

**1. General information****Course:** COMMUNICATION NETWORKS II**Type:** CORE COURSE**Degree:** 385 - DEGREE IN TELECOMMUNICATIONS TECHNOLOGY ENGINEERING**Center:** 308 - SCHOOL POLYTECHNIC OF CUENCA**Year:** 2**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 59622**ECTS credits:** 6**Academic year:** 2022-23**Group(s):** 30**Duration:** C2**Second language:****English Friendly:** Y**Bilingual:** N**Lecturer:** MARCOS DAVID FERNANDEZ BERLANGA - Group(s): 30

Building/Office	Department	Phone number	Email	Office hours
E. Politécnica Cuenca (2.15)	INGENIERÍA ELÉCTRICA, ELECTRÓNICA, AUTOMÁTICA Y COMUNICACIONES	926053935	marcos.fernandez@uclm.es	It will be published at the beginning of the term.

**2. Pre-Requisites**

Having attended with profit the subjects on Maths and Signal, as well as the course on 'Communication Networks I'.

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

Telematics is one of the professional branches of telecommunications.

This course is the second that develops the Telematics subject with more advanced topics on the way a network carries out all its functionalities.

This course is terminal in the Telematics subject and it is recommended to have taken profit before attending the elective course on 'Security in Communications'.

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

Code	Description
E06	The ability to independently acquire new knowledge and techniques suitable for the design, development or operation of telecommunication systems and services.
E07	The ability to use communication and computer applications (office automation, databases, advanced calculation, project management, visualisation, etc.) to support the development and operation of telecommunication and electronic networks, services and applications.
E08	The ability to use computer tools to search for bibliographic resources or for information related to telecommunications and electronics.
E17	Knowledge and use of the concepts of network architecture, protocols and communications interfaces.
E18	The ability to differentiate the concepts of access and transport networks, circuit and packet switching networks, fixed and mobile networks, as well as distributed network systems and applications, voice, data, audio, video services and interactive and multimedia services.
E19	Knowledge of network interconnection and routing methods, as well as the fundamentals of planning, sizing of networks based on traffic parameters.
G01	Knowledge of Information and Communication Technologies (ICT).
G02	Correct, oral and written, communication skills.
G05	Knowledge, understanding and ability to apply the necessary legislation during the development of the profession of Technical Telecommunications Engineer and being able to easily deal with specifications, regulations and mandatory regulations
G06	Knowledge of basic subjects and technologies, enabling students to learn new methods and technologies, as well as providing great versatility to adapt to new situations
G09	Being able to easily handle specifications, regulations and mandatory regulations
G11	Knowing and applying basic elements of economics and human resources management, organisation and planning of projects, as well as legislation, regulation and standardisation in telecommunications
G12	The ability to work in a multidisciplinary group and in a multilingual environment and to communicate, both in writing and orally, knowledge, procedures, results and ideas related to telecommunications and electronics
G13	The ability to look for and understand information, whether technical or commercial in different sources, to relate and structure it to integrate ideas and knowledge. Analysis, synthesis and implementation of ideas and knowledge.

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

Identification of network components, network topologies and types of networks.

Identification of the area covered by the access networks.

Correct use of oral and written expression to convey ideas, technologies, results, etc.

Use of ICT to achieve the specific objectives set in the subject.

Determination of the quality requirements required by a network service.

Distinction between circuit and packet switching networks.  
 Distinction between transport and access networks.  
 Understanding of the different principles of networks interconnection.  
 Identification of network services, both broadcast and interactive, both centralized and distributed, both voice and audio and data and video.  
 Use of different routing algorithms to determine appropriate routes to different situations and networks.  
 Distinction of the different elements of network interconnection.  
 Distinction between fixed and mobile networks.  
 Distinction between different routing algorithms and identification of the principle on which they are based, with special emphasis on a TCP / IP network .  
 Analysis, synthesis and compression of technical documentation and mastery of specific vocabulary.  
 Planning and dimensioning of networks and network elements according to traffic parameters.  
 Understanding of the different techniques for managing traffic in a network and distinguishing the different scopes covered.  
 Construction and configuration of an Ethernet network.

## 6. Units / Contents

### Unit 1: Network interconnection

- Unit 1.1 Introduction
- Unit 1.2 Routing
- Unit 1.3 VLAN
- Unit 1.4 Physical level of wired/wireless networks

### Unit 2: Wide area networks

- Unit 2.1 Transport vs. access networks
- Unit 2.2 Transport by circuit/packet switching
- Unit 2.3 Access from the wired/wireless local loop

### Unit 3: Telephone systems

- Unit 3.1 Traditional telephony: PSTN
- Unit 3.2 IP telephony: VoIP
- Unit 3.3 Telephone switching in IP

### Unit 4: Network planning

- Unit 4.1 Introduction
- Unit 4.2 Requirements
- Unit 4.3 Trends

### Unit 5: Traffic theory

- Unit 5.1 Mathematical tools
- Unit 5.2 Queueing models
- Unit 5.3 Queueing networks

### Unit 6: Laboratory

- Unit 6.1 Simulation of protocols
- Unit 6.2 Setting and configuring a switched network
- Unit 6.3 Installation and basic configuration of an Asterisk server
- Unit 6.4 Simulation of networks through queues

## ADDITIONAL COMMENTS, REMARKS

Software: O.S. Windows & Ubuntu-Linux, JMT, PacketTracer, Asterisk, softphones, NetSim.

Hardware: all the devices available at the telematics lab.

## 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	E07 E08 E17 E18 E19 G01 G02 G06 G09 G11	1.3	32.5	N	-	Theoretical lectures.
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	E07 E08 E17 E18 E19 G01 G02 G05 G06 G09 G11 G12	0.3	7.5	N	-	The teacher will show some demonstrations and problem solving techniques to illustrate some parts of the course.
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	E06 E07 E08 E17 E18 E19 G01 G02 G05 G06 G09 G11 G12 G13	0.6	15	Y	N	The students will carry on practical work according to the provided instructions. Their work will be monitored in-situ and may modulate the marks obtained in the practical part. This activity cannot be recovered.
Final test [ON-SITE]	Assessment tests	E06 E07 E08 E17 E18 E19 G01 G02 G05 G06 G09 G11 G12 G13	0.15	3.75	Y	Y	Final exam including theory and problems. This could be recovered in the fixed session of the extraordinary call.
Individual tutoring sessions [ON-SITE]		E06 E07 E08 E17 E18 E19 G01 G02 G05 G06 G09 G11 G12 G13	0.05	1.25	N	-	Personal attention to the students.
Writing of reports or projects [OFF-SITE]	Problem solving and exercises	E06 E07 E08 E17 E18 E19 G01 G02 G05 G06 G09 G11 G12 G13	0.2	5	N	-	Self-work to prepare the part of problem solving.

Practicum and practical activities report writing or preparation [OFF-SITE]	Practical or hands-on activities	E06 E07 E08 E17 E18 E19 G01 G02 G05 G06 G09 G11 G12 G13	0.6	15	Y	Y	The students should hand out a report of each practical activity according to the conditions provided and even including additional files of results and configurations. In some cases, an oral defense of the work could be demanded. These activities can be recovered by repeating the specified parts, individually and in an independent manner, but with tutorial support and with a compulsory oral defense. Plagiarism or copying will be punished with a mark of 0 point to all the people involved.
Writing of reports or projects [OFF-SITE]	Group Work	E06 E07 E08 E17 E18 E19 G01 G02 G05 G06 G09 G11 G12 G13	0.4	10	Y	N	Sinthesis work in group about a a practical case of the telematics subject. It will be carried out in an independent manner, but with tutorial support. A report will be handed out. This activity cannot be recovered. Plagiarism or copying will be punished with a mark of 0 points to all the people involved.
Study and Exam Preparation [OFF-SITE]	Self-study	E06 E07 E08 E17 E18 E19 G01 G02 G05 G06 G09 G11 G12 G13	2.4	60	N	-	Self-study.
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	50.00%	50.00%	A final written test on theory and problem solving will be considered.
Laboratory sessions	40.00%	40.00%	The job carried out along the lab activities will be considered (direct observation), as well as those reports demanded to be handed-on and the oral presentation and defense of the required tasks.
Other methods of assessment	10.00%	10.00%	Development of a synthesis course-job in small groups; a written report/project will be handed-on and an oral presentation could also be demanded.
<b>Total:</b>	<b>100.00%</b>	<b>100.00%</b>	

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:

Weights stated in the 'Grading System' section will be applied, whenever that in both, 'final test' and 'laboratory sessions', the scores obtained were, at least, equal or higher than 4 points or, on the contrary, the course will be assessed as failed.

##### Non-continuous evaluation:

The teacher must be informed at the beginning of the semester in case a student cannot attend face-to-face training activities, so that a personalized carrying-out and handing-out scheme could be agreed.

A student cannot follow non-continuous evaluation if he has attended activities that imply at least 50% of the global marks or if the period of regular classes has already finished.

Weights stated in the 'Grading System' section will be applied, whenever that in both, 'final test' and 'laboratory sessions', the scores obtained were, at least, equal or higher than 4 points or, on the contrary, the course will be assessed as failed.

#### Specifications for the resit/retake exam:

'Final test' could be retaken through an exam in the official stated date. The way to reassess the rest of the retaking activities will be specified in 'Campus Virtual' after closing the regular assessment period. The same weights as in the ordinary period will be applied.

#### Specifications for the second resit / retake exam:

It will be assessed through a theory-practice exam in the official stated date. Weights will be 40% laboratory and 60% exam.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Final test [PRESENCIAL][Assessment tests]	3.75
Individual tutoring sessions [PRESENCIAL][ ]	1.25
Writing of reports or projects [AUTÓNOMA][Problem solving and exercises]	5

Practicum and practical activities report writing or preparation [AUTÓNOMA][Practical or hands-on activities]	15
Writing of reports or projects [AUTÓNOMA][Group Work]	10
Study and Exam Preparation [AUTÓNOMA][Self-study]	60
<b>General comments about the planning:</b> Units will be taught consecutively along the real calendar of the term in which the course is placed. The planning of the course could slightly change to be adapted to the appropriate progress of the class. During the beginning of the term, the weekly planning will be published in virtual campus.	
<b>Unit 1 (de 6): Network interconnection</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	12
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
<b>Unit 2 (de 6): Wide area networks</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	5
<b>Unit 3 (de 6): Telephone systems</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	5
<b>Unit 4 (de 6): Network planning</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	3
<b>Unit 5 (de 6): Traffic theory</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	7.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	4.5
<b>Unit 6 (de 6): Laboratory</b>	
<b>Activities</b>	<b>Hours</b>
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	15
<b>Global activity</b>	
<b>Activities</b>	<b>hours</b>
Practicum and practical activities report writing or preparation [AUTÓNOMA][Practical or hands-on activities]	15
Writing of reports or projects [AUTÓNOMA][Group Work]	10
Class Attendance (theory) [PRESENCIAL][Lectures]	32.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	7.5
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	15
Final test [PRESENCIAL][Assessment tests]	3.75
Individual tutoring sessions [PRESENCIAL][ ]	1.25
Writing of reports or projects [AUTÓNOMA][Problem solving and exercises]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	60
<b>Total horas: 150</b>	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Cítv	ISBN	Year	Description
Gómez, J., Gil, F.	VoIP y Asterisk: redescubriendo la telefonía	Ra-Ma		978-84-7897-902-8	2008	
Kurose, James F.	Redes de computadoras : un enfoque descendente /	Pearson Educación,		978-84-7829-119-9	2010	
Molenaar, René	How to master CCNA <a href="http://gns3vault.com">http://gns3vault.com</a>	GNS3 Vault		978-1482364873	2013	
Pazos, J.J., Suárez, A., Díaz, R.P.	Teoría de colas y simulación de eventos discretos  <a href="https://campusvirtual.uclm.es">https://campusvirtual.uclm.es</a>	Pearson	Madrid	84-205-3675-X	2003	campus virtual de la asignatura
Wu, C-H., Irwin, J.D.	Introduction to Computer Networks and Cybersecurity	CRC-Press		978-1-4665-7213-3	2013	