UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche
ACADEMIC YEAR	2020/2021
BACHELOR'S DEGREE (BSC)	BIOLOGICAL SCIENCES
SUBJECT	MOLECULAR BIOLOGY WITH PRACTICE
TYPE OF EDUCATIONAL ACTIVITY	A
AMBIT	50029-Discipline biologiche
CODE	01642
SCIENTIFIC SECTOR(S)	BIO/11
HEAD PROFESSOR(S)	COSTA SALVATORE Ricercatore Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	149
COURSE ACTIVITY (Hrs)	76
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**COSTA SALVATORE** Tuesday 14:00 15:00 edificio 16 studio 406 Thursday 14:00 15:00 edificio 16 studio 406

DOCENTE: Prof. SALVATORE COSTA- *Lettere L-Z*

PREREQUISITES	Basic knowledge of chemistry and organic chemistry.
LEARNING OUTCOMES	Knowledge and understanding: The knowledge that students will acquire will be about the structure of nucleic acids and the basic mechanisms of molecular biology (replication, transcription and translation). Understanding of these knowledge will be realized through frontal lessons, Classroom and laboratory activities. Ability to Apply Knowledge and Understanding Students in the Molecular Biology Course will be able to spend the knowledge directly acquired in the work world (technical roles in public and private research laboratories or molecular and biotechnological analyzes), or exploit the knowledge gained for the continuation Of studies in a LM of class 6 Judgment autonomy The students of the Molecular Biology course, as the course tends to derive from the structural organization of macromolecules (nucleic acids and their ligands) their functionality in the molecular mechanisms involved in Embryonic development and cell differentiation, will be able to evaluate rationally and autonomously the basic knowledge provided by the course. Communication skills The students of the Molecular Biology course will acquire a scientific / experimental communication methodology within the basic molecular mechanisms involved in the flow of genetic information. Learning Capability The course of Molecular Biology, in a coordinated manner with other CL courses, will provide the student with a learning method and application of that learning in both basic and applied scientific experimentation
ASSESSMENT METHODS	The learning is assessed through an oral examination. The students must answer to at least three questions on the topics of the course, and they have to show an adequate knowledge, acquisition of interpretative skills, capacity of connecting and processing the arguments, as well as a relevant presentation capability. The final grade will be expressed in thirtieth and will be judged insufficient when the student will demonstrate: difficulty to focus on the proposed topics, a shallow knowledge of the arguments and extreme limited exposure ability. As the degree of details of the proven knowledge increase will proportionally increase the positivity of the grade. The maximum score is obtained in case of excellent mastery and critical-interpretative jurisdiction of the subject content of the course and a good exposition proved by the use of proper scientific terminology.
EDUCATIONAL OBJECTIVES	The Molecular Biology course will provide the basis for understanding nucleic acid structures and understanding the interactions between nucleic acids and proteins with both structural and regulatory functions. It will also deal with the chromatin structure, always finalizing the structural knowledge of the specific function. And from these structural bases it will deal with the molecular mechanisms underlying the flow of genetic information: replication, transcription and translation (at both the procariotic and eukaryotic organisms). In the credit of the exercises, the bases of recombinant technology and the laboratory will be discussed Extraction and electrophoretic DNA analysis.
TEACHING METHODS	Lessons (64 hours) Exercises (12 hours)
SUGGESTED BIBLIOGRAPHY	James D. Watson Biologia Molecolare del gene Zanichelli editore settima edizione Amaldi et al. Biologia molecolare Casa Ed. Ambrosiana terza edizione Capranico et all. casa ed. Edises Brown T.A. Genomi 4 casa ed. Edises

SYLLABUS

Hrs	Frontal teaching
8	The fine DNA structure and its components are: phosphate sugar skeleton, nitrogen bases, glycosidic beta bond. Torsional angles and helix parameters. Base pairing and stacking forces.
4	Classic helix structures (A, B, Z) and structure polymorphisms. Triple and quadruple helix.
4	Local helix parameters and interaction with proteins. Intrinsic and induced curvature.
3	DNA Properties: Torsional and Axial Flexibility; Twist, Writhe and LK
3	The topoisomerases: molecular mechanisms of action and their involvement in structure
4	Chromatin structure
10	Replication: The Replicon: - Structural organization of replicon of prokaryotes and eukaryotes. - Replication origins (prokaryotes / eukaryotes): composition structure and topology Replication: - Generality of the duplication process: the chemistry of polymerization reactions; The semiconservative nature of replication; The directionality of the replication force - DNA polymerases and replicas and their processivity - Enzyme replication: PRIMOSOMA, REPLISOMA; - Comparative analysis of replication in prokaryotes and eukaryotes - The problem of replication of the "extremities": mechanisms implemented to terminate replication in circular and linear genomes, Telomerase.

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Hrs	Frontal teaching
12	Transcription process in prokaryotes: - Structure and Function of Bacterial Polymerase RNA. - The promoter's recognition depends on consensus sequences. - Sigma factor controls DNA binding and binds to DNA's "face". - Alternative Sigma Factors. Disagreement as an example of using an alternative sigma cascade. - Stretching and pausing, overcoming pause / stopping. - Intrinsic and rho dependent termination. - Antitermination: Mechanisms. - Organization of operons and repression / induction mechanism - Examples of regulation of expression in bacteria: repression from catabolites (LAC operas, ARAs); Attenuation (Trp operon); Autogenic control; The different pharyngeal strategies (T4, T7 and Lambda)
12	The process of transcription in eukaryotes: - The organization of eukaryotic genes in introns and exons and the consequences of this organization. - The three different eukaryotic polymerase RNAs. - Eukariotic class I, II and III promoters; The PIC assembly, and the General Factors involved; The role of TBP and TAFs. - Transcription Factors Involved in Activating Transcription; Reasons for DNA binding, activation and dimerization: Gal4 as an example of a "canonical" activator. - The role of "enhancers". - Chromatin transcription: an account of the regulatory role of the organization in chromatin; The involvement of "chromatin remodeling"; The concept of functional islands and chromatinic insulators. - Type I and II splicing mechanisms, splicing of the hRNA and spliceosome, splicing of the tRNA. The catalytic role of RNA in type I and II splicing. Alternative splicing as a regulating mechanism and sex determination in drosophila - Post-transcriptional control of gene expression. RNA interference. RNAi machinery in gene silencing
4	Protein synthesis: - The role of RNAs (mRNA, rRNA and tRNA) in protein synthesis mechanisms. - Eukaryotic prokaryotic mRNA mRNAs (hood, polyA and termination) - The organization of the ribosome. The start of protein synthesis in the prokaryotes / eukaryotes. - Extension and termination of translation. - The genetic code; The third base wobble, the aminoacyl-tRNA-synthetase and the loading of the tRNAs.
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Hrs	Practice
12	Restriction enzymes - Plasmid vectors - recombinant DNA (ligase and transformation) - recombinant clones and Their selection - Extraction of plasmid DNA, cut with restriction enzymes and electrophoretic analysis.
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