



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

**93000963 - Biomedical Engineering Professional Projects**

### DEGREE PROGRAMME

09AU - Master Universitario en Ingeniería Biomedica

### ACADEMIC YEAR & SEMESTER

2020/21 - Semester 2

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## 1. Description

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### 1.1. Subject details

<b>Name of the subject</b>	93000963 - Biomedical Engineering Professional Projects
<b>No of credits</b>	6 ECTS
<b>Type</b>	Compulsory
<b>Academic year of the programme</b>	First year
<b>Semester of tuition</b>	Semester 2
<b>Tuition period</b>	February-June
<b>Tuition languages</b>	English
<b>Degree programme</b>	09AU - Master Universitario en Ingenieria Biomedica
<b>Centre</b>	09 - Escuela Tecnica Superior de Ingenieros de Telecomunicacion
<b>Academic year</b>	2020-21

## 2. Faculty

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### 2.1. Faculty members with subject teaching role

<b>Name and surname</b>	<b>Office/Room</b>	<b>Email</b>	<b>Tutoring hours *</b>
Ignacio Oropesa Garcia	D213	i.oropesa@upm.es	Sin horario.
Enrique Javier Gomez Aguilera		enriquejavier.gomez@upm.es	Sin horario.
Patricia Sanchez Gonzalez (Subject coordinator)		p.sanchez@upm.es	--
Alvaro Gutierrez Martin		a.gutierrez@upm.es	Sin horario.

Maria Elena Hernando Perez		mariaelena.hernando@upm.es	Sin horario.
Maria Teresa Arredondo Waldmeyer		mt.arredondo@upm.es	Sin horario.
Giuseppe Fico		giuseppe.fico@upm.es	Sin horario.

\* 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
Andrés Santos	andres@die.upm.es	ETSIT
Maria Jesús Ledesma	mledesma@die.upm.es	ETSIT
Juan José Gómez Valverde	jjgvalverde@die.upm.es	ETSIT

## 3. Prior knowledge recommended to take the subject

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### 3.1. Recommended (passed) subjects

- Diseño De Tecnologías Biomédicas

### 3.2. Other recommended learning outcomes

The subject - other recommended learning outcomes, are not defined.

## 4. Skills and learning outcomes \*

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### 4.1. 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-MIB06 - Proyectar, realizar, presentar y defender, un proyecto de Ingeniería Biomédica original realizado en talleres de grupos enfocado a entornos profesionales de empresa, hospital o investigación

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

## 4.2. Learning outcomes

RA101 - Creative teamwork process of iterative design of concepts of solution using iterative prototyping.

RA99 - Identifying and defining unmet clinical needs as part of the clinical care cycle or clinical processes and protocols.

RA100 - Proposal of alternative solution designs to identified unmet clinical needs.

\* 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.

## 5. Brief description of the subject and syllabus

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### 5.1. Brief description of the subject

This course will focus in the design of real world medical technology development. It will consist of an intensive and practical continuation of contents of DTB course to understand and define significant unmet medical needs and designing new

medical technologies to address them. Two main issues will be covered in this course: prototyping and creation of a business plan.

## 5.2. Syllabus

1. Validation of selected projects
2. Proof of concept definition
3. Specification of a proof of concept functional prototype
4. Prototype implementation
5. Business model

## 6. Schedule

### 6.1. Subject schedule\*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Distant / On-line	Assessment activities
1	<b>Introduction to the subject</b> Duration: 01:30 Lecture  <b>Team Building Activity</b> Duration: 00:30 Cooperative activities			
2	<b>1. Validation of selected projects</b> Duration: 02:00 Cooperative activities			
3	<b>1. Validation of selected projects</b> Duration: 02:00 Cooperative activities			
4	<b>5. Business plan</b> Duration: 02:00 Lecture			
5	<b>2. Proof of concept definition</b> Duration: 02:00 Cooperative activities			
6	<b>2. Proof of concept definition</b> Duration: 01:00 Cooperative activities  <b>3. Specification of a proof of concept functional prototype</b> Duration: 01:00 Cooperative activities			
7	<b>3. Specification of a proof of concept functional prototype</b> Duration: 02:00 Cooperative activities			
8	<b>5. Business plan</b> Duration: 02:00 Lecture			
9				<b>Midterm Report and presentation</b> Group presentation Continuous assessment and final examination Presential Duration: 04:00
10	<b>4. Prototype implementation</b> Duration: 02:00 Cooperative activities			



11	<b>4. Prototype implementation</b> Duration: 02:00 Cooperative activities			
12	<b>5. Business plan</b> Duration: 02:00 Lecture			
13	<b>4. Prototype implementation</b> Duration: 02:00 Cooperative activities			
14				<b>Final Report and presentation</b> Individual work Continuous assessment and final examination Presential Duration: 04:00  <b>Team Evaluation (internal+mentor)</b> Other assessment Continuous assessment Not Presential Duration: 00:30  <b>Individual evaluation</b> Other assessment Continuous assessment Not Presential Duration: 00:30
15				<b>Individual exam</b> Written test Final examination Presential Duration: 02:00
16				
17				

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.

## 7. Activities and assessment criteria

### 7.1. Assessment activities

#### 7.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
9	Midterm Report and presentation	Group presentation	Face-to-face	04:00	30%	5 / 10	CB06 CB07 CB08 CB09 CB10 CG-MIB01 CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CE-MIB06
14	Final Report and presentation	Individual work	Face-to-face	04:00	40%	5 / 10	CB06 CB07 CB08 CB09 CB10 CG-MIB01 CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CG-MIB08 CG-MIB09 CE-MIB06
14	Team Evaluation (internal+mentor)	Other assessment	No Presential	00:30	20%	3 / 10	
14	Individual evaluation	Other assessment	No Presential	00:30	10%	3 / 10	

#### 7.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
9	Midterm Report and presentation	Group presentation	Face-to-face	04:00	30%	5 / 10	CB06 CB07 CB08 CB09 CB10 CG-MIB01 CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CE-MIB06
14	Final Report and presentation	Individual work	Face-to-face	04:00	40%	5 / 10	CB06 CB07 CB08 CB09 CB10 CG-MIB01 CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CG-MIB08 CG-MIB09 CE-MIB06
15	Individual exam	Written test	Face-to-face	02:00	30%	4 / 10	CB06 CB08 CB09 CB10 CE-MIB06

### 7.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

## 7.2. Assessment criteria

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 have passed from 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.

- In order to pass the course, students must obtain a minimum grade of 5/10
- All assignments must reflect the personal work and teamwork of the student, Detected copies will automatically mean failing the course.

Continuos evaluation:

- Midterm Report - 30%
- Final Written Report and Presentation - 40%
- Team Evaluations 20% - (Individual- 10% mentor - 10% team members evaluate each other)
- Individual Performance, presentations, questions, quizzes and Progress Deliverables - Individual- 10%

Final and extraordinary evaluation:

- Midterm Report - 30%
- Final Written Report and Presentation. Individual exam- 70%

## 8. Teaching resources

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### 8.1. Teaching resources for the subject

Name	Type	Notes
Biodesign: The Process of Innovating Medical Technologies (second edition), P. G. Yock, S. Zenios, J. Makower, T. J. Brinton, U. N. Kumar, F. T. J. Watkins, L. Denend, T. M. Krummel, C. Q. Kurihara, Cambridge University Press 2015	Bibliography	Main resource of the subject describing the design methodology
ebiodesign.org	Web resource	Videos, and other resources to guide the students in the application of the design methodology
Espacio Moodle de la asignatura	Web resource	In this website the material covered by the subject will be uploaded as well as the quizzes and deliverables.