COURSE DATA

DATA SUBJECT

Code: 42604
Name: Data structures and databases
Cycle: Master's Degree
ECTS Credits: 9
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
2116 - Master's Degree in Bioinformatics	Escola Tècnica Superior d'Enginyeria	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2116 - Master's Degree in Bioinformatics	Data structures and databases	ELECTIVES

COORDINATION

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SUMMARY

The large amount of information generated in bioinformatics should be stored conveniently inside the computer for the programs to process it. It is therefore essential to examine the different types of data that can be used in a program and these are managed. The existence of the database makes it easier for us to store and query this information and knowledge at all levels is essential for bioinformatics.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

None

COMPETENCES / LEARNING OUTCOMES

2116 - Master's Degree in Bioinformatics

Be able to access the information required (databases, scientific articles, etc.) and to interpret and use it sensibly.

Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.

Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.

Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.

Students should demonstrate self-directed learning skills for continued academic growth.

Students should possess and understand foundational knowledge that enables original thinking and research in the field.

DESCRIPTION OF CONTENTS

1. Sequences: Classification and uses.

Lists and Tuples.
Special cases of Lists: Stacks and Queues
Sets and Frozensets.
Dictionaries (or associative arrays).

2. Complex structures of information

Trees. Definition, use and implementation.
Graphs. Definition and implementations.

3. Memory management: Memory Static Vs. dynamic Memory

Memory management in Python.
Memory Management in C Pointers and related operations.

4. Sequence comparison algorithms

Definition, uses, applications and examples

5. NumPy and SciPy: Bookstores handling 'arrays' and scientific computing.

Uses and examples

6. Introduction to Databases

Definition of database management systems and databases
Types of databases
examples

7. The Relational Model

Basic concepts of relational databases
Codd Rules

8. Databaselanguages. SQL

Queries to the database
Judgments and queries

9. Database Design

Modeling and design techniques
Applications and examples

10. Accesing databases from applications

API Database
Applications and examples

11. NoSQL databases: MongoDB

MongoDB is a non-relational database, without schema and document-oriented.
BSON. Insert, query, update and delete.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	27,00
Laboratory	18,00
Total hours	**45,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	12,00
Individual or group project	3,00
Independent study and work	60,00
Preparation of lessons	54,00
Preparation for assessment activities	24,00
Resolution of case studies	23,00
Total hours	**176,00**

TEACHING METHODOLOGY

Training tasks of the teaching-learning environment interaction in the classroom through expository sessions. Previous assignments include preparation (information search, reading texts supplied by teachers), teaching sessions themselves and the later work of deepening.

Learning through problem solving and case studies, through which it is acquiring skills on different aspects of materials and subjects. Hands-on lab. Include preparation, implementation of practices to monitor and teacher support, independent work online and reporting practices.

Transferable skills. Include attendance at courses, conferences or round tables organized by the CEC of the Master and / or conduct of a bibliographic work on issues that contribute to the integral. It produces a report of activities.

EVALUATION

Continuous assessment of student interaction in the classroom or lab or online activities conducted in groups (10%).

Evaluation reports or reports submitted regarding training activities and case studies problems of cross-cutting activities or others that arise in individual form (20%).

Evaluation reports or reports submitted concerning laboratory practice (30%).

Evaluation of objective individual tests (one or more) (40%).

You need to get at least 5.0 on the evaluation of objective individual tests to make the average of the notes and have delivered at least 90% of the work.

The final grade for the course is obtained by weighting with a 40% grade in the section on data structures and a 60% grade in the section Databases.

On second call the weights of the different sections and requirements, being able to improve or deliver all jobs except those conducted in groups will be retained.

REFERENCES

- Referencia b1: [Raúl González Duque]Python para todos (http://mundogeek.net/tutorial-python/)
- Referencia c1: [Ramakrishnan, Gehrke, 2003] Database Management Systems
- Referencia b2: [Ramez A. Elmasri, Shamkant B. Navathe, 2005] Fundamentos de sistemas de bases de datos