
COURSE: Molecular Biology and Bioinformatics

ACADEMIC YEAR: 2016-1017

TYPE OF EDUCATIONAL ACTIVITY: Affine

TEACHER: **Prof. Magnus Ludvig Monné**

e-mail: **magnus.monne@unibas.it**website:

phone:

mobile (optional):

Language: **italian**

ECTS: 10 (9 lessons and
1 tutorials/practice)n. of hours: 84 (72 h of
lessons and 12 h of
tutorials/practice)Campus: Potenza
Dept./School: Department of
Sciences
Program: Biotechnology (L2)Semester: I

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

- **Knowledge:** the fundamental processes of molecular biology in the flow of information from DNA to RNA and proteins. Mechanisms that reassures genome integrity and regulate gene expression. The development of methods and therapeutic products that have emerged from basic and applied research in molecular biology and bioinformatics.
 - **Applications:** Strategies to apply molecular cloning technology for the production of recombinant pharmacological proteins.
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PRE-REQUIREMENTS

It is necessary to have the basic knowledge provided by the courses "General Biology" and "Biochemistry".

SYLLABUS***I. The flow of information. (34 h of lectures)***

The central dogma, structure and function of DNA, RNA and proteins. Topology of DNA and topoisomerases. Genes, genomes, nucleosomes and chromosomes.

DNA replication: DNA polymerases, other enzymes at the replication fork, regulation of initiation, telomerase.

Mutations and damage of DNA, systems for repair, homologous recombination and transposons.

Transcription: RNA polymerases, promoters, general transcription factors.

Maturation of RNA: 5'-capping, 3'-polyadenylation, various forms of splicing, the spliceosome, RNA editing.

Translation: mRNA, tRNA, aminoacyl-tRNA synthase, ribosomes.

Transcriptional and translational regulation: regulatory sequences and factors in transcription, epigenetic inheritance, chromatin remodelling. Riboswitches, miRNA, siRNA.

II. Methods. (20 h of lectures)

Cloning: PCR, gel electrophoresis, endonucleases, DNA ligase, vectors, transformation of cells, DNA sequencing.

Production and manipulations of recombinant proteins.

Bioinformatics: data banks, alignment and analysis of sequences, structures and interactions.

III. Biotechnological products in the pharmaceutical industry. (18 h of lectures)

Function, structure and recombinant production of pharmaceutical recombinant proteins (hormones, cytokines, enzymes, coagulation and thrombolysis factors), recombinant vaccines, recombinant monoclonal antibodies, metabolic engineering, transgenic animals, gene therapy.

TEACHING METHODS

The course consists of 84 hours divided between lectures and laboratory practice; 72 hours of lectures and 12 hours of laboratory practice.

EVALUATION METHODS

During the course there will be organized discussions based on quiz and problems in the form of overview lectures. A final oral exam in which the capacity to respond to questions on the basics, information flow processes in biological systems and methods or products will be evaluated. For higher marks, the capacity to connect, compare and reason logically on different aspects of the arguments of this course will also be evaluated.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- James Watson, Tania Baker, Stephen Bell, Alexander Gann, Michael Levine and Richard Losick. *Molecular Biology of the Gene*. 7th edition.
- Oliver Kayser and Heribert Warzecha. *Pharmaceutical Biotechnology*. 2nd edition, Wiley-Blackwell.
- Daan J.A. Crommelin, Robert D. Sindelar and Bernd Meibohm. *Pharmaceutical Biotechnology*. 4th edition, Springer.
- Arthur M. Lesk. *Introduction to Bioinformatics*. 4th edition, Oxford University Press.
- Lecture notes.

INTERACTION WITH STUDENTS

Visiting hours: Thursdays 17-18 in the study of the lecturer (3A241).

It is also possible to contact the lecturer by e-mail.

EXAMINATION SESSIONS (FORECAST)¹

23/2/2017; 6/4/2017; 18/5/2017; 29/6/2017; 27/7/2017; 28/9/2017; 9/11/2017; 14/12/2017

SEMINARS BY EXTERNAL EXPERTS NO

FURTHER INFORMATION

¹ Subject to possible changes: check the web site of the Teacher or the Department/School for updates.