Universitat de Lleida

DEGREE CURRICULUM
COMMUNICATION NETWORKS

Coordination: FERNANDEZ CAMON, CESAR

Academic year 2023-24

Subject's general information

Subject name	COMMUNICATION NETWORKS
Code	102015
Semester	2nd Q(SEMESTER) CONTINUED EVALUATION

Typology	Degree	Course	Character	Modality
	Bachelor's Degree in Computer Engineering	2	COMPULSORY	Attendance-based
	Double bachelor's degree: Degree in Computer Engineering and Degree in Business Administration and Management	3	COMPULSORY	Attendance-based
	Master's Degree in Informatics Engineering		COMPLEMENTARY TRAINING	Attendance-based

Course number of credits (ECTS)	9

Type of activity, credits, and groups	Activity type	PRALAB	TEORIA
	Number of credits	3.6	5.4
	Number of groups	4	2

Coordination	FERNANDEZ CAMON, CESAR
Department	COMPUTER ENGINEERING AND DIGITAL DESIGN
Teaching load distribution between lectures and independent student work	9 ECTS = 25x6 = 225 hours. - 90 class and lab hours. - 135 students own autonomous work.
Important information on data processing	Consult this link for more information.
Language	Catalan.
Distribution of credits	Cèsar Fernández Camón 1.5 Enric Guitart Baraut 14.4 Paula Gallucci 9.3

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
FERNANDEZ CAMON, CESAR	cesar.fernandez@udl.cat	1,5	
GALLUCCI ZURITA, PAULA	paula.gallucci@udl.cat	10,8	
MATEU PIÑOL, CARLOS	carles.mateu@udl.cat	12,9	

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.

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

Teaching weeks of teaching. Interspersed in these weeks there will be 1 week of evaluations (exam 1), 1 week of holidays (Easter), as well as the relevant holidays.

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. Theme 5. Network level

Week 9. Theme 5. Network level

Week 10. Theme 5. Network level. / Theme 6. Transport level

Week 11. Theme 6. Transport level

Week 12. Theme 7. Congestion control and resource management

Week 13. Theme 7. Congestion control and resource management

Week 16. Theme 8. Application level

Evaluation

Block	Acr.	Evaluation Activities	Weight	Minimum score	Group	Mand	Recuperable
Block 1	B1	**Basic communications and Ethernet**	18%				
B1	E1	Exam 1	18%	No	NO	NO	NO
Block 2	B2	**IP Network**	18%				
B2	E2	Exam 2	18%	No	NO	NO	NO
Block 3	B3	**Application development**	20%				
B3	P1	Project 1	20%	No	NO	NO	NO
Block 4	B4	**Network project design and execution**	20%				
B4	P2	Project 2	24%	No	5/6	NO	NO
Block 5	B5	**Traffic analysis**	20%				
B5	P3	Project 3	20%	No	NO	NO	NO
Final grade = 0,18*B1 + 0,18*B2 + 0,20*B3 + 0,24*B4 + 0,20*B5							

Notes:

- Exams may include questions related to projects 1, 2 and 3 if there are doubts on project authorship.
- Project 2 block 4: Project is done on the laboratory with real world network equipment. Laboratory classes are mandatory with a maximum of 2 non justified absences allowed.

- The course is passed with a qualification >=5.

  There's **NO** recovery test.

Alternate evaluation

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

Single test alternate evaluation:

- Recovery test: 100% of the mark.
- 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 and follow the evaluation rules of the UdL.

  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.