



POLITÉCNICA

INTERNATIONAL
CAMPUS OF
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COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001



E.T.S. de Ingenieros
Informáticos

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000805 - Analysis Of Concurrent And Distributed Systems

DEGREE PROGRAMME

10AR - Master Interuniversitario En Métodos Formales En Ingeniería Informática

ACADEMIC YEAR & SEMESTER

2020/21 - Semester 2

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1. Description

1.1. Subject details

Name of the subject	103000805 - Analysis Of Concurrent And Distributed Systems
No of credits	6 ECTS
Type	Optional
Academic year of the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	10AR - Master Interuniversitario en Métodos Formales en Ingeniería Informática
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2020-21

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Clara Benac Earle	2307	clara.benac@upm.es	M - 09:30 - 12:00 M - 15:00 - 16:30 F - 12:00 - 14:00 Please send an e-mail to set up an appointment before going to the instructor's office

Lars-ake Fredlund	2309	larsake.fredlund@upm.es	M - 10:00 - 13:00 Th - 10:00 - 13:00 Please send an e-mail to set up an appointment before going to the instructor's office
Guillermo Roman Diez (Subject coordinator)	2304	guillermo.roman@upm.es	M - 10:00 - 14:00 Tu - 10:00 - 12:00 Please send an e-mail to set up an appointment before going to the instructor's office

* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

2.3. External faculty

Name and surname	Email	Institution
Damiano Zanardini	damiano@fi.upm.es	E.T.S. Ingenieros en Informática. Universidad Politécnica de Madrid
Elvira Albert Albiol	elvira@fdi.ucm.es	Facultad de Informática. Universidad Complutense de Madrid
Jesús Correas Fernández	jcorreas@ucm.es	Facultad de Informática. Universidad Complutense de Madrid

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Programming (moderate to advanced skills)
- Basic notions of Concurrent and Multi-threaded Programming
- First-order Logic

4. Skills and learning outcomes *

4.1. Skills to be learned

CB06 - Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación

CB07 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio

CB10 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

CE02 - Capacidad para utilizar de forma competente las herramientas existentes de demostración automática y asistida de teoremas y de propiedades matemáticas.

CE03 - Capacidad para utilizar técnicas y herramientas avanzadas, automáticas y asistidas, para verificar formalmente que un programa o sistema informático satisface las propiedades lógicas previamente especificadas.

CE04 - Capacidad para utilizar y desarrollar herramientas que analizan automáticamente propiedades de los programas, utilizando tan solo el texto fuente de los mismos.

CE05 - Capacidad para utilizar y desarrollar herramientas que analizan propiedades de los programas, mediante su ejecución en un conjunto de casos cuidadosamente seleccionado.

CG05 - Capacidad para la aplicación de los conocimientos adquiridos para resolver problemas en entornos nuevos o poco conocidos dentro de contextos amplios y multidisciplinares, siendo capaces de integrar dichos conocimientos.

CG07 - Capacidad para comprender trabajos de investigación y para crear nuevo conocimiento en el área de los métodos formales aplicados a la Ingeniería Informática.

CT01 - Capacidad para trabajar en equipo, ya sea como un miembro más o realizando la labor de dirección del mismo, promoviendo el libre intercambio de ideas.

CT02 - Capacidad para fomentar la creatividad tanto propia como la de los restantes miembros del equipo.

CT03 - Capacidad de razonamiento crítico como vía para mejorar la generación y desarrollo de ideas en un contexto profesional o de investigación.

4.2. Learning outcomes

RA11 - Ability to specify the formal semantics of a distributed systems

RA12 - Ability to specify safety and liveness properties of distributed systems

RA13 - Ability to develop static analysis for distributed systems

RA14 - Ability to competently use tools for analyzing and validating distributed systems

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

Concurrent and distributed programming consists in designing software as collections of interacting computing processes, each following its flow of instructions. The use of concurrent and distributed programming is not new, but it has intensified recently and now is an integrated part of many programming languages. This kind of programs pose a collection of challenging problems that require specific analysis techniques. In this course we will see the basics of semantics of concurrent and distributed programs, identify properties specific to these programs, and present both static and dynamic analysis techniques for analyzing them.

5.2. Syllabus

1. Semantics of Concurrent and Distributed Programs
2. Dynamic analysis of concurrent and distributed systems
3. Static analysis of concurrent and distributed systems
 - 3.1. Basic and liveness properties
 - 3.2. Termination and resource consumption
4. Analysis and verification of smart contracts
5. Property-based testing of concurrent systems

6. Schedule

6.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Distant / On-line	Assessment activities
1	Semantics of Concurrent and Distributed Systems Duration: 01:30	Guided practice Duration: 01:30	Semantics of Concurrent and Distributed Systems Duration: 01:30 Guided practice Duration: 01:30	
2	Semantics of Concurrent and Distributed Systems Duration: 01:30	Guided practice Duration: 01:30	Semantics of Concurrent and Distributed Systems Duration: 01:30 Guided practice Duration: 01:30	Practice Exam Continuous assessment Not Presential Duration: 01:30
3	Dynamic analysis of concurrent and distributed systems Duration: 01:30	Guided practice Duration: 01:30	Dynamic analysis of concurrent and distributed systems Duration: 01:30 Guided practice Duration: 01:30	
4	Dynamic analysis of concurrent and distributed systems Duration: 01:30	Guided practice Duration: 01:30	Dynamic analysis of concurrent and distributed systems Duration: 01:30 Guided practice Duration: 01:30	
5	Dynamic analysis of concurrent and distributed systems Duration: 01:30	Guided practice Duration: 01:30	Dynamic analysis of concurrent and distributed systems Duration: 01:30 Guided practice Duration: 01:30	Practice Exam Continuous assessment Not Presential Duration: 01:30
6	Analysis and Verification of smart contracts Duration: 01:30	Guided practice Duration: 01:30	Analysis and Verification of smart contracts Duration: 01:30 Guided practice Duration: 01:30	

7	Analysis and Verification of smart contracts Duration: 01:30	Guided practice Duration: 01:30	Analysis and Verification of smart contracts Duration: 01:30 Guided practice Duration: 01:30	
8	Analysis and Verification of smart contracts Duration: 01:30	Guided practice Duration: 01:30	Analysis and Verification of smart contracts Duration: 01:30 Guided practice Duration: 01:30	Practice Exam Continuous assessment Not Presential Duration: 01:30
9	Static analysis of concurrent and distributed systems Duration: 01:30	Guided practice Duration: 01:30	Static analysis of concurrent and distributed systems Duration: 01:30 Guided practice Duration: 01:30	
10	Static analysis of concurrent and distributed systems Duration: 01:30	Guided practice Duration: 01:30	Static analysis of concurrent and distributed systems Duration: 01:30 Guided practice Duration: 01:30	Practice Exam Continuous assessment Not Presential Duration: 01:30
11	Property-based testing Duration: 01:30	Guided practice Duration: 01:30	Property-based testing Duration: 01:30 Guided practice Duration: 01:30	
12	Property-based testing Duration: 01:30	Guided practice Duration: 01:30	Property-based testing Duration: 01:30 Guided practice Duration: 01:30	
13	Property-based testing Duration: 01:30	Guided practice Duration: 01:30	Property-based testing Duration: 01:30 Guided practice Duration: 01:30	
14	Property-based testing Duration: 01:30	Guided practice Duration: 01:30	Property-based testing Duration: 01:30 Guided practice Duration: 01:30	Practice Exam Continuous assessment Not Presential Duration: 01:30

15				Paper presentation Continuous assessment Presential Duration: 01:30
16				
17				Final Exam Final examination Presential Duration: 03:00

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
2	Practice Exam		No Presential	01:30	11.42%	3 / 10	CE05 CG05 CG07 CB06 CB07 CB10 CE04 CT01 CT02 CT03 CE02 CE03
5	Practice Exam		No Presential	01:30	17.14%	3 / 10	CE05 CG05 CG07 CB06 CB07 CB10 CE04 CT01 CT02 CT03 CE02 CE03
8	Practice Exam		No Presential	01:30	17.14%	3 / 10	CG07 CB06 CB07 CB10 CE05 CG05 CE04 CT01 CT02 CT03 CE02 CE03

10	Practice Exam		No Presential	01:30	11.42%	3 / 10	CE05 CG05 CG07 CB06 CB07 CB10 CE04 CT01 CT02 CT03 CE02 CE03
14	Practice Exam		No Presential	01:30	22.88%	3 / 10	CE05 CG05 CG07 CB06 CB07 CB10 CE04 CT01 CT02 CT03 CE02 CE03
15	Paper presentation		Face-to-face	01:30	20%	3 / 10	CE05 CG05 CG07 CB06 CB07 CB10 CE04 CT01 CT02 CT03 CE02 CE03

7.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final Exam		Face-to-face	03:00	100%	5 / 10	CE05 CG05 CG07 CB06 CB07 CB10 CE04 CT01 CT02 CT03 CE02 CE03

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Exam for the students who did not pass the course		Face-to-face	03:00	100%	5 / 10	CE05 CG05 CG07 CB06 CB07 CB10 CE04 CT01 CT02 CT03 CE02 CE03

7.2. Assessment criteria

The minimum grade for passing the course is 5/10.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Moodle	Web resource	All material will be available online

9. Other information

9.1. Other information about the subject

NOTA:

La situación sanitaria causada por la pandemia COVID-19 ha llevado a la decisión de que la docencia de este semestre esté planteada en modo de presencialidad adaptada, que combinará docencia online en directo (columna "tele-enseñanza" del cronograma) con pruebas de evaluación presenciales.

Si mejoraran las condiciones sanitarias y se pudieran impartir clases presenciales con normalidad, se atenderá a lo indicado en la columna "actividad en el aula".

Si, por otro lado, empeoraran las condiciones sanitarias, las pruebas de evaluación continua presenciales previstas se realizarán de forma online, sin necesidad de modificar esta guía.

10. Adendas

- Lectures may take place online if deemed necessary due to the public health situation at the time the semester starts. In that case, students will be given information on how to access the online platform ahead of time.