ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

593000610 - Short Range Wireless Communications

DEGREE PROGRAMME

59AJ - Master Universitario En Comunicaciones Inalámbricas

ACADEMIC YEAR & SEMESTER

2024/25 - Semester 2

Index

Learning guide

1. Description

1.1. Subject details

Name of the subject	593000610 - Short Range Wireless Communications
No of credits	4.5 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	59AJ - Master Universitario en Comunicaciones Inalámbricas
Centre	59 - Escuela Tecnica Superior De Ingenieria Y Sistemas De Telecomunicacion
Academic year	2024-25

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Francisco Jose Arques Orobon (Subject coordinator)		jose.arques@upm.es	- -
Juan Anton Moreno Garcia-Loygorri		juan.moreno.garcia-loygorri@upm.es	Sin horario.

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

3. Skills and learning outcomes *

3.1. Skills to be learned

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/ Students have demonstrated knowledge and understanding providing the groundwork or opportunity for innovation in developing and/or applying ideas, often within a research context

CB7 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio/Students are capable of applying their knowledge, understanding, and problem-solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study

CB8 - Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios/Students are capable of integrating knowledge and making complex decisions, which, although based on incomplete or limited information, require reflection on social and ethical responsibilities linked to the application of their knowledge and opinions

CEM08 - Adquirir las destrezas que permitan analizar e interpretar la arquitectura y servicios de los sistemas de comunicaciones inalámbricos de corta distancia e implementar sus protocolos. / Adquire the skills to analyze and interpret the architecture and services of short distance wireless communication systems and implement its protocols.

CGI02 - Comprender el procedimiento, valor y límites del método científico, siendo capaz de identificar, localizar y obtenerdatos requeridos en un trabajo de investigación, de diseñar y guiar investigaciones analíticas, de modelado y experimentales, así como de evaluar datos de una manera crítica y extraer conclusiones. / Understand the procedure, value, and limits of the scientific method, being able to identify, locate and obtain data required in a research work, to design and guide analytical, modeling, and experimental investigations, as well as to critically evaluate data and extract conclusions.

CGI03 - Valorar la importancia de las fuentes documentales, manejarlas y buscar la información para el desarrollo de cualquier trabajo de investigación. / Assess the importance of documentary sources, manage them and search for information for the development of any research work.

UPM1 - Uso de la lengua inglesa / Use of the English language

UPM4 - Organización y planificación / Planning and organization

3.2. Learning outcomes

RA39 - Distinguir entre los distintos procesos de señal que tienen lugar en un sistema de comunicaciones inalámbrico de corta distancia/ Distinguish between different signal processes that take place in a short-range wireless communication system

RA29 - Elegir los métodos y herramientas de programación necesarios para abordar la solución de un problema/ Choose the programming methods and tools necessary to tackle the solution of a problem

RA41 - Identificar el impacto social y económico de las comunicaciones inalámbricas de corto alcance en un contexto global/ Identify the social and economic impact of short-range wireless communication systems in a global context

RA42 - Aplicar el conocimiento adquirido a la solución de problemas cualitativos y cuantitativos relacionados con las comunicaciones inalámbricas de corta distancia/ Apply the knowledge acquired to the solution of qualitative and quantitative problems related to short distance Wireless communications

RA40 - Programar la pila de protocolo de un sistema de comunicaciones inalámbrico de corta distancia/ Program the protocol stack of a shortrange wireless communication systems

* 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.

4. Brief description of the subject and syllabus

4.1. Brief description of the subject

1. Short range radio characteristics and applications.
2. Radio frequency identification (RFID)

3. Near Field Communications (NFC): Proximity and Vicinity

4. Wireless Personal Area Nettworks: Bluetooth and Bluetooth Low Energy (BLE)

5. Ultra-wide band Technology (UWB)

6. Wireless Local Area Networks (IEEE 802.11)

4.2. Syllabus

1. 1. Short range radio characteristics and applications.
   - 1.1. Characteristics of short-range radio
   - 1.2. Short-range radio applications
   - 1.3. Elements of wireless communication systems
2. 2. Radio frequency identification (RFID)
3. 3. Near Field Communications (NFC): Proximity and Vicinity
4. Wireless Personal Area Nettworks. Wireless Body Area Networks (IEEE 802.15)
   - 4.1. Bluetooth
   - 4.2. Bluetooth Low Energy
   - 4.3. ZigBee. IEEE 802.15.4
   - 4.4. Other wireless personal area networks
5. Ultra-wide band Technology (UWB)
   - 5.1. Ultra-wideband characteristics
6. 6. Wireless Local Area Networks (IEEE 802.11)

5. Schedule

5.1. Subject schedule*

Week	Type 1 activities	Type 2 activities	Distant / On-line	Assessment activities
1	**Short range radio characteristics and applications** Duration: 02:00 **Radio frequency identification (RFID)** Duration: 04:00			
2	**Near Field Communications (NFC): Proximity and Vicinity** Duration: 04:00	**Near Field Communications (NFC): Proximity and Vicinity** Duration: 02:00		**Near Field Communications (NFC): Proximity and Vicinity** Progressive assessment and Global Examination Presential Duration: 02:00
3	**Wireless Personal Area Nettworks: Bluetooth and Bluetooth Low Energy (BLE)** Duration: 02:00	**Wireless Personal Area Nettworks: Bluetooth and Bluetooth Low Energy (BLE)** Duration: 04:00		**Wireless Personal Area Nettworks: Bluetooth and Bluetooth Low Energy (BLE)** Progressive assessment and Global Examination Presential Duration: 02:00
4	**Wireless Personal Area Nettworks: Bluetooth and Bluetooth Low Energy (BLE)** Duration: 06:00			**Mid-term evaluation** Progressive assessment and Global Examination Presential Duration: 02:00
5	**Ultra-wide band Technology (UWB)** Duration: 06:00			
6	**Wireless Local Area Networks (IEEE 802.11)** Duration: 02:00	**Wireless Local Area Networks (IEEE 802.11)** Duration: 04:00		**Wireless Local Area Networks (IEEE 802.11)** Progressive assessment and Global Examination Presential Duration: 02:00
7	**Wireless Local Area Networks (IEEE 802.11)** Duration: 06:00			**Final-term evaluation** Progressive assessment and Global Examination Presential Duration: 02:00

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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.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
2	Near Field Communications (NFC): Proximity and Vicinity		Face-to-face	02:00	15%	5 / 10	
3	Wireless Personal Area Nettworks: Bluetooth and Bluetooth Low Energy (BLE)		Face-to-face	02:00	25%	5 / 10	
4	Mid-term evaluation		Face-to-face	02:00	10%	5 / 10	
6	Wireless Local Area Networks (IEEE 802.11)		Face-to-face	02:00	40%	5 / 10	
7	Final-term evaluation		Face-to-face	02:00	10%	5 / 10	

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
2	Near Field Communications (NFC): Proximity and Vicinity		Face-to-face	02:00	15%	5 / 10	
3	Wireless Personal Area Nettworks: Bluetooth and Bluetooth Low Energy (BLE)		Face-to-face	02:00	25%	5 / 10	
4	Mid-term evaluation		Face-to-face	02:00	10%	5 / 10	
6	Wireless Local Area Networks (IEEE 802.11)		Face-to-face	02:00	40%	5 / 10	
7	Final-term evaluation		Face-to-face	02:00	10%	5 / 10	

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
This examination (if necessary) will be carried out in the same terms defined in the continuous assesment.		Face-to-face	02:00	%	5 / 10	CGI02 CGI03 CB6 CB7 CB8 CEM08 UPM1 UPM4

6.2. Assessment criteria

This course will be assessed by using two different methods. One based on on-line quizzes at mid-term and final-term, and other based on the realization of lab activities and the writing of a related report. The weights for these assessments are shown in the table above.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
RFID Design Principles	Bibliography	Lehpamer, Harvey. RFID Design Principles, Artech House, 2007. ProQuest Ebook Central, https://ebookcentral.proquest.com/lib/upmes/detail.action?docID=338777.
Near Field Communication (NFC) : From Theory to Practice	Bibliography	Near Field Communication (NFC) : From Theory to Practice. Coskun, Vedat;Ok, Kerem;y más John Wiley & Sons, Incorporated 2012 ISBN number:9781119971092, ISBN number:9781119965787
Wireless Personal Communications : Bluetooth and Other Technologies	Bibliography	Wireless Personal Communications : Bluetooth and Other Technologies, edited by William H. Tranter, et al., Springer, 2000. ProQuest Ebook Central, https://ebookcentral.proquest.com/lib/upmes/detail.action?docID=3035574.
Inside Bluetooth Low Energy	Bibliography	Gupta, Naresh. Inside Bluetooth Low Energy, Artech House, 2013. ProQuest Ebook Central, https://ebookcentral.proquest.com/lib/upmes/detail.action?docID=3002030.
Ultra-Wideband Radio Propagation Channels : A Practical Approach	Bibliography	Talom, Friedman Tchoffo, et al. Ultra-Wideband Radio Propagation Channels : A Practical Approach, John Wiley & Sons, Incorporated, 2009. ProQuest Ebook Central, https://ebookcentral.proquest.com/lib/upmes/

		detail.action?docID=477694.
802.11 WLANs and IP Networking : Security, QoS, and Mobility	Bibliography	Prasad, Neeli, and Anand Prasad. 802.11 WLANs and IP Networking : Security, QoS, and Mobility, Artech House, 2005. ProQuest Ebook Central, https://ebookcentral.proquest.com/lib/upmes/detail.action?docID=231634.