UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: OPERATING SYSTEMS II
Code: 42334
Type: ELECTIVE
ECTS credits: 6
Degree: 407 - DEGREE PROGRAMME IN COMPUTER SCIENCE ENGINEERING
Academic year: 2022-23
Center: 108 - SCHOOL OF COMPUTER SCIENCE OF C. REAL
Group(s): 20
Year: 3
Duration: C2
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: Y
Web site: Virtual space of the subject at https://campusvirtual.uclm.es
Bilingual: N

Lecturer: **JAVIER ALONSO ALBUSAC JIMENEZ** - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
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2. Pre-Requisites

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

- Fundamentals of Programming I
- Fundamentals of Programming II
- Operating Systems I
- Concurrent and Real Time Programming

Operating Systems I is an important prerequisite, as it covers the basic fundamentals of operating systems, process modeling, memory management, and input/output and file systems. On the other hand, the knowledge acquired in Concurrent and Real Time Programming is also an important requirement, since the basic mechanisms of synchronization and communication between processes are studied. In addition, it is necessary to have knowledge of C laguage, as well as structured, modular and object-oriented programming concepts.

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

The subject Operating Systems II belongs to the fourth year of the Degree in Computer Engineering, in particular, to the intensification of specific technology of Computer Engineering. In this course the student will be able to know in depth the entrails of an operating system, and will acquire a critical vision on the different design options. The GNU/Linux operating system will be used as the main case study, although this does not rule out the possibility of referring to other operating systems during the course.

The subject is closely related to the subject operating systems I, extending its contents, such as the design of an operating system kernel, and the ability to add new functions to it. Thus, the student will not only be able to use the operating system services in the form of calls to the system, but will also be able to understand how these services are implemented and will be able to include new services into the kernel. In addition, the knowledge acquired in the subject of Concurrent Programming and Real Time is extended through the study of multi-thread programming, and communication and synchronization between threads.

The knowledge acquired by the student will allow him to work in the future within the framework of the development of operating systems, whose market is not limited only to conventional operating systems, but also to the development of systems for the control of embedded devices. In addition, in the framework of real-time application programming it is common to work with "modified kernels" in order to achieve the desired efficiency for a specific type of application.

4. Degree competences achieved in this course

Course competences

Code	Description
IC04	Ability to design and implement system and communication software.
INS01	Analysis, synthesis, and assessment skills.
INS04	Problem solving skills by the application of engineering techniques.
INS05	Argumentative skills to logically justify and explain decisions and opinions.
PER02	Ability to work in multidisciplinary teams.
SIS01	Critical thinking.
SIS03	Autonomous learning.

5. Objectives or Learning Outcomes

Course learning outcomes

Description
Ability to design communication and synchronization services between processes.
Ability to use, configure and design services on multi-programming operating system cores.
Configure services and plan the execution of applications

6. Units / Contents

Unit 1: Structural Models of Modern Operating Systems

Unit 2: Design and Management of Services in an Operating System Kernel

Unit 3: Multi-thread Programming

Unit 4: Virtual Memory Management

Unit 5: Planning and Timing of Processes in Multicore Systems

ADDITIONAL COMMENTS, REMARKS

Laboratory Practices:

Practice 1. Service configuration, and application execution planning

Practice 2. Introduction to Multithreaded Programming.

Practice 3. Advanced Multithreaded Programming.

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	IC04	0.6	15	N	-	Lectures corresponding to topics 1-5 and theoretical-practical lessons in the laboratory [MAG]
Individual tutoring sessions [ON-SITE]		IC04	0.18	4.5	N	-	Tutoring for the follow-up of individual works [TUT]
Study and Exam Preparation [OFF-SITE]	Self-study	IC04 SIS01 SIS03	1.8	45	N	-	Study to be devoted by the student to the preparation of the subject written tests [EST]
Other off-site activity [OFF-SITE]	Practical or hands-on activities	IC04 INS01 INS04 INS05 PER02	0.9	22.5	N	-	Lab practical preparation (PLAB)
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	IC04 INS05 PER02 SIS01	0.6	15	Y	N	Worked example problems and cases resolution by the lecturer and the students (PRO)
Writing of reports or projects [OFF-SITE]	Self-study	IC04 INS01 INS05 PER02 SIS01 SIS03	0.9	22.5	Y	N	Preparation of reports covering theoretical content. This activity will have a grupal approach [RES].
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	IC04 INS01 INS05 PER02	0.72	18	Y	Y	Lab practical preparation [PLAB]
Other on-site activities [ON-SITE]	Assessment tests	IC04 INS01 INS05 SIS01	0.15	3.75	Y	Y	Completion of the first partial test corresponding to the first half of the subject programme (EVA).
Other on-site activities [ON-SITE]	Assessment tests	IC04 INS01 INS05 SIS01	0.15	3.75	Y	Y	Completion of the second partial test corresponding to the second half of the subject programme (EVA).
		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
Final test	0.00%	45.00%	Compulsory and recoverable activity to be done on the date scheduled for the final exam of the ordinary exam.
Mid-term tests	20.00%	0.00%	First partial test. Compulsory and recoverable activity to be carried out at the end of the first half of the teaching period.
Mid-term tests	25.00%	0.00%	Second partial test. Compulsory and recoverable activity to be carried out on the date scheduled for the ordinary call. In addition, the first partial test will be recovered on this date.
Theoretical papers assessment	15.00%	15.00%	Non-compulsory but recoverable activity to be completed before the end of the teaching period.
Laboratory sessions	30.00%	30.00%	Obligatory and recoverable activity to be carried out through laboratory sessions and homework.
Assessment of active participation	10.00%	10.00%	Non-mandatory and recoverable activity. In the non-continuous evaluation mode, participation may be evaluated using the means provided in the teaching platforms. In addition, voluntary exercises and their oral defence will be proposed.
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:

In compulsory activities, a minimum mark of 40% is required in order to pass that activity and have the possibility to therefore pass the entire subject. The evaluation of the activities will be global and therefore must be quantified by means of a single mark. In the case of the activities that may be retaken (i.e., rescheduling), an alternative activity or test will be offered in the resit/retake exam call (convocatoria extraordinaria).

The partial tests will be common for all the theory/laboratory groups of the subject and will be evaluated by the lecturers of the subject in a serial way, i.e., each part of the partial tests will be evaluated by the same lecturer for all the students. A student is considered to pass the subject if she/he obtains a minimum of 50 points out of 100, taking into account the points obtained in all the evaluable activities, and also has passed all the compulsory activities.

For students who do not pass the subject in the final exam call (convocatoria ordinaria), the marks of activities already passed will be conserved for the resit/retake exam call (convocatoria extraordinaria). If an activity is not recoverable, its assessment will be preserved for the resit/retake exam call (convocatoria extraordinaria) even if it has not been passed. In the case of the passed recoverable activities, the student will have the opportunity to receive an alternative evaluation of those activities in the resit/retake exam call and, in that case, the final grade of the activity will correspond to the latter grade obtained.

The mark of the passed activities in any call, except for the partial tests, will be conserved for the subsequent academic year at the request of the student, provided that mark is equal or greater than 50% and that the activities and evaluation criteria of the subject remain unchanged prior to the beginning of that academic year.

The failure of a student to attend the partial 1 and partial 2 tests will automatically result in her/him receiving a "Failure to attend" (no presentado). If the student has not passed any compulsory evaluation activity, the maximum final grade will be 40%.

Non-continuous evaluation:

Students may apply at the beginning of the semester for the non-continuous assessment mode. In the same way, the student may change to the non-continuous evaluation mode as long as she/he has not participated during the teaching period in evaluable activities that together account for at least 50% of the total mark of the subject. If a student has reached this 50% of the total obtainable mark or the teaching period is over, she/he will be considered in continuous assessment without the possibility of changing to non-continuous evaluation mode.

Students who take the non-continuous evaluation mode will be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences), through the assessment systems indicated in the column "Non-continuous evaluation".

In the "non-continuous evaluation" mode, it is not compulsory to keep the mark obtained by the student in the activities or tests (progress test or partial test) taken in the continuous assessment mode.

Specifications for the resit/retake exam:

Evaluation tests shall be carried out for all recoverable activities.

Specifications for the second resit / retake exam:

Same characteristics as in the extraordinary call.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours **hours**

General comments about the planning: The subject is taught in 3 x 1,5 hour sessions per week.

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Kernighan, Brian W.	El lenguaje de programación C : [con base en el ANSI C] /	Pearson Educación,		ISBN 968-880-205-0	2003	
Butenhof, David R.	Programming with POSIX threads	Addison-Wesley		0-201-63392-2	1997	
Silberschatz, A., Galvin, P., Gagne, G	Sistemas Operativos. Conceptos fundamentales	Mc Graw-Hill		84-481-4641-7	2006	
Stallings, W	Sistemas operativos. Aspectos internos y principios de diseño	Prentice-Hall		84-205-4462-0	2005	
Anthony Williams	C++ Concurrency in Action: Practical Multithreading	Hanning			2012	
Tanenbaum, Andrew S.	Sistemas operativos modernos	Pearson Educación		978-607-442-046-3	2009	
Vallejo Fernández, David	Programación concurrente y tiempo real	Edlibrix		978-84-942116-3-8	2014	
Javier Albusac	Sistemas Operativos y Programación Multihilo en C++	Material Asignatura			2021	
Stallings, William.	Operating systems : internals and design principles /	Pearson education,		978-0-13-603337-0	2009	
Maya Posch	Mastering C++ Multithreading: Write robust, concurrent, and parallel applications	Packt		1787121704	2017	