Universidad de Navarra

Optoelectronics/Optical Communications (Ing.Gr.)

Guía docente 2025-26

PRESENTACIÓN

Breve descripción:

Titulación (Módulo/Materia):

- Ingeniería en Sistemas de telecomunicación (Bloque Especializado de Sistemas de Telecomunicación/Sistemas de Comunicación)

Detalles:

- **ECTS**: 4 ECTS
- **Curso, semestre**: 3.º curso, 2.º semestre
- **Carácter**: Obligatorio
- **Idioma**: English

Profesores de la asignatura:

- García Muñoz, Francisco Javier/Colaborador docente
- Olaizola Izquierdo, Santiago Miguel/Profesor colaborador
- Rodríguez González, Ainara/Profesor colaborador
- Larrañaga Jaio, Aitor/Colaborador docente

RESULTADOS DE APRENDIZAJE (Competencias)

INGENIERÍA EN SISTEMAS DE TELECOMUNICACIÓN

CG9 - Capacidad de trabajar en un grupo multidisciplinar y en un entorno multilingüe y de comunicar, tanto por escrito como de forma oral, conocimientos, procedimientos, resultados e ideas relacionadas con las telecomunicaciones y la electrónica.

CE22 - Capacidad para aplicar las técnicas en que se basan las redes, servicios y aplicaciones de telecomunicación tanto en entornos fijos como móviles, personales, locales o a gran distancia, con diferentes anchos de banda, incluyendo telefonía, radiodifusión, televisión y datos, desde el punto de vista de los sistemas de transmisión.

CE23 - Capacidad de análisis de componentes y sus especificaciones para sistemas de comunicaciones guiadas y no guiadas.

CE24 - Capacidad para la selección de circuitos, subsistemas y sistemas de radiofrecuencia, microondas, radiodifusión, radioenlaces y radiodeterminación.

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CE25 - Capacidad para la selección de antenas, equipos y sistemas de transmisión, propagación de ondas guiadas y no guiadas, por medios electromagnéticos, de radiofrecuencia u ópticos y la correspondiente gestión del espacio radioeléctrico y asignación de frecuencias.

PROGRAMA

1. Photon Optics

2. Interaction of photons and materials

3. Light Amplifiers

4. Lasers

5. Fibre Optic

Fibre optics is an important light transmission technology. The main application of fibre optics, and the focus of this course, is information transmission. Of course there are other uses for fibre optics such as endoscopes, gyroscopes and physical and chemical sensors. In this chapter we will review the physical properties of the fibre including:

- Ray optics approximation: snell law and maximum angle of acceptance
- Electromagnetic optics approximation: wave propagation in fibres, monomode and multimode fibres
- Attenuation and dispersion
- Fibre optics technology and materials: main specifications and fields of application

6. Point to Point Links

This chapter brings together the technology review from all the course to discuss optical links. We will discuss the transmission of information in local and long-haul links operating at high bandwidths. We will also describe the main components of optical links, introduce the link diagram and architectures and analyze the performance of the optical links in terms of

- Power budget
- Rise-time budget
- Noise budget

ACTIVIDADES FORMATIVAS

Lectures

Lectures will combine the theoretical concepts and practical examples related to the contents in each chapter. The slides will be provided before or after the lecture, according to the lecturer criteria. The slides are only a guide to study and do not substitute the lecturer explanations and/or other bibliography resources to complete them.

Lab Sessions

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The course includes laboratory sessions to enhance the students learning process through hands-on problems. The main concept is for the students to experience important electric and optical equipment to perform measurements in the optical and electrical domain. It is also important that the students are able to visualize the theoretical concepts described in the lecture program.

The laboratory sessions include the following topics:

1. Optical Fibre Splicing
2. OTDR Introduction: fail detection in fibre
3. Light polarization
4. Fibre Optic Attenuation
5. Measurement of P/I and V/I characteristics of photoemitters

The student should complete two of the lab sessions during the course. Lab sessions will be carried out in pairs. The lab procedure, deliverables and deadlines will be provided during the first week of the course.

One-to-one tutorials

- Each student may have personal interviews with the professor to help him/her with personal study and learning.

EVALUACIÓN

CONVOCATORIA ORDINARIA

- **Course Mark (50%):** 10% lecture attendance, 20% lab sessions, 20% partial evaluations/tests
- **Exam (50%):** It will cover the theoretical aspects and practical applications of the contents.

CONVOCATORIA EXTRAORDINARIA

- The previous **Course Mark (50%)** will be taken into account**:** 10% lecture attendance, 20% lab sessions, 20% partial evaluations/tests
- **Exam (50%):** It will cover the theoretical aspects and practical applications of the contents.

The final mark will be the arithmetic mean of the course and exam marks for those students that pass the exam, and the geometrical mean of both marks for those students that fail the exam.

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In the event that the student would prefer not keeping the Course Mark, the final mark will be the Exam mark (100%)

HORARIOS DE ATENCIÓN

Dr. Santiago M Olaizola (yolaizola@ceit.es)

Dra. Ainara Rodriguez (airodriguez@ceit.es)

- Time and place: to be arranged individually

BIBLIOGRAFÍA

- S. O. Kasap, Optoelectronics and Photonics, ISBN 0-321-19046-7, Prentice Hall 2001. Localízalo en la biblioteca
- T. P. Pearsall, Photonics Essentials (2nd Ed.), ISBN 0-07-162935-1, McGraw Hill 2010. Localízalo en la biblioteca
- G. Keiser, Optical Fiber Communications, ISBN 978-0073380711, McGraw Hill 2011. Localízalo en la biblioteca