

SUBJECT TEACHING GUIDE

1092 - Interdisciplinary Telecommunication Systems

Master's Degree in Telecommunication Engineering

Academic year 2025-2026

1. IDENTIFYING DATA					
Degree	Master's Degree in Telecommunication Engineering			Type and Year	Compulsory. Year 2
Faculty	School of Industrial Engineering and Telecommunications				
Discipline					
Course unit title and code	1092 - Interdisciplinary Telecommunication Systems				
Number of ECTS credits allocated	3	Term	Semester based (2)		
Web	https://moodle.unican.es/				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA DE COMUNICACIONES				
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Other lecturers					

3.1 LEARNING OUTCOMES
<p>- At the end of the course, the student will have a broad and realistic view of the full range of options open to him when finish their university studies. By an adaptation professional profile to the real profile demanded by today's society and industries, which will facilitate the employment of Telecommunications Engineering, and result in greater satisfaction for both the individual and society.</p> <p>On the other hand, students will be a more collaborative and proactive professional, which has been achieved by carrying out interdisciplinary projects and such diverse applications such as telemedicine, defense, energy, cybersecurity, encryption, signal processing and imaging, remote, AUVs, etc. With all students, overcome learning simple knowledge through the acquisition of skills: understanding and knowledge management, teamwork, stimulation and personal search for problem solving, and broader knowledge of the telecommunications sector.</p>

4. OBJECTIVES

The primary objectives of this subject are multiple, emphasizing the integration of technologies and systems of Telecommunication Engineering, with general character and in broader and multidisciplinary than those received during the degree and career contexts, such as: bioengineering, medicine, defense, photovoltaic conversion, environmental engineering nanotechnology, telemedicine and quality control of manufacturing industrial processes, telecommunications equipment. More specifically, the subject of "Interdisciplinary Telecommunications Systems" has the following two objectives:

- 1) Teach, train and educate, a more collaborative and proactive professional, which will be achieved basically by teaching based on the realization of interdisciplinary projects and applications as diverse as: telemedicine, defense, cyber defense, encryption, signal processing and imaging, remote, AUVs, etc. This is to overcome the simple learning of knowledge, aiming at the acquisition of skills rather, understanding and knowledge management, teamwork, stimulation and personal search for problem solving, and knowledge broader Telecommunications industry. Additionally, an ongoing evaluation process complements by project-based learning and using the support of ICTs technologies available through the Aula Virtual facilities of the University of Cantabria.
- 2) Adaptation to professional profile demanded by today's society, through research profiles required in the telecommunications sector and use them in the learning process. The secondary objective of the course is to combine satisfactorily basic training student with a closer approximation to the actual practice for being prepared for the real world. Complementing theoretical and practical learning, teamwork and real projects, the presence in classrooms of teachers with professional and experienced practitioners constitute a methodological framework of great possibilities in this regard. These skills acquired thought this subject fulfills the professional profile demanded by the sector to facilitate the employment of Telecommunications Engineering , which will result in greater satisfaction for both the individual and society.

6. SUBJECT PROGRAM

CONTENTS

1	SECTION No. 1 MILITARY APPLICATIONS: SECURITY AND DEFENCE Collective Security and Defense. Communications, Information and Advocacy. Communications Security. Evolution of Electronic Defense Aspects Future. Evolution of Satellite Communications Government and Defense. Waveguide Subsystems Antenna Feeding. Principles of Radio Frequency Identification and RFID applications. The World of Underwater Communications. Digital processing of acoustic image (SONAR). Satellite antennas for civil and military missions. Application of Active Antennas.
2	SECTION No. 2 IMAGE SYSTEMS ACQUISITION AND TREATMENT OF IMAGES FOR BIOSANITARY, TELEMEDICINE AND TELECARE APPLICATIONS. Fluoroscopy. Magnetic resonance imaging (MRI). Positron emission tomography (PET). CT projection radiography. Computed tomography (CT). Ultrasound. Open source software for medical image analysis: ImageJ, ITK and Ginkgo CADx. New trends in medicine and surgical teleintervention.
3	SECTION No. 3 ENVIRONMENTAL AND ENERGY APPLICATIONS Remote sensing environmental information: Meteorology, pollution and environmental protection. Physicochemical pollution. Electromagnetic pollution. Ionizing and Non-ionizing radiation. The precautionary principle. Regulations and recommendations on radiation ITU, WHO and ICNIRP. Clean energies. Nanotechnology.
4	SECTION No. 4 MULTITECHNOLOGY NETWORKS: MONITORING AND REMOTE SENSING. Introduction to the remote control of Instrumentation. GPIB, LAN, Wi-Fi, I2C and ZigBee. Monitoring and Quality Control of Industrial Processes. Global Positioning Systems: GPS, Glonass, Beidou and Galileo. ICT applications in monitoring and control processes. Use of drones in monitoring and security tasks. Future trends in control and monitoring. 5G telephony. Internet of things (IoT). Digitization of production processes. Industry 4.0. How to access public databases and scientific articles with fines for applied research. Future trends in Telecommunication: Artificial Intelligence and quantum computing.

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Research work about topics of section number 1 and 2.	Work	No	Yes	30,00
Research work about topics of section number 3 and 4.	Work	No	Yes	30,00
Research mandatory topic to be set by the teacher responsible for the subject	Work	No	Yes	40,00
This final work of Investigation work will have done by those students who have not deliver in time any of the partial Works mentioned above.	Work	Yes	No	0,00
TOTAL				100,00
Observations				
<p>The final evaluation for the course is calculated by the weighted average of the obtained partial notes (partial work of each block).</p> <p>To make this average is a necessary condition that in each partial mark has been obtained at least 4 (out of 10). The end goal of research is to recover those partial jobs that have not been exceeded during the quarter.</p> <p>The remote evaluation of the works, laboratory practical exercises and written tests is foreseen, in the event that a new health alert by COVID-19 makes it impossible to carry out the evaluation in person.</p>				
Observations for part-time students				
<p>The subject is virtualized through the Moodle platform of the UC Virtual Campus , the evaluation of the subject for part-time students will be carried out in a similar way to the rest of the student body.</p>				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
<p>1) Telecomunicaciones Militares para el despliegue de fuerzas en misiones humanitarias y de mantenimiento de paz . Grupo de Trabajo de Defensa y Seguridad Colegio Oficial de Ingenieros de Telecomunicación ISBN : 978-84-936910-2-8. Disponible gratuitamente en formato electrónico a través de la web del Colegio de Ingenieros de Telecomunicación http://www.coit.es/descargar.php?idfichero=9311</p> <p>2) Blondel, P. "The Handbook of Sidescan Sonar". Springer/Praxis, Heidelberg, Germany/Chichester, U.K 2009., 316 pp. ISBN: 978-3-540-42641-7 (Print) 978-3-540-49886-5 (Online).</p> <p>3) C. Fernando Mugarra González. "La Radiología Digital: Adquisición de imágenes" http://www.conganat.org/SEIS/is/is45/IS45_33.pdf</p> <p>4) Carles Rubies-Feijoo et al "Imagen médica, telemedicina y teleasistencia médica". Medicina Clínica Volume 134, Supplement 1, January 2010, Pages 56–62. Elsevier,</p> <p>5) Constantino Pérez Vega, José Mª Zamanillo Sáinz de la Maza, Alicia Casanueva López. "Sistemas de telecomunicación", Servicio de Publicaciones de la Universidad de Cantabria, [2007], ISBN: 978-84-8102-454-8</p>