



POLITÉCNICA

INTERNATIONAL
CAMPUS OF
EXCELLENCE

COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001



E.T.S. de Ingenieros de
Telecomunicación

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

93000964 - Telemedicine

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	93000964 - Telemedicine
No of credits	3 ECTS
Type	Optional
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 Ingeniería Biomedica
Centre	09 - Escuela Técnica 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 *
Maria Fernanda Cabrera Umpierrez (Subject coordinator)	D-108	mf.cabrera@upm.es	M - 11:00 - 12:00

* 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
Abril Jimenez, Patricia	patricia.abril@upm.es	Cabrera Umpierrez, Maria Fernanda

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-MIB10 - Aplicar los métodos de análisis, modelado y tecnologías más actuales para el análisis, diseño, desarrollo y evaluación de sistemas y servicios avanzados de telemedicina.

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

3.2. Learning outcomes

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

RA76 - Study available technologies to design a telemedicine system

RA75 - Apply evaluation methodologies to assess the impact of a telemedicine system

RA74 - Design and develop a telemedicine system

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

* 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 objective of this subject is to provide the student with a technical and practical overview of the most relevant actors, methodologies and technologies involved in the design, development and evaluation of a telemedicine project.

Note: This subject can be offered 100% in on-line mode in case the health situation originated by the Covid-19 pandemic requires it.

4.2. Syllabus

1. Telemedicine
 - 1.1. Introduction
 - 1.2. Personalised health
 - 1.3. eHealth challenges
 - 1.4. Practical case
2. Design and development methodologies
 - 2.1. User requirements methodologies
 - 2.2. Modelling the interaction
 - 2.3. Development methodologies
 - 2.4. Interfaces and interaction
 - 2.5. Evaluation methodologies
 - 2.6. Usability evaluation
3. Validation of Health systems
 - 3.1. Unified Modelling Language
 - 3.2. Business Process Management (BPM)
4. Technologies and architectures
 - 4.1. Technologies
 - 4.2. Architectures
5. Health information management

6. Health projects deployment and evaluation
7. Healthcare management models
8. Examples of telemedicine systems

5. Schedule

5.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	<p>Introduction Duration: 00:30 Lecture</p> <p>Lesson 1 Duration: 01:00 Lecture</p> <p>Debate (workshop) Duration: 00:30 Additional activities</p> <p>Lesson 2.1 Duration: 01:15 Lecture</p> <p>Debate (workshop) Duration: 00:45 Additional activities</p>			
2	<p>Lessons 2.2 2.3 Duration: 01:15 Lecture</p> <p>Debate (workshop) Duration: 00:45 Additional activities</p> <p>Lesson 2.4 Duration: 01:15 Lecture</p> <p>Debate (workshop) Duration: 00:45 Additional activities</p>			<p>Attendance and active participation in the debate Other assessment Continuous assessment Presential Duration: 00:00</p>
3	<p>Lessons 2.5, 2.6 Duration: 01:15 Lecture</p> <p>Debate (workshop) Duration: 00:45 Additional activities</p> <p>Lesson 3 Duration: 01:15 Lecture</p> <p>Debate (workshop) Duration: 00:45 Additional activities</p>			<p>Attendance and active participation in the debate Other assessment Continuous assessment Presential Duration: 00:00</p> <p>Attendance and active participation in the debate Other assessment Continuous assessment Presential Duration: 00:00</p>

4	<p>Lesson 4.1 Duration: 01:15 Lecture</p> <p>Debate (workshop) Duration: 00:45 Additional activities</p> <p>Lesson 4.2 Duration: 01:15 Lecture</p> <p>Debate (workshop) Duration: 00:45 Additional activities</p>			<p>Attendance and active participation in the debate Other assessment Continuous assessment Presential Duration: 00:00</p> <p>Attendance and active participation in the debate Other assessment Continuous assessment Presential Duration: 00:00</p>
5	<p>Lesson 5 Duration: 01:15 Lecture</p> <p>Debate (workshop) Duration: 00:45 Additional activities</p> <p>Lesson 6 Duration: 01:15 Lecture</p> <p>Debate (workshop) Duration: 00:45 Additional activities</p>			<p>Attendance and active participation in the debate Other assessment Continuous assessment Presential Duration: 00:00</p> <p>Attendance and active participation in the debate Other assessment Continuous assessment Presential Duration: 00:00</p>
6	<p>Lesson 7 Duration: 01:15 Lecture</p> <p>Debate (workshop) Duration: 00:45 Additional activities</p> <p>Lesson 8 Duration: 01:15 Lecture</p> <p>Debate (workshop) Duration: 00:45 Additional activities</p>			<p>Attendance and active participation in the debate Other assessment Continuous assessment Presential Duration: 00:00</p> <p>Attendance and active participation in the debate Other assessment Continuous assessment Presential Duration: 00:00</p>
7	<p>Lesson 9 Duration: 01:15 Lecture</p> <p>Debate (workshop) Duration: 00:45 Additional activities</p>			<p>Attendance and active participation in the debate Other assessment Continuous assessment Presential Duration: 00:00</p> <p>Practical case presentation Group presentation Continuous assessment Presential Duration: 02:00</p>

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17				<p>Final exam Written test Continuous assessment Presential Duration: 02:00</p> <p>Final assessment: Exam Written test Final examination Presential Duration: 02:00</p> <p>Practical case presentation Group presentation Final examination Presential Duration: 01:00</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
2	Attendance and active participation in the debate	Other assessment	Face-to-face	00:00	1%	5 / 10	CG-MIB01 CG-MIB02 CG-MIB03 CE-MIB10 CB10 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CB06 CB07 CB08 CB09
3	Attendance and active participation in the debate	Other assessment	Face-to-face	00:00	1%	5 / 10	CG-MIB01 CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CB06 CB07 CB08 CB09 CB10 CE-MIB10
3	Attendance and active participation in the debate	Other assessment	Face-to-face	00:00	1%	5 / 10	CG-MIB02 CG-MIB03 CG-MIB05 CG-MIB06 CG-MIB07 CB06 CB07 CB08 CB09 CB10 CE-MIB10

4	Attendance and active participation in the debate	Other assessment	Face-to-face	00:00	1%	5 / 10	CG-MIB01 CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CB06 CB07 CB08 CB09 CB10 CE-MIB10
4	Attendance and active participation in the debate	Other assessment	Face-to-face	00:00	1%	5 / 10	CG-MIB01 CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CB06 CB07 CB08 CB09 CB10 CE-MIB10
5	Attendance and active participation in the debate	Other assessment	Face-to-face	00:00	1%	5 / 10	CG-MIB01 CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CB06 CB07 CB08 CB09 CB10 CE-MIB10
5	Attendance and active participation in the debate	Other assessment	Face-to-face	00:00	1%	5 / 10	CG-MIB01 CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CB06 CB07 CB08 CB09 CB10 CE-MIB10

6	Attendance and active participation in the debate	Other assessment	Face-to-face	00:00	1%	5 / 10	CG-MIB02 CG-MIB03 CG-MIB05 CG-MIB06 CG-MIB07 CB06 CB07 CB08 CB09 CB10 CE-MIB10
6	Attendance and active participation in the debate	Other assessment	Face-to-face	00:00	1%	5 / 10	CG-MIB01 CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CB06 CB07 CB08 CB09 CB10 CE-MIB10
7	Attendance and active participation in the debate	Other assessment	Face-to-face	00:00	1%	5 / 10	CG-MIB01 CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CB06 CB07 CB08 CB09 CB10 CE-MIB10
7	Practical case presentation	Group presentation	Face-to-face	02:00	50%	5 / 10	CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CB06 CG-MIB01 CG-MIB02 CB07 CB08 CB09 CB10 CE-MIB10

17	Final exam	Written test	Face-to-face	02:00	40%	5 / 10	CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB06 CG-MIB07 CB06 CB07 CB08 CB09 CB10 CE-MIB10
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6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final assessment: Exam	Written test	Face-to-face	02:00	50%	5 / 10	CG-MIB02 CG-MIB03 CG-MIB04 CG-MIB05 CG-MIB01 CG-MIB06 CB06 CB07 CB10 CE-MIB10
17	Practical case presentation	Group presentation	Face-to-face	01:00	50%	5 / 10	CB07 CB08 CB09

6.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

6.2. Assessment criteria

Students will be qualified through progressive evaluation by default. Students willing to renounce to progressive evaluation must direct a request to the coordinator of the subject.

The course will be approved when a grade greater than or equal to 5 points is obtained out of a total of 10. The final grade in progressive evaluation will be obtained by adding the grades corresponding to the different evaluation activities, with the following weights:

- Examination: 40%
- Final project development and presentation: 50%
- Attendance and participation: 10%

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 progressive 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 and students that have withdrawn the progressive evaluation will be assessed through a final exam and a final project development and presentation that will assess all competences of the subject.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Documentation with the material provided during the lectures.	Others	
M. Maheu. E-health, telehealth, and telemedicine: a guide to start-up and success. 2001.	Bibliography	
R. Wootton. Introduction to telemedicine (2nd ed). 2006	Bibliography	
T. Weilkiens. Systems engineering with SysML/UML: modeling, analysis, design. 2006	Web resource	
Joseph C. Kvedar MD, MB, Carol Colman, Gina Cella (2015) The Internet of Healthy Things. Ed. Partners Connected Health	Bibliography	
Mobile Health A Technology Road Map. Adibi, Sasan (Ed.) 2015	Bibliography	
Pieter Cullis. The Personalized Medicine Revolution: How Diagnosing and Treating Disease Are About to Change Forever. 2015	Bibliography	

8. Other information

8.1. Other information about the subject

This course aims to contribute to educating students to become empowered as active global citizens and to realize themselves with an innovative program aligned with several of the SDGs, transforming them into innovative engineers and leaders for sustainable development that are necessary to find new ways to tackle the problems of today and tomorrow. In particular, with SDG 3, which promotes guaranteeing a healthy life and promoting well-being for all.

With this subject the skills related to creativity will be expanded, the design of sustainable solutions considering technical, functional and socioeconomic aspects; promoting teamwork, planning, organization and communication; identifying, formulating and solving engineering problems, evaluating their impact on society and taking into account the ethical and privacy considerations that must be considered. They will contribute to sub-objectives 4.3: Ensure that students access quality technical, professional and superior training; 4.4: Significantly increase the number of people with the professional and technical skills necessary to access employment and entrepreneurship; and 4.7: Ensure that all students acquire the theoretical and practical knowledge necessary to promote sustainable development.

In this way, new learning opportunities and skills are offered to students. The digital transformation of health will lead to improving the efficiency and sustainability of current models of healthcare systems, as well as a significant advance in the health and well-being of patients and citizens, in general.