

**1. General information****Course:** AUDIOVISUAL EQUIPMENTS IN ELECTROMEDICINE**Code:** 59638**Type:** ELECTIVE**ECTS credits:** 6**Degree:** 385 - DEGREE IN TELECOMMUNICATIONS TECHNOLOGY ENGINEERING**Academic year:** 2020-21**Center:** 308 - SCHOOL POLYTECHNIC OF CUENCA**Group(s):** 30**Year:** 4**Duration:** First semester**Main language:** Spanish**Second language:****Use of additional****languages:****English Friendly:** Y**Web site:****Bilingual:** N**Lecturer:** RAUL ALCARAZ MARTINEZ - Group(s): 30

Building/Office	Department	Phone number	Email	Office hours
E. Politécnica Cuenca (0.03)	INGENIERÍA ELÉCTRICA, ELECTRÓNICA, AUTOMÁTICA Y COMUNICACIONES	926054053	raul.alcaraz@uclm.es	

**Lecturer:** CESAR SANCHEZ MELENDEZ - Group(s): 30

Building/Office	Department	Phone number	Email	Office hours
0.05	INGENIERÍA ELÉCTRICA, ELECTRÓNICA, AUTOMÁTICA Y COMUNICACIONES	926053743	cesar.sanchez@uclm.es	

**2. Pre-Requisites**

It is necessary to know the contents related to the identification of components of a basic electrical circuit, basic experimental measurement techniques and the identification of the main audio and video components present in consumer electronic equipment.

**3. Justification in the curriculum, relation to other subjects and to the profession**

In this subject, students will acquire knowledge about the origin of bioelectric signals and the methods of measurement and registration of them. The different equipment present in a health center will be described and the role that technicians specialized in electromedicine play in the acquisition of non-implantable active medical devices, their implementation and the preventive and corrective maintenance of them.

This specialty of engineering is called to be one of the main economic growth engines in the coming years, with a high presence of techniques associated with audiovisual systems that are the subject of study in this curriculum.

**4. Degree competences achieved in this course****Course competences**

Code	Description
E21	The ability to build, use and manage telecommunications services and applications, defined as capture, analogue and digital processing, coding, transport, representation, processing, storage, reproduction, management and presentation of audiovisual services and information multimedia systems.
G02	Correct, oral and written, communication skills.
G06	Knowledge of basic subjects and technologies, enabling students to learn new methods and technologies, as well as providing great versatility to adapt to new situations
G07	The ability to tackle problems with initiative, making decisions, creativity, and to communicate and transmit knowledge, skills and abilities, including the ethical and professional responsibility of the activity of a Technical Telecommunications Engineer
G08	Knowledge to perform measurements, calculations, assessments, appraisals, surveys, studies, reports, task planning and other similar work in their specific telecommunications field
G13	The ability to look for and understand information, whether technical or commercial in different sources, to relate and structure it to integrate ideas and knowledge. Analysis, synthesis and implementation of ideas and knowledge.

**5. Objectives or Learning Outcomes****Course learning outcomes****Description**

Application of sound and image in other engineering areas, such as electromedicine.

Synthesis of capacities of several telecommunications engineering areas.

Correct use of oral and written expression to convey ideas, technologies, results, etc.

Use of ICT to achieve the specific objectives set in the subject.

Knowledge and respect of professional ethics and deontology.

Analysis, synthesis and compression of technical documentation and mastery of specific vocabulary.

**6. Units / Contents****Unit 1: Introduction to Health Technology****Unit 1.1** Professional field and training**Unit 1.2** Health Technology Sector**Unit 1.3** Management and maintenance of Health Technology

- Unit 1.4** Safety in Health Technology  
**Unit 1.5** Practice 1. Visit to health centers  
**Unit 1.6** Practice 2. Health Technology Management Software  
**Unit 1.7** Practice 3. Electrical safety in Health Technology

**Unit 2: Diagnostic systems**

- Unit 2.1** Physiology of the human body  
**Unit 2.2** Registration systems and devices  
**Unit 2.3** Diagnostic image systems  
**Unit 2.4** Other diagnostic systems  
**Unit 2.5** Practice 4. Functional verification of an electrocardiograph  
**Unit 2.6** Practice 5. Functional verification of an ultrasound machine  
**Unit 2.7** Practice 6. Functional verification of a centrifuge

**Unit 3: Therapy and monitoring systems**

- Unit 3.1** Systems and therapy devices  
**Unit 3.2** Monitoring systems and devices  
**Unit 3.3** Practice 7. Functional verification of a defibrillator  
**Unit 3.4** Practice 8. Functional verification of an electrosurgery unit  
**Unit 3.5** Practice 9. Functional verification of an infusion pump  
**Unit 3.6** Practice 10. Functional verification of a respirator

**7. Activities, Units/Modules and Methodology**

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	E21 G02 G06 G08	0.89	22.25	N	-	
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	E21 G02 G06 G07 G08 G13	0.18	4.5	N	-	
Writing of reports or projects [OFF-SITE]	Guided or supervised work	E21 G02 G06 G07 G08 G13	1	25	Y	N	
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	E21 G02 G06 G07 G08 G13	0.9	22.5	N	-	
Practicum and practical activities report writing or preparation [OFF-SITE]	Self-study	E21 G02 G06 G07 G08 G13	0.5	12.5	Y	N	
Individual tutoring sessions [ON-SITE]		E21 G02 G06 G07 G08 G13	0.08	2	N	-	
Progress test [ON-SITE]	Assessment tests	E21 G02 G06 G07 G08 G13	0.35	8.75	Y	N	
Study and Exam Preparation [OFF-SITE]	Self-study	E21 G02 G06 G07 G08 G13	2.1	52.5	N	-	
<b>Total:</b>			<b>6</b>	<b>150</b>			
<b>Total credits of in-class work: 2.4</b>			<b>Total class time hours: 60</b>				
<b>Total credits of out of class work: 3.6</b>			<b>Total hours of out of class work: 90</b>				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

**8. Evaluation criteria and Grading System**

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Progress Tests	40.00%	40.00%	Partial tests performed at the end of each thematic block
Laboratory sessions	60.00%	60.00%	Realization of practical cases in group
<b>Total:</b>	<b>100.00%</b>	<b>100.00%</b>	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

**Evaluation criteria for the final exam:**

**Continuous assessment:**

The weightings indicated in the section on 'assessments' will be applied. Progress tests' and laboratory practices may be made up by an examination on a date set by the Sub-directorate of Studies. The student who passes the laboratory will keep the mark during the following course, unless he decides to repeat it voluntarily. In case of not passing the course in the following course, the student will have to do the laboratory practices again.

**Non-continuous evaluation:**

The student who cannot attend the training activities regularly, with justification, must inform the subject's teacher at the beginning of the semester in order to be able to carry them out at a time and on a date agreed with the teacher.

**Specifications for the resit/retake exam:**

The student will be able to recover the part corresponding to the tests of progress and laboratory practices through an examination on the date established by the sub-direction of studies. The same weightings will be applied as in the ordinary call.

**Specifications for the second resit / retake exam:**

Training activities corresponding to progress tests and laboratory practices will be evaluated through an examination on a date set by the Sub-Directorate of Studies. The same weightings will be applied as in the ordinary call.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	4.5
Writing of reports or projects [AUTÓNOMA][Guided or supervised work]	25
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	22.5
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	12.5
Individual tutoring sessions [PRESENCIAL][ ]	2
Progress test [PRESENCIAL][Assessment tests]	8.75
Study and Exam Preparation [AUTÓNOMA][Self-study]	52.5
Unit 1 (de 3): Introduction to Health Technology	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	6.5
Unit 2 (de 3): Diagnostic systems	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	9.25
Unit 3 (de 3): Therapy and monitoring systems	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	6.5
Global activity	
Activities	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	22.25
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	4.5
Writing of reports or projects [AUTÓNOMA][Guided or supervised work]	25
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	22.5
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	12.5
Individual tutoring sessions [PRESENCIAL][ ]	2
Progress test [PRESENCIAL][Assessment tests]	8.75
Study and Exam Preparation [AUTÓNOMA][Self-study]	52.5
<b>Total horas: 150</b>	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Carr, Joseph J.	Introduction to biomedical equipment technology	Prentice Hall		0-13-010492-2	2001	
Dyro, Joseph	Clinical engineering handbook	Elsevier Academic Press		0-12-226570-X	2004	
Khandpur, Raghbir Singh (1942-)	Biomedical instrumentation : technology and applications	McGraw-Hill		0-07-144784-9	2005	
Ruždiger Kramme, Klaus-Peter Hoffmann, Robert S. Pozos	Springer Handbook of Medical Technology	Springer		978-3-540-74657-7	2011	
Street, Laurence J.	Introduction to biomedical engineering technology	CRC Press		978-0-8493-8533-9	2008	
Sörnmo, Leif	Bioelectrical signal processing in cardiac and neurological applications	Elsevier Academic Press		0-12-437552-9	2005	
A. Badnjevic, M. Cifrek, R. Magjarevic, and Z. Dzemic	Inspection of Medical Devices for Regulatory Purposes <a href="https://www.springer.com/gp/book/9789811066498">https://www.springer.com/gp/book/9789811066498</a>	Springer		978-981-10-6650-4	2018	