Universitat de Lleida

DEGREE CURRICULUM
OPERATING SYSTEMS

Coordination: SOLSONA TEHÀS, FRANCESC XAVIER

Academic year 2021-22

Subject's general information

Subject name	OPERATING SYSTEMS
Code	102012
Semester	1st Q(SEMESTER) CONTINUED EVALUATION

Typology	Degree	Course	Character	Modality
	Bachelor's Degree in Computer Engineering	2	COMPULSORY	Attendance-based
	Double bachelor's degree: Degree in Computer Engineering and Degree in Business Administration and Management	3	COMPULSORY	Attendance-based
	Master's Degree in Informatics Engineering		COMPLEMENTARY TRAINING	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 TEHÀS, FRANCESC XAVIER
Department	COMPUTER SCIENCE AND INDUSTRIAL ENGINEERING
Important information on data processing	Consult this link for more information.
Language	Castellà/Català
Distribution of credits	Lluís Mas Ruíz 2.7 Francesc Solsona Tehas 2.7 + 3.6 Valentí Pardo Casanovas 3.6 + 3.6

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
MAS RUIZ, LLUIS	lluis.mas@udl.cat	5,4	
PARDO CASANOVAS, VALENTÍ	valenti.pardo@udl.cat	7,2	
SOLSONA TEHÀS, FRANCESC XAVIER	francesc.solsona@udl.cat	9	

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: Comunicating 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. Pagined 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 resolution and Practices of Linux Bash in medium-sized class groups (MG) in the laboratory.

Theory and problems evaluation will be carried out by means ot two partial exams. The evaluation of the practices will be carried out by delivering the requested practices in groups formed as much by two students. The second partial exam will contain a question of practices.

In addition, students must complete 4 deliverable problems. It is considered very important the attendance and participation in class.

Development plan

See "Pla Docent 21-22.pdf" in the Recursos folder

Evaluation

Activitat d'Avaluació	Weight	Minimum Note	with Group	Mandatory
1ˢᵗ Exam	45%	NO	NO	YES
2ⁿᵈ Exam	45%	NO	NO	YES
Practices	10%	5	YES (≤2)	YES
Class Attendance	0.5 points	NO	NO	NO

Bibliography

Basic Bibliografy:

[Sil99] SilberschatzA., Peterson J. Y Galvin P.: "Sistemas Operativos. ConceptosFundamentales"; Addison-Wesley, 1999.

Additional Bibliografy:

[Car01] CarreteroPérez, Jesús, y otros: "Sistemas Operativos. Una VisiónAplicada". McGraw-Hill, 2001.

[Mar04] F.M. Marquez García: "Unix. Programación Avanzada", Edt. Ra-ma 3ªedició, 2004.

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

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

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

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

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

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