

# Syllabus

**N° documenti: 16**

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# Testi del Syllabus

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Resp. Did. **BIGGIOGERA MARCO** **Matricola: 004077**

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Docente **BIGGIOGERA MARCO, 6 CFU**

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Anno offerta: **2016/2017**

Insegnamento: **502305 - ADVANCED MICROSCOPY**

Corso di studio: **08412 - MOLECULAR BIOLOGY AND GENETICS**

Anno regolamento: **2015**

CFU: **6**

Settore: **BIO/06**

Tipo Attività: **D - A scelta dello studente**

Anno corso: **2**

Periodo: **Primo Semestre**

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## Testi in italiano

**Lingua insegnamento** INGLESE

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## Testi in inglese

**Lingua insegnamento** ENGLISH

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**Prerequisiti** =

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**Obiettivi formativi e risultati di apprendimento** The course is aimed at presenting some advanced microscopy techniques, in their application to cell and molecular biology.

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**Programma e contenuti** Basic concepts will first be given on fluorescence microscopy and on conventional transmission and scanning electron microscopy; students will then be introduced to more refined new tools (such as confocal microscopy and Energy Filtering electron microscopy, EFTEM) for visualizing in situ subcellular structures, also under living conditions. FRET (fluorescence resonance energy transfer), FRAP (fluorescence recovery after photobleaching), FLIP (fluorescence loss in photobleaching), electron tomography and electron spectroscopic imaging, as well as correlative microscopy will be also considered in their application to different cell models. Superresolution: scanning tunneling microscopy, atomic force microscopy; Stimulated Emission Depletion (STED), Photoactivated Localization Microscopy (PALM), Stochastic optical

reconstruction microscopy (STORM). Some of the above mentioned techniques will be used in the practical part of the course.

**Metodi didattici**

Lectures

**Testi di riferimento**

Chandler & Roberson: BIOIMAGING. Jones & Bartlett Publishers

**Modalità di verifica dell'apprendimento**

Oral exam

**Altre informazioni**

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# Testi del Syllabus

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Resp. Did.	<b>GIULOTTO ELENA</b>	<b>Matricola: 002498</b>
Docenti	<b>GIULOTTO ELENA, 3 CFU MC VEY MITCHELL WAYNE, 1.5 CFU SULLIVAN KEVIN FRANCIS, 1.5 CFU</b>	
Anno offerta:	<b>2016/2017</b>	
Insegnamento:	<b>500805 - ADVANCED MOLECULAR BIOLOGY</b>	
Corso di studio:	<b>08412 - MOLECULAR BIOLOGY AND GENETICS</b>	
Anno regolamento:	<b>2016</b>	
CFU:	<b>6</b>	
Settore:	<b>BIO/11</b>	
Tipo Attività:	<b>B - Caratterizzante</b>	
Anno corso:	<b>1</b>	
Periodo:	<b>Primo Semestre</b>	

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## Testi in italiano

<b>Lingua insegnamento</b>	INGLESE
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## Testi in inglese

<b>Lingua insegnamento</b>	ENGLISH
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<b>Prerequisiti</b>	Basic concepts in Molecular Biology
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<b>Obiettivi formativi e risultati di apprendimento</b>	The objective of the course is to provide advanced knowledge in genomics and post-genomics.
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<b>Programma e contenuti</b>	Specific subjects include: organization of different genomes; DNA markers; genome maps; sequencing of entire genomes; next generation sequencing methods and applications; genome sequence interpretation (sequence analysis, experimental approaches, gene identification); defining gene function (gene inactivation, RNAi); genome modification by engineered nucleases; chromosome architecture (chromatin, centromeres, telomeres); comparative genomics; molecular mechanisms of genome evolution. Model organisms. Production of recombinant proteins.
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<b>Metodi didattici</b>	Lectures, Journals clubs, Discussion with students
<b>Testi di riferimento</b>	"Genomes 3", TA Brown, Garland Science Publishing "From genes to genomes, Concepts and applications of DNA technology", JW Dale, MV Schantz, N Plant, third edition, Wiley-Blackwell "Gene cloning and DNA analysis, An Introduction" Fifth edition, TA Brown, Blackwell Publishing
<b>Modalità di verifica dell'apprendimento</b>	Written exam
<b>Altre informazioni</b>	=

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# Testi del Syllabus

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Resp. Did. **BIONE SILVIA** **Matricola: 032430**

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Docenti **BIONE SILVIA, 3 CFU**  
**SASSERA DAVIDE, 3 CFU**

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Anno offerta: **2016/2017**

Insegnamento: **500190 - BIOINFORMATICS**

Corso di studio: **08412 - MOLECULAR BIOLOGY AND GENETICS**

Anno regolamento: **2016**

CFU: **6**

Settore: **ING-INF/06**

Tipo Attività: **C - Affine/Integrativa**

Anno corso: **1**

Periodo: **Primo Semestre**

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## Testi in italiano

**Lingua insegnamento** INGLESE

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## Testi in inglese

**Lingua insegnamento** ENGLISH

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**Prerequisiti** =

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**Obiettivi formativi e risultati di apprendimento** Aim of the course is to provide students with the basic knowledge of bioinformatic methodologies, tools and approaches that are essential to integrate molecular biology and genetics studies and researches.

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**Programma e contenuti** Course content Functions and goals of Bioinformatics. NCBI and EBI sites. Query tools for integrated databases. Biomedical primary and derivative databases. Sequence comparison: basic notions and alignment tools. Multiple sequences alignment and evolutionary clustering. Genome Browsers. Regulatory elements in genome browsers. Transcriptional profiles in genome browsers and database. Analysis of nucleotide variations and repeated sequences. Human diseases and mutations. Bioinformatic analysis of alternative splicing. Bioinformatic analysis of microRNA targets. Next-generation sequencing data analysis Microbial genomics Comparative transcriptomics Basis of proteomics data analysis Laboratories. Finding information in biomedical databases. Tools for

sequence comparison. Primer design Introduction to the R language for bioinformatics

**Metodi didattici**

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**Testi di riferimento**

- Lesk A -Introduction to bioinformatics . Oxford Univ. Press, ed. - Westhead DR, Parish JH, Twyman RM Bioinformatics (Instant notes)- Taylor and Francis, ed. - NCBI Help Manual (<http://www.ncbi.nlm.nih.gov/books/NBK3831/>)

**Modalità di verifica dell'apprendimento**

Written examination

**Altre informazioni**

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# Testi del Syllabus

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Resp. Did. **MINETTI GIAMPAOLO** **Matricola: 019625**

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Docenti **KÄSTNER LARS JÜRGEN, 1.5 CFU**  
**MINETTI GIAMPAOLO, 4.5 CFU**

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Anno offerta: **2016/2017**

Insegnamento: **500462 - CELLULAR BIOCHEMISTRY**

Corso di studio: **08412 - MOLECULAR BIOLOGY AND GENETICS**

Anno regolamento: **2015**

CFU: **6**

Settore: **BIO/10**

Tipo Attività: **B - Caratterizzante**

Anno corso: **2**

Periodo: **Primo Semestre**

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## Testi in italiano

**Lingua insegnamento** INGLESE

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## Testi in inglese

**Lingua insegnamento** ENGLISH

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**Prerequisiti** =

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**Obiettivi formativi e risultati di apprendimento** =

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**Programma e contenuti** Protein synthesis and its regulation. Selenoproteins. Protein structure: overview of the main types of structural domains. Protein folding and molecular chaperones. Mechanisms and regulation of protein sorting and transport. Post-translational modifications of proteins. Protein turnover and degradation. Biological membranes. Membrane proteins. Membrane transport including ion channels. Exploring cellular biochemistry by imaging methods: Principles and Examples. Biochemistry of subcellular structures: cell organelles. Membrane trafficking and recycling. Cell signaling: pathways of signal transduction, signaling molecules, receptors. Programmed cell-death (apoptosis). Cancer.



<b>Metodi didattici</b>	=
<b>Testi di riferimento</b>	1) Lecture slides. 2) Alberts B, Johnson A, Lewis J, Raff M, Roberts K, Walter P: Molecular Biology of the Cell. 5th ed. Garland Science, 2007. 3) Voet D, Voet JG: Biochemistry. Wiley, 2010.
<b>Modalità di verifica dell'apprendimento</b>	Written exam
<b>Altre informazioni</b>	=

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# Testi del Syllabus

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Resp. Did. **REDI CARLO ALBERTO** **Matricola: 000786**

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Docente **REDI CARLO ALBERTO, 6 CFU**

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Anno offerta: **2016/2017**

Insegnamento: **502300 - DEVELOPMENTAL BIOLOGY**

Corso di studio: **08412 - MOLECULAR BIOLOGY AND GENETICS**

Anno regolamento: **2015**

CFU: **6**

Settore: **BIO/06**

Tipo Attività: **B - Caratterizzante**

Anno corso: **2**

Periodo: **Primo Semestre**

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## Testi in italiano

<b>Lingua insegnamento</b>	INGLESE
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## Testi in inglese

<b>Lingua insegnamento</b>	ENGLISH
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<b>Prerequisiti</b>	=
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<b>Obiettivi formativi e risultati di apprendimento</b>	=
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<b>Programma e contenuti</b>	Mechanisms of sex determination. Gonad development and sexual phenotype. The development of germ cells: spermatogenesis and oogenesis. Stem cells. Stemness genes. Genetic reprogramming. Cloning: therapeutic and reproductive options. Fertilisation. Creating multicellularity: patterns of embryonic cleavage. Patterning of the body plan: setting up the body axes; origin and specification of the germ layers; general features of gastrulation. Pattern formation. Determination by cytoplasmic specification. Progressive determination. Genomic equivalence and differential gene expression.
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<b>Metodi didattici</b>	=
<b>Testi di riferimento</b>	Materiale didattico formato da una quantità di lavori pubblicati su riviste specialistiche: indirizzo gli allievi alla consultazione.
<b>Modalità di verifica dell'apprendimento</b>	Una presentazione di 10 - 15 immagini in una presentazione in PPT su un argomento deciso insieme a ciascun allievo su un argomento della materia da me ritenuto idoneo ad un approfondimento.
<b>Altre informazioni</b>	=

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# Testi del Syllabus

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Resp. Did. **RANZANI GUGLIELMINA** **Matricola: 002352**

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Docenti **PELLEGATA NATALIA SIMONA, 1.5 CFU**  
**RANZANI GUGLIELMINA, 4.5 CFU**

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Anno offerta: **2016/2017**

Insegnamento: **500811 - HUMAN MOLECULAR GENETICS**

Corso di studio: **08412 - MOLECULAR BIOLOGY AND GENETICS**

Anno regolamento: **2016**

CFU: **6**

Settore: **BIO/18**

Tipo Attività: **B - Caratterizzante**

Anno corso: **1**

Periodo: **Secondo Semestre**

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## Testi in italiano

**Lingua insegnamento** Inglese

**Prerequisiti** E' richiesta una conoscenza adeguata della lingua inglese

**Obiettivi formativi e risultati di apprendimento** =

**Programma e contenuti**

The human genome: structure, organization and function. From the Human Genome project to ENCODE, 1000-Genomes, and beyond. Human DNA variability: extent and technologies. DNA polymorphisms as tools in forensic genetics and in medical genetic research. Identification of disease-genes and linkage analysis. Genes in pedigrees; inheritance of genetic diseases, genotype-phenotype correlations. Cystic fibrosis. The human hemoglobin: structure, organization and evolution of globin genes; hemoglobinopathies; sickle-cell anemia; molecular basis of thalassemias. Cancer genetics: oncogenes and tumor suppressor genes, genome instability. The genetic model of retinoblastoma. The sporadic and hereditary colorectal cancers. Epigenetics (histone code, DNA methylation, miRNAs); epigenetics and cancer. Complex diseases: the genetic component and the Genome Wide Association Studies (GWAS). Trinucleotide repeat disorders and Huntington's disease. The nucleotide excision repair (NER) and the NER-defect syndromes. Pharmacogenetics and pharmacogenomics (applications in cancer treatment).

**Metodi didattici** Lezioni frontali

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<b>Testi di riferimento</b>	HUMAN MOLECULAR GENETICS: Tom Strachan & Andrew Read (John Wiley & Sons Ed.)
<b>Modalità di verifica dell'apprendimento</b>	Esame orale
<b>Altre informazioni</b>	=



## Testi in inglese

<b>Lingua insegnamento</b>	English
<b>Prerequisiti</b>	An adequate knowledge of the English language is required
<b>Obiettivi formativi e risultati di apprendimento</b>	=
<b>Programma e contenuti</b>	The human genome: structure, organization and function. From the Human Genome project to ENCODE, 1000-Genomes, and beyond. Human DNA variability: extent and technologies. DNA polymorphisms as tools in forensic genetics and in medical genetic research. Identification of disease-genes and linkage analysis. Genes in pedigrees; inheritance of genetic diseases, genotype-phenotype correlations. Cystic fibrosis. The human hemoglobin: structure, organization and evolution of globin genes; hemoglobinopathies; sickle-cell anemia; molecular basis of thalassemias. Cancer genetics: oncogenes and tumor suppressor genes, genome instability. The genetic model of retinoblastoma. The sporadic and hereditary colorectal cancers. Epigenetics (histone code, DNA methylation, miRNAs); epigenetics and cancer. Complex diseases: the genetic component and the Genome Wide Association Studies (GWAS). Trinucleotide repeat disorders and Huntington's disease. The nucleotide excision repair (NER) and the NER-defect syndromes. Pharmacogenetics and pharmacogenomics (applications in cancer treatment).
<b>Metodi didattici</b>	Lectures
<b>Testi di riferimento</b>	HUMAN MOLECULAR GENETICS: Tom Strachan & Andrew Read (John Wiley & Sons Ed.)
<b>Modalità di verifica dell'apprendimento</b>	Oral examination
<b>Altre informazioni</b>	=

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# Testi del Syllabus

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Resp. Did. **GHERARDI ERMANNO** **Matricola: 007288**

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Docente **GHERARDI ERMANNO, 6 CFU**

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Anno offerta: **2016/2017**

Insegnamento: **501708 - IMMUNOLOGY**

Corso di studio: **08412 - MOLECULAR BIOLOGY AND GENETICS**

Anno regolamento: **2015**

CFU: **6**

Settore: **MED/04**

Tipo Attività: **D - A scelta dello studente**

Anno corso: **2**

Periodo: **Secondo Semestre**

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## Testi in italiano

**Lingua insegnamento** INGLESE



## Testi in inglese

**Lingua insegnamento** ENGLISH

**Prerequisiti** Students enrolling in this Course will have covered Molecular Biology, Biochemistry and Genetics at BA level and such background is expected.

**Obiettivi formativi e risultati di apprendimento** To provide students with a comprehensive view of immunity, including the evolutionary basis of self - non self discrimination, the main types of immunity (innate and adaptive) and of the molecular and cellular processes responsible for resistance to infection and immune surveillance.

**Programma e contenuti** The Immunology Course addresses the biological processes responsible for resistance against disease. The Course offers an evolutionary and molecular perspective of the study of immunity and consists of several lecture blocks: Foundations, provides a short historic account of the discovery and impact of artificial immunity and the experimental foundations of modern immunology. Evolution of Immunity addresses the innate and adaptive immunity across the evolutionary ladder and introduces the cells and molecules responsible for immunity in higher vertebrates. Proteins and Genes is devoted to the study of the molecular basis of immunity, namely: the properties of antigens and the pathways of antigen presentation, the proteins involved in antigen recognition and

the complex genetics that underlies the diversity of the adaptive immune system. Cells of immunity covers the cellular basis of immunity: the development of B and T cells, the immune network and tolerance. Effector Responses reviews the processes responsible for immunity to viruses and bacterial and effector mechanisms: cell-, complement-, and cytokine-mediated. Blood Groups, Transplants and Vaccines address the impact of Immunology in these major areas of medical science. Immunity and Disease covers the causes and mechanisms of autoimmunity, hypersensitivities and immune deficiencies, genetic and acquired.

## Metodi didattici

Lectures, seminars and tutorials.

## Testi di riferimento

Students should be aware that the two Immunology and General Pathology Exam papers are based on the content of the Courses as taught. Nevertheless, student need to use a Immunology textbook and a General Pathology textbook for revision. There is now a wide range of excellent Immunology textbooks for Natural Science and Medical students. These are listed below and most are regularly updated and the choice of a particular one is largely a matter of personal preference for style, illustrations and emphasis on particular topics. Students should bear in mind that the most expensive books are not necessarily the best and that it is advisable to spend some time looking at several titles before deciding which one to buy. Most titles are also available for consultation at the Institute of General Pathology (contact Giuseppe Panebianco). The first title is extensively used in Universities in the United Kingdom and is one of two textbooks with contributions by Ivan Roitt, an immunologist who made important contributions to autoantibodies and autoimmunity and is currently a member of Middlesex University. The other British textbook listed is from Peter Wood who is a member of the University of Manchester and has research interests in the area of type I diabetes and T helper cells. The textbooks from the USA include Abul K Abbas's Cellular and Molecular Immunology. Abul K Abbas is currently a member of University of California at San Francisco also has a main interest in immunological tolerance. Janeway's Immunobiology is a follow up of the textbook of the late Charles Janeway (d 2003), a distinguished Yale immunologist who made important contributions to the field of innate immunity and the interface between innate and adaptive responses. The most recent edition of Janeway's Immunobiology has been produced by Kenneth Murphy, a member of the Washington University in St Louis. Kuby's Immunology is the continuation of the excellent and prize-winning textbook authored by the late Janis Kuby (d. 1996), an immunologist at the University of California, Berkeley. This textbook has reached the 7th edition and retains the original style with a strong emphasis on experimental strategies and foundations to the main concepts of contemporary immunological research. Immunology, Infection and Immunity is another excellent textbook whose lead author, Gerald B Pier has a strong research interest in bacterial pathogens and mechanism of pathogenicity. He is currently a member of Harvard University. Roitt's Essential Immunology. Delves PJ et al. Wiley Blackwell, 12th ed., (2011) £ 42.74 Understanding Immunology. Wood P. Prentice Hall., 3rd ed (2011) £ 48.44 Cellular and Molecular Immunology. Abbas AK et al. Saunders Co., 7th ed., (2011) £ 49.29 Janeway's Immunobiology. Murphy K et al. Garland Science. 7th ed. (2011) £. 48.94 Kuby's Immunology. Owen J et al. W.H. Freeman Co. 7th ed., (2013) £. 49.99 Immunology, Infection and Immunity. Pier GB, Lyczak JB & Wetzler LM. ASM International (2004) £ 54.00 The Immune System. Parham P. Garland Publishing. Garland Scienc. 3rd ed (2009) £ 44.65 Immunology. Male D et al. Saunders. 8th ed (2012) £ 46.99

## Modalità di verifica dell'apprendimento

General The Immunology exam of the Course at the University of Pavia is a written paper and consists of the following three parts: Long Essay (one) (30% of the marks). This requires an extensive and in-depth discussion of the topic assigned and students should pay special attention to the following points: (i) the essay should be logically structured and the different parts should be balanced, (ii) where relevant, a brief conceptual/historical introduction should be given, (iii) technical terms should be defined. The length of this essay typically is one A4

page. Short Essays (four) (60% of the marks). These should be structured as discussed above for the long essay but these essays are more concise (half an A4 page). Problem Solving (one) (10% of the marks). Typically each exam paper contains one problem of immunochemistry, immunogenetic (HLA typing) or agglutination reactions (blood typing). Typical examples include calculations of  $K_d$  or  $K_a$  of antibody-antigen reactions, analysis of VDJ rearrangements, MHC typing and ABO typing. When problems involve numerical calculations, it is sufficient for students to give the answer in outline. Discussion Paper. In addition, students may choose to write a short discussion paper on one of the primary research papers listed at the end of each lecture. Students may write this paper anytime during the Course but should hand it on the day in which they take the Immunology exam. The discussion paper is up to three pages in length and must address critically the contents of the research paper under study (strength of the study, limitations, alternative experimental strategies, etc). It must not be a mere summary of the results of the study. Marking Students have one hour and half for completing the Immunology paper. I attach great importance to the exam paper and the integrity of the exam procedure. Misconduct will not be tolerated and the students involved will be asked to leave the examination and will be denied access to the subsequent exam date. Students are not allowed to request clarifications on meaning or interpretation of questions during the exam itself as this leads to disruption. They can comment in writing, however, about their understanding of the exam question (or lack of clarity where applicable) and these comments will taken into account at the marking stage.

## Altre informazioni

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# Testi del Syllabus

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Resp. Did. **IADAROLA PAOLO** **Matricola: 000498**

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Docenti **GUIDETTI GIANNI FRANCESCO, 3 CFU**  
**IADAROLA PAOLO, 6 CFU**

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Anno offerta: **2016/2017**

Insegnamento: **500802 - METHODS IN BIOCHEMISTRY**

Corso di studio: **08412 - MOLECULAR BIOLOGY AND GENETICS**

Anno regolamento: **2016**

CFU: **9**

Settore: **BIO/10**

Tipo Attività: **B - Caratterizzante**

Anno corso: **1**

Periodo: **Primo Semestre**

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## Testi in italiano

<b>Lingua insegnamento</b>	Inglese
<b>Prerequisiti</b>	Conoscenze di base di biochimica e biologia molecolare
<b>Obiettivi formativi e risultati di apprendimento</b>	Il modulo ha l'obiettivo di affrontare la descrizione teorica e pratica di alcune delle più comuni tecniche usate in ambito biochimico.
<b>Programma e contenuti</b>	Metodi per l'estrazione e purificazione di proteine da tessuti animali/vegetali e culture cellulari. processi di purificaione primaria. Aspetti teorici/pratici dei vari processi cromatografici: IEC; SEC; Affinity; HIC; Perfusion; GC; SFC; HPLC. Elettroforesi mono e bibimensionale. SDS-PAGE, Isoelectrofocusing, Metodi spettroscopici di caratterizzazione delle proteine: raggi X; UV-Vis; IR; NMR; Fluorescenza; Spettrometria di Massa; Proteomica e metabolomica; Radioisotopi: principi teorici, manipolazione, tipi di decadimento, metodi e strumenti per la misura della radioattività. Utilizzo di sostanze radioattive nelle applicazioni biochimiche. Tecniche immunologiche: produzione e purificazione di anticorpi policlonali e monoclonali e loro uso nelle studio della biochimica. Saggi RIA ed ELISA (enzyme-linked immunosorbent assay): applicazioni cliniche, industriali e ambientali.
<b>Metodi didattici</b>	Lezioni frontali
<b>Testi di riferimento</b>	Principles and Techniques of Biochemistry and Molecular Biology. Edited by Wilson and Walker

**Modalità di verifica dell'apprendimento**

Esame orale

**Testi in inglese****Lingua insegnamento**

English

**Prerequisiti**

Basic knowledge of biochemistry and molecular biology

**Obiettivi formativi e risultati di apprendimento**

The module aims to provide a complete description and practical examples of several common techniques used in the biochemical investigations.

**Programma e contenuti**

a) Methods for extraction and purification of proteins from animal/vegetal tissues and cultured cells. Procedures typically used in industry/research laboratories for primary purification of proteins. Theoretical principles and practical protocols of the most common chromatographic approaches: adsorption; partition; ion-exchange (IEC); gel-filtration (SEC); affinity; hydrophobic-interaction (HIC); perfusion; gas-chromatography (GC) and supercritical-fluid chromatography (SFC). Chromatofocusing; high performance liquid chromatography (HPLC); fast protein liquid chromatography (FPLC) and principles of green chromatography. b) Electrophoretic techniques: analytical and preparative monodimensional (1-DE) electrophoresis of proteins in their native and denaturated state. Sodium-dodecyl-sulfate gel electrophoresis (SDS-PAGE). Isoelectrofocusing (IEF). Two-dimensional (2-DE) electrophoresis: application to proteomic studies. Capillary Zone electrophoresis (CZE) and Micellar Electrokinetic Chromatography (MEKC). c) Spectroscopic techniques for the qualitative/quantitative characterization of proteins. Adsorption spectroscopy: ultraviolet (U.V.); Visible; Infrared (IR); Nuclear Magnetic Resonance (NMR); Electron Spin Resonance (ESR). Emission spectroscopy: fluorescence and phosphorescence. Mass Spectrometry (MS). Radioisotopes: principles, manipulation, types of emission, detection and measurement of radiation. Use of radioisotopes in biochemistry. Immunochemical techniques: production and purification of polyclonal and monoclonal antibodies and their application in biochemistry. Radioimmuno assay (RIA) and enzyme-linked immunosorbent assay (ELISA): applications in industry, clinical biochemistry and environmental monitoring.

**Metodi didattici**

Frontal lessons

**Testi di riferimento**

Principles and Techniques of Biochemistry and Molecular Biology. Edited by Wilson and Walker

**Modalità di verifica dell'apprendimento**

Oral exam

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# Testi del Syllabus

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Resp. Did. **CALVIO CINZIA** **Matricola: 008756**

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Docente **CALVIO CINZIA, 6 CFU**

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Anno offerta: **2016/2017**

Insegnamento: **500810 - MICROBIAL GENETICS**

Corso di studio: **08412 - MOLECULAR BIOLOGY AND GENETICS**

Anno regolamento: **2016**

CFU: **6**

Settore: **BIO/18**

Tipo Attività: **B - Caratterizzante**

Anno corso: **1**

Periodo: **Secondo Semestre**

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## Testi in italiano

<b>Lingua insegnamento</b>	INGLESE
<b>Prerequisiti</b>	Conoscenze di base di genetica e biologia molecolare
<b>Obiettivi formativi e risultati di apprendimento</b>	Conseguimento di un adeguato livello di conoscenza dei meccanismi genetici di maggiore rilevanza nel campo dei microorganismi.
<b>Programma e contenuti</b>	Bacterial Genetics: importance and tools. Mutations and their origin. Genetic exchange in Bacteria and its evolutionary role. Transformation and competence in the Gram+ B. subtilis. Plasmids: general properties, replication, partitioning and incompatibility. Conjugation: F plasmid, Hfr strains, Prime factors. From the discovery of conjugation to genetic maps. Genetics of bacteriophages. Lytic phages: developmental cycle, gene expression regulation and replication. Lysogenic phages: the Lambda paradigm. Genetic analysis with bacteria and phages. Benzer experiments with T4. Cell division and DNA segregation. Gene expression regulation: Promoters, RNA polymerase, sigma factors. Positive and negative transcriptional regulation; attenuation & antitermination. Regulons: Catabolite Repression. Bacterial defense systems; CRISPR; Toxin-Antitoxin systems. Signal transduction in bacteria: two-component systems, quorum sensing, phosphorelay and sporulation. Developmental processes in bacteria: Biofilm formation, bistable switches and phenotypic heterogeneity.
<b>Metodi didattici</b>	Lezioni frontali; materiale di supporto reso disponibile sulla piattaforma KIRO

<b>Testi di riferimento</b>	L. Snyder & W. Champness, Molecular Genetics of Bacteria, 3rd Edition. ASM Press.
<b>Modalità di verifica dell'apprendimento</b>	Esame scritto con domande aperte
<b>Altre informazioni</b>	=



## Testi in inglese

<b>Lingua insegnamento</b>	ENGLISH
<b>Prerequisiti</b>	Familiarity with Genetics and Molecular Biology concepts
<b>Obiettivi formativi e risultati di apprendimento</b>	Achievement of an adequate level of knowledge of the main genetic mechanisms in the field of microorganisms.
<b>Programma e contenuti</b>	Bacterial Genetics: importance and tools. Mutations and their origin. Genetic exchange in Bacteria and its evolutionary role. Transformation and competence in the Gram+ B. subtilis. Plasmids: general properties, replication, partitioning and incompatibility. Conjugation: F plasmid, Hfr strains, Prime factors. From the discovery of conjugation to genetic maps. Genetics of bacteriophages. Lytic phages: developmental cycle, gene expression regulation and replication. Lysogenic phages: the Lambda paradigm. Genetic analysis with bacteria and phages. Benzer experiments with T4. Cell division and DNA segregation. Gene expression regulation: Promoters, RNA polymerase, sigma factors. Positive and negative transcriptional regulation; attenuation & antitermination. Regulons: Catabolite Repression. Bacterial defense systems; CRISPR; Toxin-Antitoxin systems. Signal transduction in bacteria: two-component systems, quorum sensing, phosphorelay and sporulation. Developmental processes in bacteria: Biofilm formation, bistable switches and phenotypic heterogeneity.
<b>Metodi didattici</b>	Lectures; supplementary material will be available on the KIRO platform
<b>Testi di riferimento</b>	L. Snyder & W. Champness, Molecular Genetics of Bacteria, 3rd Edition. ASM Press.
<b>Modalità di verifica dell'apprendimento</b>	Written test with open questions on the programme.
<b>Altre informazioni</b>	=

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# Testi del Syllabus

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Resp. Did. **BONIZZONI MARIANGELA** **Matricola: 014279**

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Docenti **BONIZZONI MARIANGELA, 4.5 CFU**  
**FAILLOUX ANNA BELLA, 1.5 CFU**

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Anno offerta: **2016/2017**

Insegnamento: **502314 - MOLECULAR ENTOMOLOGY**

Corso di studio: **08412 - MOLECULAR BIOLOGY AND GENETICS**

Anno regolamento: **2015**

CFU: **6**

Settore: **BIO/05**

Tipo Attività: **D - A scelta dello studente**

Anno corso: **2**

Periodo: **Secondo Semestre**

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## Testi in inglese

<b>Prerequisiti</b>	none
<b>Obiettivi formativi e risultati di apprendimento</b>	This course will give a broad perspective of the molecular biology of insects, with a focus on vectors of human pathogens (i.e. malaria and dengue vectors) and insect of economic importance.
<b>Programma e contenuti</b>	The course will provide an introduction to insect physiology, developmental biology, genomics, molecular evolution and ecology, starting from the model organism <i>Drosophila melanogaster</i> . Molecular mechanisms implicated in insect-host and insect-pathogen interactions will be discussed as well. Experimental methodologies used in entomology will be presented, including research and large-scale applications. The economic and public health implications related to insects, their role as vectors for human diseases or agricultural pests and considerations related to the use of genetically-modified insects will be discussed as well.
<b>Metodi didattici</b>	lectures
<b>Testi di riferimento</b>	current scientific literature will be provided during the course

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**Modalità di verifica dell'apprendimento**

written tests (multiple choices and essay)

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# Testi del Syllabus

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Resp. Did. **ORIOLO DONATA** **Matricola: 029446**

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Docente **ORIOLO DONATA, 6 CFU**

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Anno offerta: **2016/2017**

Insegnamento: **501561 - MOLECULAR GENETICS**

Corso di studio: **08412 - MOLECULAR BIOLOGY AND GENETICS**

Anno regolamento: **2015**

CFU: **6**

Settore: **BIO/18**

Tipo Attività: **D - A scelta dello studente**

Anno corso: **2**

Periodo: **Secondo Semestre**

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## Testi in italiano

**Lingua insegnamento** INGLESE

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## Testi in inglese

**Lingua insegnamento** ENGLISH

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**Prerequisiti** =

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**Obiettivi formativi e risultati di apprendimento** =

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**Programma e contenuti**

The aim of the course is to give basic and advanced knowledge on transgenic animals, ranging from the *Drosophila*, *C. elegans*, *Xenopus laevis* and Zebrafish organisms to the Mouse system. It covers the techniques and applications of knock-out, knock-in and knock-down animals, as well as the generation and use of conditional transgenic organisms designed to inactivate, express and silence genes in an inducible, tissue-specific manner. Besides homologous recombination, the course faces the use of zinc-finger nucleases and TALENS recombinant proteins for the purpose of targeting DNA on specific loci. Moreover, the course describes large-scale approaches of functional genomics in transgenic animals, like gene-trapping and genome-wide screenings by RNAi libraries. It includes a discussion on the mouse

system as an invaluable genetic tool to engineer strains that show disease conditions similar to those of human disorders and some "disease model" mouse strains are detailed described. The topics include the subject of genetic reprogramming by cell-cell fusion, nuclear transfer technology (animal cloning) and generation of induced Pluripotent Stem cells (iPS).

**Metodi didattici**

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**Testi di riferimento**

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**Modalità di verifica dell'apprendimento**

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**Altre informazioni**

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# Testi del Syllabus

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Resp. Did. **RICCARDI GIOVANNA** **Matricola: 001093**

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Docente **RICCARDI GIOVANNA, 6 CFU**

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Anno offerta: **2016/2017**

Insegnamento: **502301 - MOLECULAR MICROBIOLOGY**

Corso di studio: **08412 - MOLECULAR BIOLOGY AND GENETICS**

Anno regolamento: **2015**

CFU: **6**

Settore: **BIO/19**

Tipo Attività: **B - Caratterizzante**

Anno corso: **2**

Periodo: **Secondo Semestre**

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## Testi in italiano

<b>Lingua insegnamento</b>	English
<b>Prerequisiti</b>	Basic knowledge of Genetics and Biochemistry
<b>Obiettivi formativi e risultati di apprendimento</b>	The role of bacterial pathogens and viruses in human health.
<b>Programma e contenuti</b>	Host-pathogen interaction. Innate and adaptive immunity. Phagocytosis process. Autophagy in infectious diseases. Antigen processing and presentation. Microbial pathogenesis: adhesion/invasion, Type III Secretion Systems, iron acquisition, evasion of host defences, antigenic variation, endotoxin and exotoxins. Immunotoxins. Pathogenicity Islands. Tuberculosis as a model of host-pathogen interaction. Multidrug resistance and efflux pumps. New antibacterial drugs. Quorum sensing and biofilm. Phage therapy. Animal viruses: HIV, HCV, HPV, flu viruses. Ebola virus and Zika virus. Old and new vaccines.
<b>Metodi didattici</b>	Lectures and discussion with the students.
<b>Testi di riferimento</b>	Slides plus articles and reviews
<b>Modalità di verifica dell'apprendimento</b>	Oral exam and seminars on a topic chosen by the student



## Testi in inglese

<b>Lingua insegnamento</b>	English
<b>Prerequisiti</b>	Basic knowledge of Genetics and Biochemistry
<b>Obiettivi formativi e risultati di apprendimento</b>	The role of bacterial pathogens and viruses in human health.
<b>Programma e contenuti</b>	Host-pathogen interaction. Innate and adaptive immunity. Phagocytosis process. Autophagy in infectious diseases. Antigen processing and presentation. Microbial pathogenesis: adhesion/invasion, Type III Secretion Systems, iron acquisition, evasion of host defences, antigenic variation, endotoxin and exotoxins. Immunotoxins. Pathogenicity Islands. Tuberculosis as a model of host-pathogen interaction. Multidrug resistance and efflux pumps. New antibacterial drugs. Quorum sensing and biofilm. Phage therapy. Animal viruses: HIV, HCV, HPV, flu viruses. Ebola virus and Zika virus. Old and new vaccines.
<b>Metodi didattici</b>	Lectures and discussion with the students.
<b>Testi di riferimento</b>	Slides plus articles and reviews
<b>Modalità di verifica dell'apprendimento</b>	Oral exam and seminars on a topic chosen by the student
<b>Altre informazioni</b>	=

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# Testi del Syllabus

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Resp. Did. **FORNERIS FEDERICO** **Matricola: 021554**

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Docente **FORNERIS FEDERICO, 6 CFU**

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Anno offerta: **2016/2017**

Insegnamento: **500812 - MOLECULAR PHARMACOLOGY**

Corso di studio: **08412 - MOLECULAR BIOLOGY AND GENETICS**

Anno regolamento: **2016**

CFU: **6**

Settore: **BIO/14**

Tipo Attività: **B - Caratterizzante**

Anno corso: **1**

Periodo: **Secondo Semestre**

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## Testi in italiano

<b>Lingua insegnamento</b>	INGLESE
<b>Prerequisiti</b>	Knowledge of basic concepts of molecular biology and biochemistry, as well as protein structure and function. It is expected that students can easily visualize and interpret structural representations of proteins to understand their mechanisms of function.
<b>Obiettivi formativi e risultati di apprendimento</b>	The course will provide an advanced view on modern strategies for drug development and targeted therapeutics, starting from analysis of drug targets, their structures and functions.
<b>Programma e contenuti</b>	Molecular Pharmacology addresses the study of the molecular mechanisms and biological consequences of the interactions of drugs and other small molecules with biological targets. The course will comprehensively explore the topics of modern molecular pharmacology with a strong focus on the structure-function relationships that enable the specific interactions between drugs and their biological targets. The material covered by this course include: i) modern biophysical and structural approaches to study molecular interactions; ii) basic principles of drug-receptor interactions; iii) principles of pharmacokinetics and pharmacodynamics; iv) structural biology of drug targets: ion channels, transporters, GPCRs, kinases, RTKs, signaling complexes, transcription factors, nuclear receptors, enzymes and mediators of inflammation, with examples of interacting drugs as tools to achieve knowledge of cell macromolecular structure and function; v) mechanism of action of various drugs commonly used in clinical practice; vi) drug discovery, development, optimization, structure-based drug design, structural vaccinology; vii) protein engineering, biotechnological drugs (recombinant proteins, drug delivery reagents, antibodies as therapeutics), and strategies to overcome the possible drawbacks associated with their usage; viii) pharmacogenetics and pharmacogenomics; ix) gene therapy and gene editing.

<b>Metodi didattici</b>	Lectures
<b>Testi di riferimento</b>	Bertram G. Katzung, Susan B. Masters, Anthony J. Trevor, Basic and clinical pharmacology, 13th Edition, McGraw-Hill
<b>Modalità di verifica dell'apprendimento</b>	Oral or written test, to be discussed with students
<b>Altre informazioni</b>	The book will be integrated with slides from various structural biology, biochemistry and pharmacology books, and recent literature. Slides will be available only after lectures.



## Testi in inglese

<b>Lingua insegnamento</b>	ENGLISH
<b>Prerequisiti</b>	Knowledge of basic concepts of molecular biology and biochemistry, as well as protein structure and function. It is expected that students can easily visualize and interpret structural representations of proteins to understand their mechanisms of function.
<b>Obiettivi formativi e risultati di apprendimento</b>	The course will provide an advanced view on modern strategies for drug development and targeted therapeutics, starting from analysis of drug targets, their structures and functions.
<b>Programma e contenuti</b>	Molecular Pharmacology addresses the study of the molecular mechanisms and biological consequences of the interactions of drugs and other small molecules with biological targets. The course will comprehensively explore the topics of modern molecular pharmacology with a strong focus on the structure-function relationships that enable the specific interactions between drugs and their biological targets. The material covered by this course include: i) modern biophysical and structural approaches to study molecular interactions; ii) basic principles of drug-receptor interactions; iii) principles of pharmacokinetics and pharmacodynamics; iv) structural biology of drug targets: ion channels, transporters, GPCRs, kinases, RTKs, signaling complexes, transcription factors, nuclear receptors, enzymes and mediators of inflammation, with examples of interacting drugs as tools to achieve knowledge of cell macromolecular structure and function; v) mechanism of action of various drugs commonly used in clinical practice; vi) drug discovery, development, optimization, structure-based drug design, structural vaccinology; vii) protein engineering, biotechnological drugs (recombinant proteins, drug delivery reagents, antibodies as therapeutics), and strategies to overcome the possible drawbacks associated with their usage; viii) pharmacogenetics and pharmacogenomics; ix) gene therapy and gene editing.
<b>Metodi didattici</b>	Lectures
<b>Testi di riferimento</b>	Bertram G. Katzung, Susan B. Masters, Anthony J. Trevor, Basic and clinical pharmacology, 13th Edition, McGraw-Hill
<b>Modalità di verifica dell'apprendimento</b>	Oral or written test, to be discussed with students

**Altre informazioni**

The book will be integrated with slides from various structural biology, biochemistry and pharmacology books, and recent literature. Slides will be available only after lectures.

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# Testi del Syllabus

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Resp. Did. **BALESTRAZZI ALMA** **Matricola: 005864**

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Docente **BALESTRAZZI ALMA, 3 CFU**

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Anno offerta: **2016/2017**

Insegnamento: **504226 - PLANT MOLECULAR BIOLOGY AND BIOTECHNOLOGY - MOD. 1**

Corso di studio: **08412 - MOLECULAR BIOLOGY AND GENETICS**

Anno regolamento: **2015**

CFU: **3**

Settore: **BIO/04**

Tipo Attività: **C - Affine/Integrativa**

Anno corso: **2**

Periodo: **Primo Semestre**

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## Testi in italiano

**Lingua insegnamento** INGLESE

### **Programma e contenuti**

The genetic manipulation of plants: case studies. Controlling plant response to the environment: insects, nematodes and other pests. Biotechnological approaches to disease resistance: cry proteins and Bt crops; cowpea trypsin inhibitor; novel insecticidal protection. Plant viral diseases: RNA silencing-based applications for developing resistant plants. Biotechnological approaches for phytoremediation. Plants as factories: metabolic engineering of carbohydrates and lipids, bioplastics, edible vaccines, medically related proteins, volatiles, and aroma compounds.

### **Metodi didattici**

Frontal lessons

### **Testi di riferimento**

non vi sono testi consigliati ma articoli specifici su riviste internazionali

### **Modalità di verifica dell'apprendimento**

Oral exam

## Testi in inglese

<b>Lingua insegnamento</b>	ENGLISH
<b>Prerequisiti</b>	=
<b>Obiettivi formativi e risultati di apprendimento</b>	=
<b>Programma e contenuti</b>	The genetic manipulation of plants: case studies. Controlling plant response to the environment: insects, nematodes and other pests. Biotechnological approaches to disease resistance: cry proteins and Bt crops; cowpea trypsin inhibitor; novel insecticidal protection. Plant viral diseases: RNA silencing-based applications for developing resistant plants. Biotechnological approaches for phytoremediation. Plants as factories: metabolic engineering of carbohydrates and lipids, bioplastics, edible vaccines, medically related proteins, volatiles, and aroma compounds.
<b>Metodi didattici</b>	Frontal lessons
<b>Testi di riferimento</b>	no text books are suggested but specialized articles on international scientific journals
<b>Modalità di verifica dell'apprendimento</b>	Oral exam
<b>Altre informazioni</b>	=

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# Testi del Syllabus

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Resp. Did.	<b>BALESTRAZZI ALMA</b>	<b>Matricola: 005864</b>
Docenti	<b>BALESTRAZZI ALMA, 1.5 CFU BARCELÓ CALDEIRA PINTO PAIVA JORGE ALMIRO, 1.5 CFU</b>	
Anno offerta:	<b>2016/2017</b>	
Insegnamento:	<b>504227 - PLANT MOLECULAR BIOLOGY AND BIOTECHNOLOGY - MOD. 2</b>	
Corso di studio:	<b>08412 - MOLECULAR BIOLOGY AND GENETICS</b>	
Anno regolamento:	<b>2015</b>	
CFU:	<b>3</b>	
Settore:	<b>BIO/04</b>	
Tipo Attività:	<b>C - Affine/Integrativa</b>	
Anno corso:	<b>2</b>	
Periodo:	<b>Primo Semestre</b>	

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## Testi in italiano

<b>Lingua insegnamento</b>	INGLESE
<b>Programma e contenuti</b>	Module 2. The genetic manipulation of plants: case studies. Controlling plant response to the environment: insects, nematodes and other pests. Biotechnological approaches to disease resistance: cry proteins and Bt crops; nematode-resistant crops; cowpea trypsin inhibitor; novel insecticidal protection. Plant viral diseases: RNA silencing-based applications for developing resistant plants. The genetic manipulation of stress tolerance: water-deficit stress, oxidative stress. Plants as factories: metabolic engineering of carbohydrates and lipids, bioplastics, edible vaccines, medically related proteins, volatiles, and aroma compounds. OGM traceability in food and environment.
<b>Testi di riferimento</b>	non vi sono testi consigliati ma articoli specifici su riviste internazionali
<b>Modalità di verifica dell'apprendimento</b>	oral exam



## Testi in inglese



<b>Lingua insegnamento</b>	ENGLISH
<b>Prerequisiti</b>	=
<b>Obiettivi formativi e risultati di apprendimento</b>	=
<b>Programma e contenuti</b>	Module 2. The genetic manipulation of plants: case studies. Controlling plant response to the environment: insects, nematodes and other pests. Biotechnological approaches to disease resistance: cry proteins and Bt crops; nematode-resistant crops; cowpea trypsin inhibitor; novel insecticidal protection. Plant viral diseases: RNA silencing-based applications for developing resistant plants. The genetic manipulation of stress tolerance: water-deficit stress, oxidative stress. Plants as factories: metabolic engineering of carbohydrates and lipids, bioplastics, edible vaccines, medically related proteins, volatiles, and aroma compounds. OGM traceability in food and environment.
<b>Metodi didattici</b>	=
<b>Testi di riferimento</b>	No text books are suggested but specialized review articles on international scientific journals
<b>Modalità di verifica dell'apprendimento</b>	Oral exam
<b>Altre informazioni</b>	=

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# Testi del Syllabus

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Resp. Did. **MATTEVI ANDREA** **Matricola: 007207**

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Docenti **MATTEVI ANDREA, 4.5 CFU**  
**MUSACCHIO ANDREA, 1.5 CFU**

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Anno offerta: **2016/2017**

Insegnamento: **500806 - STRUCTURAL BIOLOGY AND PHARMACOLOGY**

Corso di studio: **08412 - MOLECULAR BIOLOGY AND GENETICS**

Anno regolamento: **2016**

CFU: **6**

Settore: **BIO/11**

Tipo Attività: **B - Caratterizzante**

Anno corso: **1**

Periodo: **Secondo Semestre**

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## Testi in italiano

<b>Lingua insegnamento</b>	INGLESE
<b>Prerequisiti</b>	Buone conoscenze di biologia molecolare, chimica e matematica
<b>Obiettivi formativi e risultati di apprendimento</b>	Il Corso intende approfondire le metodiche ed i concetti fondamentali nello studio della struttura tridimensionale delle macromolecole biologiche con particolare enfasi sugli aspetti attinenti allo sviluppo di farmaci.
<b>Programma e contenuti</b>	Metodi per lo studio della struttura tridimensionale di macromolecole biologiche. Introduzione alla biocristallografia. Teoria della diffrazione. Problema della fase e metodi per la sua soluzione. Metodologie sperimentali in biocristallografia. Spettroscopia NMR NMR Multidimensionale Altre tecniche (microscopia elettronica, spettroscopia di massa) "Structure-based drug design" Esempi di farmaci sviluppati a partire da dati strutturali
<b>Metodi didattici</b>	Lezioni
<b>Testi di riferimento</b>	Physical Biochemistry: Principles and Applications, 2nd Edition David Sheehan Wiley-Blackwell
<b>Modalità di verifica dell'apprendimento</b>	Esame orale



## Testi in inglese

<b>Lingua insegnamento</b>	ENGLISH
<b>Prerequisiti</b>	Bachelor-level knowledge of molecular biology, chemistry and math.
<b>Obiettivi formativi e risultati di apprendimento</b>	This course investigates the fundamental concepts and methods for the study of the structures of biological macromolecules with a focus on the implications for drug development and design.
<b>Programma e contenuti</b>	Methods for the study of the three-dimensional structure of biological macromolecules. Introduction to biocrystallography. Diffraction theory. The phase problem and methods for its solution. Experimental methods in biocrystallography. NMR spectroscopy Multidimensional NMR Other methods for structural biology (electron microscopy, mass spectrometry) Structure-based drug design Examples of the application of the structural biology methods for drug development
<b>Metodi didattici</b>	Lectures
<b>Testi di riferimento</b>	Physical Biochemistry: Principles and Applications, 2nd Edition David Sheehan Wiley-Blackwell
<b>Modalità di verifica dell'apprendimento</b>	Oral test
<b>Altre informazioni</b>	=