



POLITÉCNICA

INTERNATIONAL
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LEARNING ACTIVITIES
PR/CL/001



E.T.S. de Ingenieros de
Telecomunicación

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

93000962 - Biomedical Engineering Research And Development Projects

DEGREE PROGRAMME

09AU - Master Universitario En Ingeniería Biomedica

ACADEMIC YEAR & SEMESTER

2022/23 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	93000962 - Biomedical Engineering Research And Development Projects
No of credits	3 ECTS
Type	Compulsory
Academic year of the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	09AU - Master Universitario en Ingenieria Biomedica
Centre	09 - Escuela Tecnica Superior De Ingenieros De Telecomunicacion
Academic year	2022-23

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Giuseppe Fico		giuseppe.fico@upm.es	Sin horario. It is necessary to schedule an appointment via e-mail
M.del Mar Duque Garcia	ETSIT C-204	mariadelmar.duque@upm.es	Sin horario. It is necessary to schedule an appointment via e-mail

Gema Garcia Saez (Subject coordinator)	B302.2	gema.garcia.saez@upm.es	M - 13:00 - 14:00 F - 11:00 - 13:00 It is necessary first to schedule an appointment via email.
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* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

2.2. Research assistants

Name and surname	Email	Faculty member in charge
López Pérez, Laura	laura.loperez@alumnos.upm.es	Fico, Giuseppe
Merino Barbancho, Beatriz	beatriz.merino@upm.es	Fico, Giuseppe

3. Skills and learning outcomes *

3.1. Skills to be learned

CB06 - 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

CB07 - 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

CB08 - 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

CB09 - Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades

CB10 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

CE-MIB03 - Ser capaz de aplicar los métodos y tecnologías actuales en investigación biomédica aplicadas en la prevención, diagnóstico y tratamiento de enfermedades.

CE-MIB04 - Realizar investigación, desarrollo e innovación en productos, procesos y/o métodos en ingeniería biomédica

CG-MIB01 - Resolver problemas e integrar conocimiento en temas nuevos o escasamente definidos y en entornos multidisciplinares del área de la Ingeniería Biomédica

CG-MIB02 - Analizar y aplicar la reglamentación correspondiente a la sensibilidad social y ética en los ámbitos de operación que pueden darse en Ingeniería Biomédica

CG-MIB03 - Utilizar la filosofía, el método científico y el método experimental para la búsqueda de innovación, la curiosidad científica y el desarrollo de actitudes creativas

CG-MIB04 - Utilizar las tecnologías de la información y la comunicación para la búsqueda de información, datos bibliográficos y adquisición de nuevo conocimiento para la formación permanente y el trabajo autónomo

CG-MIB05 - Utilizar técnicas de expresión oral y escrita para comunicar trabajos y conclusiones a comunidades de iguales o divulgación científica, elaboración de artículos, manuales de estilo y herramientas de edición para fomentar la capacidad de comunicación y disseminación de resultados

CG-MIB06 - Aplicar técnicas de trabajo colaborativo en equipos multidisciplinares internacionales y liderazgo, así como utilizar métodos para asumir la responsabilidad de orientar y dirigir trabajos científicos en el ámbito de la ingeniería Biomédica

CG-MIB07 - Utilizar la lengua inglesa como herramienta de trabajo

CG-MIB08 - Analizar y aplicar métodos de gestión, organización y planificación de proyectos avanzados en Ingeniería Biomédica

CG-MIB09 - Identificar y utilizar métodos para la búsqueda de recursos, la gestión económica y administrativa de proyectos avanzados en Ingeniería Biomédica

3.2. Learning outcomes

RA63 - Accomplish individual and team works by searching different sources of information and critical discussion as well as presenting the results in oral presentation

RA62 - Apply the scientific method in research and development projects, as well as in the dissemination of Project results

* 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

The main goal is to learn how to apply the scientific method in the definition of research and development projects in the field of biomedical engineering.

The contents consider the following aspects:

1. Introduction to research and development projects in Biomedical engineering.
2. Scientific knowledge: aims and characteristics.
 - 2.1. Scientific methods for systematic review and dissemination in R&D projects.
4. Dissemination of technical and scientific documentation.
5. Introduction to Health technology assessment.
 - 5.1. Certification of medical devices
6. Case studies about R&D projects in biomedical engineering.
7. Management of R & D projects.

4.2. Syllabus

1. Introduction. Definition of research and development projects
2. Scientific knowledge
 - 2.1. Aims and characteristics
 - 2.2. Bibliographic search for scientific documentation
 - 2.3. Scientific methods for systematic review and dissemination in R&D projects.
3. Dissemination of technical and scientific documentation
 - 3.1. Introduction to Sustainable Development Goals
 - 3.2. Technical and scientific writing in professional settings
4. Introduction to health technology assessment
5. Case studies in R&D projects in biomedical engineering

5. Schedule

5.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	1. Course presentation and introduction to research and development projects. Duration: 02:00 Lecture			
2	2. Scientific knowledge, Hypothesis formulation Duration: 02:00 Lecture			
3	2.2. Bibliographic search for scientific documentation Duration: 01:00 Lecture	Case discussion Duration: 01:00 Cooperative activities		Individual research work 1 Individual work Continuous assessment Not Presential Duration: 01:00
4	2.3. Scientific methods for systematic review and dissemination in R&D projects. Duration: 01:00 Lecture	Case discussion Duration: 01:00 Cooperative activities		
5	3. Dissemination of technical and scientific documentation Duration: 01:00 Lecture	Case discussion Duration: 01:00 Cooperative activities		
6	3.1. Introduction to SDGs Duration: 01:00 Additional activities 3.2. Technical writing in professional settings Duration: 01:00 Additional activities			
7	3.2. Technical writing in professional settings Duration: 01:00 Additional activities	Case discussion Duration: 01:00 Cooperative activities		
8	4. Introduction to health technology assessment. Duration: 02:00 Lecture	Case discussion Duration: 01:00 Cooperative activities		
9	4.1. Certification of medical devices Duration: 02:00 Lecture			

10	<p>Case studies about R&D projects in biomedical engineering. Duration: 02:00 Cooperative activities</p>			<p>Midterm report + individual performance within the team Group work Continuous assessment Not Presential Duration: 13:00</p>
11	<p>Case studies about R&D projects in biomedical engineering. Duration: 02:00 Cooperative activities</p>			
12	<p>Case studies about R&D projects in biomedical engineering. Duration: 02:00 Cooperative activities</p>			
13	<p>Presentation of projects Duration: 02:00 Additional activities</p>			<p>Final report team work + individual performance within the team Group work Continuous assessment Not Presential Duration: 15:00</p>
14	<p>Presentation of projects Duration: 02:00 Additional activities</p>			<p>Presentation of team works Group presentation Continuous assessment Presential Duration: 04:00</p> <p>Attendance, participation and tests in the classroom Other assessment Continuous assessment Presential Duration: 00:00</p>
15				
16				
17				<p>Written exam Written test Final examination Presential Duration: 02:00</p> <p>Final report Group work Final examination Not Presential Duration: 12:00</p> <p>Presentation of team works Group presentation Final examination Presential Duration: 00:30</p>

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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
3	Individual research work 1	Individual work	No Presential	01:00	10%	4 / 10	CB06 CB08 CG-MIB04 CG-MIB07 CG-MIB09
10	Midterm report + individual performance within the team	Group work	No Presential	13:00	25%	4 / 10	CE-MIB03 CE-MIB04 CB06 CB07 CB09 CB08 CB10 CG-MIB01 CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CG-MIB08 CG-MIB09
13	Final report team work + individual performance within the team	Group work	No Presential	15:00	35%	4 / 10	CE-MIB04 CB06 CB07 CB09 CB08 CB10 CG-MIB01 CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CG-MIB08 CG-MIB09 CE-MIB03

14	Presentation of team works	Group presentation	Face-to-face	04:00	15%	4 / 10	CB06 CB07 CB08 CG-MIB06 CG-MIB07
14	Attendance, participation and tests in the classroom	Other assessment	Face-to-face	00:00	15%	0 / 10	CG-MIB06 CG-MIB07 CG-MIB09 CB07

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Written exam	Written test	Face-to-face	02:00	40%	5 / 10	CE-MIB03 CB06 CB07 CB09 CB08 CB10 CG-MIB01 CG-MIB03 CG-MIB05 CG-MIB07 CG-MIB08
17	Final report	Group work	No Presential	12:00	45%	5 / 10	CE-MIB03 CE-MIB04 CB06 CB07 CB09 CB08 CB10 CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CG-MIB01 CG-MIB09
17	Presentation of team works	Group presentation	Face-to-face	00:30	15%	5 / 10	CB06 CB07 CB08 CG-MIB06 CG-MIB07

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Written report + presentation	Other assessment	Face-to-face	03:00	50%	5 / 10	CG-MIB01 CG-MIB06 CG-MIB04 CB09 CB10 CB06 CG-MIB05 CG-MIB08 CE-MIB03 CE-MIB04 CB08 CG-MIB03 CG-MIB02 CG-MIB07 CG-MIB09 CB07
Written exam	Written test	Face-to-face	03:00	50%	5 / 10	CE-MIB03 CE-MIB04 CB07 CB09 CB08 CB10 CG-MIB01 CG-MIB03 CG-MIB05 CG-MIB07 CG-MIB08

6.2. Assessment criteria

The evaluation will be carried out following the **progressive evaluation** and it will consider the following:

- Attendance, participation and tests in the classroom: 15%.
- Team work: 60%
- Team presentation: 15%
- Individual research work 1: 10%

In order to pass the course, there is a minimum score of 4 points out of 10 that should be obtained in all the team work deliverables and in the individual work. Individual contribution to the team works will be considered.

Global evaluation

Students willing to renounce to the progressive evaluation must send an email via Moodle to the coordinator at least six weeks before the ordinary exam period approved by Junta de Escuela for the current academic semester and year. In this case, it is necessary to perform a team work + presentation in order to acquire all the competences of the subject. The content of this work will be agreed with the coordinator at least six weeks before the end of the semester. In addition, a final exam will account for 40% of the total score.

Evaluation will assess if students have acquired all the competencies of the subject. Thus, evaluation through global assessment will be carried out considering all the evaluation techniques used in the progressive evaluation. Evaluation activities that assess learning outcomes that cannot be evaluated through a single exam can be carried out along the semester.

Extraordinary evaluation

Extraordinary evaluation will be carried out following the same evaluation techniques as in the global assessment.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
http://moodle.upm.es/titulaciones/oficiales	Web resource	Material provided by teachers: presentations, documents, technical notes, wording of deliverables, tests, forum, etc

8. Other information

8.1. Other information about the subject

The Sustainable Development Goals are the blueprint to achieve a better and more sustainable future for all. This course is related to SDG 3 and 4, specifically to points:

- 3.D Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks.
- 4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship