



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

93000973 - Personalized Medicine

DEGREE PROGRAMME

09AU - Master Universitario en Ingeniería Biomedica

ACADEMIC YEAR & SEMESTER

2020/21 - Semester 1

Index

Learning guide

| | |
|---|----|
| 1. Description..... | 1 |
| 2. Faculty..... | 1 |
| 3. Skills and learning outcomes | 2 |
| 4. Brief description of the subject and syllabus..... | 4 |
| 5. Schedule..... | 6 |
| 6. Activities and assessment criteria..... | 8 |
| 7. Other information..... | 11 |

1. Description

1.1. Subject details

| | |
|---------------------------------------|---|
| Name of the subject | 93000973 - Personalized Medicine |
| 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 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 * |
|---|--------------------|----------------------------|-------------------------|
| Bryan Strange | | bryan.strange@upm.es | Sin horario. |
| Enrique Javier Gomez Aguilera (Subject coordinator) | | enriquejavier.gomez@upm.es | -- |

* 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 |
|---------------------|-----------------------------|-----------------------|
| Majo Víctor | vmajo@infomed.dia.fi.upm.es | ETSI Informáticos-UPM |
| David Pérez Del Rey | dperezdelrey@fi.upm.es | ETSI Informáticos-UPM |

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-MIB01 - Utilizar el lenguaje especializado empleado en entornos biomédicos y los fundamentos de las ciencias biomédicas para su aplicación en la resolución de problemas médicos de la Ingeniería Biomédica.

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.

CE-MIB11 - Seleccionar y aplicar métodos avanzados de modelado para el diseño y simulación de sistemas biomédicos.

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

RA78 - Use the fundamentals of telemedicine, modeling of biomedical systems, decision support systems and bioinformatics for its application in the design of personalized medicine systems.

* 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

OBJECTIVES

The main goal of this course is to provide the students with the knowledge to use the fundamentals of telemedicine, modelling of biomedical systems, decision support systems and bioinformatics for its application in the design of personalized medicine systems.

CONTENTS

1. Introduction to personalized medicine: general concepts, telemedicine services for personalized patient monitoring, examples
2. Fundamentals of genomics for personalized medicine
3. Bioinformatics for specialized medicine:
 - Advanced techniques in bioinformatics for the analysis of information
 - Semantic integration of clinical-genomic information in the context of personalized medicine
 - Models of representation in genomic medicine

- Ontologies in genomic research

- Identification and analysis of relevant international projects in the area.

4. Application of personalized medicine in nutrition, oncology and neurology and examples of companies working in personalised medicine

4.2. Syllabus

1. 1. Introduction to personalized medicine: general concepts, telemedicine services for personalized patient monitoring, examples

2. 2. Fundamentals of genomics for personalized medicine

3. 3. Bioinformatics for specialized medicine:

4. 4. Application of personalized medicine in nutrition, oncology and neurology and examples of companies working in personalised medicine

5. Schedule

5.1. Subject schedule*

| Week | Face-to-face classroom activities | Face-to-face laboratory activities | Distant / On-line | Assessment activities |
|------|---|---|-------------------|---|
| 1 | Course presentation and introduction to personalised medicine; examples Duration: 02:00 Lecture Unit 3 Duration: 02:00 Lecture | | | Lecture attendance and participation Other assessment Continuous assessment Presential Duration: 00:00 Written report about seminars Other assessment Continuous assessment Presential Duration: 02:00 |
| 2 | Unit 3 Duration: 02:00 Lecture Unit 2 Duration: 02:00 Lecture | | | |
| 3 | Unit 2 Duration: 02:00 Lecture Unit 4 Duration: 02:00 Lecture | | | |
| 4 | Unit 2 Duration: 04:00 Lecture | Practical session 2 Duration: 04:00 Laboratory assignments | | Practical work- Written report Problem-solving test Continuous assessment Presential Duration: 04:00 |
| 5 | Unit 2 Duration: 02:00 Lecture Unit 4 Duration: 02:00 Lecture | | | |
| 6 | Unit 4 Duration: 02:00 Lecture Preparation of group work Duration: 02:00 Additional activities | | | |

| | | | | |
|----|--|--|--|---|
| 7 | | | | Group work Group presentation Continuous assessment Presential Duration: 04:00 |
| 8 | | | | Exam Written test Final examination Presential Duration: 02:00 |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 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.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Continuous assessment

| Week | Description | Modality | Type | Duration | Weight | Minimum grade | Evaluated skills |
|------|--------------------------------------|----------------------|--------------|----------|--------|---------------|--|
| 1 | Lecture attendance and participation | Other assessment | Face-to-face | 00:00 | 10% | 5 / 10 | CB10 CE-MIB01 CB08 CG-MIB07 CB07 |
| 1 | Written report about seminars | Other assessment | Face-to-face | 02:00 | 20% | 5 / 10 | CG-MIB04 CB10 CB06 CG-MIB05 CE-MIB01 CB08 CG-MIB03 CG-MIB07 |
| 4 | Practical work- Written report | Problem-solving test | Face-to-face | 04:00 | 20% | 5 / 10 | CG-MIB01 CG-MIB06 CB09 CB10 CB06 CG-MIB05 CE-MIB01 CB08 CG-MIB03 CG-MIB07 CE-MIB10 CE-MIB11 CB07 |
| 7 | Group work | Group presentation | Face-to-face | 04:00 | 50% | 5 / 10 | CG-MIB01 CG-MIB06 CG-MIB04 CB09 CB10 CB06 CG-MIB05 CE-MIB01 CB08 CG-MIB03 CG-MIB07 CG-MIB02 CE-MIB10 CE-MIB11 |

CB07

6.1.2. Final examination

| Week | Description | Modality | Type | Duration | Weight | Minimum grade | Evaluated skills |
|------|-------------|--------------|--------------|----------|--------|---------------|--|
| 8 | Exam | Written test | Face-to-face | 02:00 | 100% | 5 / 10 | CG-MIB01 CG-MIB06 CG-MIB04 CB09 CB10 CB06 CG-MIB05 CE-MIB01 CB08 CG-MIB03 CG-MIB07 CG-MIB02 CE-MIB10 CB07 CE-MIB11 |

6.1.3. Referred (re-sit) examination

| Description | Modality | Type | Duration | Weight | Minimum grade | Evaluated skills |
|-------------|--------------|--------------|----------|--------|---------------|--|
| Exam | Written test | Face-to-face | 02:00 | 100% | 5 / 10 | CG-MIB01 CG-MIB06 CG-MIB04 CB09 CB10 CB06 CG-MIB05 CE-MIB01 CB08 CG-MIB03 CG-MIB07 CG-MIB02 CE-MIB10 CE-MIB11 |

6.2. Assessment criteria

Written report about seminars (20%), practical work (20%), lecture attendance and participation (10%), group work (50%)

Continuous assessment

Passing score for the whole course is 5/10.

Assistance to lectures and practical session is compulsory unless justified absence.

Students who do not reach the passing score via continuous assessment will be able to do so in the extraordinary examination.

Final assessment

Final assessment is based solely on an exam. Students will need to attain a score of 5 or above to pass the course.

Students who do not reach the passing score via continuous assessment will be able to do so in the extraordinary examination.

Extraordinary assessment

Extraordinary assessment is based solely on an exam. Students will need to attain a score of 5 or above to pass the course.

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.

7. Other information

7.1. Other information about the subject

NOTA IMPORTANTE: MODALIDAD NO PRESENCIAL DE LA ASIGNATURA

Debido a la crisis sanitaria por la covid-19, se indica en esta nota qué modificaciones experimentaría la asignatura si la situación sanitaria obligara a continuar la docencia en modalidad "no presencial". En ese caso, las acciones que se prevén son las siguientes:

Docencia: las clases se impartirían on-line a través de una sala virtual.

Evaluación: las pruebas de evaluación serían las mismas pero en formato "no presencial" a través del moodle de la asignatura. El examen final consistiría en un cuestionario