Main course information	
Academic subject	Bioinformatics and Comparative Genomics
Degree course	Cellular and Molecular Biology
Degree class	LM/6
ECTS credits (CFU)	6
Compulsory attendance	YES
Teaching language	Italian
Accademic Year	2019/2020

Professor/Lecturer	
Name & SURNAME	Marcella Attimonelli
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Tutorial time/day	Upon request via e-mail

Course details	Pass-fail exam/Exam with mark out of 30	SSD code	Type of class
	Exam with mark out of 30	Bio11	Lecture/workshop

Teaching schedule	Year	Semester
	1st	1st

Lesson type	CFU/ECTS	Lessons (hours)	CFU/ECTS lab	Lab hours	CFU/ECTS tutorial/workshop	Tutorial/workshop hours	CFU/ECTS field trip	Field trip Hours
	4	32	2	24	0	0	0	0

Time management	Total hours	Teaching hours	Self-study hours
	150	56	94

Academic Calendar	First lesson	Final lesson
	!° Ottobre 2019try	20 Gennaio 2020

Syllabus	
Course entry requirements	Knowledge of molecular biology, genetics and biochemistry principles
Expected learning outcomes (according to Dublin Descriptors) (it is recommended that they are congruent with the learning outcomes contained in A4a, A4b, A4c tables of the SUA-CdS)	
Knowledge and understanding	Acquisition of in-depth theoretical and operational skills with reference to modern BIOINFORMATICS methods of studying genes, genomes, transcriptomes and proteomes
Applying knowledge and understanding	In order to verify the application skills related to the concepts acquired during the frontal lessons and the individual study, the student will attend computer exercises from whose results it will be possible to verify the acquired skills
Making informed judgements and choices	The knowledge acquired during the entire course must allow the student to acquire considerable autonomy in areas related to the evaluation and interpretation of experimental data. To support this objective the student will carry out the exercises on the basis of protocols provided by the teacher but without results.
Communicating knowledge and understanding	The communication skills will be mainly acquired in the final period of the Master's degree course when the student will carry out in the laboratory assigned the internship work to the premise of the writing of the thesis. However during the exercises the exchange of comments and results between the students and between the students and the teacher facilitate the process of acquiring communication skills.
Capacities to continue learning	Graduates will acquire good skills that favor the development, deepening and constant updating of knowledge with particular reference to the consultation of bibliographic material, to the consultation of databases and other information on the net, to the use of

	basic cognitive tools.

Sylabus	
Course content	1. Introduction to the principles of molecular biology: definition of gene, genome, transcriptome and proteome. The genetic code. Read DNA by sequencing. DNA variants. Pseudogenes. 2.Introduction to bioinformatics for genomics; the Barcode project; pharmacogenomics and personalized medicine. 3. Biological data banks: description and their use (associated exercise) 4. Introduction to the Bioinformatics analysis of Biosequences: alphabets and strings 4. Alignments, multi-alignments and search for similarities in the database (associated exercise) 5. Principles of molecular evolution and methods for the construction of phylogenetic trees and for the dating of evolutionary processes (associated exercise). 6. Methods for functional annotation of the genome (associated exercise). 7. Prediction of RNA and PROTEIN structures (associated exercise). 8. Use of "genome-browsers" and systems for the characterization of new genomic regions (associated exercise). 9. Sequencing with NGS approaches 10. Application of bioinformatics methodologies for the analysis of NGS data: the qualitative evaluation of the produced data and approaches for their assembly. 11. Applications of metagenomics: barcoding approach and approach for the functional characterization of the metagenome 12. The prokaryotic genomes 13. Eukaryotic genomes 14. The genomes of organelles: mitochondria and chloroplast 15. Virus genomes
Course books/Bibliography	1. Helmer-Citterich M, Ferrè F, Pavesi G, Pesole G – Fondamenti di Bioinformatica Zanichelli Eds 2018 2. Amaldi, Benedetti, Pesole e Plevani, BIOLOGIA MOLECOLARE, Seconda edizione, Casa Editrice Ambrosiana.
Notes	However, other Molecular Biology texts may provide useful support for the study.
Teaching methods	Frontal lessons with power point prepared by the teacher. At the end of each topic, computer exercises are performed by accessing databases and tools freely available on the web. Students receive a detailed protocol that allows the exercise to be repeated independently during individual study.
Assessment methods (indicate at least the type written, oral, other)	Oral
Evaluation criteria (Explain for each expected learning outcome what a student has to know, or is able to do, and how many levels of achievement there are	The oral exam is based on questions of a general nature in response to which an extended dissertation is expected to demonstrate how much the student has developed and assimilated the proposed topic.
Further information	