Advanced Genomics and Proteomics   **2014/2015**

Code: 43473
ECTS Credits: 9

Degree	Type	Year	Semester
4313794 Bioquímica, Biologia Molecular i Biomedicina	OT	0	1

Contact

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Use of languages

Principal working language: espanyol (spa)

Some groups entirely in English: No

Some groups entirely in Catalan: Yes

Some groups entirely in Spanish: No

Teachers

Antoni Barbadilla Prados

Alfredo Ruíz Panadero

Julia Lorenzo Rivera

Barbara Negre de Bofarull

Silvia Bronsoms Fabrellas

Sònia Casillas Viladerrams

Raquel Egea Sánchez

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 aimof the subject is to provide studentsan overview of Genomics and Proteomics including fundamentals, current techniques and applications. The specific objectives include understandingthe following aspects the diversity and complexityof eukaryotic genomes, thehistorical 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. Techniques and methods of Proteomics, Interactomics and Metabolomics. Proteogenomics. The first draft of the human proteome and the Proteome Atlas. Proteomics for drug-target, biomarkers and pathogen identification.

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: Eukaryotic genomes. Genome size. The human genome. Comparative genomics. Transposable elements. Genomic technologies. Population genomics. Nucleotide and structural variability. Association Studies. Functional Genomics and Transcriptomics.
PROTEOMICS: Update of Proteomics methods. Proteogenomics annotation. The challenge of protein biological function: function by context, moonlighting, etc. First draft of the human proteome and Proteome Atlas. Biomedical and biotechnological applications of Proteomics: Biomarkers in biomedicine; MS imaging; Identification of drug targets (i.e., malaria targets) and of virulence factors in reverse vaccinology by differential proteomics, surfomics and immunomics; pathogen identification ("BioTyper"). Interactomics in Network 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 cuestions 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 their peers.

Activities

Title	Hours	ECTS	Learning outcomes

Type: Directed			
Lectures	45	1.8	4, 5, 6, 9, 10, 8
Type: Supervised			
Oral presentations	40	1.6	4, 1, 7, 9, 10, 8
Type: Autonomous			
Student work and learning	137	5.48	4, 3, 5, 6, 2, 7, 9, 10, 8

Evaluation

Final grades are a weighed average of items:

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

Evaluation activities

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

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 spectroetry 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
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/