DEGREE CURRICULUM

COMMUNICATION NETWORKS

Coordination: MARTINEZ RODRIGUEZ, SANTIAGO

Academic year 2022-23

COMMUNICATION NETWORKS 2022-23

Subject's general information

<table>
<tr><td>Subject name</td><td>COMMUNICATION NETWORKS</td></tr>
<tr><td>Code</td><td>102379</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 Digital Interaction and Computing Techniques</td><td>2</td><td>COMPULSORY</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>
<table>
<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>MARTINEZ RODRIGUEZ, SANTIAGO</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 in-class hours,
60% -> 90 independent work 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.</td></tr>
<tr><td>Distribution of credits</td><td>Theory: 3
Practices: 3</td></tr>
</table>

COMMUNICATION NETWORKS 2022-23

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
MARTINEZ RODRIGUEZ, SANTIAGO	santi.martinez@udl.cat	6	Arrange with the teacher. Optionally, by videoconference.

Subject's extra information

Office hours need to be appointed beforehand by e-mail with the teacher.

To properly follow this course, previous skills on 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

Basic Competences

- **B03.** That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical issues.

Transversal Competences

- **CT3.** Acquire training in the use of new technologies and information and communication technologies.

General Competences

- **CG2.** Design, develop, evaluate and guarantee the accessibility, ergonomics, usability and security of computer systems.
- **CG3.** Use adequate hardware and software platforms to develop and execute interactive digital applications.

Specific Competences

- **CE7.** Know, manage and maintain systems, services and interactive applications.
- **CE12.** Knowledge and ability to apply the characteristics, functionalities and structure of computer networks and internet, and design and implement interactive applications based on them.

Subject contents

Standards and organizations.

OSI and TCP/IP models.

Physical level: Introduction to data transmission.

Data-link level:

- Medium access.
- Direct access networks: Ethernet (802.3), Wireless (802.11).
- Switching.

Network level:

- IP protocol.
- IP addressing.
- Basic routing: static and vector-distance.
- Advanced routing: link-state.

Transport level:

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

Congestion control and resource management.

Application level: Application protocols.

Methodology

Each week students attend 2 hours with a Large Group and 2 hours with a Medium Group.
Medium Group sessions are practices.

The course is structured following the layered model of ISO/OSI 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 OSI theoretical model, the protocol suite studied is the constituent of the Internet, TCP/IP.

Also in a series of laboratory sessions, students will consolidate this knowledge as well as gaining a more applied view of networks.

Development plan

Week 1. Standards and organizations.

Week 2. OSI and TCP/IP models.

Week 3. Physical level: Introduction to data transmission.

Week 4. Physical level: Introduction to data transmission.

Week 5. Data-link level.

Week 6. Data-link level.

Week 7. Network level.

Week 8. Network level.

Week 9. Midterm exams 1.

Week 10. Transport level.

Week 11. Transport level.

Week 12. Congestion.

Week 13. Congestion.

Week 14. Presentation.

Week 15. Application protocols.

Week 16. Midterm exams 2.

Week 17. Midterm exams 2.

Week 18. Tutorial week.

Week 19. Improvement exams.

Evaluation

Acronym	Evaluation Activity	Weight	Minimum Score	Group	Compulsory	Recoverable
P1	Project 1	20%	No	Yes	No	No
P2	Project 2	20%	No	Yes	No	No
P3	Project 3	20%	No	Yes	No	No
E1	1st Midterm Exam	20%	No	No	No	Yes
E2	2nd Midterm Exam	20%	No	No	No	Yes

Final score = 0,2 · P1 + 0,2 · P2 + 0,2 · P3 + 0,2 · E1 + 0,2 · E2

The course is passed with a qualification larger or equal than 5.

The midterm exams can be recovered during the improvement week.

Bibliography

- Larry L. Peterson, Bruce S. Davie: Computer Networks: A Systems Approach, Fifth Edition. Morgan Kaufmann, 2011.
- Andrew S. Tanenbaum, David J. Wetherall: Computer Networks (5th Edition). Pearson, 2010.
- James F. Kurose, Keith W. Ross: Computer Networking: A Top-Down Approach (5th Edition). Addison-

Wesley, 2010.

- W. Richard Stevens: TCP/IP Illustrated, Volumes 1 & 2. Addison-Wesley.
- Jeffrey S. Beasley: Networking. Pearson, 2008.