

## MASTER ON COMPUTATIONAL BIOTECHNOLOGY

**Admission and  
Academic Service**

Julián Romea 18, 28003 Madrid

Telefono: 91 536 27 27

Fax: 91 536 06 60

[info.postgrado@ceu.es](mailto:info.postgrado@ceu.es)

[www.postgradoceu.es](http://www.postgradoceu.es)

<http://biolab.uspceu.com/CompBiotech>





Biotechnology is one of the fields of the modern sciences which is acquiring a great impulse both at the business and the scientific level. Biotechnological applications include drugs designed for the specific characteristics of each patient; medicine based in nanotechnology; environmental problem solving; specialization and control of new food products; biomaterials and biofuels design, etc.

One of the most important problems found in Biotechnology is the analysis and processing of the huge amount of data being produced. For example, information about the expression of 30,000 genes can be obtained using only one cDNA array. Any experiment in microscopy, genomics, or proteomics produces hundreds or even thousands of data. The number of databases grows at a rate of more than 150 new databases per year, and the amount of data deposited in those biotechnology-related databases is exponentially growing. Therefore, the companies and scientists are facing a situation in which an increase of the data available is not implying a proportional increase of knowledge.

The appropriate treatment of this data is something that must be handled from the computer engineering and statistics. However, the educational background of biologists, biochemists, etc. does not cover these aspects. Two are the current solutions adopted in companies and research centres: either the researcher facing the problem acquires the necessary programming skills and the data analysis knowledge, or some technical professionals are hired to perform these tasks although they largely ignore the meaning of the data being analyzed and how it is produced. In any of the two cases, the general complain is the lack of knowledge of the other discipline hindering the efficiency of a research team and the development of new techniques and applications.

**Coordinator of the Official  
Postgraduate Program**  
Dr. D. Mariano Fernández López



## Master on Computational Biotechnology

The contents of this Master, which is imparted in English and is compatible with a part-time job, are applicable to many professional fields: agriculture, pharmacy, medicine, environment, biomaterials, biofuels, etc.

The master is addressed to both technologists (engineers, computer scientists, physicists and mathematicians) and biotechnologists (biologists, pharmacists, biochemists, medical doctors, etc). The master carefully balances the biotechnological studies with the technical ones. The initial background of each student is complemented with an adaptation module for 7 weeks.

### Objectives

The master main objective is to provide technological as well as biotechnological professionals with the necessary background for solving data analysis problems in biotechnology. The Master carefully balances the biotechnological studies with the technical ones. The Master concentrates on the practical aspects of the problem and all courses have practices either on a wet lab or a computer.

After finishing the Master, the students will be able to join R&D departments of biotechnological, pharmaceutical, chemical, food, or bioinformatics companies, as well as research centres specialized on biomedicine and bioengineering fields.

### Prerequisites for being student of the Master

Students with a bachelor degree in life science or engineering are accepted. Subsequently, when the European Higher Education Area (EHEA) is introduced, the students with a graduate program will be also accepted. This Master is totally accessible for foreigner students with the requisites above commented.

### Mobility of the students

Students may carry out their master thesis inside San Pablo University or in any of the top-quality R&D centers or companies with an agreement both in Spain and abroad.

### Validation of previous qualifications

On request, a committee will evaluate the validation of subjects related to the Master that have been already passed by the student.

### Language

English.

### Calendar

Classes will be given from Monday to Friday (from 16'30 to 20'30).

### Study regime

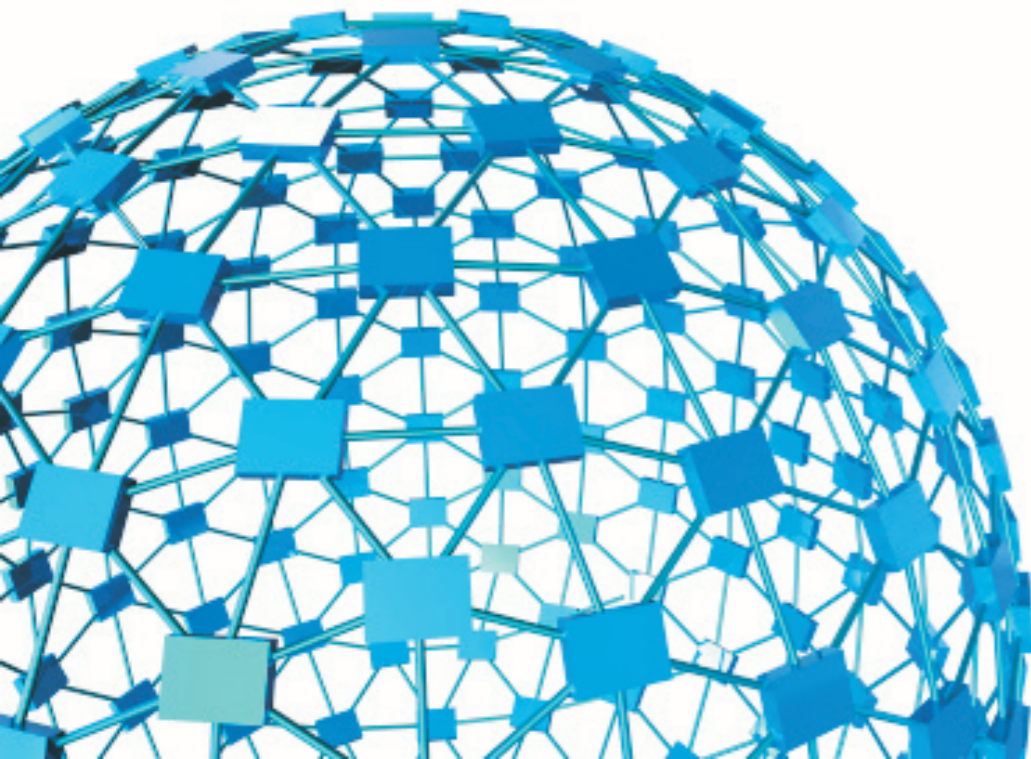
Face-to-face.

### Coordinators of the course

Dr. D. Carlos Óscar Sánchez Sorzano,  
Polytechnical School  
Dr. D. Carlos Bocos De Prada  
Pharmacy School

### Collaborating institutions

ASEBIO (Spanish Association of BioCompanies)  
BioMadrid (Association of biotechnological companies of Madrid)



# PROGRAMME

## MODULE 1A

Biotechnological adaptation  
(10 ECTS)  
BT0.1.- Adaptation 1  
(6 ECTS)  
BT0.2.- Adaptation 2  
(4 ECTS)

## MODULE 2

Data Analysis 1(14 ECTS)  
DA1.1.- Statistical inference,  
Regression and  
Experiment design (5 ECTS)  
DA1.2.- Multivariate data  
analysis(3 ECTS)  
DA1.3.- Bayesian networks  
(3 ECTS)  
DA1.4.- Neural networks  
(3 ECTS)

## MODULE 1B

Computational adaptation  
(10 ECTS)  
DA0.1.- Adaptation 1  
(6 ECTS)  
DA0.2.- Adaptation 2  
(4 ECTS)

## MODULE 3

Biotechnology 1 (14 ECTS)  
BT1.1.- Molecular biology and  
Recombinant DNA  
technology (5 ECTS)  
BT1.2.- Sequencing, genotyping  
and transcriptomics (3 ECTS)  
BT1.3.- Proteomics (3 ECTS)  
BT1.4.- Metabolomics (3 ECTS)

## MODULE 5

Biotechnology 2  
(11 ECTS)  
BT2.1.- Structural  
biology and protein  
engineering (3 ECTS)  
BT2.2.-  
Biotechnology  
(4 ECTS)  
BT2.3.- Synthetic and  
systems biology  
(4 ECTS)

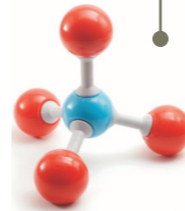
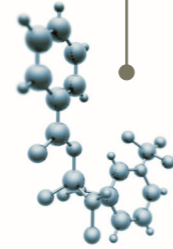
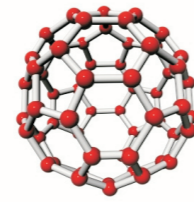
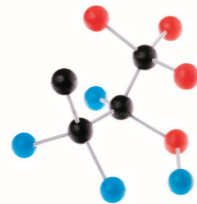
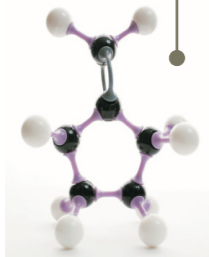
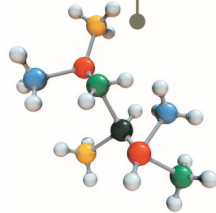
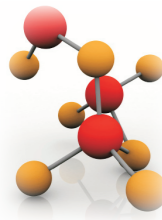
**FINALLY, THE  
STUDENT MUST  
PERFORM A MASTER  
THESIS OF 15 ECTS**

## MODULE 4

Data analysis 2  
(11 ECTS)  
DA2.1.- Classification  
and clustering  
(5 ECTS)  
DA2.2.- Dynamic  
models (3 ECTS)  
DA2.3.- Associative  
rules, logic networks  
and grammars  
(3 ECTS)

## MODULE 6

Bioinformatics  
(15 ECTS)  
BI.1.- Bioinformatic  
databases and  
literature analysis  
(3 ECTS)  
BI.2.- DNA, protein  
and structure  
analysis (7 ECTS)  
BI.3.- Interaction  
networks and arrays  
analysis (5 ECTS)



Courses may be taken individually. Students with a biotechnological background do not have to follow Module 1A, while students with a technical background do not have to follow Module 1B.