



IDENTIFYING DATA

Legislation and noise measurement techniques

Subject	Legislation and noise measurement techniques			
Code	V05G306V01419			
Study programme	Bachelor Degree in Telecommunication Technologies Engineering (BTTE)			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	English			
Department				
Coordinator	Torres Guijarro, María Soledad			
Lecturers	Torres Guijarro, María Soledad			
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General description	In this subject, the main methods of measurement of environmental noise are discussed. The European and national regulations on noise and acoustic insulation are also presented. As part of the measurement process, a guide for the evaluation of the measurement uncertainty in acoustics is also presented. The teaching will be in English.			

Training and Learning Results

Code				
B2	CG2: The knowledge, comprehension and ability to apply the needed legislation during the development of the Technical Telecommunication Engineer profession and aptitude to manage compulsory specifications, procedures and laws.			
B5	CG5: The knowledge to perform measurements, calculations, assessments, appraisals, technical evaluations, studies, reports, task scheduling and similar work to each specific telecommunication area.			
B7	CG7: The ability to analyze and assess the social and environmental impact of technical solutions.			
B8	CG8: To know and apply basic elements of economics and human resources management, project organization and planning, as well as the legislation, regulation and standardization in Telecommunications.			
C75	(CE75/OP18) The ability to elaborate noise maps and their geographical information display.			
C78	(CE78/OP21) The ability to write essays on environmental, construction and automation acoustics.			
C79	(CE79/OP22) The ability to elaborate specific acoustic essay procedures.			

Expected results from this subject

Expected results from this subject	Training and Learning Results	
Knowledge of the European, national and regional legislation in the field of acoustic engineering.	B2	
Knowledge of the most common measurement standards in acoustics testing laboratories.	B2	
Ability to prepare technical reports, test reports and expert reports in the field of acoustic engineering.	B5 B7 B8	C75
Ability to develop measurement procedures adapted to legislative requirements.		C78 C79

Contents

Topic		
Introduction: noise, its description and annoyance.	Classification of noise and descriptors. The assessment of noise. General overview of measurements in acoustics. Noise levels, vehicle noise. Practices for measurement car pass by noise.	

Description and measurement of environmental noise	Characterization of the noise sources. Influence of the propagation conditions. Practices for indoor and outdoor noise measurements
Environmental noise regulations in Europe.	The EU Environmental Noise Directive. Directive 2002/49/EC of the European Parliament and of the Council of 25th June 2002 relating to the assessment and management of environmental noise. National noise regulations. Practices for measurement procedures application.
Acoustic Insulation, description and regulations in Europe.	Acoustic insulation, descriptors. National Code Buildings in Europe, and the regulations on acoustic insulation. Practices for measurement.
Measurement uncertainty.	The need to assess the measurement uncertainty: quality management in laboratories. The guide for expression of uncertainty in measurement- GUM. Measurement Uncertainty in Acoustics. Exercises for uncertainty computation.

Planning

	Class hours	Hours outside the classroom	Total hours
Mentored work	6	24	30
Laboratory practical	12	9	21
Previous studies	0	15	15
Lecturing	19	38	57
Problem and/or exercise solving	2	8	10
Report of practices, practicum and external practices	2	10	12
Essay	1	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
Mentored work	The student has to develop in group and write a report on two projects: 1. Procedure to describe and assess environmental noise in a real scenario. 2. Project of acoustic insulation according to the simplified method described in the CTE-DB HR (Spanish Building Code, document for protection against noise). Through this methodology the competencies B2, B5, B7, B8, C75, C78, C79 are developed.
Laboratory practical	Laboratory practises in group on: 1. Characterization and assessment of noise annoyance. Spatial and temporal sampling. 2. Measurement of vehicle pass-by noise. 3. Measurement of acoustic insulation in buildings. 4. Uncertainty budget of the measurements made in the practical session 3. 5. Estimation of uncertainties by the Monte Carlo method. Software to be used: Excel, Matlab/Python Through this methodology the competencies B2, B5, B7, B8, C78, C79 are developed.
Previous studies	The students must individually study and prepare with the sources of information given before the lectures and the practical sessions. Through this methodology the competencies B2, B5, B8, B75, C78, C79 are developed.
Lecturing	Lectures will be given, developing the main concepts of the subject. Through this methodology the competencies B2, B5, B7, B8, C75, C78, C79 are developed.

Personalized assistance

Methodologies	Description
Lecturing	Doubts can be solved in the rests of the classes and in the teacher tutorial sessions. These tutorial sessions will be done individually or in short groups (with a maximum of 2-3 students). The tutorial sessions are typically agreed with the professor. The meeting requests can be done personally or by email. https://www.uvigo.gal/es/universidad/administracion-personal/pdi/maria-soledad-torres-guijarro
Mentored work	The projects have its own classes of C group in which the students of each team consult their doubts about the project and the professor is with them helping to define the project and giving them support for the development of their particular project. They are classes with a very pleasant interaction.
Laboratory practical	In the classes of practices is a good moment to consult doubts with the professor. The professor moves between the tables and some students take advantage of the proximity of the professor to consult doubts of the own class or punctual doubts of other classes.

Assessment

Description		Qualification	Training and Learning Results	
Mentored work	Tutored practical project, with the delivery of a final report and oral presentation of results. The individual grade of group work is obtained as the weighted sum of: 1) the common grade of the group (60%); 2) The individual grade (40%), obtained from one or more of the following assessment methods: peer assessment by the other members of the group, oral questions during presentations of the work, written questions about the content of the work.	30	B2 B5 B7 B8	C75 C78 C79
Problem and/or exercise solving	Written test, with short questions on the theory of the subject.	40	B2 B5 B7	C75 C78 C79
Report of practices, practicum and external practices	Questions and report of the practical tasks.	30	B2 B5 B7	C78 C79

Other comments on the Evaluation

TEACHING LANGUAGE: English

ASSESSMENT LANGUAGE: The student can choose to do the written test in English or Spanish.

Following the guidelines of the degree, two systems of evaluation are offered: CONTINUOUS ASSESSMENT (recommended) and GLOBAL ASSESSMENT. Global assessment will be only allowed in situations in which it is imposible to follow the recommended system.

In case of detection of plagiarism in any of the tests (short tests, reports of the laboratory practices, reports of the directed works or final exam), the final grade will be of FAIL (0) and the fact will be communicated to the Centre Management for the opportune effects.

ORDINARY EXAM

A) CONTINUOUS ASSESSMENT:

The continuous assessment will be based in the evaluation of practical task, projects and two tests. Once a student has signed a document of agreement with the process of continuous assessment, and if not communicated otherwise within one month, it will be understood that the student has submitted to the call, and the final degree will be obtained by the application of the criteria described bellow, regardless of whether or not the final exam is taken.

The subject is assessed in a 0 to 10 points scale and is considered "passed" if each activity is graded equal or greater than 4, and the final grade obtained is equal or greater than 5. The final grade will be obtained from the weighted sum of the grade obtained in the following tasks with the given weights. If in any of the activities the grade does not reach 4 but the average exceeds 5, the final grade will be 4.9.

Types and weights of the activities:

1. Tutored works: 30 % of the final grade. Two reports will be delivered: the first halfway through the term and the second at the end. The individualized part of the assessment will be done through cross-evaluation, oral questions during presentations, and written exam questions.
2. Reports of practical tasks (Weight: 40 %).
3. Short answer tests: A short answer test is included in the process of continuous assessment, at the end of the term, with a weight of 40% on the final grade.

B) GLOBAL ASSESSMENT

A final examination is available for those students that for some reason could not follow the continuous evaluation assessment process. In this case the final examination will consist in a short answer test, and some additional questions related with the practical tasks and projects. The subject is assessed in a 0 to 10 points scale and it is considered "passed" if the final grade obtained is equal or greater than 5.

EXTRAORDINARY EXAM

There is scheduled date for a final examination retake, for those students that either dropped out during the semester or failed. Prior the examination, a student can choose to follow the continuous assessment or the global assessment. In the

former selection, the grades obtained in the projects and practical tasks will be taken into account and the student will only answer to the short answer test. If the later, the student will have also to answer a full examination as described before.

END-OF-PROGRAM EXAM

The exam will consist of a short answer test. This final exam will be rated between 0 and 10 points. It includes all the topics of the course. To pass, at least five points are needed. No other activity is valued.

Sources of information

Basic Bibliography

DIRECTIVE 2002/49/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 June 2002 relating to the assessment and management of environmental noise,

ISO Standard, **ISO 1996-1. Acoustics -- Description, measurement and assessment of environmental noise -- Part 1: Basic quantities and assessment procedures,**

ISO Standard, **ISO 1996-2. Acoustics -- Description, measurement and assessment of environmental noise -- Part 2: Determination of environmental noise levels,**

UNE EN ISO 11819-1:2002 Measurement of the influence of road surfaces on traffic noise – Part 1 – Statistical pass-by method,

ISO 16283-1 (2014). Acoustics – Field measurement of sound insulation in buildings and of building elements, Ley 37/2003 del Ruido,

Real Decreto 1367/2007,

Decreto 106_2015 sobre contaminación acústica de Galicia,

Documento Básico de protección frente al ruido del Código Técnico de la Edificación,

ISO 717- 1 (2013) Acoustics – Rating of sound insulation in buildings and of building elements, Part 1 – Airborne sound insulation,

ISO IEC Guide 98-3 Guide to the expression of uncertainty in measurement, GUM (1995),

ISO 12999-1-(2014) Uncertainties in building acoustics,

A Beginners Guide to Uncertainty of Measurement (1999), National Physical Laboratory (NPL),

Estimating Uncertainties in Testing (2001), National Physical Laboratory (NPL),

Sonometer uncertainty (2004), National Physical Laboratory (NPL),

Complementary Bibliography

RODRIGO AVILÉS LÓPEZ, ROCÍO PERERA MARTÍN, Manual de acústica ambiental y arquitectónica, Paraninfo, 2017

Recommendations

Subjects that are recommended to be taken simultaneously

Room Acoustics/V05G301V01330

Subjects that it is recommended to have taken before

Fundamentals of Sound and Image/V05G301V01209

Design of audiovisual installations/V05G301V01334

Fundamentals of Acoustics Engineering/V05G301V01327