



POLITÉCNICA

INTERNATIONAL
CAMPUS OF
EXCELLENCE

COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001



E.T.S. de Ingenieros de
Telecomunicacion

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

2020/21 - 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	2020-21

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
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.

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

2.3. External faculty

Name and surname	Email	Institution
Maria Del Mar Duque Garcia	marduque@etsit.upm.es	ETSIT C-204
Miguel Sánchez Ibañez	miguel.sanchezi@upm.es	ETSIT C204

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 diseminación 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, considering criteria such as excellence, impact and implementation.

The contents are divided into 4 main blocks and consider the following aspects:

- Definition of research and development projects
- Scientific knowledge: aims and characteristics
- Introduction to Sustainable Development
- Methodology of R&D projects
- * Excellence of R& D projects
- * Impact of R&D projects. Evaluation of project results and clinical studies
- * Implementation of R&D projects. Management of research and development projects

4.2. Syllabus

1. Introduction. Definition of research and development projects
2. Scientific knowledge
 - 2.1. Aims and characteristics
 - 2.2. Scientific documentation and Dissemination of results in scientific publications
3. Methodology of research and development projects
 - 3.1. Excellence of S&T project
 - 3.1.1. Introduction to Sustainable Development Goals
 - 3.2. Impact of R&D projects
 - 3.3. Validation of hypothesis and clinical studies
 - 3.4. Implementation of R&D projects
 - 3.5. Management of research projects
4. Effective Oral presentations or reseach works

5. Schedule

5.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Distant / On-line	Assessment activities
1	1. Course presentation and introduction to Methodology of research and development projects. Presentation of project topics. Duration: 02:00 Lecture			
2	2. Scientific knowledge Duration: 02:00 Lecture			
3	Presentation of research areas and selection of project topic Duration: 01:00 Additional activities	Case discussion Duration: 01:00 Cooperative activities		Individual research work 1 Individual work Continuous assessment Not Presential Duration: 03:00
4	4. Methodology of research and development projects. Excellence of S&T projects Duration: 02:00 Lecture			Project idea Group work Continuous assessment Not Presential Duration: 02:00
5	4. Methodology of research and development projects. Excellence of S&T projects Duration: 01:00 Additional activities	Case discussion Duration: 01:00 Cooperative activities		
6	4. Methodology of research and development projects. Excellence of S&T projects Duration: 01:00 Additional activities	Case discussion Duration: 01:00 Cooperative activities		
7	4. Methodology of research and development projects. Excellence of S&T projects Duration: 01:00 Additional activities	Case discussion Duration: 01:00 Cooperative activities		Team work part 1 Individual work Continuous assessment Not Presential Duration: 10:00
8	4. Methodology of research and development projects. Impact of R&D projects Duration: 01:00 Additional activities	Case discussion Duration: 01:00 Cooperative activities		
9	4. Methodology of research and development projects. Validation of hypothesis and clinical studies Duration: 01:00 Additional activities	Case discussion Duration: 01:00 Cooperative activities		Team work part 2 Group work Continuous assessment Not Presential Duration: 12:00

10	4. Methodology of research and development projects. Impact of R&D projects Duration: 01:00 Additional activities	Case discussion Duration: 01:00 Cooperative activities		
11	4. Methodology of research and development projects. Implementation of R&D projects Duration: 01:00 Additional activities	Case discussion Duration: 01:00 Cooperative activities		Team work part 3 Group work Continuous assessment Not Presential Duration: 02:00
12	4. Methodology of research and development projects. Implementation of R&D projects Duration: 01:00 Additional activities	Case discussion Duration: 01:00 Cooperative activities		
13	4. Methodology of research and development projects. Implementation of R&D projects Duration: 01:00 Additional activities	Case discussion Duration: 01:00 Cooperative activities		Team work part 4 Group work Continuous assessment Not Presential Duration: 15:00
14	Presentation of research projects Duration: 02:00 Additional activities			Individual Oral presentation Group presentation Continuous assessment Presential Duration: 00:05 Presentation of projects Group presentation Continuous assessment Presential Duration: 02:00
15				Attendance, participation and tests in the classroom Other assessment Continuous assessment Presential Duration: 00:00
16				
17				Final assessment Written test Final examination Presential Duration: 02:00 Project proposal description Individual work Final examination Presential Duration: 02:00

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. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
3	Individual research work 1	Individual work	No Presential	03:00	10%	3 / 10	CB06 CB08 CG-MIB04 CG-MIB07 CG-MIB09
4	Project idea	Group work	No Presential	02:00	5%	3 / 10	CB07 CB09 CG-MIB01 CG-MIB02 CG-MIB04 CE-MIB03 CB06 CG-MIB05 CG-MIB06 CG-MIB07 CG-MIB09
7	Team work part 1	Individual work	No Presential	10:00	15%	4 / 10	CB06 CB09 CG-MIB01 CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB07 CG-MIB09
9	Team work part 2	Group work	No Presential	12:00	10%	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
11	Team work part 3	Group work	No Presential	02:00	5%	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
13	Team work part 4	Group work	No Presential	15:00	15%	4 / 10	
14	Individual Oral presentation	Group presentation	Face-to-face	00:05	10%	0 / 10	CB08 CG-MIB06 CG-MIB07 CB06 CB09
14	Presentation of projects	Group presentation	Face-to-face	02:00	15%	4 / 10	CG-MIB06 CB06 CB08 CG-MIB07 CB07
15	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. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final assessment	Written test	Face-to-face	02:00	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

17	Project proposal description	Individual work	Face-to-face	02:00	50%	5 / 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
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6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Extraordinary examination	Written test	Face-to-face	04:00	100%	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

6.2. Assessment criteria

Continuous Evaluation will consider the following:

- Attendance, participation and questionnaires: 15%
- Team work + project presentation: 65%
- Individual research work 1: 10%
- Individual oral presentation: 10%

Students will be qualified through continuous evaluation by default. According to the Normativa de Evaluación del Aprendizaje de la Universidad Politécnica de Madrid, students willing to renounce to continuous evaluation must send an email via Moodle to the coordinator before three weeks since the beginning of the course.

Evaluation will assess if students have acquired all the competences of the subject. Thus, evaluation through final assessment will be carried out considering all the evaluation techniques used in continuous evaluation (EX, ET, TG, etc.), and will be celebrated in the exam period approved by Junta de Escuela for the current academic semester and year. Evaluation activities that assess learning outcomes that cannot be evaluated through a single exam can be carried out along the semester.

Extraordinary examination will be carried out exclusively by the final examination method.

Depending on the total number of students, and the pandemic evolution, it might be necessary to reduce presential classes. In case it is necessary, attendance will be organized with the available resources and sanitary requirements.

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