

## 300474 - 5GNET - Network Support for 5G

Coordinating unit:	300 - EETAC - Castelldefels School of Telecommunications and Aerospace Engineering
Teaching unit:	744 - ENTEL - Department of Network Engineering
Academic year:	2019
Degree:	MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Teaching unit Optional) MASTER'S DEGREE IN APPLIED TELECOMMUNICATIONS AND ENGINEERING MANAGEMENT (MASTEAM) (Syllabus 2015). (Teaching unit Optional)
ECTS credits:	3
Teaching languages:	English

### Teaching staff

Coordinator:	M. ELENA LOPEZ AGUILERA
Others:	Primer quadrimestre: CRISTINA CERVELLO PASTOR - M1B11 M. ELENA LOPEZ AGUILERA - M1B11

### 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

Basic:

CB6. (ENG) CB6 - Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación.

CB9. (ENG) CB9 - Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades.

Transversal:

06 URI N1. EFFECTIVE USE OF INFORMATION 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.

### Teaching methodology

The teaching methodology combines the following components:

- Traditional lectures incorporating student's participation (short questions, debates, presentations done by the students)
- Laboratory sessions
- 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

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### 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

Total learning time: 75h	Hours large group:	27h	36.00%
	Self study:	48h	64.00%

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### Content

<p>Unit 1: Introduction to 5G ecosystem</p>	<p>Learning time: 6h 10m Theory classes: 2h 10m Self study : 4h</p>
<p>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.</p>	
<p>Unit 2: Core network softwarization in 5G</p>	<p>Learning time: 37h 30m Theory classes: 5h 30m Practical classes: 8h Self study : 24h</p>
<p>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:</p> <ul style="list-style-type: none"> <li>- Network services evolution. 5G network architecture. Softwarization and programmability. Multiservice platform. Development, Service Development and Operation and Integrated Management and Operation.</li> <li>- Introduction NFV. Reference model. Physical infrastructure, logical infrastructure, software network functions, and network service management. Elements (NS, VNF, VNFC, NSD..). ETSI MANO. Policies, security, reliability</li> <li>- Multiservice Management Functions. Network Service Orchestration. Definitions. Interfaces. Taxonomy. Standardization.</li> <li>- Service Function chaining (SFC). IETF architecture. NSH.</li> <li>- Network Slicing. Network slice templates.</li> <li>- Multi administrative domains. Multidomain orchestration. Orchestration and management.</li> <li>- Intelligent Network Slicing Management</li> <li>- Use cases</li> </ul> <p>Related activities: Laboratory Sessions Final Exam</p>	

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<p>Unit 3: Transport and radio access networks in 5G</p>	<p>Learning time: 15h 40m Theory classes: 4h 10m Practical classes: 1h 30m Self study : 10h</p>
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<p>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.</p> <p>Related activities: Assignments Final Exam</p>	
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<p>Unit 4: Quality of Service in 5G networks</p>	<p>Learning time: 15h 40m Theory classes: 4h 10m Practical classes: 1h 30m Self study : 10h</p>
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<p>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.</p> <p>Specific objectives: Assignments Final Exam</p>	
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### Qualification system

- Laboratory sessions: 25%
- Assignments carried out groupwise: 25%
- Final written exam: 50%

### Regulations for carrying out activities

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

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### Bibliography

#### Basic:

Marsch, Patrick. 5G system design : architectural and functional considerations and long term research. Hoboken, New Jersey: John Wiley & Sons, Inc, [2018]. ISBN 978-1-119-42512-0.

#### Complementary:

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