UNIVERSITÀ DI PAVIA

Anno Accademico 2021/2022

INTEGRATED LABORATORY OF MOLECULAR BIOTECHNOLOGIES

Enrollment year	2019/2020
Academic year	2021/2022
Regulations	DM270
Academic discipline	BIO/13 (APPLIED BIOLOGY)
Department	DEPARTMENT OF BIOLOGY AND BIOTECHNOLOGY "LAZZARO SPALLANZANI"
Course	BIOTECHNOLOGY
Curriculum	Biomolecolare
Year of study	3°
Period	1st semester (01/10/2021 - 14/01/2022)
ECTS	12
Lesson hours	144 lesson hours
Language	Italian
Activity type	ORAL TEST
Teacher	NERGADZE SOLOMON (titolare) - 3 ECTS CHIARELLI LAURENT ROBERT - 3 ECTS GRUGNI VIOLA - 3 ECTS SCOFFONE VIOLA CAMILLA - 3 ECTS
Prerequisites	The course consists of a series of laboratory activities, which cover the main fields of molecular biotechnology. To better attend the course the student must therefore have acquired the basic knowledge of genetics, molecular biology, general microbiology and biochemistry.
Learning outcomes	The aim of the course is to provide the students with the basic theoretical and practical tools required to work in a laboratory. The course is divided in 4 modules that encompass the main arguments of the molecular biotecnologies: : module 1 molecular biology, module 2 genetics, module 3 microbiology and module 4 biochemistry. During the laboratory activities, the basic knowledge of the main techniques to carry out: DNA manipulation and analysis of human

	genetic variation (modules 1 and 2), microbiological experiments (module 3), functional and structural studies of proteins (modules 4 and 1).
Course contents	Module 1. In this module the main techniques of DNA manipulation will be addressed, such as: PCR (Polimerase Chain Rection), bacterial genomic DNA extraction; restriction digestion of genomic and plasmid DNA; DNA gel electrophoresis; restriction analysis- generation of restriction map. Moreover in this module the structural biology of proteins will be addressed, through: crystallization experiments of lysozime by different techniques; analysis of the results and phase diagram determination; computational structural biology, computer practicals using softwares for determination and analysis of three-dimensional structures of biological macromolecules. Module 2. This module acts as a bridge between module 1 and module 4 since on the one hand it applies DNA analysis techniques learned in the module of Molecular Biology to the analysis of human genetic variation, and on the other hand it deals with the construction of a recombinant expression vector for the production of a protein that will be studied in the module of Biochemistry. In particular, practical experience includes: isolation of human DNA and genetic tests to determine bitter taste sensitivity (PROP tasting included) associated with polymorphic variants of the TAS2R38 gene; cloning in a pET expression vector of the nitroreductase gene, whose purification and characterization will be the objectives of the module of Biochemistry; identification of recombinant clones by PCR and plasmid DNA extraction. Module 3. To teach microbiology techniques such as: bacterial cultures, bacterial staining and microscopy observation; isolation of microorganisms from different environment onto selective media; bacterial identification through biochemical tests; antibiotic activity evaluation. Module 4. The module deals with the method of extraction, purification and characterization of proteins, both from naturale source and produced in recombinant form. The main technique approached are: preparation of buffers and solution; chromatographic techniques for protein purification, centrifugation, electrophoresis, protein and activity assays. The different biochemical techniques will be approached both theoretically and practically .
Teaching methods	The course consists in a series of experiments conducted in educational laboratories, accompanied by short theoretical lessons on applied techniques.
Reccomended or required readings	Books used for the courses of Genetics, Microbiology, Biochemistry and Molecular Biology and Material provided by the teacher.
Assessment methods	Written tests, that will be carried out at the end of each modules, consisting of multiple choice and open questions. For each module, attendance of at least 75% of the hours is required. Final mark: pass/fail

Further information	Students are required to bring a lab coat to wear during the experiments.
Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile