VNIVERSITAT DE VALÈNCIA

Course Guide
36436 Network and security

COURSE DATA

Data Subject	
Code	36436
Name	Network and security
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1406 - Degree in Data Science	School of Engineering	2	Second term

Subject-matter

Degree	Subject-matter	Character
1406 - Degree in Data Science	12 - Computer Science	Obligatory

Coordination

Name	Department
SORIANO GARCIA, FRANCISCO R	240 - Computer Science

SUMMARY

Networks and Security are two fundamental requirements of computer systems, computing and data use.

Any task that requires the acquisition, use and processing of data must be based on the use of communication networks and take into account the security of information throughout the process (from acquisition to treatment and publication).

The security requirements and benefits of using networks change rapidly basically due to dependence on computer systems, the requirements of these systems, and the emergence of new technologies.

This course is designed to present an overview of the essential elements of networks and the security of computer systems in order to teach students how to follow this process of continuous change, keep up to date, and use the most suitable techniques at all times.

Networks and Security is taught in the second semester of the second year as a component of Computing.

The theory classes will be taught in Spanish. The language for the practical and laboratory classes will be stated in the course guidelines available on the website for this degree.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

For a good progress in the subject, it is necessary to have successfully taken the Data Storage Infrastructure subject of the first semester of the second year of the Data Science Degree.

OUTCOMES

1406 - Degree in Data Science

- (CG01) Knowledge of basic subjects and technologies that enable students to learn new methods and technologies, and to provide them with versatility to adapt to new situations.
- (CG04) Ability to work in a multidisciplinary group in a multilingual environment and to communicate, orally and in writing, knowledge, procedures, results and ideas related to data science.
- (CT01) To be able to access (bibliographical) information tools and appropriately use them in the development of their daily tasks.
- (CT02) To be able to complete technical, scientific, social and human training in general, and to organise self-learning with a high degree of autonomy.
- (CT05) Ability to evaluate the advantages and disadvantages of different methodological and / or technological alternatives in different fields of application.
- (CE08) Ability to understand, select and use the infrastructure and the techniques used to handle mass data, according to criteria of efficiency, scalability, security, error tolerance and adaptation to the production environment.

- (CE11) Ability to design and implement data acquisition, its integration, transformation, selection, verification of its quality and veracity from different sources, taking into account its character, heterogeneity and variability.
- (CB3) Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

LEARNING OUTCOMES

Students should acquire the following skills and competences:

- Know the layer structure of computer networks and the main protocols and services used on the Internet and in data processing (G-1, T-1, CE-8, CE-11).

- Know and know how to use the physical and virtual devices needed to create and maintain computer networks (G-1, T-1, T-5, CE-11).

- Know the risks involved in obtaining, processing, storing and exchanging data (G-1, T-1, T-5, CE-8, CE-11).

- Know and know how to use appropriate cryptographic techniques for obtaining, processing, storing and exchanging data (G-1, T-1, T-5, CE-8, CE-11).

- Be able to select and apply technical measures for maintaining the security of systems for obtaining, processing, storing and exchanging data (G-1, T-1, T-5, CE-8, CE-11).

- Be able to access and understand technical literature and to access the information required to know the details of a specific network configuration and security (G-1, T-1, T-2, T-5, CE -8, CE-11).

- Be able to work as part of a team, distributing the workload to create designs and configurations to tackle complex problems, and to coordinate with other technical professionals (system, networks, databases and applications administrators, etc.) to enable the proper functioning of computer systems (B-3, G-4).

DESCRIPTION OF CONTENTS

1. Computer networks. Layers structure. Physical layer and data link layer.

Layers structure
Physical layer
Data link layer
- Medium Access Control sublayer
Hubs and switches
Spanning Tree
VLANs

2. IP layer

Internet Protocol IP Layer
ARP protocol
IPv4 addressing
IPv6 addressing
Routers and routing protocols

3. Transport layer

Objectives of the transport layer
TCP protocol
UDP protocol
Sockets and ports

4. Application layer

Examples of the application layer using TCP and UDP
DNS. Name server
SMTP Email
HTTP. Web
Specific protocols for IoT: MQTT
Evolution of networks: NFV, SDN, IoT, Cloud

5. Computer security introduction

The process of computer security
Risks, vulnerabilities, threats and impact
Regulations on data processing and security

6. Cryptography and applications

Encryption with symmetric key
Public key cryptography
Hashes
Applications to storage and communication
Integrity and authentication
Certificates and digital signatures
HTTPs and SSH protocols

7. Preventive measures. Hardening and Firewalls

Preventive measures at the host level. Hardening. Malware
Preventive measures at the network level. Perimetral security. Firewalls, proxies and VPNs

8. Intrusion detection systems. Audit

Intrusion detection systems
HIDS
NIDS and NIPS
Audit

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Laboratory practices	20,00	100
Classroom practices	10,00	100
Attendance at events and external activities	2,00	0
Development of group work	5,00	0
Development of individual work	5,00	0
Study and independent work	25,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	30,00	0
Preparing lectures	6,00	0
Preparation of practical classes and problem	6,00	0
Resolution of case studies	6,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The teaching activities for this course are:

1. Theoretical activities. The topics taught in the theory classes will provide a global and integrating vision, analyze the key and most complex aspects in detail, and encourage student participation at all times (G-1, T-5, CE-8, CE-11).

2. Practical activities. These activities will complement the theoretical activities. The basic concepts will be applied and expanded with the knowledge and experience students will acquire by completing their assignments. These face-to-face activities include finding solutions to problems and questions discussed in the classroom, discussion sessions, problem solving and other exercises previously worked on by the students, laboratory practice, oral presentations, conferences and scheduled individual or group tutoring sessions (B -3, G-1, G-4, T-1, T-5)

3. Individual work. This includes completion (outside the classroom) of monographs, literature research, questions, problems, and studying for classes and exams. These activities are done individually and are intended to promote autonomous learning (T-1, T-2).

4. Small-group work. Group work completed outside the classroom in small groups of 2-4 students comprising assignments, questions and problems. This type of activity complements individual activities and fosters teamwork (G-4)

EVALUATION

The subject can be evaluated in two different ways, one giving more weight to classroom activities and another with greater weight for the final exam. All students will have the final grade of the higher of the following two options.

Option with greater weight in continuous evaluation: 0.2 * EC + 0.3 * Exam + 0.5 * Lab

Where EC can include one or more of: classroom activities, controls, assistance, exercises, individual and group homework, presentations, etc. This note is not recoverable (SE2, SE3), (G-4, CE-8, CE-11).

Where Lab will be the assistance and work in 7 laboratory practices (SE2) (T-1, T-2, CE-8, CE-11).

To apply this option it will be necessary to have a minimum of 5 in the Lab part and 4 in the Exam part. If the minimum of the part of the exam is not reached, the final grade will be the minor of both Exam and Lab.

Option with greater weight for the final exam: 0.1 * EC + 0.5 * Exam + 0.4 * Lab

If a minimum of 4 is not reached in the exam part, the exam grade will be taken as the final grade.

In the second call the subject will be evaluated in the same way as in the first call, but only the option of greater weight for the final exam will be used as a note and in addition it will be possible to improve some laboratory note that can be done on a non-contact basis and this laboratory note can never be greater than 7 out of 10.

The exams of any call could be related to any activity in the subject: theory, problems and labs.

Advance call: To be able to request an advance notice, students must have previously studied the subject and have obtained the minimum grade required in the evaluation of practical laboratory activities (Lab).

In all cases the evaluation system will be governed by the University of Valencia's regulations on grading and assessment for bachelor's degrees and master's degrees, which is available at:

http://www.uv.es/graus/normatives/2017_108_Reglament_avaluacio_qualificacio.pdf

REFERENCES

Basic

- Redes de computadoras 5ED. Andrew S. Tanenbaum et alt. Ed.: Pearson. 2012. ISBN: 9786073208185
- Comunicaciones y redes de computadores. William Stallings. Ed.: Pearson. 2004. ISBN: 9788483227589

Additional

- Privacidad y anonimización de datos. Jordi Casas et altres. 2017. UOC. ISBN 978-84-9116-939-0