DEGREE CURRICULUM

COMMUNICATION NETWORKS

Coordination: MATEU PIÑOL, CARLOS

Academic year 2020-21

COMMUNICATION NETWORKS 2020-21

Subject's general information

<table>
<tr><td>Subject name</td><td>COMMUNICATION NETWORKS</td></tr>
<tr><td>Code</td><td>102015</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>2</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
<tr><td>Double bachelor's degree: Degree in Computer Engineering and Degree in Business Administration and Management</td><td>3</td><td>COMPULSORY</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>9</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
<table>
<tr><th>Activity type</th><td>PRALAB</td><td>TEORIA</td></tr>
<tr><th>Number of credits</th><td>3.6</td><td>5.4</td></tr>
<tr><th>Number of groups</th><td>4</td><td>1</td></tr>
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<tr><td>Coordination</td><td>MATEU PIÑOL, CARLOS</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>9 ECTS = 25x6 = 225 hours.
- 90 class and lab hours.
- 135 students own autonomous 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>Catalan.</td></tr>
<tr><td>Distribution of credits</td><td>Carles Mateu Piñol 4.2
Enric Guitart Baraut 12</td></tr>
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COMMUNICATION NETWORKS 2020-21

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
FERNÁNDEZ CAMÓN, CÈSAR	cesar.fernandez@udl.cat	1,8	
GUITART BARAUT, ENRIQUE	enrique.guitart@udl.cat	14,4	
MATEU PIÑOL, CARLOS	carles.mateu@udl.cat	3,6	

Subject's extra information

Office hours need to be appointed beforehand by e-mail to be sure we can attend you and that we are not attending other students.

To properly follow this course, previous skills on basic programming and operating systems are recommended.

Learning objectives

- Knowledge of current standard mechanisms and institutions.
- Learning data link protocols basics, as well as their weaknesses and capacities.
- Designing a physical and data-link level solution for a given scenario.
- Learning current network level protocol basics.
- Understanding network level protocol weaknesses and limitations and their solutions.
- Designing and addressing and routing solution for a given and basic scenario.
- Knowledge and ability to optimize transport protocols.
- Studying current data encoding and compression mechanisms.
- Knowledge and understanding encapsulation and abstraction models between network levels.
- Knowledge and understanding physical level data transmission mechanisms.
- Designing transport level protocols.
- Understanding performance factors and congestion control procedures.
- Knowledge and understanding of application level protocols, particularly those with multimedia containers.

Competences

Degree-specific competences

- GII-CR11 - Knowledge and application of the characteristics, functionalities and structure of Distributed Systems, Computer and Internet Networks, and the design and deployment of applications based on them.

Degree-transversal competences

- EPS12 - Be motivated by quality and continual improvement.

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Subject contents

Theme 1 Standards and organizations.

Theme 2 OSI and TCP/IP models.

Theme 3 Physical level: Introduction to data transmission

Theme 4 Data-link level:

4.1 Direct access networks: Ethernet (802.3), Wireless (802.11).

4.2 Transport networks: ATM, xDSI, xDSL, MPLS/VPLS.

4.3 Switching.

Theme 5 Network level.

5.1 IP protocols: IPv4 i IPv6.

5.2 IP addressing: IPv4 i IPv6.

5.3 Basic routing: static and vector-distance.

5.4 Advanced routing: link-state.

Theme 6 Transport level.

6.1 End-to-end protocols: TCP and UDP.

6.2 Another end-to-end protocols.

Theme 7 Congestion control and resource management.

Theme 8 Application level.

8.1 Application protocols.

8.2 Multimedia applications.

Methodology

The course is structured following the layered model of OSI/ISO network abstracion, we study the different technologies and network protocols starting with the physical level, and progressively increasing the ISO/OSI level, and hence abstraction with respect to the physical transportation of data. Despite using the ISO theoretical model, the protocol suite studied is the constituent of the Internet, TCP/IP. For each level there is a collection of problems that allow students to validate they achieved required knowledge. Also in a series of laboratory sessions, students will consolidate this knowledge as well as gaining a more applied view of networks, as the laboratories will be done using real enterprise-level network equipment to implement realistic networks in realistic scenarios.

Development plan

Week 1. Theme 1. Standards and organizations.

Week 2. Theme 2. OSI and TCP/IP models

Week 3. Theme 3. Physical level: Introduction to data transmission

Week 4. Theme 3. Physical level: Introduction to data transmission

Week 5. Theme 4. Data-link level

Week 6. Theme 4. Data-link level

Week 7. Theme 4. Data-link level

Week 8. Holidays

Week 9. Theme 5. Network level

Week 10. Partial Exams 1

Week 11. Theme 5. Network level

Week 12. Theme 5. Network level. / Theme 6. Transport level

Week 13. Theme 6. Transport level

Week 14. Theme 7. Congestion control and resource management

Week 15. Theme 7. Congestion control and resource management

Week 16. Theme 8. Application level

Week 17. Partial Exams 2

Evaluation

Acr.	Evaluation Activities	Weight	Minimum score	Group	Compulsory	Recoverable
P1	Project 1	20%	Yes	No	Yes	NO
P2	Project 2	24%	Yes	5	Yes	NO
P3	Project 3	20%	Yes	No	Yes	NO
E1	Midterm 1	18%	Yes	No	Yes	NO
E2	Midterm 2	18%	Yes	No	Yes	NO
Final score = 0,18*E1 + 0,18*E2 + 0,20*P1 + 0,24*P2 + 0,25*P3						

Continuous assessment:

- Midterm 1 test: 18 % (projects included).
- Midterm 2 test: 18 % (projects included)).
- Project 1 (Sockets/Programming): 20 %
- Project 2 (Physical and data-link level): 24 %
- Project 3 (Network level and TCP/IP): 20 %

The course is passed with a qualification >=5.

There's **NO** recovery test.

Acr.	Evaluation Activity	Weight	Minimum grade	Group	Compulsory	Recoverable
EU	Unique Exam	100%	Yes	No	Yes	Yes

Single test assessment:

- Recovery test: 100% of the mark.
- Recovery test: (recoverable up to 80% of the grade).

  This includes all the topics of the course (theory, practice and laboratory) in a single test.
  To follow this evaluation students must notify it beforehand.
  In case of delivery of any item of continuous assessment (practice and/or test) we will consider that sudents follow continuous assesment.

  The course is passed with a qualification >=5.

Bibliography

ComputerNetworks. A System Approach (Fifth Edition). Larry Peterson and Bruce S. Davie. Morgan Kaufmann, 2011.

ComputerNetworks (5th Edition). Andrew S. Tanenbaum and David J. Wetherall. Pearson, 2010.

Computer Networking: A Top-Down Approach (5th Edition). James F. Kurose and Keith W. Ross. Addison-Wesley, 2010.

TCP/IP Illustrated, Volumes 1 & 2. W. Richard Stevens. Addison-Wesley.

Networking.Jeffrey S. Beasley. Pearson, 2008.