

Degree	Type	Year	Semester
4313794 Biochemistry, Molecular Biology and Biomedicine	OT	0	1

Contact

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Other comments on languages

approx 50% of the lectures

Use of languages

Principal working language: catalan (cat)

Teachers

Antoni Barbadilla Prados

Enric Querol Murillo

Alfredo Ruiz Panadero

Julia Lorenzo Rivera

Barbara Negre de Bofarull

Silvia Brongsom Fabrellas

Sònia Casillas Viladerrams

Prerequisites

Languages: Lectures will be mainly in Spanish and English

Postgraduates in Biochemistry, Biotechnology, Biology, Biomedicine, Genetics, Microbiology, Chemistry, Informatics/Bioinformatics, Pharmacy, Medicine and Veterinary Medicine

Objectives and Contextualisation

The overall aim of the subject is to provide students an overview of Genomics and Proteomics including fundamentals, current techniques and applications. The specific objectives of Genòmica include understanding the following aspects: the diversity and complexity of eukaryotic genomes, the historical and evolutionary perspective of genomic content, the meaning and consequences of intraspecific variability, techniques commonly employed in studies of genomics and transcriptomics and applications derived from the knowledge provided by this science. The aim of the Proteomics lectures is to provide students an overview of the advanced methods of Proteomics and Interactomics (Proteogenomics annotation, MS Imaging...) and applications (biomarkers in biomedicine, differential proteomics for drug and vaccine target identification, network pharmacology and toxicology...). And the first draft of the human Proteome and the Proteome Atlas

Skills

- Analyse and correctly interpret the molecular mechanisms operating in living beings and identify their applications.
- Communicate and justify conclusions clearly and unambiguously to both specialist and non-specialist audiences.
- Continue the learning process, to a large extent autonomously.
- Develop critical reasoning within the subject area and in relation to the scientific or business context.
- Identify and use bioinformatic tools to solve problems in biochemistry, molecular biology and biomedicine.
- Integrate contents in biochemistry, molecular biology, biotechnology and biomedicine from a molecular perspective.
- Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
- Use and manage bibliography and IT resources related to biochemistry, molecular biology or biomedicine.
- Use scientific terminology to account for research results and present these orally and in writing.

Learning outcomes

1. Communicate and justify conclusions clearly and unambiguously to both specialist and non-specialist audiences.
2. Continue the learning process, to a large extent autonomously.
3. Develop critical reasoning within the subject area and in relation to the scientific or business context.
4. Identify and describe the different components in prokaryotic and eukaryotic genomes and proteomes.
5. Identify molecular mechanisms responsible for diseases.
6. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
7. Use and manage bibliography and IT resources related to biochemistry, molecular biology or biomedicine.
8. Use scientific terminology to account for research results and present these orally and in writing.
9. Use the different methodologies, techniques and tools commonly used in genome sequencing, assembly and annotation.
10. Use the different methodologies, techniques and tools commonly used in proteomics and interactomics and metabolomics.

Content

GENOMICS: Introduction to Genomics. The human genome project. Genomic technologies. Transposable elements. Comparative genomics nucleotide-level changes. Comparative genomics: chromosomal changes. Population genomics: Theory. Population genomics in model species. Nucleotide variation in humans. Structural variation. Association Studies/System genetics. Functional Genomics and Transcriptomics. Epigenomics.

PROTEOMICS: Proteomics and proteogenomics. Proteogenomic annotation. How many proteins and proteoforms are in a mammal cell? Instrumentation and methods of the proteomics. Practical session. Atlas and first draft of the human proteome. Interactomics: methods and applications. Proteomics and protein function. Genomics and proteomics of parasitic organisms: malaria and leishmania. Proteomics and post-translational modifications (PTMs). Molecular imaging by mass spectrometry and applications. Biomedical and biotechnological applications of the proteomics: Biomarkers in biomedicine; Identification of drug and vaccine targets by differential proteomics, surfomics and immunomics; pathogen microorganisms identification ("BioTyper"). MS for protein structure/function analysis. Metabolomics. Networks and applications in pharmacology and toxicology.

Methodology

Subject teaching includes three types of activities:

- Lectures. Spoken explanations of the subject that is to be learned accompanied by powerpoint presentations to help students visualize questions and answers.
- Reading and discussion. Students are expected to read a number of research papers during the course and participate in the critical discussion of the papers in the class room.
- Oral presentations. Students will prepare a subject and make an oral and powerpoint presentation of the subject to their peers.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Lectures	45	1.8	5, 6, 8
Type: Supervised			
Oral presentations	40	1.6	1, 7, 8
Type: Autonomous			
Student work and learning	137	5.48	3, 5, 6, 2, 7, 8

Evaluation

Final grades are a weighed average of items:

- Attendance and participation in the classroom (20%)
- Oral presentation and defense (40%)
- Exam (40%)

The student will be "not qualifiable" when the number of evaluable tests/tasks/activities done by the student do not reach to a global minimal qualification of 5.0

Important: If plagiarism is detected in any of the works submitted, the student will fail the whole module.

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Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Exam	40%	2	0.08	4, 3, 5, 6, 1, 2, 9, 10, 8
Lecture attendance	20%	0	0	6, 1
Oral presentation	40%	1	0.04	6, 1, 7

Bibliography

Basic books

- Gibson, G. i S. V. Muse. A Primer of Genome Science. Sinauer, Massachusetts. USA. 2009, 3rd edition.
- Brown, T. A. Genomes. Garland Science, UK. 2009, 3rd edition.
- Twyman, R.M. Principles of Proteomics. Bios Scientific Publisher, Oxford, 2004.
- Kraj, A. & Silberring J. Introduction to Proteomics. Ed. Wiley, UK 2008.
- Lovrik, J. Introducing Proteomics: From concepts to sample separation, mass spectrotry and data analysis. Ed. Wiley-Blackwell, UK, 2011.
- Klipp, E. et al. Systems Biology: A textbook. Ed. Wiley-Blackwell, UK, 2009.
- Baldwin, G. et al. Synthetic Biology: A primer. Imperial College Press, UK, 2012
- Manual de Proteómica. Ed. Sociedad Española de Proteómica. Pdf 15€ en <https://payhip.com/b/FNt7>

Additional journal references will be commented in the lectures

Useful links

UAB Virtual Campus: <https://cv2008.uab.cat/>

Entrez Genome Database: <http://www.ncbi.nlm.nih.gov/genome>

Expasy: <http://www.expasy.org>

Human Proteome Map: <http://www.humanproteomemap.org/>

ProteomicsDB: <http://www.proteomicsdb.org/>