



Universitat de Lleida

DEGREE CURRICULUM  
**COMPUTER NETWORKS AND  
COMMUNICATIONS**

Coordination: FERNANDEZ CAMON, CESAR

Academic year 2022-23

Subject's general information

<b>Subject name</b>	COMPUTER NETWORKS AND COMMUNICATIONS			
<b>Code</b>	102024			
<b>Semester</b>	2nd Q(SEMESTER) CONTINUED EVALUATION			
<b>Typology</b>	Degree	Course	Character	Modality
	Bachelor's Degree in Computer Engineering	3	COMPULSORY	Attendance-based
	Bachelor's Degree in Computer Engineering	3	OPTIONAL	Attendance-based
	Master's Degree in Informatics Engineering		COMPLEMENTARY TRAINING	Attendance-based
<b>Course number of credits (ECTS)</b>	6			
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	PRALAB	TEORIA	
	<b>Number of credits</b>	3	3	
	<b>Number of groups</b>	1	1	
<b>Coordination</b>	FERNANDEZ CAMON, CESAR			
<b>Department</b>	COMPUTER SCIENCE AND INDUSTRIAL ENGINEERING			
<b>Teaching load distribution between lectures and independent student work</b>	6 ECTS = 25x6 = 150 working hours 40% --> 60 working hours at class/lab rooms 60% --> 90 non guided working hours			
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.			
<b>Language</b>	Catalan/English Teaching materials: english			
<b>Distribution of credits</b>	Cèsar Fernández 6			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
FERNANDEZ CAMON, CESAR	cesar.fernandez@udl.cat	6	

## Subject's extra information

The subject deeply analyzes the following concepts; routing, service load balancing and network management. A theoretical and practical approach is proposed, using several real scenario cases, deployed by the student using simulation tools.

## Learning objectives

- To understand the concepts and mechanisms related to unicast and multicast routing
- To develop and configure routing devices in OSPF, RIP, BGP and multicast scenarios
- To understand redundancy and load balancing in routing networks
- To design and configure fault tolerant and load balancing communication networks
- To understand network management concepts
- To learn about SNMP protocol
- To design management tools based on SNMP

## Competences

### University of Lleida strategic competences

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

### Degree-specific competences

- GII-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.
- GII-TI4. Capacity to choose, design, deploy, integrate and manage networks and infrastructures of communications in an organisation.
- GII-TI6. Capacity to conceive systems, applications and services based in network technologies, including Internet, web, e-commerce, multimedia, interactive services and mobile computation.
- GII-TI7. Capacity to comprise, apply and manage the computer systems guarantee and security.

### Competències transversals de la titulació

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

## Subject contents

- Advanced Routing

- Routing basic concepts. Algorithms and protocols
- Routing Information Protocol (RIP)
- Open Shortest Path First (OSPF)
- Border Gateway Protocol (BGP)
- Multicast Routing
- Tunnels
- Redundancy and Balancing
  - Virtual Redundancy Routing Protocol (VRRP)
  - Load Balancing
  - Server Load Balancing
- Network Management
  - Basic concepts
  - Simple Network Management Protocol (SNMP). Architecture, details and tools
  - Abstract Syntax Notation (ASN)

## Methodology

This subject is splitted into three parts; Routing, Redundancy and Balancing and Network Management. Besides the corresponding master class and problem resolution sessions, for each part a practical exercise is proposed and developend in laboratory sessions.

## Development plan

- 11/2 - 25/2. **Theme 1. Advanced Routing. (Basic concepts, RIP, OSPF)**
- 26/2 - 27/2. **Lab tools setup**
- 4/3 - 14/3. **Theme 1. (BGP, Multicast)**
- 19/3. **Practice 1 (Routing)**
- 20/3. **Theme 1. (Tunnels)**
- 25/3 - 8/4. **Theme 2. Load Balancing (Redundancy and Load Balancing)**
- 10/4. **Partial exam 1 (Theme 1) . Practice 1 validation**
- 22/4- 25/4 **Theme 2 (Server load balancing)**
- 28/4 - 9/5. **Practice 2 (Redundancy and Balancing)**
- 12/5 - 23/5. **Theme 3 (Network Management)**
- 26/5 - 30/5. **Practice 3. (SNMP)**
- 11/6. Tema 4 .**Partial exam 2 (Themes 2 and 3). Practices 2 and 3 validation**

## Evaluation

Evaluation Activities

Acr.	Activity	Weight	Min Score	Groupal	Mandatory	Remedial
P1	Practice 1	14%	-	Yes	No	No
EP1	Partial Exam 1. Validation P1	29%	-	Yes	No	No
P2	Practice 2	14%	-	Yes	No	No
P3	Practice 3	14%	-	Yes	No	No
EP2	Partial Exam 2. Validation P2 and P3	29%	-	Yes	No	No

Final score:  $0.14*(P1+P2+P3) + 0.29*(EP1+EP2)$

## Bibliography

- TCP/IP Illustrated, Vol 1. W. Richard Stevens. Addison-Wesley, 1994.
- Network Warrior 2nd Ed. Gary A. Donahue. O'Reilly, 2011
- Server Load Balancing. Tony Bourke. O'Reilly, 2001
- Essential SNMP. Douglas Mauro, Kevin Schmidt. O'Reilly, 2001.