

**1. General information****Course:** PLANNING AND MANAGEMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY INFRASTRUCTURES**Code:** 310604**Type:** CORE COURSE**ECTS credits:** 6**Degree:** 2362 - MÁSTER UNIVERSITARIO EN INGENIERÍA INFORMÁTICA (CR) - (2020)**Academic year:** 2023-24**Center:** 108 - SCHOOL OF COMPUTER SCIENCE OF C. REAL**Group(s):** 20**Year:** 1**Duration:** C2**Main language:** Spanish**Second language:****Use of additional languages:****English Friendly:** Y**Web site:** Available on <https://campusvirtual.uclm.es>**Bilingual:** N**Lecturer:** JULIAN CABA JIMENEZ - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
3.05	TECNOLOGÍAS Y SISTEMAS DE INFORMACIÓN	6725	julian.caba@uclm.es	Available on https://esi.uclm.es/index.php/grado-en-ingenieria-informatica/profesorado/

2. Pre-Requisites

The student must have basic knowledge of the various information and communication technologies and their use.

Good knowledge of the Windows and Unix operating systems.

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

Nowadays data centers seek a balance between efficiency and availability to support high service demand through a combination of technologies such as virtualization (servers, network, storage), automatization and cloud and edge computing.

This course, which is part of the Systems and Network Architecture, aims to train in the methodology of applying this multidisciplinary knowledge to the approach, development and management of ICT infrastructures. The course allows students to learn the knowledge and application of the processes necessary for the management of an ICT infrastructure aligned with business requirements.

4. Degree competences achieved in this course**Course competences**

Code	Description
CE01	Ability to integrate technologies, applications, services and systems within the field of computer engineering in a general manner, in wide and multidisciplinary situations.
CE04	Ability to model, design, architecture define, implement, manage, operate, administrate and maintain applications, networks, systems services and computer content.
CE05	Ability to understand and apply the functioning steps and organisation of the internet, the newest network technologies and protocols, models for components, intermediary software and services.
INS01	Analysis, synthesis and assessment skills.
INS02	Organising and planning skills.
INS03	Ability to manage information and data.
INS04	Problem solving skills by the application of engineering techniques.
INS05	Argumentative skills to logically justify and explain decisions and opinions.
PER01	Team work abilities.
PER03	Ability to work in an international context.
PER04	Interpersonal relationship skills.
PER05	Acknowledgement of human diversity, equal rights and cultural variety.
SIS01	Critical thinking.
SIS03	Autonomous learning.
UCLM01	Command of a second language at a B1 level within the Common European Framework of Reference for Languages
UCLM02	Ability to use Information and Communication Technologies.
UCLM03	Accurate speaking and writing skills.

5. Objectives or Learning Outcomes**Course learning outcomes****Description**

Know real-life examples of large ICT infrastructures in companies and/or administrations

Know the basics of hardware planning in large installations, as well as its integration with communication systems

Know how to deal with the management of large system infrastructures

Know how to effectively apply communications support to a hardware infrastructure

Know how to implement and configure high-availability systems based on standard servers
 Know how to implement, configure and run virtual services on servers
 Know the principles of High-Availability Architecture systems

6. Units / Contents

Unit 1: Introduction - Large ICT Architectures

Unit 2: Large ICT Systems

Unit 3: Virtualization

Unit 4: High-Availability Systems

Unit 5: Cloud Computing

ADDITIONAL COMMENTS, REMARKS

This subject follows the problem-based learning methodology. Thus, hands-on activities are carried out for each of the units/contents.

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	CE01 CE04 CE05 INS01 INS03 SIS01	0.96	24	N	-	Teaching of the subject matter by lecturer (MAG)
Workshops or seminars [ON-SITE]	Lectures	CE01 CE04 CE05 INS01 INS02 INS03 INS04 INS05 PER01 PER03 PER04 SIS01 SIS03 SIS04 UCLM01 UCLM02 UCLM03	0.16	4	N	-	Lectures and seminars given by professionals related to the subject (MAG)
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	CE01 CE04 CE05 INS01 INS02 INS03 INS04 INS05 PER01 PER03 PER04 SIS01 SIS03 SIS04 UCLM01 UCLM02 UCLM03	0.96	24	Y	Y	Realization of practicals in laboratory/computing room (LAB)
Group tutoring sessions [ON-SITE]	Guided or supervised work	CE01 CE04 CE05 INS01 INS04 INS05 SIS01 UCLM03	0.18	4.5	N	-	Individual or small group tutoring in lecturer's office, classroom or laboratory (TUT)
Project or Topic Presentations [ON-SITE]	Debates	CE01 CE04 CE05 INS01 INS02 INS03 INS05 PER01 PER04 PER05 SIS01 SIS03 UCLM02 UCLM03	0.08	2	Y	N	Preparation of essays on topics proposed by lecturer (RES)
Study and Exam Preparation [OFF-SITE]	Self-study	CE01 CE04 CE05 INS01 INS02 INS03 INS04 INS05 SIS01 SIS03 UCLM01 UCLM02 UCLM03	0.2	5	Y	N	Self-study (EST)
Writing of reports or projects [OFF-SITE]	Project/Problem Based Learning (PBL)	CE01 CE04 CE05 INS01 INS02 INS03 INS04 INS05 PER01 PER03 PER04 PER05 SIS01 SIS03 UCLM01 UCLM02 UCLM03	2.4	60	Y	Y	Preparation of essays on topics proposed by lecturer (RES)
Writing of reports or projects [OFF-SITE]	project-based learning	CE01 CE04 CE05 INS02 INS03 INS04 INS05 PER01 SIS01 SIS03	1	25	Y	Y	
Final test [ON-SITE]	Assessment tests	CE01 CE04 CE05 INS01 INS02 INS03 INS04 INS05 SIS01 SIS03 UCLM03	0.06	1.5	Y	Y	Tests of the syllabus of the subject (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
Practicum and practical activities reports assessment	20.00%	20.00%	Non-compulsory activity that can be retaken. To be carried out during the theory/lab sessions. (LAB)
Assessment of problem solving and/or case studies	25.00%	25.00%	Theoretical and/or practical work, reports and/or problem solving and cases. (EVA). Compulsory activity that can be retaken.
Final test	30.00%	30.00%	Theoretical and/or practical work, reports and/or resolution of problems and cases. (EVA). Compulsory activity that can be retaken.

Self Evaluation and Co-evaluation	15.00%	15.00%	Self-evaluation test. Compulsory activity that can be retaken. (EST)
Oral presentations assessment	10.00%	10.00%	Non-Compulsory activity that can be retaken (EVA).
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. A compulsory activity cannot be divided into eliminatory parts, nor can minimum marks be established for each of its parts. 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 final exam 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 final exam 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 examcall (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 final exam, 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 final exam 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 will be conducted for all recoverable activities.

The failure of a student to attend the final exam will automatically result in her/him receiving a "Failure to attend" (no presentado), except in the case that the student conserves the mark for the final exam from the final exam call (convocatoria ordinaria). In the latter case, the student's carrying out of any other evaluable activity in the resit/retake exam call (convocatoria extraordinaria) will result in a numerical mark.

Specifications for the second resit / retake exam:

Same characteristics as the resit/retake exam call.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Unit 1 (de 5): Introduction - Large ICT Architectures	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	1
Final test [PRESENCIAL][Assessment tests]	.2
Unit 2 (de 5): Large ICT Systems	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	8
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	6
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	1
Project or Topic Presentations [PRESENCIAL][Debates]	.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	1
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	5
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	10
Final test [PRESENCIAL][Assessment tests]	.3
Unit 3 (de 5): Virtualization	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	6
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	6

Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	1
Project or Topic Presentations [PRESENCIAL][Debates]	.75
Study and Exam Preparation [AUTÓNOMA][Self-study]	1
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	5
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	20
Final test [PRESENCIAL][Assessment tests]	.5
Teaching period: 3 Weeks	
Unit 4 (de 5): High-Availability Systems	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Workshops or seminars [PRESENCIAL][Lectures]	4
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	6
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	2
Project or Topic Presentations [PRESENCIAL][Debates]	.75
Study and Exam Preparation [AUTÓNOMA][Self-study]	1
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	8
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	20
Final test [PRESENCIAL][Assessment tests]	.25
Teaching period: 2,5 Weeks	
Unit 5 (de 5): Cloud Computing	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	6
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	1
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	7
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	10
Final test [PRESENCIAL][Assessment tests]	.25
Teaching period: 2.5 weeks	
Global activity	
Activities	hours
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	25
Workshops or seminars [PRESENCIAL][Lectures]	4
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	24
Final test [PRESENCIAL][Assessment tests]	1.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Class Attendance (theory) [PRESENCIAL][Lectures]	24
Project or Topic Presentations [PRESENCIAL][Debates]	2
Total horas: 85.5	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Sander van Vugt	Pro Linux High Availability Clustering	Apress		978- 1484200803	2014	
Luiz André Barroso, Urs Hölzle, and Parthasarathy Ranganathan	The Datacenter as a Computer. Third Edition https://www.morganclaypool.com/doi/abs/10.2200/S00874ED3V01Y201809CAC046	Morgan & Claypool			2018	
Tom White	Hadoop. The Definitive Guide. 4th Edition	O'Reilly			2015	En su lugar, puede usarse la 3.ª edición.
Christoph Fehling, Frank Leymann, Ralph Retter, Walter Schupeck, and Peter Arbitter	Cloud Computing Patterns. Fundamentals to Design, Build, and Manage Cloud Applications http://www.cloudcomputingpatterns.org/	Springer			2014	
Rajkumar Buyya , Christian Vecchiola, S Thamarai Selvi	Mastering Cloud Computing	Morgan Kaufmann		978-0-12- 411454-8	2013	
Adrian Mouat	Using Docker	O'Reilly		978-1-491-91576-9	2016	
Sam Newman	Building Microservices	O'Reilly Media, Inc.		978-1-491-95035-7	2014	
Brendan Burns, Joe Beda, and Kelsey Hightower	Kubernetes: Up and Running	O'Reilly Media, Inc.		978-1-492-04653-0	2019	
Holden Karau; Andy Konwinski; Patrick Wendell; Matei Zaharia	Learning Spark	O'Reilly Media, Inc.		978-1-4493-5862-4	2015	