# Course guide
# 230651 - OVNET - Overlay Networks

**Last modified:** 11/04/2025

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| **Unit in charge:** | Barcelona School of Telecommunications Engineering |
| **Teaching unit:** | 744 - ENTEL - Department of Network Engineering. |

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| **Degree:** | MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Compulsory subject). MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Optional subject). |

**Academic year:** 2025     **ECTS Credits:** 5.0     **Languages:** English

## LECTURER

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| **Coordinating lecturer:** | OSCAR ESPARZA MARTIN |
| **Others:** | Primer quadrimestre:<br>OSCAR ESPARZA MARTIN - 11 |

## PRIOR SKILLS

Skills to deal with Linux, networks and command line interface
TCP/IP protocol suite
Firewall configuration

## DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

**Specific:**
1. Ability to deal with the convergence, interoperability and design of heterogeneous networks with local, access and core networks, as well as with service integration (telephony, data, television and interactive services).
2. Ability to design and dimension transport, broadcast and distribution networks for multimedia signals
3. Ability to model, design, implement, manage, operate, administrate and maintain networks, services and contents
4. Ability to plan networks and decision-making about services and applications taking into account: quality of service, operational and direct costs, implementation plan, supervision, security processes, scalability and maintenance. Ability to manage and assure the quality during the development process
5. Ability to understand and to know how to apply the functioning and organization of the Internet, new generation Internet technologies and protocols, component models, middleware and services

**Transversal:**
6. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

7. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

## TEACHING METHODOLOGY

Lectures
Laboratory classes
Short answer quizzes
Laboratory exam

# LEARNING OBJECTIVES OF THE SUBJECT

The aim of this course is to train students in the mechanisms and protocols needed to design and deploy overlay networks. We will introduce the basics of tunneling and multicast techniques, which are essential to the proper deployment of overlay-based multimedia services over the Internet. We will also introduce some example of overlays, like p2p (peer-to-peer) and SIP (Session Initiation Protocol).

Learning results of the subject:

- Ability to design and deploy overlay networks and more specifically, those that provide multimedia services over the Internet.
- Ability to use and analyze networks.
- Ability to understand the basic working of some existing overlay networks.

# STUDY LOAD

| Type | Hours | Percentage |
|------|-------|-----------|
| Hours large group | 26,0 | 20.80 |
| Hours small group | 13,0 | 10.40 |
| Self study | 86,0 | 68.80 |

**Total learning time:** 125 h

# CONTENTS

## 1. Introduction

**Description:**
Introduction to the concept of overlay and underlaying network, kinds of networks and typical examples.

**Full-or-part-time:** 5h
Theory classes: 2h
Self study : 3h

## 2. p2p

**Description:**
Concept of peer-to-peer. Generations of p2p networks. Security problems in p2p networks.

**Full-or-part-time:** 16h
Theory classes: 6h
Self study : 10h

## 3. IP tunnels

**Description:**
Creation and management of IPIP tunnels. Problems and solutions of tunnels.

**Full-or-part-time:** 26h
Theory classes: 2h
Laboratory classes: 4h
Self study : 20h

### 4. Multicast

**Description:**
Tools to manage multicast flows. Transmission of multicast flows (files and video streaming). Problems related to the use of multicast.

**Full-or-part-time:** 26h
Theory classes: 2h
Laboratory classes: 4h
Self study : 20h

### 5. SIP

**Description:**
SIP signalling. SIP session management. SIP call with and without proxies.

**Full-or-part-time:** 30h
Theory classes: 4h
Laboratory classes: 4h
Self study : 22h

## ACTIVITIES

### Lab sessions

**Full-or-part-time:** 12h
Laboratory classes: 12h

### Quizzes

**Full-or-part-time:** 3h
Theory classes: 3h

### Lab exam

**Full-or-part-time:** 2h
Laboratory classes: 2h

### Lectures

**Full-or-part-time:** 26h
Theory classes: 26h

## GRADING SYSTEM

Short answer quizzes: 55%
Laboratory exam: 35%
Attendance: 10%

## EXAMINATION RULES.

Each chapter will be evaluated by a quiz.
The laboratory exam will be practical (using the lab tools) and individual
Attendance is mandatory in lectures and lab sessions, and it will be controlled every class day.

## BIBLIOGRAPHY

**Basic:**
- Perkins, C. RTP: audio and video for the internet. Boston: Addison-Wesley, 2003. ISBN 0672322498.
- Rao, K.R.; Bojkovic, Z.S.; Milovanovic, D.A. Introduction to multimedia communications: applications, middleware, networking. Hoboken: Wiley, 2005. ISBN 0471467421.
- Minoli, D. IP multicast with applications to IPTV and mobile DVB-H. Hoboken, NJ: Wiley, 2008. ISBN 9780470258156.

**Complementary:**
- Panwar, S.S. [et al.].. TCP/IP essentials: a lab-based approach. Cambridge: Cambridge University, 2004. ISBN 052160124X.
- Halsall, F. Multimedia communications: applications, networks, protocols and standards. Harlow: Addison-Wesley, 2001. ISBN 0201398184.