DEGREE CURRICULUM

DISTRIBUTED COMPUTING AND APPLICATIONS

Coordination: CORES PRADO, FERNANDO

Academic year 2020-21

DISTRIBUTED COMPUTING AND APPLICATIONS 2020-21

Subject's general information

<table>
<tr><td>Subject name</td><td>DISTRIBUTED COMPUTING AND APPLICATIONS</td></tr>
<tr><td>Code</td><td>102027</td></tr>
<tr><td>Semester</td><td>2nd Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's Degree in Computer Engineering</td><td>3</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
<table>
<tr><th>Activity type</th><th>PRALAB</th><th>TEORIA</th></tr>
<tr><td>Number of credits</td><td>3</td><td>3</td></tr>
<tr><td>Number of groups</td><td>1</td><td>1</td></tr>
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</td></tr>
<tr><td>Coordination</td><td>CORES PRADO, FERNANDO</td></tr>
<tr><td>Department</td><td>COMPUTER SCIENCE AND INDUSTRIAL ENGINEERING</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>6 ECTS = 25x6 = 150 hours
40% -> 60 classroom hours
60% -> 90 hours of autonomous student work</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>The materials are provided in english.
The course will be teach 80% in Catalan and 20% in spanish.</td></tr>
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DISTRIBUTED COMPUTING AND APPLICATIONS 2020-21

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CORES PRADO, FERNANDO	fernando.cores@udl.cat	6	
LERIDA MONSO, JOSEP LLUIS	joseplluis.lerida@udl.cat	0	

Subject's extra information

The course is eminently practical, so activities and a project will have an important weight. Basically we will work with JAVA programming language. However, in distributed applications as important as the program itself is the design of the application, for which we will also apply intensively the concepts of programming engineering

To follow the course is essential for students to have good fundamentals in Java programming. It is much harder learn to develop distributed programs when sequential programming is not previously mastered. In this course it is assumed that students are able to design, develop and debug sequential applications of medium difficulty without problems.

Learning objectives

- Introduce the basic concepts on Distributed Computing and the organisation of distributed systems.
- Provide an overview of the main architectures of Distributed Computing and his impact on the information technologies.
- Assimilate the fundamental principles and the distinct types of underlying models of Distributed Computing.
- Know the main paradigms of Distributed Computing and understand his strong points, his disadvantages and main fields of application.
- Comprise the technological challenges that represent the utilisation, the design and the implementation of the distributed systems.
- Provide an overview of the distributed systems, analysing different cases of study and applying them to solve real problems in different fields of Distributed Computing.
- Develop the skills of design and analysis of distributed systems that help to comprise, evaluate the quality the solutions proposed
- Encourage the adoption of the distributed model for the resource sharing on large scale, in a transparent form and independently of his physical location.

Competences

Strategic Competences of the UdL:

- CT2.Mastering a foreign language, especially English.
- CT3. Training Experience in the use of the new technologies and the information and communication technologies.

Cross-disciplinary competences:

- EPS11. Capacity to understand the needs of the user expressed in a no technical language.

Specific Competences:

- TI2. Capacity to choose, design, deploy, integrate, evaluate, build, manage, explode and keep the hardware, software and network technologies inside the cost and quality requirements.
- TI5. Capacity to select, deploy, integrate and manage systems of information that satisfy the needs of the organisation, within the cost and quality requirements.
- TI6. Capacity to conceive systems, applications and services based in network technologies, including Internet, web, e-commerce, multimedia, interactive services and mobile computation.

Subject contents

1. **Introduction to the Distributed Computing**
    1. Definitions and concepts
    2. Distributed Computing Challenges
    3. Types of Distributed Systems
    4. Distributed Computing systems
        1. Distributed Information systems
        2. Distributed Embedded systems
        3. Distributed Systems Architectures

2. **Paradigms of Distributed Computing**
    1. Message passing
    2. Client-server
    3. Peer-to-Peer
    4. Messages systems
    5. RPC (Remote Procedure Call)
    6. Distributed Objects
    7. Mobile agents
    8. Component-based
    9. Service-oriented

3. **Distributed Objects**
    1. Introduction
    2. Paradigm of distributed objects
    3. RMI: Remote method invocation
    4. Advanced RMI
        1. Callbacks
        2. Security Management in RMI

4. **Service-Oriented Applications**
    1. Introduction to Web Services
    2. Communication protocols: SOAP and REST
    3. Persistent Web Services
    4. Applications Integration

Methodology

Theory Virtual Sessions (3 credits)

- Lecture: classes based on notes and transparencies where the concepts of the subject will be presented.
- Problems: The concepts of the subject will work through a series of exercises to be resolved collaboratively and help assimilate key concepts.
- Use Cases: It will apply the techniques seen in class to real examples and their impact on application performance will be analyzed.

Laboratory Virtual Sessions (3 credits)

- Tutorials and personalized monitoring by groups of practices.

- Laboratory: technologies and APIs for distributed programming will be presented and worked through tutorials and examples.
- Problems: Making and correcting exercises related to both the theoretical and practical part of the course.

Autonomous work:

- The homework exercises and practices will be completed outside of class time.
- Forums Tool. In this space the student can raise doubts regarding the contents seen in the Theory and Laboratory sessions as well as pose all kind of doubts about the project. All students are encouraged to participate in resolving the doubts of their peers.Teachers participate to clarify or resolve those doubts that have no answer from students.

Development plan

Check the development plan in the following document: https://cv.udl.cat/access/content/group/102027-2021/Planificacion_CDA_2021.pdf

Evaluation

The course is approved with a final mark greater or equal to 5. The final mark will be obtained from the weighted sum of the two Assessment Test, Oral Activities, Projects and Individual Participation. The plagium of any activity will involve not passing the course.

Objectives	Assesment Activities	%	Dates	O/V (1)	I/G (2)	Remarks
Unit 1	**Exam1.** Assesment Test	15	Week 9	O	I	
Unit 3 - 4	**Exam2.** Project Validation		Week 16/17	O	I	
Unit 1	**Oral.** Oral Activities	10		O	I	
Unit 1	**A.** Activities	20		O	I/G	
Unit 1 - 4	**P.** Project	55	Weeks 15	O	G	
	Participation and Involvement	5		V	I	
Units 1, 2, 3, 4	Re-assesment	55	Week 19	V	I	Referred examinations
Final = Exam1 + Oral + Activities + Project						

(1) Mandatory / Voluntary
(2) Individual / Group

(*) On the 19th week the student can recover with a **validation exam** the Project grade or can be requested for the **delivery or improvement of some Activity (A) and/or the Project (P)**.

Bibliography

Basic Bibliography:

- Coulouris G, Dollimore J., Kindberg T.: “Sistemas distribuidos: Conceptos y diseño”; Addison-Wesley, 2001.
- M.L. Liu, “Computación distribuida”. Edt. Addison Wesley, 2004
- M. Ben-Ari, "Principles of Concurrent and Distributed Programming", Addison-Wesley, 2nd Edition, 2006