



POLITÉCNICA

INTERNATIONAL
CAMPUS OF
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COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001



E.T.S. de Ingenieros de
Telecomunicacion

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

93000812 - Advanced Topics On Optical Communications

DEGREE PROGRAMME

09AQ - Master Universitario En Ingenieria De Telecomunicacion

ACADEMIC YEAR & SEMESTER

2023/24 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	93000812 - Advanced Topics On Optical Communications
No of credits	6 ECTS
Type	Optional
Academic year of the programme	Second year
Semester of tuition	Semester 3
Tuition period	September-January
Tuition languages	English
Degree programme	09AQ - Master Universitario en Ingenieria de Telecomunicacion
Centre	09 - Escuela Tecnica Superior De Ingenieros De Telecomunicacion
Academic year	2023-24

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Miguel Angel Muriel Fernandez	B-118	m.muriel@upm.es	Sin horario. Concertar hora previa
Francisco Jose Lopez Hernandez (Subject coordinator)	B-120	francisco.lopez.hernandez@ upm.es	Sin horario. Concertar hora previa

* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

- Sistemas De Comunicaciones
- Redes De Comunicaciones

3.2. Other recommended learning outcomes

- Fundamentals of optical communication systems

4. Skills and learning outcomes *

4.1. Skills to be learned

CE13 - Capacidad para aplicar conocimientos avanzados de fotónica y optoelectrónica, así como electrónica de alta frecuencia.

CE3 - Capacidad para implementar sistemas por cable, línea, satélite en entornos de comunicaciones fijas y móviles.

CG4 - 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.

CG5 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

CT4 - Capacidad para trabajar de forma efectiva como individuo, organizando y planificando su propio trabajo, de forma independiente o como miembro de un equipo.

4.2. Learning outcomes

RA67 - Capacidad de utilizar dispositivos e instrumentos relacionados con comunicaciones ópticas avanzadas

RA66 - Capacidad de analizar, diseñar, implementar y caracterizar sistemas avanzados de comunicaciones ópticas

RA68 - Compresión de los procesos físicos que afectan las prestaciones de los sistemas avanzados de comunicaciones ópticas

RA10 - Saber realizar una presentación de carácter técnico, ante una audiencia de pares, que describa el trabajo realizado y sus resultados, de forma clara y bien estructurada, en el tiempo establecido, y usando un lenguaje preciso

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

The general objective of the subject is to provide students with the ability to understand, analyze, and design, as well as the associated knowledge, in present fiber optic communications systems and in recent technological advances defining the future evolution.

To achieve this general objective, the different types of components and current systems will be studied (new modulation formats, coherent communications, high spectral efficiency, etc.) with emphasis on their behavior from the point of view of optical signal and their channel performance.

1. THEORETICAL LECTURES: These lectures will be used for the presentation of the contents of the theoretical basements of these technologies .

2. EXPERIMENTAL SESSIONS: Some topics will be clarified by numerical modeling and development of simulations.

3. DEVELOPMENT AND PRESENTATION OF A TECHNICAL WORK: Each student, under the direct advising of a professor, will write and present a technical document in this subject.

5.2. Syllabus

1. Introduction to present Optical Communication Systems
2. Optical Signal Generation
3. Signal propagation in optical fibers
4. Optical Amplification
5. Signal recovery and noise
6. Advanced Systems
7. Channel Capacity and Shannon Limit
8. Simulations

6. Schedule

6.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	Chapter 1: Introduction to Optical Communications Duration: 03:00 Lecture Tutorial Duration: 02:00 Research-based learning			
2	Chapter 2: Optical Signal Generation Duration: 03:00 Lecture Tutorial Duration: 02:00 Research-based learning			
3	Chapter 3: Signal propagation in optical fibers Duration: 03:00 Lecture Tutorial Duration: 02:00 Research-based learning			
4	Chapter 4: Optical Amplification Duration: 03:00 Lecture Tutorial Duration: 02:00 Research-based learning			
5	Chapter 5: Signal Recovery and Noise Sources Duration: 03:00 Lecture Tutorial Duration: 02:00 Research-based learning			
6	Chapter 6: Advanced Systems Duration: 03:00 Lecture Tutorial Duration: 02:00 Research-based learning			

7	Chapter 7:Channel Capacity and Shannon Limit Duration: 03:00 Lecture Tutorial Duration: 02:00 Research-based learning	Simulations Duration: 03:00 Laboratory assignments		
8	Tutorial Duration: 02:00 Research-based learning	Simulations Duration: 03:00 Laboratory assignments		
9	Tutorial Duration: 02:00 Research-based learning	Simulations Duration: 03:00 Laboratory assignments		
10	Tutorial Duration: 02:00 Research-based learning	Simulations Duration: 03:00 Laboratory assignments		
11	Tutorial Duration: 02:00 Research-based learning			
12				Oral presentation of the technical document developed by the student and evaluation of the document technical quality Individual presentation Continuous assessment and final examination Presential Duration: 00:30
13				
14				
15				
16				
17				Final Exam Written test Final examination Presential Duration: 03:00

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
12	Oral presentation of the technical document developed by the student and evaluation of the document technical quality	Individual presentation	Face-to-face	00:30	60%	5 / 10	CG4 CG5 CT4 CE3 CE13

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
12	Oral presentation of the technical document developed by the student and evaluation of the document technical quality	Individual presentation	Face-to-face	00:30	60%	5 / 10	CG4 CG5 CT4 CE3 CE13
17	Final Exam	Written test	Face-to-face	03:00	40%	0 / 10	CG4 CG5 CT4 CE3 CE13

7.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

7.2. Assessment criteria

Although the final exam is recommended, a student will be able of passing the qualification without it. His mark will be limited to 6 point (maximum).

The final grade in the **continuous evaluation** consists of the marks obtained in final exam, quality of the technical document and the presentation of that document:

Final grade = 60% Presentation and quality of the technical document + 40% Exam

No progressive evaluation is considered. Nevertheless, the professor will advice the student along the course in the tutorial sessions about the evolution of the work.

The minimum qualification in exam to be able to pass is 2 points out of 10. Document preparation an presentation quality minimum level is 5 points.

Extraordinary call

The extraordinary call will consist both in a written exam and the preparation and presentation of a technical document similar to the ordinary call

The written exam is mandatory and its minimum level is 4 points over 10.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Personal tutorial	Others	Weekly personal tutorial session
Agrawal, G.P. Fiber-Optic Communication Systems. WileyInterscience (2010)	Bibliography	Complementary consultation book
Agrawal, G.P. Lightwave Technology: Telecommunication Systems. WileyInterscience (2005)	Bibliography	Complementary consultation book
Martín Pereda, J.A. Sistemas y Redes Ópticas de Comunicaciones. PearsonPrentice Hall (2004)	Bibliography	Complementary consultation book
Slides	Web resource	Slides and problems with solutions available in Moodle
Sala de trabajo en grupo: Laboratorio	Equipment	
Keiser, Gerd; Optical Fiber Communications", McGraw-Hill (2010)	Bibliography	Complementary consultation book
Senior, J.M. Optical Fiber Communications, Prentice Hall, (2009)	Bibliography	Complementary consultation book
M. Cvijetic and I. B. Djordjevic: Advanced Optical Communication Systems and Networks (Artech House) 2013.	Bibliography	Reference text
Optical Fiber Communications Vol. VI-B, Systems and Networks, ed. I. Kaminow, T. Li, A. Willner, Academic, 2013.	Bibliography	Complementary consultation book

Le Nguyen Binh: Advanced Digital Optical Communications, CRC Press 2015	Bibliography	Second reference text
Simulation tools	Others	Matlab, Simulink. Optiperformer and other software tools available under UPM campus license.