DEGREE CURRICULUM

COMPUTER NETWORKS AND COMMUNICATIONS

Coordination: FERNANDEZ CAMON, CESAR

Academic year 2022-23

COMPUTER NETWORKS AND COMMUNICATIONS 2022-23

Subject's general information

<table>
<tr><td>Subject name</td><td>COMPUTER NETWORKS AND COMMUNICATIONS</td></tr>
<tr><td>Code</td><td>102024</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>
<tr><td>Bachelor's Degree in Computer Engineering</td><td>3</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
<tr><td>Master's Degree in Informatics Engineering</td><td></td><td>COMPLEMENTARY TRAINING</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>
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<tr><th>Activity type</th><td>PRALAB</td><td>TEORIA</td></tr>
<tr><th>Number of credits</th><td>3</td><td>3</td></tr>
<tr><th>Number of groups</th><td>1</td><td>1</td></tr>
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<tr><td>Coordination</td><td>FERNANDEZ CAMON, CESAR</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 working hours
40% --> 60 working hours at class/lab rooms
60% --> 90 non guided working hours</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Catalan/English
Teaching materials: english</td></tr>
<tr><td>Distribution of credits</td><td>Cèsar Fernández 6</td></tr>
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COMPUTER NETWORKS AND COMMUNICATIONS 2022-23

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.