Network Management and Administration

Code: 102776
ECTS Credits: 6

2024/2025

Degree	Type	Year
2502441 Computer Engineering	OB	3
2502441 Computer Engineering	OT	4

Contact

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

Recommendations: to have passed the subjects Foundations of Computing, Computer Organisation, Operating Systems and Networks

Objectives and Contextualisation

With this subject, the student will obtain the necessary knowledge for the administration and management of computer networks. The student will be able to apply this knowledge in aspects of general configuration and typical services as well as in monitoring, performance analysis, disaster recovery and security.

Competences

Computer Engineering

- Acquire personal work habits.
- Acquire thinking habits.
- Have the capacity to design, deploy, administer and manage computer networks.
- Have the capacity to understand, apply and manage the guarantee and security of computer systems.

Learning Outcomes

1. Analyse communication requirements in high performance computer systems.
2. Apply knowledge of computer networks to design high performance computer networks.
3. Apply knowledge of the security of high performance computer systems.
4. Design components to guarantee the security of high performance computer systems.
5. Design computer networks for high performance computer systems.
6. Develop a mode of thought and critical reasoning.
7. Estimate the risks associated to high performance computer systems, in terms of their guarantee and security.
8. Manage time and resources available. Work in an organized manner .

Content

Topic 1: Network management.

Introduction to Gnu / Linux, Virtualization. Cgroups, Containers (LXC, Docker)
Administration of networks in Gnu/Linux systems (interconnection of private/public networks, IPv4/6).
Basic services (DNS/secureDNS, DHCP, LDAP/NIS/AD, SSH).
Network storage (NFS, DFS, SMB/CIF, CDN).
Management of integrated networks (WAN, Mobile, Domestic, LAN, IoT).
Software Defined Networks (SDN)

Topic 2: Network management.

Standard management models (OSI, Internet).
Functional areas (configuration, benefits, security, fault, accounting).
Introduction to SNMP, MIB.
Monitoring tools (tcpdump, Icinga/Nagios, Cacti, MRTG)

Topic 3: Network security

PKI Infrastructure and Digital Certificates (Certifying Entity).
Authentication: Passwords, Hashing (Hash Functions)
Access Authentication: PAM, LDAP.
Firewalls and proxies (Iptables, nftables, Apache Proxy, SOCKS, Squid).
Virtual private network (OpenVPN).
Security in wireless networks and virtual networks (MITM, DMZ, Brute-Force / SYN Flood Attacks).
Detection of intrusions and vulnerabilities (Nmap, Snort, OpenVas). Mitigation D/DoS.
Security in services (WAF).

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Applied concepts	11.5	0.46	3, 2, 6, 4, 7
Conceptual classroms	22.1	0.88	3, 2, 6, 4, 7, 8
Labs	11.5	0.46	1, 3, 6, 4, 5, 7, 8
Type: Autonomous			

Home work	100	4

The subject contains three sections where each one will have a methodology appropriate to the type of teaching provided:

Conceptual classrooms: the theoretical and conceptual aspects of the contents of the subject.

Applied concepts: collaborative group work in the classroom with tutoring by the teacher in each group and in each session. The group will have to develop certain subjects assigned by the teacher.

Practical sessions: sessions of groups of 2 students. These students will develop labs about specific items in the laboratory of the subject (the student must have 80% attendance at these sessions).
To promote learning and interaction, it is recommended that each student have a digital device with a browser (preferably laptop) in order to connect to the subject's cloud.

TRANSFERABLE COMPETENCES

In the subject, as well as the work and evaluation of the basic/specific competences, the transversal competences will be considered in each section (and will be evaluated):

T01.01 - Develop critical thinking and reasoning: in conceptual aspects and concepts applied in classrooms. This will be evaluated in the assessment testthat students will take during the course.
T02.03 - Manage time and resources available. Work in an organised manner: these competences will be worked on in all the sessions and will be evaluated in the practical sessions.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Applied concepts	20%	1	0.04	3, 2, 6, 4, 5
General concepts	50%	1.4	0.06	1, 2, 6, 4, 5, 7
Labs	30%	2.5	0.1	1, 2, 5, 8

Assessment

Considering the practical content, this subject does not have the single assessment option.

a) Assessment activities

The evaluation of the student will be based on the evaluation of the different activities of the subject:

General concepts: individual test on general concepts developed over the whole subject.

Applied concepts: test for the evaluation of concepts developed in group work.

Practice sessions: assessment of collaborative work and personal work developed during the sessions.

Important: the Practice sessions activity cannot be retaken. If the grade is lower than 5, the student cannot pass the subject.

b) Calendar of assessment activities

The assessment activities will be continuous and submission is through the Campus Virtual. The continuous assessment and work submission dates will be published on the Campus Virtual.
The student will be informed via the Campus Virtual about possible changes since this is the information exchange platform between teachers and students. The calendar for the re-assessments will be published on the School's website in the official exam calendar.

c) Re-assesment procedure

If the student does not pass the individual assessment of general/applied concepts and has a practical session grade >= 5 points and the weighted grade is >= 3.5 points, an additional test will be scheduled.

The marks will count in the final grade (toward the indicated percentage) from >= 5 points. Otherwise, if after the retake test the student does not reach 5 points in each part, the student will not pass the course and as a final grade will have the equivalent weighted grade if <=5 or 4.5 if the calculation of the grade weighted with this mark is greater >=5. It should be noted that there will be no review of the auto-correct follow-up tests unless there are demonstrable errors in the proposed answers.

d) Review of grades

For each assessment activity, a place, date and time for grade review will be fixed. The student can review the activity with the teacher. If the student does not apply forthis review, this activity cannot be reviewed later.

e) Grades

Distinction. A distinction is awarded at the discretion of the subject staff. The regulations of the UAB indicate that a distinction can only be granted to students who have obtained a final grade >= 9.00 and can only be assigned to up to 5% of the total number of students registered.

The awarding of a distinction is considered a merit and sign of excellence and is reserved for students who meet the requirements and will not be assigned automatically. A procedure will be enabled for a selection if there are more candidates than those allowed by regulations.

In the case of not attending any assessment session the student will have Non-assessable (NA) as the final grade for the subject.

f) Irregularities by the student, copying and plagiarism

Without prejudice to other disciplinary measures and in accordance with current academic regulations, irregularities committed by a student in an assessable activity will result in a grade = zero (0).

These assessment activities graded with a zero (0) cannot be retaken. If this activity is necessary to pass compulsory assessment activities, this subject will be failed directly (without the opportunity to retake it in the same academic year).

These irregularities include, among others:

- copying a project, report, or any other evaluation activity totally or partially;
- letting someone else copy;
- unauthorized use of AI platforms (eg Copilot, ChatGPT or equivalent)
- presenting group work not done entirely by the members of the group (applied to all members, not only those who have not worked);

- presenting as ownmaterials those prepared by a third party, even if they are translations or adaptations, and in general work with non-original and exclusive elements of the student;
- having communication devices (such as mobile phones, smart watches, camera pens, etc.) accessible during the individual assessment test;
- talking with peers during the individual test;
- copying or attempting to copy from other students during the assessment test;
- using or attempting to use writings related to the subject during the individual test.

In future years of this subject, students undertaking these irregular actions may not compensate activities from the previous year.
In summary: copying or plagiarism (or attempts at copying or plagiarism) in any of the assessment activities will result in the subject not being passed and this action invalidates compensatory activities in subsequent academic years.

h) Students who did not pass the subject in the previous year.

These students, with a practical sessions grade >= 5 can compensate the practical sessions of the current year.

Bibliography

(BR) Administració/Administració Avançada del Sistema Operatiu GNU/Linux. (OCW-UOC) Edició 2016. http://openaccess.uoc.edu/webapps/o2/handle/10609/60687 http://openaccess.uoc.edu/webapps/o2/handle/10609/60685	Remo Suppi i Josep Jorba	Document electrònic
(BR) Network Security. André Pérez. *John Wiley & Sons Incorporated.* Willey Online Library eBooks EBS (UAB) 2014		Document electrònic
Firewalls and Internet security : repelling the Wily Hacker / William R. Cheswick, Steven M. Bellovin, Aviel D. Rubin	Cheswick, William R.	Document físic
(BR) Fundamentos de seguridad en redes : aplicaciones y estándares / William Stallings ; revisión técnica: Manuel González Rodríguez, Luis Joyanes Aguilar	Stallings, William, autor	Document electrònic
Network intrusion detection / Stephen Northcutt, Judy Novak	Northcutt, Stephen	Document físic
Network management : concepts and practice, a hands-on approach / J. Richard Burke	Burke, J. Richard	Document físic
Network management : principles and practice / Mani Subramanian	Subramanian, Mani	Document físic
Network security essentials : applications and standards / William Stallings	Stallings, William, autor	Document físic
Network security : private communication in a public world / Charieli Kaufman, Radia Perlman, Mike Spencer	Kaufman, Charlie	Document físic
(BR) The Practice of system and network administration / Thomas A. Limoncelli, Christine J. Hogan, Strata R. Chalup	Limoncelli, Tom	Document físic

Software

Students must use VirtualBox (open source software) on their personal computers and a Browser to connect to the Department's Cloud and run virtual machine software. All the software used in the course is done so under a free licence.

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	430	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	431	Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	432	Spanish	first semester	morning-mixed