Course guides
804038 - ASXI-M - Architecture and Security of Computer Networks

Unit in charge: Image Processing and Multimedia Technology Centre
Teaching unit: 804 - CITM - Image Processing and Multimedia Technology Centre.
Degree: BACHELOR'S DEGREE IN MULTIMEDIA STUDIES (Syllabus 2009). (Compulsory subject).
Academic year: 2021  ECTS Credits: 6.0  Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: Careglio, Davide

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
4. Analyse the security needs of communications.
5. Catalogue the types of networks, their operation and components.
6. Provide a basic diagnosis of the features of a computer and a network.
7. Distinguish technologies from access networks.
8. Manage and carry out projects to integrate virtual architectural elements in the urban landscape.
9. Use the communication technologies used on the Internet.

Transversal:
1. SELF-DIRECTED LEARNING. Detecting gaps in one’s knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.
2. EFFICIENT ORAL AND WRITTEN COMMUNICATION. Communicating verbally and in writing about learning outcomes, thought-building and decision-making. Taking part in debates about issues related to the own field of specialization.
3. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

TEACHING METHODOLOGY

1. Teaching of lectures by the teacher: Acquisition of new knowledge.
2. Resolution of exercises interspersed during lectures.
3. Realization of group laboratory practices.

LEARNING OBJECTIVES OF THE SUBJECT

1. Understand the fundamental concepts related to computer networks, especially the Internet.
2. Properly install and configure basic communication devices: modems, ethernet switches and Wi-Fi access points.
3. Set up a home or small business network.
4. Apply the necessary resources to guarantee the security, privacy and authenticity of communications over a TCP / IP network.
5. Apply the knowledge gained to the completion of a task based on belonging and importance, deciding how to carry it out and the time it takes to dedicate and selecting the most appropriate sources of information.
6. Plan and use the information necessary for academic work based on a critical reflection on the information resources used.
7. Communicate clearly and efficiently in oral and written presentations adapted to the type of audience and the objectives of the communication using appropriate strategies and means.
## STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Hours medium group</td>
<td>60,0</td>
<td>40.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
</tbody>
</table>

**Total learning time:** 150 h

## CONTENTS

### Item 1: Introduction and protocols architecture (1.5 weeks)

**Description:**
1. Explicació del temari i funcionament de l’assignatura.
2. Introducció:
   - Tipus de xarxes de comunicacions.
   - Conceptes.

**Related competencies:**
CEM 10.3. Catalogue the types of networks, their operation and components.

CEM 10.4. Manage and carry out projects to integrate virtual architectural elements in the urban landscape.

**Full-or-part-time:** 15h

- Theory classes: 6h
- Self study: 9h

### Item 2: Local Area Networks (2.5 weeks)

**Description:**
1. Introduction
2. Mechanisms medium access (MAC)
3. Ethernet
   - CSMA / CD
   - Ethernet frame format
   - Switched Ethernet
   - Flow control
3. WiFi
   - Frequencies
   - CSMA / CA
   - Hidden terminal
   - Format plot
   - Scenarios

**Related competencies:**
CEM 10.3. Catalogue the types of networks, their operation and components.

10.2. Provide a basic diagnosis of the features of a computer and a network.
CEM 10.6. Distinguish technologies from access networks.
CEM 10.5. Use the communication technologies used on the Internet.

**Full-or-part-time:** 25h

- Theory classes: 10h
- Self study: 15h
Item 3: IP networks (3 weeks)

Description:
1. Introduction
2. Addressing
3. Subnetting
4. IP Header
5. Protocol ICMP
6. Routing
7. NAT
8. VLAN

Related activities:
Lab P1, P2, P3 and P4

Related competencies:
CEM 10.3. Catalogue the types of networks, their operation and components.

10.2. Provide a basic diagnosis of the features of a computer and a network.
CEM 10.5. Use the communication technologies used on the Internet.
07 AAT. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.

Full-or-part-time: 15h
Theory classes: 6h
Self study: 9h

Item 4: UDP and TCP protocols (2.5 setmanes)

Description:
1. Introduction
2. UDP protocol
3. TCP Protocol
   - architecture
   - Concept of confirmations and timer
   - Information unit MSS
   - Establishment and termination of a connection
   - Flow control and congestion and sliding window
   - TCP header format

Related competencies:
CEM 10.3. Catalogue the types of networks, their operation and components.

10.2. Provide a basic diagnosis of the features of a computer and a network.
CEM 10.4. Manage and carry out projects to integrate virtual architectural elements in the urban landscape.
CEM 10.5. Use the communication technologies used on the Internet.

Full-or-part-time: 25h
Theory classes: 10h
Self study: 15h
**Item 5: Applications and security in Internet (2 weeks)**

**Description:**
1. Basic concept of cybersecurity
2. Introduction to cryptography
   - Symmetric cryptography
   - Asymmetric cryptography
   - Public Key Infrastructure
3. Security at the network level
   - Firewall and access lists
   - Security in TCP/IP: IPSEC, TLS, SSL.
4. Security at the application level
   - Common errors in programming
   - Audit and intrusion tests

**Related activities:**
Lab P5

**Related competencies:**
10.7. Analyse the security needs of communications.
10.2. Provide a basic diagnosis of the features of a computer and a network.
CEM 10.5. Use the communication technologies used on the Internet.
06 URI. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

**Full-or-part-time:** 20h
  Theory classes: 8h
  Self study: 12h

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**Weeks 8 and 15: Evaluation (2 weeks)**

**Description:**
Primer i segon controls.

**Full-or-part-time:** 50h
  Theory classes: 20h
  Self study: 30h

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**GRADING SYSTEM**

The note of the continuous assessment is calculated as follows:
- 25%: Control theory of the first part of the course.
- 25%: Control theory of the second part of the course.
- 30%: Final exam with the course content.

Then the rest is
- 10%: Activities and exercises.
- 10%: Attitude learning and student participation.

Students who do not pass the subject through the continuous evaluation will have the option of presenting themselves to the re-evaluation exam. With this exam, the two partial examinations and the final exam will be able to re-evaluate (80% of the mark of the subject). If the subject is exceeded, the final grade will be 5.
EXAMINATION RULES.

The controls contain theoretical questions and problems. Revisions and/or complaints regarding examinations will take place exclusively during the dates and times established in the Academic Calendar.

BIBLIOGRAPHY

Basic:
- Apunts de l’assignatura.

Complementary:

RESOURCES

Computer material:
- Packet tracer. Free tool to simulate the actual operation of a network configuration and network equipment like routers, switches and access points.