

Code: 1653 Bioinformatics

Degree: 1st cycle - Biology

Curricular Year: 3rd

Credits: 6 ECTS

Semester Course: 2nd

Compulsory

Language: Portuguese/English

Responsible: Maria Leonor Mota Morais Cecílio

Other lecturer(s): Marta Guerreiro Duarte Mesquita de Oliveira and Maria Manuela Costa Neves Figueiredo

Web Site: <http://www.isa.utl.pt/home/node/3971>

1. Contact hours:

Lecture/Practicals 70 Others 14 Total 84

2. Objectives:

In this course students should

Gain knowledge in several bioinformatics tools in order to use on-line databases, and the most important alignment programs;

Understand the results obtained

Develop skills in the most used bioinformatic algorithms

Be able to program in R language

Learn how to develop phylogenetic inferences between different groups of organisms

Understand the probabilistic models used in bioinformatics

3. Programme:

Introduction to Bioinformatics: most common problems

Major events in Molecular Biology and bioinformatics

Genomes and different types of organization

DNA sequencing:

classical methods (Maxam & Gilbert and Sanger) and high through put methods

(pyrosequencing)

critical analysis of sequencing outputs

Genome sequencing: strategies and problems

Biological data bases:

NCBI – entrez; EMBL; Swiss-Prot e TrEMBL

File formats

Search for homologies: the BLASTY family

Statistic scores

Introduction to bioinformatics algorithms: programming in R language

Pairwise and multiple sequence alignments. Score matrixes

The algorithms ClustalW, Kalign and T-Coffee

Probabilistic models

Conditional probability

Statistical inference: Bayesian

Introduction to the stochastic processes: Bootstrap and Jackknife

Introduction to phylogenetic analysis and evolutionary trees

Most important methods to build evolutionary trees

UPGMA; Neighbour joining, Minimum evolution, maximum likelihood, Maximum parsimony and Bayesian inference.

4. Bibliography:

Main Bibliography

Westhead D, Parish H, Twyman R - **Bioinformatics** – Instant Notes - BIOS Scientific Publishers , Oxford, 2002

Jones N. C. and Pevzner P - **An Introduction to Bioinformatics Algorithms**, MIT Press, 2004

5. Assessment:

2 midterm exams

2 individual homeworks

1 oral presentation and discussion of a bioinformatics project

6. Estimated Workload:

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| 168 | Hours |
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7. Last Update:

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| 7/7/2010 |
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