%	NO	NO	YES
Practices	10%	NO	YES (≤ 2)	NO
Class Attendance	0.5 points	NO	NO	NO

Alternative Evaluation

Students who have the approval to be assessed through alternative assessment (see requirements and procedure in the assessment regulations) must carry out the following activities.

There will be a single written test that will contain all the practical and theoretical content of the subject. This written test will have a weight of 100% and will be carried out on the day reserved in the calendar for the completion of the second part of the subject (consult the exam calendar for more information).

The recovery will also be a written test with a weight of 100% and will be carried out on the day reserved in the calendar for the recovery of the second part of the subject (consult the exam calendar for more information).

Bibliography

Basic Bibliografy:

Francesc Solsona. "Sistemes Operatius. Teoria aplicada". Edicions de la Universitat de Lleida (Col·lecció eines 78). ISBN: 978-84-8409-747-1. 2015.

Additional Bibliografy:

[Sil99] Silberschatz A., Peterson J. Y Galvin P.: "Sistemas Operativos. Conceptos Fundamentales"; Addison-Wesley, 1999.

[Car01] Carretero Pérez, Jesús, y otros: "Sistemas Operativos. Una Visión Aplicada". McGraw-Hill, 2001.

[Mar04] F.M. Marquez García: "Unix. Programación Avanzada", Edt. Rama 3ª edición, 2004.

[Qui02] E. Quigley: "UNIX Shells by Example", Edt. Prentice-Hall, 3ra edición, 2002

[Tan98] Tanenbaum, Andrew S. "Sistemas Operatius, Diseño e Implementación", 2ª edición, Ed. Prentice-Hall, 1998.

[Tac96] Tackett J. y Gunter D., "Utilizando Linux", Prentice Hall, 1996

[Kay97] Kay A. Robbins, Steven Robbins, "UNIX Programación Práctica. Guía para la Concurrencia, la Comunicación y los Multihilos", Ed. Prentice-Hall, 1997.

[Afz97] Afzal, A.: Introducción a Unix. Un enfoque práctico. Ed. Prentice Hall, 1997.

[Tac96] Tackett J. y Gunter D.: Utilizando Linux 2ª. Prentice Hall, 1996