ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

93000970 - Entrepreneurship And Innovation In Biomedical Engi

DEGREE PROGRAMME

09AU - Master Universitario En Ingenieria Biomedica

ACADEMIC YEAR & SEMESTER

2025/26 - Semester 1

Index

Learning guide

1. Description

1.1. Subject details

Name of the subject	93000970 - Entrepreneurship And Innovation In Biomedical Engi
No of credits	3 ECTS
Type	Optional/elective
Academic year ot 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 - E.T.S. De Ingenieros De Telecomunicacion
Academic year	2025-26

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Angel Hernandez Garcia (Subject coordinator)	A-127	angel.hernandez@upm.es	Sin horario. Appointment by e-mail.
Laura Del Rio Carazo	A-127	laura.delrio@upm.es	Sin horario. Appointment by e-mail.

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Foundations of Business Management

4. Skills and learning outcomes *

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-MIB02 - Analizar los procesos organizativos y de dirección de las empresas de ingeniería biomédica para aplicar herramientas de gestión en las distintas áreas funcionales de la misma.

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

4.2. Learning outcomes

RA23 - Ser capaz de elaborar un plan de negocio.

RA21 - Conocer los conceptos y las herramientas asociadas a la gestión de la tecnología

RA22 - Conocer y aplicar las herramientas para generar modelos de negocio a partir del análisis del estado actual de la tecnología.

* 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

5.1. Brief description of the subject

The main objective of the course is to provide the knowledge and tools to better understand the process of creating a new technology-based venture (innovation-driven start-up), from the business idea to business plan development and running the business. This involves the following:

- Understanding the main concepts related to the management of technology business ventures.
- Understanding and applying the main tools for business model generation.
- Developing the ability to search, analyze and combine business and technology information to build a business plan.

5.2. Syllabus

1. Introduction: entrepreneurship and innovation-driven start-ups
2. Generation of business models and ideas
   2.1. Business model generation
   2.2. Business idea generation
3. Establishing and developing the business idea
4. Customer analysis
   4.1. Market segmentation. Beachhead market selection. End user profile
   4.2. Total Addressable Market (TAM) analysis. Improving end user profile
5. Value proposition
   5.1. Full Life Cycle. Product specification. Quantifying the value proposition. Competitive analysis
6. Product acquisition: understanding customers' decision process
7. Business models and unit economics
   7.1. Business model design. Lifetime Value of a Customer. Cost of Customer Acquisition
8. Product design: defining the Minimum Viable Business Product
9. Scaling the business

6. Schedule

6.1. Subject schedule*

Week	Type 1 activities	Type 2 activities	Distant / On-line	Assessment activities
1	**Course presentation** Duration: 00:45 Lecture **Team formation** Duration: 00:30 Additional activities **1. Introduction to entrepreneurship: main concepts about technology new ventures** Duration: 00:45 Lecture **2. Generation of business models and ideas** Duration: 01:00 Lecture **2. Generation of business models and ideas** Duration: 01:00 Cooperative activities			
2	**4. Customer analysis** Duration: 01:00 Lecture **3. Establishing and developing the business idea** Duration: 01:00 Cooperative activities **4. Customer analysis** Duration: 01:00 Lecture **3. Establishing and developing the business idea** Duration: 01:00 Cooperative activities			
3	**Test (Topic 2)** Duration: 00:10 Additional activities **5. Value proposition** Duration: 00:50 Lecture **3. Establishing and developing the business idea** Duration: 01:00 Cooperative activities			**Test (Topic 2)** Written test Progressive assessment Presential Duration: 00:00

	6. Product acquisition Duration: 01:00 Lecture **3. Establishing and developing the business idea** Duration: 01:00 Cooperative activities			
4	**7. Business models and unit economics** Duration: 01:00 Lecture **7. Business models and unit economics** Duration: 01:00 Cooperative activities **Test (Topics 4, 5 & 6)** Duration: 00:10 Additional activities **7. Business model** Duration: 00:50 Lecture **7. Business models and unit economics** Duration: 01:00 Cooperative activities			**Test (Topics 4, 5 & 6)** Written test Progressive assessment Presential Duration: 00:00
5	**7. Business models and unit economics** Duration: 01:00 Lecture	**Intermediate presentation** Duration: 02:00 Additional activities **3. Establishing and developing the business idea.** Duration: 01:00 Cooperative activities		**Intermediate presentation** Group presentation Progressive assessment Presential Duration: 00:00
6	**Test (Topic 7)** Duration: 00:10 Additional activities **8. Product design** Duration: 00:25 Lecture **9. Scaling the business** Duration: 00:25 Lecture	**3. Establishing and developing the business idea.** Duration: 01:00 Cooperative activities **3. Establishing and developing the business idea.** Duration: 02:00 Cooperative activities		**Test (Topic 7)** Written test Progressive assessment Presential Duration: 00:00
7	**Active participation** Duration: 00:00 Additional activities	**3. Establishing and developing the business idea.** Duration: 02:00 Cooperative activities **Final project presentation** Duration: 02:00 Additional activities		**Final project presentation** Group presentation Progressive assessment Presential Duration: 00:00 **Final project document** Group work Progressive assessment Not Presential Duration: 00:00 **Active participation** Other assessment Progressive assessment

				Presential Duration: 00:00
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				**Final exam** Written test Global examination Presential Duration: 02:00 **Final project presentation** Group presentation Global examination Presential Duration: 00:00 **Final project document** Group work Global examination Not Presential Duration: 00:00

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.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
3	Test (Topic 2)	Written test	Face-to-face	00:00	10%	0 / 10	CG-MIB04 CG-MIB07 CB06
4	Test (Topics 4, 5 & 6)	Written test	Face-to-face	00:00	10%	0 / 10	CG-MIB04 CG-MIB07 CB06
5	Intermediate presentation	Group presentation	Face-to-face	00:00	12.5%	0 / 10	CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CG-MIB01 CB06 CB07 CB09 CB10 CE-MIB02
6	Test (Topic 7)	Written test	Face-to-face	00:00	10%	0 / 10	CG-MIB04 CG-MIB07 CB06
7	Final project presentation	Group presentation	Face-to-face	00:00	25%	5 / 10	CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CG-MIB01 CB06 CB07 CB09 CB10 CE-MIB02
7	Final project document	Group work	No Presential	00:00	25%	5 / 10	CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CG-MIB01 CG-MIB02 CB06 CB07 CB08

							CB09 CB10 CE-MIB02
7	Active participation	Other assessment	Face-to-face	00:00	7.5%	0 / 10	CG-MIB07 CG-MIB05

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final exam	Written test	Face-to-face	02:00	50%	5 / 10	CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CG-MIB01 CB06 CB07 CB09 CB10 CE-MIB02
17	Final project presentation	Group presentation	Face-to-face	00:00	25%	5 / 10	CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CG-MIB01 CB06 CB07 CB09 CB10 CE-MIB02
17	Final project document	Group work	No Presential	00:00	25%	5 / 10	CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CG-MIB01 CG-MIB02 CB06 CB07 CB08 CB09 CB10 CE-MIB02

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Final project document	Group work	Face-to-face	00:00	25%	5 / 10	CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CG-MIB01 CG-MIB02 CG-MIB03 CB06 CB07 CB08 CB09 CB10 CE-MIB02
Final exam	Written test	Face-to-face	01:30	50%	5 / 10	CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CG-MIB01 CB06 CB07 CB09 CB10 CE-MIB02
Final project presentation	Group presentation	Face-to-face	00:15	25%	5 / 10	CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CG-MIB01 CB06 CB07 CB09 CB10 CE-MIB02

7.2. Assessment criteria

Considering the methodology of this course (Project Based Learning), **it is strongly recommended for students to opt for the progressive assessment method and to attend all course sessions.**

Progressive assessment

Due to the nature of the course methodology, and because the progressive evaluation method seeks to assess the progress of each student throughout the course, it is strongly recommended to attend all sessions. In this assessment method, grading will be carried out in the following way:

- Tests (3): 30% (10% each test)
- Intermediate oral presentation: 12.5%

- Final project: 50% (deliverable document: 25%; oral presentation: 25%). The students who pass this activity (grade equal or higher than 5 points out of 10 in both components) will keep their score in the project for global test assessment and extraordinary call by default.
- Active participation in the classroom and virtual spaces: 7.5%.

Additionally, small activities conducted during class sessions throughout the course may allow students to earn up to an extra 10% of the final grade in the active participation component.

If students do not reach the minimum grade in any of the two components of the final project, the final grade will be equal to the arithmetic mean of the components that did not meet the minimum grade.

Global test assessment

Due to the nature of Project Based Learning, it is strongly recommended to follow the course through progressive

assessment.

In global test assessment, the weights of the grades in the different assessed activities are as follows:

- Final project: 50% (deliverable document: 25%; oral presentation on the date of examination: 25%).
    - Students who passed this activity in progressive assessment will keep the score achieved in the activity by default.
    - Other than that, students must deliver and present an original project (not submitted for assessment before).
    - The delivery of the final project (document and supporting material for the presentation) is mandatory to pass the course.
    - The deadline for submission of the final project is one week before the official date of final examination.
    - The presentation will be given on the date of examination.
- Written exam: 50%. The written exam will combine theoretical and practical aspects of the different topics covered in the course.

If students do not reach the minimum grade in the exam or any of the two components of the final project, the final grade will be equal to the arithmetic mean of the elements of assessment that did not meet the minimum grade.

Extraordinary call

The evaluation will assess the competence level achieved by students. Therefore, students renouncing to progressive assessment and opting for extraordinary call (referred examination) will be subject to all the assessment techniques used in continuous assessment (EX, ET, TG, etc.).

In the extraordinary call, grade weigths will be distributed as follows:

- Final project: 50% (deliverable document: 25%; oral presentation on the date of examination: 25%).
    - Students who passed this activity in progressive assessment or global test assessment will keep the score achieved in that activity by default.
    - Other than that, students must deliver and present an original project (not submitted for assessment before).
    - The delivery of the final project (document and supporting material for the presentation) is mandatory to pass the course.
    - The deadline for submission of the final project is one week before the official date for the final exam.
    - The presentation will be given on the date of examination.
- Written exam: 50%. The written exam will combine theoretical and practical aspects of the different topics taught in the course.

If students do not reach the minimum grade in the exam or any of the two components of the final project, the final grade will be equal to the arithmetic mean of the elements of assessment that did not meet the minimum grade.

Unless explicitly stated, any submitted assessment may be subject to an additional oral examination by the instructor in order to verify that the work has been completed independently by the student, without the use of artificial intelligence systems. Should this verification be required, or in cases of total or partial plagiarism in any submission, the student will receive a grade of zero for the corresponding assessment period.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
http://moodle.upm.es/titulaciones/oficiales	Web resource	Course materials developed by the instructors: presentations, documents, cases, etc.
Aulet, B. (2024). Disciplined Entrepreneurship: 24 Steps to a Successful Startup, Expanded & Updated. John Wiley & Sons. Hoboken, New Jersey	Bibliography	Course textbook
Aulet, B. (2017). Disciplined entrepreneurship workbook John Wiley & Sons. Hoboken, New Jersey	Bibliography	Course workbook
Cheek, P. (2024). Disciplined Entrepreneurship Startup Tactics: 15 Tactics to Turn Your Business Plan into a Business. Wiley.	Bibliography	Supplementary bibliography
Osterwalder, A., & Pigneur, Y. (2010). Business model generation. Wiley.	Bibliography	Course materials for topic 2
Lee, J. S. (2010). Biomedical engineering entrepreneurship. World Scientific. Chicago	Bibliography	Supplementary bibliography
The disciplined entrepreneurship website	Web resource	Additional resources. URL: https://www.d-eship.com

9. Other information

9.1. Other information about the subject

- Communications between the instructor and students: In order to facilitate the communication with the instructors, and whenever the questions or doubts cannot be solved during the class, e-mail will be the preferred way to direct any inquiry, question or doubt about the course to the instructors. Additionally, office hours and meetings will also be requested by e-mail.
- Supporting tools and technologies: Certain tasks and activities may require the use of Moodle, Zoom or Microsoft Teams. If there is a mandate or recommendation for the use of other digital tools from the authorities (University, State), the information about the alternative means of communication/assessment/teaching will be communicated to the students in advance
- Sustainable development goals: the course aims to foster awareness and knowledge about the Sustainable Development Goals through the development and presentation of projects that motivate students to work on different solutions from a biomedical engineering perspective. More specifically, the course will contribute to substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship (SDG 4.4)