Universidade Vigo

IDENTIFYING DATA
Distributed and Concurrent Programming

Subject	Distributed and Concurrent Programming			
Code	V05G300V01641			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	García Duque, Jorge			
Lecturers	García Duque, Jorge Pazos Arias, José Juan			
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General description	The main goal of this subject is to provide the foundations of the synchronisation and communication among processes in centralised and distributed systems.			

Competencies

Code	
A3	CG3: The knowledge of basic subjects and technologies that capacitates the student to learn new methods and technologies, as well as to give him great versatility to confront and update to new situations
A4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
A9	CG9: The ability to work in multidisciplinary groups in a Multilanguage environment and to communicate, in writing and orally, knowledge, procedures, results and ideas related with Telecommunications and Electronics.
A42	CE33/TEL7 The ability to program network and distributed applications and services.

Learning aims

Expected results from this subject	Training and Learning Results
The ability to program network and distributed applications and services.	A42
The knowledge of basic subjects and technologies that capacitates the student to learn new methods and technologies, as well as to give him great versatility to confront and update to new situations	A3
The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.	A4
The ability to work in multidisciplinary groups in a Multilanguage environment and to communicate, in writing and orally, knowledge, procedures, results and ideas related with Telecommunications and Electronics.	A9

Contents

Topic	
Introduction to Concurrent Programming	Concepts of concurrence, parallelism and multitasking. Interleaving of atomic instructions. Precedence graphs.

The critical section problem	The definition of the problem. Busy waiting. Starvation Deadlock. Dekker´s algorithm. Peterson´s algorithm
Concurrent Programming Constructs	Semaphores. The problem of the producer-consumer. The problem of the philosophers. Monitors. Variables of Condition. The problem of the readers-writers.
Deadlock	Introduction and definition of deadlock. Necessary conditions. Deadlock prevention. Deadlock avoidance. Detection and Recovery
Communication among processes	Message Passing. Remote Procedure Call (RPC).
Distributed Programming	Introduction to Distributed Systems. Distributed mutual exclusion Ricart-Agrawala Algorithm. Token ring Algorithms. Consensus: Crash Failures. Byzantine Failures.

Planning

	Class hours	Hours outside the classroom	Total hours
Workshops	5	30	35
Practice in computer rooms	13	26	39
Master Session	20	46	66
Multiple choice tests	1	0	1
Practical tests, real task execution and / or simulated.	1	0	1
Jobs and projects	2	6	8

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Workshops	Each group of students will tackle the design and implementation of a software project with half complexity. This task will be realised in successive steps, that will be discussed and validated in the face-to-face sessions. The aim of this methodology is to provide a suitable feedback to improve the proposed solutions. This methodology deals with skills CG4 and CG9
Practice in computer rooms	The students will resolve practical problems under supervision of teachers This methodology deals with skill CE33/TEL7
Master Session	Presentation of the ideas, concepts, technics and algorithms of each lesson. This methodology deals with skill CG3

Personalized attention

Methodologies	Description
Master Session	Personalised attention will be dispensed through individual and face-to-face meetings scheduled at the beginingt of the course. For practices and workshops, the personal attention will be articulated by means of the follow-up of the job of each student, monitoring the partial proposed solutions and reorienting them if it was necessary.
Workshops	Personalised attention will be dispensed through individual and face-to-face meetings scheduled at the beginingt of the course. For practices and workshops, the personal attention will be articulated by means of the follow-up of the job of each student, monitoring the partial proposed solutions and reorienting them if it was necessary.

Practice in computer rooms	Personalised attention will be dispensed through individual and face-to-face meetings scheduled at the beginingt of the course. For practices and workshops, the personal attention will be articulated by means of the follow-up of the job of each student, monitoring the partial proposed solutions and reorienting them if it was necessary.

Assessment

	Description	Qualification
Multiple choice tests	Proof of theoretical contents exposed in the master classes. These tests evaluate skill CG3	60
Practical tests, real task execution and / or simulated.	Validation of the work realised in every laboratory session. These exercises evaluate skills CE33/TEL7	20
Jobs and projects	In the last face-to-face session of workshop, students will deliver and will expose to their mates the design and the proposed solution for their project. This solution will be exposed to debate for students and professors This project evaluates skills CG4 and CG9	20

Other comments on the Evaluation

The subject can be surpassed by means of Continuous Evaluation according to the following criteria, having opened the possibility to opt by the No Continuous Evaluation anytime until the beginning of the final examination to celebrate the day fixed to such effect in the official calendar of the EET. All those students that opt by the continuous evaluation will consider presented if they evaluate of the part of the work in Workshops.

Continuous evaluation:

The final note will result of the sum of the corresponding notes to the three following components:

1.   Four proofs of type Test to evaluate the contents given in the masterclasses. Each proof will take place in one of the master classes , except the last that will realise in one of the sessions of the Workshop.

Punctuation: Up to 1,5 points each proof.

2.   Six Practical Proofs that will realise when finalising each one of the sessions of laboratory and that will consist in the validation of the results obtained during said session.

Punctuation: Up to 1/3 points each proof.

3.   Presentation of the Project proposed like work in the sessions of the Workshop.

Punctuation: Up to 2 points.

To pass the subject by Continuous Evaluation will have to give the three following conditions: (i) obtain an equal or upper qualification to 2 points in the group of the tests.; (ii) Upper qualification to 0 points in, at least, four of the six practical proofs; and (iii) to attend all the face-to-face sessions and obtain more than 0 points in the presentation of the project.

No Continuous Evaluation:

By means of an examination on 10 points scheduled in the official calendar of the EET.

Final Call:

It will be governed by the indicated for the No Continuous evaluation.

Sources of information

M. Ben-Ari, **Principles of Concurrent And Distributed Programming**, Second Edition,

George Coulouris, Jean Dollimore, Tim Kindberg and Gordon Blair, **Distributed Systems Concepts and Design**, Fifth Edition,

William Stallings, **Operating Systems: Internals and Design Principles, 6/E**, Seventh Edition,

Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, **Operating system concepts**, Eight Edition,

Lea, Douglas, **Programación concurrente en Java : principios y patrones de diseño**, Second Edition,

Recommendations

Subjects that are recommended to be taken simultaneously

Architectures and Services/V05G300V01645
Information Systems/V05G300V01644

Subjects that it is recommended to have taken before

Informatics: Computer Architecture/V05G300V01103
Programming I/V05G300V01205
Programming II/V05G300V01302
Operating Systems/V05G300V01541