UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: OPERATING SYSTEMS I
Code: 42313
Type: CORE COURSE
ECTS credits: 6
Degree: 406 - UNDERGRADUATE DEGREE IN COMPUTER SCIENCE AND ENGINEERING (AB)
Academic year: 2022-23
Center: 604 - SCHOOL OF COMPUTER SCIENCE AND ENGINEERING (AB)
Group(s): 10 11 12
Year: 2
Duration: First semester
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: N
Web site: https://campusvirtual.uclm.es
Bilingual: Y

Lecturer: **DIEGO CAZORLA LOPEZ** - Group(s): **10 11**

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Lecturer: **GABRIEL CEBRIÁN MÁRQUEZ** - Group(s): **12**

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2. Pre-Requisites

This subject is based on the competences and knowledge acquired in the subjects:

- Basics of Programming I (1st course)
- Basics of Programming II (1st course)
- Computer Structure (1st course)

3. Justification in the curriculum, relation to other subjects and to the profession

An operating system is a program that manages the hardware of a computer and facilitates the interaction between it and the user. It is, therefore, a low-level software element that acts as an interface between high-level software and hardware.

This subject addresses the question of how a program can finally run on a physical system (hardware), and therefore his knowledge is indispensable for a computer engineer. It can be considered as one of the fundamental subjects of the degree and appears in all similar study plans, both national and international.

This subject belongs to a degree qualification that complies with what is specified in the Resolution of June 8th, 2009, of the "Secretaría General de Universidades" that establishes recommendations for the proposal by the Universities of reports of applications for official degrees that lead to the profession of Technical Engineer in Computer Science, and covers the specific competences common to the branch of computing [CO5] Knowledge, administration and maintenance of systems, services and computer applications, and [CO10] Knowledge of the features, functionalities and structure of the Operating Systems and design and implement applications based on their services.

It is, therefore, a compulsory subject in the curriculum, regardless of the specific technology that the student wants to follow. The knowledge acquired in this subject is complemented not only with those obtained in the subjects cited in the section of prerequisites but also with those of other contemporary subjects in the curriculum (Organization of Computers, Real Time and Concurrent Programming) as well as those of higher-level subjects (Distributed Systems, Operating Systems II).

4. Degree competences achieved in this course

Course competences

Code	Description
CO05	Knowledge, administration, and maintenance of systems, services and digital systems.
CO10	Knowledge about the features, functions, and structures of operating systems and the design and implementation of applications based on their services.
INS04	Problem solving skills by the application of engineering techniques.
PER01	Team work abilities.
PER02	Ability to work in multidisciplinary teams.
SIS03	Autonomous learning.
UCLM02	Ability to use Information and Communication Technologies.

5. Objectives or Learning Outcomes

Course learning outcomes

Description
Understanding and use operating systems, both at user level and at programming level using its services.
Performance of the basic administration of an operating system.

6. Units / Contents

Unit 1: Computer Systems Overview
- **Unit 1.1** Mode of operation
- **Unit 1.2** Interrupts
- **Unit 1.3** Input/Output

Unit 2: Operating systems: a brief introduction
- **Unit 2.1** What is an Operating System?
- **Unit 2.2** Components of the operating system
- **Unit 2.3** Evolution of operating systems.
- **Unit 2.4** Operating systems structure
- **Unit 2.5** Types of operating systems
- **Unit 2.6** Activation of the operating system

Unit 3: Processes
- **Unit 3.1** Process Concept
- **Unit 3.2** Multitasking
- **Unit 3.3** Process information
- **Unit 3.4** Lifecicle of a process
- **Unit 3.5** Threads
- **Unit 3.6** Services

Unit 4: Deadlocks
- **Unit 4.1** Principles of concurrency
- **Unit 4.2** Principles of deadlock
- **Unit 4.3** Deadlock prevention
- **Unit 4.4** Deadlock Avoidance
- **Unit 4.5** Deadlock detection and recovery

Unit 5: Scheduling
- **Unit 5.1** Introduction
- **Unit 5.2** The problem of resource scheduling
- **Unit 5.3** Characterization of processes
- **Unit 5.4** Objectives of scheduling
- **Unit 5.5** Scheduling levels
- **Unit 5.6** Non-expulsive scheduling algorithms
- **Unit 5.7** Expulsive scheduling algorithms

Unit 6: Memory management
- **Unit 6.1** General aspects of memory management
- **Unit 6.2** Swapping
- **Unit 6.3** Management of partitioned memory
- **Unit 6.4** Paging and Segmentation
- **Unit 6.5** Introduction to Virtual Memory

Unit 7: File and directory management
- **Unit 7.1** Functions and structure of a file system
- **Unit 7.2** Files
- **Unit 7.3** Directories
- **Unit 7.4** Physical storage of files: block allocation and free space management
- **Unit 7.5** Case studies

Unit 8: Lab
- **Unit 8.1** Introduction to Linux
- **Unit 8.2** Introduction to shell-scripts
- **Unit 8.3** The awk tool
- **Unit 8.4** Programming of process and file services

ADDITIONAL COMMENTS, REMARKS

In parallel to theoretical classes (topics 1 to 7), practical sessions (topic 8) will be conducted weekly where issues related to operating systems, both at the user level as a programmer and administrator, will be addressed.

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	CO05 CO10 SIS03	0.72	18	N	-	[MAG] Review of theoretical concepts previously prepared by students
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	CO05 CO10 INS04 PER01 SIS03	0.6	15	N	-	[PRO] Problem solving (individual and group)
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	CO05 CO10 INS04 SIS03	0.6	15	N	-	[LAB] Completion of the proposed laboratory practices (individual)
							[EVA] Final evaluation test. It allows to recover parts not passed during

Formative Assessment [ON-SITE]	Assessment tests	CO05 CO10 INS04	0.3	7.5	Y	Y	the progress tests (theory, exercises and lab). If a student has passed the subject in the progress tests, he/she will not have to take this final test (individual)
Study and Exam Preparation [OFF-SITE]	Self-study	CO05 CO10 INS04	2.1	52.5	N	-	[EST] Preparation/study of theory and exercises tests (individual)
Study and Exam Preparation [OFF-SITE]	Self-study	CO05 CO10 INS04	0.6	15	N	-	[EST] Preparation/study of practice tests (individual)
Writing of reports or projects [OFF-SITE]	Group Work	CO05 CO10 INS04 PER01 SIS03 UCLM02	0.9	22.5	Y	N	[RES] Elaboration of deliveries related to the exercises and a practical work (in group). Recovery tests of this activity will be programmed in all the calls.
Individual tutoring sessions [ON-SITE]	Combination of methods	CO05 CO10 INS04 UCLM02	0.18	4.5	N	-	[TUT] Tutoring
		Total:	**6**	**150**			
		Total credits of in-class work: 2.4					**Total class time hours: 60**
		Total credits of out of class work: 3.6					**Total hours of out of class work: 90**

As: Assessable training activity
Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Test	50.00%	50.00%	[ESC] (25% Theory and 25% Exercises). There will be 2 partial tests of theory and exercises throughout the course. A final exam will be scheduled to recover the parts not passed during the course.
Laboratory sessions	25.00%	25.00%	[LAB] There will be 2 partial practice tests during the course. A final exam will be scheduled to recover the parts not passed during the course.
Assessment of active participation	10.00%	10.00%	[INF] Elaboration of asigments related to exercises topics. Students following non-continuous evaluation will be evaluated for this activity in the ordinary call through an alternative method.
Projects	15.00%	15.00%	[RES] Elaboration of a practical programming work (in group). It will be evaluated by means of a written report and a laboratory exam.
Total:	**100.00%**	**100.00%**	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject , an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

There will be two controls of theory, exercises and practices throughout the course, as well as a final exam to recover the parts not passed during the course.
The final grade will be obtained by the weighted sum of all items according to the weights indicated in the table above.
Conditions:
- A minimum grade of 35% in theory+exercises and 35% in practices is required to pass the course.
- The student who does not exceed the minimum grades required in the subject will have a grade no higher than 4.00 even if the overall grade obtained is other, including more than 5.00.

By default, the student will be assessed by continuous assessment. If you wish to change to non-continuous assessment, you must indicate it through the following link https://www.esiiab.uclm.es/alumnos/evaluacion.php before the end of the term and as long as 50% or more of the subject has not been assessed by continuous assessment.

Non-continuous evaluation:

Tests/activities covering all the evaluation systems indicated in the table above will be carried out.
The final grade will be obtained by the weighted sum of all items according to the weights indicated in the table.
In order to pass the course, the same conditions apply as in the continuous evaluation.

Specifications for the resit/retake exam:

Tests/activities covering all the evaluation systems indicated in the table above will be carried out.
In order to pass the course, the same conditions apply as in the ordinary exam.

Specifications for the second resit / retake exam:

Tests/activities covering all the evaluation systems indicated in the table above will be carried out.
In order to pass the course, the same conditions apply as in the ordinary and extraordinary exams.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	hours
Formative Assessment [PRESENCIAL][Assessment tests]	7.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	52.5

Study and Exam Preparation [AUTÓNOMA][Self-study]	15
Writing of reports or projects [AUTÓNOMA][Group Work]	22.5
Individual tutoring sessions [PRESENCIAL][Combination of methods]	4.5

General comments about the planning: This course schedule is APPROXIMATE. It could vary throughout the academic course due to teaching needs, bank holidays, etc. A weekly schedule will be properly detailed and updated on the online platform (Virtual Campus). Note that all the lectures, practice sessions, exams and related activities performed in the bilingual groups will be entirely taught and assessed in English. Classes will be scheduled in 3 sessions of one hour and a half per week. Evaluation activities or catch-up classes may exceptionally be scheduled in the afternoon.

Unit 1 (de 8): Computer Systems Overview

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5

Unit 2 (de 8): Operating systems: a brief introduction

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5

Unit 3 (de 8): Processes

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3

Unit 4 (de 8): Deadlocks

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3

Unit 5 (de 8): Scheduling

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3

Unit 6 (de 8): Memory management

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3

Unit 7 (de 8): File and directory management

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3

Unit 8 (de 8): Lab

Activities	**Hours**
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	15

Global activity

Activities	**hours**
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	15
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	15
Formative Assessment [PRESENCIAL][Assessment tests]	7.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	52.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	15
Class Attendance (theory) [PRESENCIAL][Lectures]	18
Writing of reports or projects [AUTÓNOMA][Group Work]	22.5
Individual tutoring sessions [PRESENCIAL][Combination of methods]	4.5
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Andrew S. Tanembaum and Herbert Ros	Modern operating systems	Pearson Education		978-0-13-359162-0	2015	
Gunnar Wolf, Esteban Ruiz, Federico Bergero y Erwin Meza	Fundamentos de Sistemas Operativos	Universidad Nacional Autónoma de México		978-607-02-6544-0	2015	
	http://sistop.gwolf.org/					
J. Carretero, F. García, P de Miguel, F. Pérez.	Sistemas operativos : una visión aplicada	McGraw-Hill		978-84-481-5643-5	2007	
Milenkovic, Milan	Sistemas operativos : conceptos y diseño	McGraw-Hill		84-481-1871-5	1998	
Pedro de Miguel Anasagasti, Fernando Pérez Costoya	Sistemas Operativos	Universidad Politécnica de Madrid	Madrid		2016	
	http://www.elai.upm.es/moodle/pluginfile.php/3574/mod_resource/content/1/sistemasoperativosupm.pdf					
Stallings, William	Sistemas operativos : aspectos internos y principios de diseño	Prentice Hall		84-205-4462-0	2005	
Tanenbaum, Andrew S.	Sistemas operativos modernos	Pearson Educación		978-607-442-046-3	2009	
						Referencia oficial del API Win32
	http://msdn.microsoft.com/en-us/library/Aa383688					
						Linux Documentation Project (LDP)
	http://tldp.org/					

Stallings, William.	Operating systems : internals and design principles	Pearson education,	978-1-292-21429-0	2018
Silberschatz, Abraham.	Operating system concepts	John Wiley & Sons,	0-471-69466-5	2005