Universidad de Alcalá

TEACHING GUIDE

Laboratory of Networks, Systems and Services

Degree in
Telecommunication Technologies Engineering (GITT)
Telematics Engineering (GIT)

Universidad de Alcalá

Academic Year 2024/2025

4th Year - 2nd Semester (GITT)

3rd Year - 2nd Semester (GIT)

TEACHING GUIDE

Course Name:	**Laboratory of Networks, Systems and Services**
Code:	**350042 (GITT)** **380005 (GIT)**
Degree in:	**Telecommunication Technologies Engineering (GITT)** **Telematics Engineering (GIT)**
Department and area:	**Automática** **Telematics Engineering**
Type:	**Optional (Specialized) (GITT)** **Compulsory (GIT)**
ECTS Credits:	**6.0**
Year and semester:	**4th Year - 2nd Semester (GITT)** **3rd Year - 2nd Semester (GIT)**
Teachers:	Luis de la Cruz Piris Antonio García Herraiz
Tutoring schedule:	To be defined
Language:	Spanish/English friendly

1. COURSE SUMMARY

Computers communicate among them through communication networks using software that, in most cases, use client-server or P2P architectures. All these concepts have been already studied in previous courses.

This subject has a special nature into the pool of specific subjects of telematics engineering, as it integrates concepts from the rest of subjects in that knowledge field, putting them closer from a practical point of view to the problems that arise in real frameworks. For that reason, this subject is completely taught in the laboratory.

The course is divided into three large blocks of content:

- Design and implementation of network applications.
- Configuration and deployment of network services.
- Configuration and administration of IP networks.

Pre-requisites:

It is encouraged to have studied Networks Architecture I and II and Servicios Telemáticos.

2. SKILLS

Basic, Generic and Cross Curricular Skills.

This course contributes to acquire the following generic skills, which are defined in the Section 3 of the Annex to the Orden CIN/352/2009:

en_TR2 - Knowledge of basic subjects and technologies that enables to learn new methods and technologies, as well as to provide versatility that allows adaptation to new situations.

en_TR5 - Easy to handle specifications, regulations and mandatory standards.

en_TR6 - Ability to analyze and assess the social and environmental impact of technical solutions.

en_TR7 - Know and apply basic elements of economics and human resources management, organization and planning of projects, as well as legislation,regulation and standardization in telecommunications

en_TR8 - Capacity of working in a multidisciplinary and multilingual team and of communicating, both in spoken and written language, knowledge, procedures, results and ideas related to telecommunications and electronics.

en_TRU5 - Team work.

Professional Skills

This course contributes to acquire the following professional skills, which are defined in the Section 5 of the Annex to the Orden CIN/352/2009:

en_CTE1 - Ability to build, operate and manage telecommunications networks, services, processes and applications, understood as systems for capturing, transporting, representing, processing, storing, managing and presenting multimedia information, from the point of view of telematic services.

en_CTE2 - Ability to apply the techniques on which telematic networks, services and applications are based, such as management systems, signaling and switching, routing, security (cryptographic

protocols, tunneling, firewalls, collection mechanisms, authentication and content protection), traffic engineering (graph theory, queuing theory and teletraffic) charging and reliability and quality of service, both in fixed, mobile, personal, local or long distance environments, with different bandwidths, including telephony and data.

en_CTE4 - Ability to describe, program, validate and optimize communication protocols and interfaces at different levels of a network architecture.

en_CTE7 - Ability of programming services and telematic applications, in networking and distributed.

Learning Outcomes

After succeeding in this subject the students will be able to:

RA1. Program applications that communicate through IP networks.

RA2. Apply standard communication protocols by means of programming applications.

RA3. Experiment and run different complementary services.

RA4. Setup IP networks (IPv4 and IPv6) to provide them with connectivity by means of static routes and dynamic routing protocols.

3. CONTENTS

Contents Blocks	Number of lessons, credits or hours
Module 1: Network applications programming. This module is devoted to programming applications that are able to communicate through the network using the socket interface. Students will develop applications that include Internet standards using both client-server and P2P network architectures.	13 blocks of 2 hours
Module 2: Configuration and implementation of network services. In this module it will be performed an installation and later configuration of one or more network services. In addition to this work it will be considered the modification and/or integration with other existing systems to improve its effectiveness and administration. The network services that are considered are expected to be useful in the work environment to who the student will belong after concluding his studies. Examples of services that fulfil these requirements are installation and configuration of: VoIP exchange, email, web hosting, documentation repository,…	11 blocks of 2 hours
Module 3: Configuration and administration of IP networks. In this module it is performed the configuration of IP networks both manually through commands and automatically through routing protocols. Morevor, in addition to "classic" network concepts, we will work with more advance network topics like tunneling, IPv6,…	4 blocks of 2 hours

4. TEACHING - LEARNING METHODOLOGIES. FORMATIVE ACTIVITIES.

4.1. Credits Distribution

Number of on-site hours:	58 hours (56 hours on-site +2 exams hours)
Number of hours of student work:	92
Total hours	150

4.2. Methodological strategies, teaching materials and resources

Practical lectures (reduced groups)	• Practical concept presentation and/or review • Practical lab sessions: oriented to strengthen previously presented concepts and integrate other like the ones presented in subjects like Networks Architecture I and II, as well as to familiarize the student with tools and methodologies that are useful to support the study of the subject and future professional performance (implementation of networking applications, installation and administration of different network services, and configuration and management of networks). • Oral presentations and other activities.
Tutoring and Consultancy (individual and groups, in-room, e-mail, etc)	• Solving questions. • Support to self-learning.
Autonomous working	• Laboratory assignments. • Reading assignments. • Activities: search for information, data analysis.

5. ASSESSMENT: procedures, evaluation and grading criteria

Preferably, students will be offered a continuous assessment model that has characteristics of formative assessment in a way that serves as feedback in the teaching-learning process.

5.1. PROCEDURES

The evaluation must be inspired by the criteria of continuous evaluation (Learning Assesment Guidelines, LAG, art 3). However, in compliance with the regulations of the University of Alcalá, an alternative process of final evaluation is made available to the student in accordance with the Learning Assesment Guidelines as indicated in Article 10, students will have a period of fifteen days from the start of the course to request in writing to the Director of the Polytechnic School their intention to take the

non-continuous evaluation model adducing the reasons that they deem convenient. The evaluation of the learning process of all students who do not apply for it or are denied it will be done, by default, according to the continuous assessment model. The student has two calls to pass the subject, one ordinary and one extraordinary.

- **Ordinary Call.** The evaluation must be inspired by the criteria of continuous evaluation.

- **Extraordinary Call.** The assessment procedure of the extraordinary call is similar to the one of final evaluation of the ordinary call.

Due to the practical nature of the subject, passing the on-site laboratory assignments is mandatory to pass the subject, for both the ordinary and extraordinary calls.

5.2. EVALUATION

EVALUATION CRITERIA

The assessment criteria measure the level in which the competences have been acquired by the students:

CE1. The student shows ability and initiative for solving practical problems related to programming communication applications via Internet.

CE2. The student is able to completely design an application that communicate with another one using standard communication protocols.

CE3. The student shows ability and initiative for implementing and configuring network services.

CE4. The student i sable to give connectivity to different interconnected IP networks using static routing and using Dynamic routing protocols.

CE5. The student is able to handle and interpret the information provided by manuals, standards and other documents.

GRADING TOOLS

The work of the student is graded in terms of the assessment criteria above, through the following tools:

- **Laboratory assignments (PL)**:   the different assignments are assessed attending the reports presented before the deadline and the oral presentation or defense in the laboratory in the date established by the teacher. Monitoring the student work let the teacher to know the dedication effort of the student with respect to the different prposed activities. At the same time, for the students is useful to know if they are reaching the proposed objectives. Assignments are structured around the three main blocks of content respectively: PL1, PL2 and PL3.
- **Final assessment (PEF)**: it includes questions regarding the different assignments performed in the subject, focusing on assessing the capacity of relation of the learnt concepts and review the concepts assessed in the assignments.

Due to the eminently practical nature of the subject, in order to pass the course it will be necessary to have completed all of the assignments corresponding to all of the PL blocks to the best of one's ability, guaranteeing the acquisition of the competencies addressed in each one of them, both in the ordinary and extraordinary exams.

GRADING CRITERIA

Ordinary call, continuous assessment: in the ordinary call-continuous assessment the relationship between the skills, learning outcomes, criteria and evaluation instruments is as follows:

Skill	Learning Outcomes	Evaluation Criteria	Grading Tool	Contribution to the final mark
TR5, TR7, TR8, TRU5, CTE1, CTE4, CTE7	RA1, RA2	CE1, CE2, CE5	PL1	30%
TR2, TR5, TR6, TR8, TRU5, CTE1	RA3	CE3, CE5	PL2	25%
TR2, TR5, TR8, TRU5, CTE2	RA4	CE4, CE5	PL3	10%
TR2, CTE1, CTE2, CTE4, CTE7	RA1-RA4	CE1-CE5	PEF	35%

Those students that, following the continuous assessment, do not present any assignment and do not perform PEF, will have the qualification of "Not Presented" in the ordinary call.

- **Ordinary call, final evaluation:** due to the obligatory nature of passing laboratory assignments before their deadline, the evaluation of those students that have the right of following a final evaluation, according to the regulation of the University of Alcalá, will consist on, similarly to the continuous assessment, in the presentation before their deadline of the laboratory assignments and the oral presentation or defense in the laboratory of such assignments and the PEF. For that reason, the table that relate the different elements of the assessment for the "Ordinary call-final evaluation" is the same that the one corresponding to "Ordinary Call-continuous assessment". Those students that do not present any assignment and do not perform PEF, will have the qualification of "Not Presented" in the ordinary call.

- **Extraordinary call:** due to the obligatory nature of passing laboratory assignments before their deadline, the assessment of the extraordinary call will consist on, similarly to the continuous assessment, in the presentation before their deadline of the laboratory assignments and the oral presentation or defense in the laboratory of such assignments and the PEF. For that reason, the table that relate the different elements of the assessment for the "Ordinary call-final evaluation" is the same that the one corresponding to "Ordinary Call-continuous assessment". Moreover, for the extraordinary call, students can use their marks of the PL that have presented. Those students that do not present any assignment and do not perform PEF, will have the qualification of "Not Presented" in the extraordinary call.

6. BIBLIOGRAPHY

6.1. Basic Bibliography

- Richard Stevens, "UNIX Network Programming with TCP/IP", Prentice Hall, 1990.
- Michael J. Donahoo, Kenneth L. Calvert, "TCP/IP Sockets in C: Practical Guide for Programmers", Morgan Kauffman, 2001.
- Request for Comments (RFC), http://www.ietf.org/rfc.html.

6.2. Additional Bibliography

- Manuals and README files of the applications and services to install. It will be attempted that all of them are free software.

Disclosure Note

During the evaluation tests, the guidelines set out in the Regulations establishing the Rules of Coexistence of the University of Alcalá must be followed, as well as the possible implications of the irregularities committed during said tests, including the consequences for committing academic fraud according to the Regulation of Disciplinary Regime of the Students of the University of Alcalá.