Course guide
300474 - 5GNET - Network Support for 5G

Last modified: 11/05/2026

Unit in charge: Castelldefels School of Telecommunications and Aerospace Engineering
Teaching unit: 744 - ENTEL - Department of Network Engineering.

Degree: MASTER'S DEGREE IN APPLIED TELECOMMUNICATIONS AND ENGINEERING MANAGEMENT (MASTEAM) (Syllabus 2015). (Optional subject).
MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Optional subject).
ERASMUS MUNDUS MASTER IN COMMUNICATIONS ENGINEERING AND DATA SCIENCE (CODAS 1) (Syllabus 2024). (Optional subject).
ERASMUS MUNDUS MASTER IN COMMUNICATIONS ENGINEERING AND DATA SCIENCE (CODAS 2) (Syllabus 2024). (Compulsory subject).
MASTER'S DEGREE IN ARTIFICIAL INTELLIGENCE FOR CONNECTED INDUSTRIES (AI4CI) (Syllabus 2025). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 3.0 **Languages:** English

LECTURER

Coordinating lecturer: Defined in the course webpage at the EETAC website.

Others: Defined in the course webpage at the EETAC website.

PRIOR SKILLS

Cellular mobile communications networks (3G and 4G): architecture, elements and functions

REQUIREMENTS

Next-generation Wireless Communications and IoT (WICOM)

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Transversal:
06 URI N1. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.
03 TLG. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.
05 TEQ N2. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.

Basic:
CB6. Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context.
CB9. Students will be able to communicate their conclusions and the knowledge and ultimate reasons that support them to specialized and non-specialized audiences in a clear and unambiguous manner.

TEACHING METHODOLOGY

The teaching methodology combines the following components:
- Traditional lectures incorporating student's participation (short questions, debates, presentations done by the students)
- Autonomous work, whereby students complete the information provided by the professors, and develop activities for knowledge consolidation
- Collaborative work, whereby teams of students are mutually responsible for the learning process within a team

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course, the student should be able to:
- Understand de 5G ecosystem and differentiate it from previous generations of mobile communications
- Analyze the 5G architecture, transport and access networks
- Evaluate transport and access networks mechanisms and QoS provision in 5G

STUDY LOAD

Type	Hours	Percentage
Self study	48,0	64.00
Hours large group	27,0	36.00

Total learning time: 75 h

CONTENTS

Unit 1: Introduction to 5G ecosystem

Description:
This unit provides an introduction to the 5G ecosystem, differentiating 5G from previous generations of mobile communications, and introducing its capabilities, service pillars and enablers. This unit also introduces the 5G network architecture and the migration strategies from previous generations. It also presents the use cases and the regulation status.

Related activities:
Final exam

Full-or-part-time: 6h
Theory classes: 2h
Self study : 4h

Unit 2: Timing and synchronization in 5G

Description:
This unit presents the concept of timing and synchronization in networks, and its role in 5G.
- Introduction to timing and synchronization. Precision Time Protocol (PTP)
- Time-Sensitive Networking (TSN)
- Timing and Synchronization in 5G networks

Related activities:
Assignments
Final Exam

Full-or-part-time: 18h 45m
Theory classes: 5h 15m
Practical classes: 1h 30m
Self study : 12h

Unit 3: Network softwarization in 5G

Description:
This unit presents network softwarization and slicing as technologies to be adopted in 5G networks to allow end-to-end flexibility and fast re-configuration of the network, based on the delivered services, and the automation of the network management. The fundamental requirements, the enabling technologies, and the operations management are presented:
- Drivers and motivations for a new architecture. Limitations of traditionally networks
- Network services evolution. 5G network architecture. Softwarization and programmability
- Introduction to NFV. Reference model. ETSI MANO
- NFV Management and Orchestration
- Service Function chaining (SFC). IETF architecture. NSH
- Network Slicing
- Use cases
- Standardization efforts. Open projects

Related activities:
Assignments
Final Exam

Full-or-part-time: 18h 45m
Theory classes: 4h 25m
Practical classes: 2h 20m
Self study : 12h

Unit 4: Transport and radio access networks in 5G

Description:
This unit presents the 5G transport network, distributed and centralized radio access networks, the enabling technologies, focusing on the joint access–backhaul concept and the available mechanisms. The concepts of Flexible RAN and functional splits, together with its functionalities, architecture and performance implications are presented.

Related activities:
Assignments
Final Exam

Full-or-part-time: 15h 45m
Theory classes: 4h
Guided activities: 1h 45m
Self study : 10h

Unit 5: Quality of Service in 5G networks

Description:
This unit focuses on the provision of Quality of Service (QoS) in 5G networks and the QoS enablers. The 5G QoS scenario and its architecture implications are presented, together with the available mechanisms and the performance implications.

Related activities:
Assignments
Final Exam

Full-or-part-time: 15h 45m
Theory classes: 4h
Guided activities: 1h 45m
Self study : 10h

ACTIVITIES

Unit 2: Assignments

Full-or-part-time: 1h 30m
Practical classes: 1h 30m

Unit 3: Assignments

Full-or-part-time: 1h 30m
Practical classes: 1h 30m

Unit 4: Assignments

Full-or-part-time: 1h 30m
Guided activities: 1h 30m

Unit 5: Assignments

Full-or-part-time: 1h 30m
Guided activities: 1h 30m

Final Exam

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

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the **Action Framework for Academic Integrity in Assessment at the UPC**.

Defined in the course webpage at the EETAC website.

EXAMINATION RULES.

Attendance is mandatory in activities and in classes involving oral presentations of tasks performed by students

BIBLIOGRAPHY

Basic:

- Marsch, Patrick. 5G system design : architectural and functional considerations and long term research [on line]. Hoboken, New Jersey: John Wiley & Sons, Inc, [2018] [Consultation: 22/10/2026]. Available on: https://learning-oreilly-com.recursos.biblioteca.upc.edu/library/view/5g-system-design/9781119425120/?ar=. ISBN 9781119425120.

Complementary:
- Chayapathi, Rajendra; Shah, Paresh; Farrukh Hassan, Syed. Network functions virtualization (NFV) with a touch of SDN. Boston: Addison-Wesley, [2017]. ISBN 9780134463056.