VNIVERSITAT ĠDVALÈNCIA

COURSE DATA

Data Subject	
Code	42589
Name	Computational systems biology
Cycle	Master's degree
ECTS Credits	6.0
Academic year	2021 - 2022

Study (s)			
Degree	**Center**	**Acad. year**	**Period**
2116 - M.U. en Bioinformática 12-V.1	School of Engineering	2	First term

Subject-matter		
Degree	**Subject-matter**	**Character**
2116 - M.U. en Bioinformática 12-V.1	7 - Computational systems biology	Obligatory

Coordination	
Name	**Department**
ARNAU LLOMBART, VICENTE	240 - Computer Science
MORENO MARIÑO, JOAQUIN	30 - Biochemistry and Molecular Biology
PERETO MAGRANER, JULI	30 - Biochemistry and Molecular Biology

SUMMARY

It is important for handling bioinformatic concepts entendienda systems biology and the cell as a set of elements that interact to perform functions. Thus, it must acquire the skills to manage data in a network and integrate omics data networking.
One must learn to model both known networks (eg. Pathways) as new networks as described in SMBL standards.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

Graph theory. Basic concepts in biochemistry (metabolism, intra- and intercellular signaling), molecular biology (macromolecule structure and interactions) and molecular genetics

OUTCOMES

2116 - M.U. en Bioinformática 12-V.1

- 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.

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

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

- Be able to access to information tools in other areas of knowledge and use them properly.

- To be able to assess the need to complete the scientific, historical, language, informatics, literature, ethics, social and human background in general, attending conferences, courses or doing complementary activities, self-assessing the contribution of these activities towards a comprehensive development.

- Desarrollar la iniciativa personal y ser capaces de realizar una toma rápida y eficaz de decisiones en su labor profesional y/o investigadora.

- Trabajar en equipo con eficiencia en su labor profesional y/o investigadora y con personas de diferente procedencia.

- Manejar conceptos de biología de sistemas y entender la célula como un conjunto de elementos que interactúan para llevar a cabo funciones.

- Adquirir los conocimientos para manejar datos en forma de red e integrar datos ómicos en redes así como modelar tanto redes conocidas (p. ej. pathways) como redes nuevas descritas en estándares como SMBL.

LEARNING OUTCOMES

1) Operating systems biology concepts and understand the cell as a set of elements that interact to perform functions.
2) Acquire the skills to manage data in a network and integrate omics data networking.
3) Model both known networks (eg. Pathways) as new networks as described in standards SMBL.

DESCRIPTION OF CONTENTS

1. Databases with information specific to systems biology.

Introduction to biological modeling system SMBL (http://sbml.org). Databases with information specific to systems biology. Standards for systems biology (SMBL)

2. Biological Networks: interactome, transcriptional networks, coexpression networks

Introduction to networks of interactions between proteins.
Introducing the gene coexpression analysis.

3. Biological networks (2): metabolicnetworks

Introduction tometabolic databases.
Stoichiometric analysis and constraint-based modelling.
Genome-scale modeling

4. Modeling.

Models: concept and classification. Models in time-dependent differential equations. Steady state and stability. Bifurcations and dynamic chaos. Examples of models of functional circuits: homeostatic, signal perception and oscillating.

5. Tools for visualization and analysis of biological networks(Cytoscape)

Introduction to Cytoscapesoftware(http://www.cytoscape.org/)

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WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	21,00	100
Laboratory practices	9,00	100
Attendance at events and external activities	10,00	0
Development of group work	10,00	0
Development of individual work	20,00	0
Study and independent work	20,00	0
Readings supplementary material	20,00	0
Preparation of evaluation activities	15,00	0
Preparing lectures	25,00	0
Preparation of practical classes and problem	20,00	0
Resolution of case studies	10,00	0
TOTAL	180,00	

TEACHING METHODOLOGY

MD1 - Task training 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.

MD2 - Learning through problem solving and case studies, through which it is acquiring skills on different aspects of materials and subjects.

MD3 - Activities labs. Include preparation, implementation of the monitoring practices and teacher support, online freelance work and reporting practices.

MD4 - Cross-disciplinary 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

In the two calls:

SE1 Continuous assessment: minimum 5 and maximum 15.

SE2 Activities: minimum 10 and maximum 40.

SE3 Laboratory: minimum 25 and maximum 50.

SE4 Exams: minimum 0 and maximum 50.

REFERENCES

Basic

- Analysis of Biological Networks
  Björn H. Junker, Falk Schreiber

- http://books.google.es/books?id=YeXLbClh1SIC&printsec=frontcover&dq=biological+networks&hl=en&sa=X&ei=

- Handbook on Biological Networks
  Stefano Boccaletti
  http://books.google.es/books?id=0T6w9gbAvq4C&printsec=frontcover#v=onepage&q&f=false

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

English version is not available