ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

203000031 - Health Data And Knowledge Management

DEGREE PROGRAMME

20BC - Master Universitario En Biologia Computacional

ACADEMIC YEAR & SEMESTER

2025/26 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	203000031 - Health Data And Knowledge Management
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	20BC - Master Universitario en Biologia Computacional
Centre	20 - Etsi Agronómica, Aliment. Y Biosistemas
Academic year	2025-26

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Jose Crespo Del Arco	2311	jose.crespo@upm.es	Th - 14:00 - 20:00
Miguel Garcia Remesal		miguel.garcia.remesal@upm.es	Sin horario.
Victor Manuel Maojo Garcia (Subject coordinator)	2102	victormanuel.maojo@upm.es	Tu - 11:00 - 14:00 W - 11:00 - 14:00

* 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
Paraiso Medina, Sergio	sergio.paraiso@upm.es	Maojo Garcia, Victor Manuel

2.3. External faculty

Name and surname	Email	Institution
Raul Alonso Calvo	raul.alonso@upm.es	ETSII
Sergio Paraiso	sergio.paraiso@upm.es	ETSIII

3. Skills and learning outcomes *

3.1. Skills to be learned

CE02 - Utilizar sistemas operativos, programas y herramientas de uso común en biología computacional, así como, manejar plataformas de cómputo de altas prestaciones, lenguajes de programación y análisis bioinformáticos

CE03 - Analizar e interpretar bioinformáticamente los datos que se derivan de las tecnologías ómicas, y proponer soluciones bioinformáticas en relación a dichos datos.

CE05 - Utilizar herramientas de biología computacional para el análisis genómico, incluida la genómica comparativa y biología evolutiva.

CE10 - Conocimiento de las técnicas de representación del conocimiento reutilizables y modelos de razonamiento en entornos centralizados y distribuidos a utilizar en la resolución de problemas que impliquen conducta inteligente.

CG03 - 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 el area de la Biología Computacional.

CG05 - Que los estudiantes sean capaces de integrar conocimientos en el area de la Biología Computacional, de formular conclusiones, hipótesis o líneas de trabajo a partir de la información disponible, y de formarse una opinion fundamentada sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos.

CT07 - Ser capaz de manejar las tecnologías de la información y comunicación en un contexto profesional.

3.2. Learning outcomes

RA37 - Conocer las aplicaciones informáticas utilizadas en medicina

RA38 - Conocer ejemplos prácticos de proyectos de datos y conocimiento de salud.

RA36 - Adquirir los conocimientos para la gestión de datos del área de salud

* 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

Biomedical informatics is a scientific discipline created in the 1960s with the intention of improving the management of data, information and knowledge in the biomedical area. Achievements include the creation of decision support systems, electronic medical records, omic projects, hospital information systems, terminologies and other projects of similar importance. The creation of the so-called digital medicine and precision medicine are the latest advances in this direction, seeking ubiquitous computing, with the goal of improving the health of the citizen. Artificial Intelligence is a key topic in this regard.

There will be a survey of bioinfomatics techniques, from a practical perspective, and of Artificial Intelligence, including recent developments related to Large Language Models and their applications in medicine.

The management of data and knowledge in health has its own characteristics. The design of the studies and the evaluation of the results, for example, are completely different from those that are necessary in other multiple areas.

4.2. Syllabus

1. Introduction to the course

2. Data,information and knowledge: concepts and foundations

3. Databases, data integration and standards: techniques and concepts

4. Electronic health records and Real World data

5. Artificial Intelligence in Biomedicine: basics

6. Data and text mining

7. Bioinformatics: basis concepts and techniques

5. Schedule

5.1. Subject schedule*

Week	Type 1 activities	Type 2 activities	Distant / On-line	Assessment activities
1	**Introduction** Duration: 02:00 Lecture		**Use of distance learning may be necessary if there were special circunstantes. Instructions will be provided by the university** Duration: 00:00 Lecture	
2	**Data, information and knowledge in biomedicine** Duration: 02:00 Lecture		**Use of distance learning may be necessary if there were special circunstantes. Instructions will be provided by the university** Duration: 00:00 Lecture	
3	**Databases and structures for research and practice in biomedicine** Duration: 02:00 Lecture		**Use of distance learning may be necessary if there were special circunstantes. Instructions will be provided by the university** Duration: 00:00 Lecture	
4	**Artificial intelligence in biomedicine: medical reasoning and foundations** Duration: 02:00 Lecture		**Use of distance learning may be necessary if there were special circunstantes. Instructions will be provided by the university** Duration: 00:00 Lecture	
5	**Artificial intelligence in biomedicine: medical decision support** Duration: 02:00 Lecture		**Use of distance learning may be necessary if there were special circunstantes. Instructions will be provided by the university** Duration: 00:00 Lecture	
6	**Biomedical vocabularies and standards I** Duration: 02:00 Lecture		**Use of distance learning may be necessary if there were special circunstantes. Instructions will be provided by the university** Duration: 00:00 Lecture	
7	**Biomedical vocabularies and standards II** Duration: 02:00 Lecture		**Use of distance learning may be necessary if there were special circunstantes. Instructions will be provided by the university** Duration: 00:00 Lecture	

8	**Electronic Health Records and Real World Data management I** Duration: 02:00 Lecture		**Use of distance learning may be necessary if there were special circunstantes. Instructions will be provided by the university** Duration: 00:00 Lecture	
9	**Presentation of assignments** Duration: 02:00 Additional activities		**Use of distance learning may be necessary if there were special circunstantes. Instructions will be provided by the university** Duration: 00:00 Lecture	**Presentation of first assignment** Group presentation Progressive assessment Presential Duration: 00:00
10	**Electronic Health Records and Real World Data management II** Duration: 02:00 Lecture		**Use of distance learning may be necessary if there were special circunstantes. Instructions will be provided by the university** Duration: 00:00 Lecture	
11	**Integration and interoperability for health data and knowledge sources** Duration: 02:00 Lecture		**Use of distance learning may be necessary if there were special circunstantes. Instructions will be provided by the university** Duration: 00:00 Lecture	
12	**Bioinformatics applications in biomedicine. Techniques and applications for data sequence processing and analysis. Sequence allignment. Clinical applications** Duration: 02:00 Lecture		**Use of distance learning may be necessary if there were special circunstantes. Instructions will be provided by the university** Duration: 00:00 Lecture	
13	**Bioinformatics applications in biomedicine. Techniques and applications for data sequence processing and analysis. Sequence allignment. Clinical applications** Duration: 02:00 Lecture		**Use of distance learning may be necessary if there were special circunstantes. Instructions will be provided by the university** Duration: 00:00 Lecture	
14	**Presentation of assignments** Duration: 02:00 Additional activities		**Use of distance learning may be necessary if there were special circunstantes. Instructions will be provided by the university** Duration: 00:00 Lecture	**Presentation of second assignment** Group presentation Progressive assessment Presential Duration: 00:00
15				
16				**A final assignment/examination that will include topics from the two regular assignments** Individual work Global examination Not Presential Duration: 00:00
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.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
9	Presentation of first assignment	Group presentation	Face-to-face	00:00	50%	3 / 10	CG03 CG05 CT07 CE02 CE03 CE05 CE10
14	Presentation of second assignment	Group presentation	Face-to-face	00:00	50%	3 / 10	CG03 CG05 CT07 CE02 CE03 CE05 CE10

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
16	A final assignment/examination that will include topics from the two regular assignments	Individual work	No Presential	00:00	100%	5 / 10	CG03 CG05 CT07 CE02 CE03 CE05 CE10

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Contents of the clases and assignments included in the course	Individual presentation	Face-to-face	01:00	100%	5 / 10	CG03 CG05 CT07 CE02 CE03 CE05 CE10

6.2. Assessment criteria

Presentations of assignments in groups of 2-3 students

For the extraordinary evaluation the presentation will be individual

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
PUBmed and its resources (NCBI, for instance=I	Web resource	Different bibliographic and research databases
Biomedical Informatics books	Bibliography	Available at the website of the American Medical Informatics Association
Journals available through Internet and the UPM network	Bibliography	papers from the Journal of biomedical informatics, Journal of the American Medical Informatics Association, International Journal of Medical Informatics. All of them available over the Internet

Dispositivos para teleenseñanza (ordenador, tablet, móvil)	Equipment	For online lecturing and teaching

8. Other information

8.1. Other information about the subject

We will emphasize the practical use of the tools and techniques explained in the course. The Use of Generative AI will strictly forbidden (and penalized) for all assignments