

MASTER DEGREE IN MICROBIOLOGY



FUNCTIONAL AND COMPARATIVE GENOMICS – Instituto Superior Técnico

Objectives:

The discipline describes the most recent experimental approaches and bioinformatics tools in the field of Comparative and Functional Genomics, as well as its applications to the study of Biology at a genome-wide scale, in an integrative perspective.

Program:

1. Genome structure and organization. Genome sequencing methods and strategies. Genome annotation.
2. Comparative genomics. Orthologous and Paralogous genes. Synteny.
3. Genome-wide expression analysis: transcriptomics and expression proteomics. Experimental methodologies to study gene and genome-wide expression regulation.
4. Functional genomics. Chemogenomics, metabolomics, RNomics and other Omics.
5. Introduction to Systems Biology: modeling of metabolic and transcription regulatory networks.
6. Applications to research in Biology, Biotechnology and Biomedicine.

Lab classes will focus on the use of bioinformatics tools for:

1. Genome annotation and comparative genomics
2. Protein structure prediction
3. Phylogenetic analysis based on synteny maps
4. Quantitative analysis of 2-dimensional protein gels
5. Interpretation of the biological meaning of genome-wide data
6. NMR-based metabolomics analysis
7. Metabolic network modeling

Evaluation methodology

Teaching methodologies include lectures and practical classes. The final grade results from the balance between the contributions of two evaluation elements:

- 1 – Final exam - 50% - The exam is mandatory. A minimal grade of 9,5 values is required.
- 2 – Laboratory works focused in the use of bioinformatics tools - 50% - Practical sessions will take place throughout the semestre and will be evaluated based on five reports, two be delivered by groups of three students.

Presence in all lab classes is mandatory.

Recommended bibliography:

- * S. B. Primrose, R. M. Twyman, Principles of Genome Analysis and Genomics, ISBN 1-40510-120-2, 2003
- * C.W. Sensen, Handbook of Genome Research, vol. I e vol. II, ISBN 3-527-31348-6, 2005
- *C.M. Arraiano, A.M. Fialho, “O Mundo do RNA: Novos Desafios e Perspectivas Futuras”, Lidel Edições Técnicas, Lisboa, Portugal, 2007
- *Sá-Correia I., Teixeira M.C., Two-dimensional Electrophoresis-based Expression Proteomics: a microbiologist’s perspective. Expert Reviews in Proteomics, 7(6), 943-953, 2010.
- * Porta e-escola em Biologia (<http://www.e-escola.utl.pt>); Tópico: Eng^a Genética e Genómica (grupo de Ciências)

Biológicas do CEBQ)