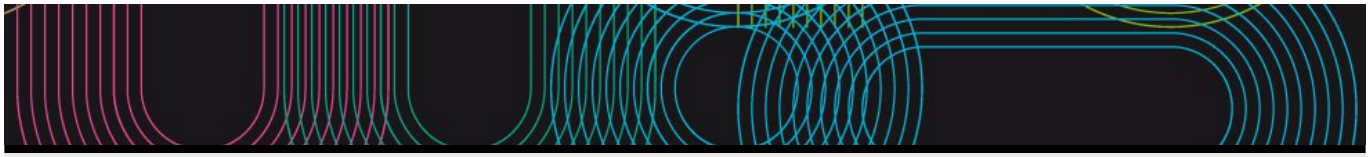

IDENTIFYING DATA				
Wireless and Mobile Communications				
Subject	Wireless and Mobile Communications			
Code	V05M145V01313			
Study programme	Máster Universitario en Ingeniería de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Optional	2nd	1st
Teaching language	English			
Department				
Coordinator	Vazquez Alejos, Ana			
Lecturers	Pérez Fontán, Fernando Vazquez Alejos, Ana			
E-mail	analejos@uvigo.es			
Web	http://http://faitic.uvigo.es			
General description	This subject introduces the student in the technology of the main present mobile and wireless communication systems, with training in analysis of coverage and quality planning at radio interface level.			

Training and Learning Results	
Code	
C20	CE20/RAD3 Ability to analyse and specify the basic parameters of a mobile or wireless radio network, as well as of quality of service.

Expected results from this subject	Training and Learning Results
Ability to compute the coverage and capacity of a mobile communications site and estimate the cellular radius.	C20
Dimensioning and capacity planning of mobile and wireless systems.	C20
Ability to carry out a mobile network deployment planning.	C20
Ability to select the radio technology most appropriate to a given application.	C20

Contents	
Topic	
Unit 1. Overview of mobile wireless radio communication systems.	1.1. Introduction to mobile and wireless systems. 1.2. Mobile and wireless radio propagation channel modeling.
Unit 2. Dimensioning and quality of service planning in mobile and wireless radio systems.	2.1. Dimensioning of a mobile radio system. 2.2. Quality of service. 2.3. Enabling technologies.
Unit 3. Cellular systems.	3.1. 1G and 2G mobile sytems. 3.2. 3G mobile systems: CDMA, UMTS. 3.3. 4G mobile systems: LTE. 3.4. Next Generation mobile systems: 5G and B5G.
Unit 4. Wireless local and wide area networks.	4.1. Local area wireless systems and services: WLAN, and LPWAN. 4.2. Internet of Things (IoT). 4.3. Vehicular communications. 4.4. Design fundamentals: radio propagation channel modeling, dimensioning and quality of service. 4.5. Other wireless systems: WiMAX and WPAN.

Laboratory practices	1. Behavioral simulation of a transmission link under conditions of Rayleigh fading. 2. Rayleigh radio channel with Jakes-type Doppler spectrum. 3. Link balance and preliminary error estimation. 4. Simulation of different system configurations: no channel coding vs. channel coding and interleaving. 5. Beamforming.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	12	30	42
Case studies	6	5	11
Problem solving	7.5	10	17.5
Practices through ICT	7.5	10	17.5
Mentored work	4	10	14
Laboratory practice	0	10	10
Essay questions exam	1.5	2	3.5
Presentation	1.5	0	1.5
Essay questions exam	1.5	2	3.5
Objective questions exam	1.5	3	4.5

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
	Description
Lecturing	Presentation of the theoretical contents of the subject by teachers.
Case studies	Conducting case studies in laboratory with delivery of a memory/report to be assessed.
Problem solving	Theoretical contents taught in the master lessons will be complemented with the resolution of problems and/or exercises during class time.
Practices through ICT	Practical cases will be realized with delivery of evaluable memory.
Mentored work	The development in group of two works will be proposed that covers any of the subjects considered in master lessons and practices.

Personalized assistance	
Methodologies	**Description**
Lecturing	The students will be able to consult any doubt during this time of classes. If necessary, an appointment for tutoring with the faculty must be scheduled through the contact information provided in Moovi and the following link: Ana Vázquez Alejos @ https://www.uvigo.gal/universidade/administracion-persoal/pdi/ana-vazquez-alejos
Case studies	The case study is carried out during face-to-face hours and the students will be able to consult any doubt during this time of classes. If necessary, an appointment for tutoring with the faculty must be scheduled through the contact information provided in Moovi and the following link: Ana Vázquez Alejos @ https://www.uvigo.gal/universidade/administracion-persoal/pdi/ana-vazquez-alejos
Problem solving	The resolution of problems and exercises is carried out during face-to-face hours and the students will be able to consult any doubt during this time of classes. If necessary, an appointment for tutoring with the faculty must be scheduled through the contact information provided in Moovi and the following link: Ana Vázquez Alejos @ https://www.uvigo.gal/universidade/administracion-persoal/pdi/ana-vazquez-alejos
Practices through ICT	The lecturer will be available during the completion of the proposed practices to attend and resolve doubts. If necessary, an appointment for tutoring with the faculty must be scheduled through the contact information provided in Moovi and the following link: Fernando Pérez Fontán @ https://www.uvigo.gal/universidade/administracion-persoal/pdi/fernando-perez-fontan
Mentored work	The students will be able to consult any doubt during this time of classes. If necessary, an appointment for tutoring with the faculty must be scheduled through the contact information provided in Moovi and the following link: Ana Vázquez Alejos @ https://www.uvigo.gal/universidade/administracion-persoal/pdi/ana-vazquez-alejos
Tests	**Description**
Laboratory practice	For the delivery and assessment of the memory of the practices an appointment for tutoring with the faculty must be scheduled through the contact information provided in Moovi and the following link: Fernando Pérez Fontán @ https://www.uvigo.gal/universidade/administracion-persoal/pdi/fernando-perez-fontan

Essay questions exam	To resolve doubts related to this test, an appointment for tutoring with the faculty must be scheduled through the contact information provided in Moovi and the following link: Ana Vázquez Alejos @ https://www.uvigo.gal/universidade/administracion-persoal/pdi/ana-vazquez-alejos
Presentation	To resolve doubts related to the presentation of mentored work, an appointment for tutoring with the faculty must be scheduled through the contact information provided in Moovi and the following link: Ana Vázquez Alejos @ https://www.uvigo.gal/universidade/administracion-persoal/pdi/ana-vazquez-alejos
Essay questions exam	To resolve doubts related to this test, an appointment for tutoring with the faculty must be scheduled through the contact information provided in Moovi and the following link: Ana Vázquez Alejos @ https://www.uvigo.gal/universidade/administracion-persoal/pdi/ana-vazquez-alejos
Objective questions exam	To resolve doubts related to this test, an appointment for tutoring with the faculty must be scheduled through the contact information provided in Moovi and the following link: Ana Vázquez Alejos @ https://www.uvigo.gal/universidade/administracion-persoal/pdi/ana-vazquez-alejos

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practice	For each lab practice an individual report of results must be presented for assessment.	30	C20
Essay questions exam	Short exercise resolution exam oriented to contents of Units 1 and 2.	20	C20
Presentation	Oral presentation in a group of the tutored work. The evaluation of each member of the group will be carried out by personalized follow-up.	10	C20
Essay questions exam	Short exercise resolution exam oriented to contents of Units 3 and 4.	20	C20
Objective questions exam	Single-answer question test on the total content of the subject	20	C20

Other comments on the Evaluation

Students enrolled in the subject can choose one of the two proposed assessment systems: continuous assessment or exam-onlyl assessment.Each student must notify the coordinating professor by email of the selected assessment system one month after the start of classes.

Continuous assessment (ordinary exam)

Continuous assessment involves performing throughout the semester of the paragraphs disaggregated in the above table. Each of the blocks is of mandatory fulfillment in the form of continuous and individual assessment, and to pass the subject a minimum of 25% of the note assigned to each of the sections and the total mark accumulated within the five sections to be achieved must overcome at least 50% of the final grade.

The essay questions exams consist of a reasoned resolution of short exercises on the subject topics.The short answer test is multiple choice and is done the day indicated in the official exam schedule. Regarding the block of laboratory practices, one report is required per practice and per student, made in a individual way. Evidences of report copying or cloning will drive to fail the related task.

Continuous assessment involves making 100% of all proposed tasks. Failure to take any of these tests implies the loss of continuous assessment and the final grade will be "SUSPENSO".

These tasks are not recoverable, that is, if a student does not satisfy the scheduled tasks, the teacher has no obligation to repeat any of them, and also they will be only valid for the academic year in which they are completed.

The schedule of the midterm/intermediate exams will be approved in the Comisión Académica de Máster (CAM) and will be available at the beginning of each academic semester.

It is considered that the subject is passed if the total grade is equal to or greater than 5. In case of leaving the modality of continuous assessment, the final grade will be "SUSPENSO".

Exam-only assessment (ordinary exam)

A student who does not opt for continuous assessment should be eligible for the highest grade by a final exam, which will consist of three parts:

- Part 1: realization of laboratory practices and delivery of reports due (30% of the final grade). One report is required per practice and per student, made in a individual way. Evidences of report copying or cloning will drive to grade as zero the related practice.

- Part 2: test exam (50% of the final grade).

- Part 3: troubleshooting (20% of the final grade).

It is considered that the subject is passed by eventual assessment if the total grade is equal to or greater than 5.

Extraordinary exam

For students who chose the exam-only assessment, the grade will be given by a final exam that will consist of three parts: a practical examination (pass /non-pass) (20%), a standard test exam (40%) and an examination of problems (40%) .

It is considered that the subject is approved in second call if the total grade is equal to or greater than 5.

End-of-program exam

It will consist of an exam with three parts: a practical examination (pass /non-pass)(20%), a standard test exam (40%) and an examination of problems (40%). It is considered that the subject is approved if the total grade is equal to or greater than 5.

Ethical code and plagiarism

Plagiarism is regarded as serious dishonest behavior. If any form of plagiarism is detected in any of the tests or exams, the final grade will be FAIL (0), and the incident will be reported to the corresponding academic authorities for prosecution.

An ethical and critical use of tools based on artificial intelligence is recommended, and it is advisable to indicate their use in the reports delivered.

Sources of information

Basic Bibliography

Ana Vazquez Alejos, **Lecture Notes and Powerpoint Slides**, 2017,

Andreas F. Molisch, **Wireless Communications: From Fundamentals to Beyond 5G, 3rd Edition**, 3, Wiley, 2022

William Stallings, **5G Wireless: A Comprehensive Introduction**, 1, Addison-Wesley Professional, 2021

Oriol Sallent, **Fundamentos de diseño y gestión de sistemas de comunicaciones móviles celulares**, 978-8-49-880482-9, Iniciativa Digital Politècnica, 2014

Complementary Bibliography

Jose María Hernando Rábanos, **Comunicaciones Móviles**, 2004,

Mª Teresa Jiménez Moya, Juan Reig Pascual, Lorenzo Rubio Arjona, **Problemas de comunicaciones móviles**, 2006,

José Manuel Huidobro Moya, **Comunicaciones móviles : sistemas GSM, UMTS Y LTE**, 2012,

Martin Sauter, **From GSM to LTE: An Introduction to Mobile Networks and Mobile Broadband**, 2011,

Maciej Stasiak et al., **Modelling and Dimensioning of Mobile Wireless Networks: From GSM to LTE**, 2010,

W. Dargie, C. Poellabauer, **Fundamentals of Wireless Sensor Networks: Theory and Practice**, 2010,

Recommendations

Subjects that continue the syllabus

Antennas/V05M145V01208
Wireless Networks and Ubiquitous Computation/V05M145V01211
Satellites/V05M145V01311
Communication Advanced Systems/V05M145V01302

Subjects that are recommended to be taken simultaneously

Wideband Radio Systems/V05M145V01312

Subjects that it is recommended to have taken before

Radio Laboratory/V05M145V01209
Radiocommunication/V05M145V01103