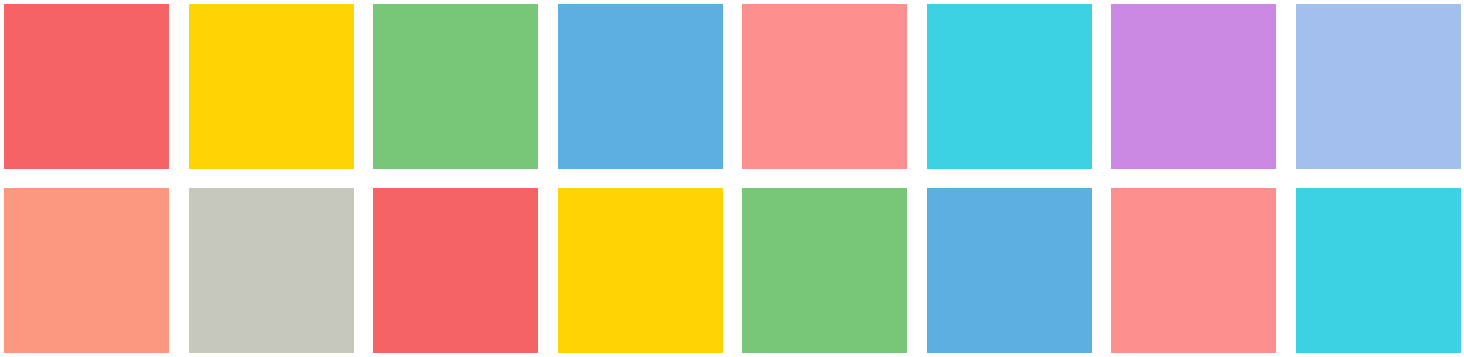
UNIVERSITÀ
DEGLI STUDI
DI TORINO

010098

COURSES BROCHURE



Cellular and Molecular Biology

Indice

ADVANCED CELL BIOLOGY AND BIOTECHNOLOGY

ACBB

Academic year:	2017/2018
Course ID:	SVB0040
Teachers:	Prof. Giovanna GAMBAROTTA Prof. Isabelle Perroteau
Teacher contacts:	+39.011.6705436, *giovanna.gambarotta@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	1st year
Type:	Distinctive
Credits/recognition:	9
Course SSD (disciplinary sector):	BIO/06 - anatomia comparata e citologia
Delivery:	Blended
Language:	English
Attendance:	Optional
Type of examination:	Written and oral (optional)

PREREQUISITES
Cytology, cellular biology with elements of signal transduction, molecular biology and recombinant DNA technology first level (Bachelor degree)

COURSE OBJECTIVES

Through the critical reading of cell biology scientific articles, students learn to address issues related to the biology of the cell, and in particular, signal transduction and cross-talk receptor, intracellular transport, cell cycle regulation, autophagocytosis, cell-cell communication and interaction, with particular attention to the mechanisms and molecules involved in the regulation of attraction and repulsion, neuronal migration, axon pathfinding. Potential applications in the biomedical field will be also discussed. The main objective is to develop the ability to critically analyze and interpret the results of the recent scientific literature. For each item, students learn how to highlight the specific scientific question, to interpret data, to discuss the experimental approach followed by the authors. Through a series of activities, students learn how to design and implement (in a virtual way) different gene expression constructs to answer questions related to a scientific problem.

COURSE AIMS

Advanced cell biology

- Extending and applying knowledge of cell biology to new situations, interpreting and analysing information
- Selecting information from a variety of sources and presenting detailed information appropriately in a variety of forms
- Making reasoned predictions and generalisations from a range of evidence/information
- Drawing valid conclusions and giving explanations supported by evidence/justification
- Drawing on knowledge and understanding of cell biology to make accurate statements, describe complex information, provide detailed explanations and integrate knowledge
- Critically evaluating experimental procedures by identifying sources of error, suggesting and implementing improvements
- Communicating cell biology findings/information fully and effectively
- Analysing and evaluating scientific publications and media reports

Biotechnology:

- Planning and designing biotechnological experiments/investigations, using reference materials, to test a hypothesis or to illustrate particular effects
- Processing and analysing biological information (using calculations, significant figures and units, where appropriate)

COURSE DELIVERY

Lectures and tutorials

Students will be assigned specific readings and online activities on moodle platform and will prepare a biotechnology project (mandatory) and a multidisciplinary research assay (optional).

- Lectures : Emphasis is given to the specific scientific question addressed, as compared to the status of art. Experimental approaches and results are deeply analysed.
- Biotechnology project tutorial: Eight sessions in a computer room, students will perform the experimental design for the construction of several plasmids and viral constructs aimed to express a recombinant protein, both wild-type, and fused with GFP or a FLAG.
- Additional exercises and tests will be provided online on the Moodle platform.

LEARNING ASSESSMENT METHODS

Examinations will be based on material covered in lectures, assigned readings, online and on site activities.

Midterm Multidisciplinary Test (MMT, optional) – This test will be in common with the courses of Cell Physiology, and Virology. It will be a Moodle-based test of 30 questions (10 for each course): 27 with a variety of formats (multiple choice, true/false, filling in checklists....) and three open questions. The optional midterm Multidisciplinary test will give rise to additional points to the final grade of final exam of each of the three courses, provided this will be passed in the first session (January-February 2016). Correspondence between Midterm Multidisciplinary Test vote and additional points for final exams is as follows: 22-23/32, 0.5 points; 24-25/32, 1 points; 26-27/32, 1.5 points; 28-30/32, 2 points.

Multidisciplinary Research Essay (MRE, optional) – This at-home assignment will be in common with the courses of Advanced Cell Biology and Biotechnology, Cell Physiology, and Virology, and will refer to methodologies and technical approaches relevant to the three courses. The essay (up to 2000 characters + figures, tables and references) will be prepared by groups of normally three students and presented oraly by the end of the semester. The optional Multidisciplinary Research Essay will give rise to additional points to the final grade of final exam of each of the three courses, provided this will be passed in the first exam session (January-February 2016). Correspondence between vote to the Multidisciplinary Research Essay and additional points for final exams is as follows: 22-23, 0.5 points; 24-25, 1 points; 26-27, 1.5 points; 28-30, 2 points.

Final exam – This exam will be a Moodle-based test of 20-25 questions with different formats : open question, multiple choice quizzes, true/false, short answers, open-ended questions; interpretation of experimental data and resolution of exercises similar to those carried out in the theoretical and practical cell biotechnology lessons (it is therefore strongly suggested to attend the laboratory lessons). The maximum grade will be 32/30. Grading 31 and 32 will give rise to " 30 cum laude". Any additional points obtained by MMT and MRE will be added to the final exam of the first exam session (January-February 2016).

Upon student's request, an integrative final interview can be taken (written/oral: 1/1).

Academic conduct: The penality for course-related dishonesty (ei. cheating on exams, plagism, etc) will be failure for the entire course.

SUPPORT ACTIVITIES

Useful websites:

- http://www.ncbi.nlm.nih.gov/ http://tools.neb.com/NEBcutter2/index.php

- http://www.bioinformatics.org/annhyb/

SYLLABUS

The main objective of the course is to convey to the students the ability to

- analyze and interpret scientific papers concerning cell biology topics;
- design constructs for the expression of recombinant proteins, taking into account all the necessary steps.

Topics:

- Advanced cell biology experimental approaches
- Cell transduction pathways
- Cell comunication
- Stem cells and differentiation
- Cell migration and adhesion
- Axon pathfinding and analysis methods

SUGGESTED TEXTBOOKS AND READINGS

- Molecular Cell Biology (7 th edition) by Lodish et al. (2013) or Molecolar Biology of the Cell (6th edition) by Alberts et al. (2015).
- Any article from the "News and Views", and "Perspectives" section of Nature and Science from Aug. to Dic., 2015). Supplemental journal articles and reviews will be assigned for each topic (see reading list on Moodle platform).
- Material covered in lectures (pdf of lectures and integrative material) is also published on Moodle platform.

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=g283

ADVANCED MOLECULAR BIOLOGY

ADVANCED MOLECULAR BIOLOGY

Academic year:	2017/2018
Course ID:	SVB0041
Teachers:	Prof. Michele De Bortoli Prof. Santina CUTRUPI
Teacher contacts:	0116705058, *michele.debortoli@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	1st year
Type:	Distinctive
Credits/recognition:	9
Course SSD (disciplinary sector):	BIO/11 - biologia molecolare
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written and oral

PREREQUISITES

No specific prerequisite is indicated in addition to the Syllabus for Master course admission. Nevertheless, for a full comprehension of the subjects of this course Students must be familiar with basic Molecular and Cellular Biology and basic Genetics and Bioinformatics.

COURSE OBJECTIVES

Students will acquire an advanced level of knowledge on the activity of genes and genomes and the mechanisms of genome regulation at the transcriptional and post-transcriptional level, in the contexts of development, differentiation, cellular homeostasis and cancer.

In the first part of the course Students will understand how the modern global methods (microarrays, Next Generation Sequencing, epigenomics, protein-DNA, protein-RNA, proteomics), make it possible to represent the organization and control of most evolved genomes.

In the second part of the course, Students will acquire the ability to use their theoretical knowledge in solving applicative problems, with special regard to biomedical issues, through the study of literature. In particular, Students will learn how to associate the genomic variants with possible control functions and with disease states.

Specific objectives are to:

- make the point on the evolution of Molecular Biology since the completion of the Human Genome Project and the advent of high throughput genome sequencing technologies
- discuss the advancements in regulatory Biology produced by Genomics, with specific regard on the regulation of gene expression and gene interaction at the network level
- introduce students to the understanding of molecular biology at the systems level
- guide students to the reading and interpretation of research articles in the field of regulatory molecular biology
- allow students to perceive what applications the new genomics studies can generate, particularly in the fields of medicine and neurobiology.

COURSE AIMS

Expected outcomes, divided in "knowledge, understanding, abilities", are:

knowledge

- the most common analytical methods in Genomics and transcriptomics, comprising the fundamentals of bioinformatics analysis of results
- the most important modalities of transcriptional regulation in higher Eukaryotes.
- the mechanisms of alternative RNA transcript generation, including non-coding RNAs and associated functions.
- the constitutive principles of gene regulatory networks
- the involvement and the changes of components of those networks in human disease

understanding

- how a molecular biology study, aiming at a knowledge of the above, is planned and conducted; how results are presented and discussed in a primary scientific journal; and finally how results must be understood and analyzed in the framework of current knowledge.
- what kind of methodological approach (among those studied) should be used to answer a specific scientific question.
- what information can be obtained from genomic analysis to understand the molecular mechanisms associated with diseases;
- how to use this knowledge to develop a potential therapeutic strategy

ability

- to do literature searches on the course topics
- to search for information on and expose a summary of the main methods of genomics and functional genomics
- to analyze, interpret and report publicly on a recent scientific article, including the methodology used, concerning one of the course topics
- to interpret results and diagrams relating to the main issues discussed
- to expose briefly one of the topics of the program, with specific reference to genomics and methodology
- to individuate which methods should be used to address a specific problem in the field

COURSE DELIVERY

The first part of this course is composed of 5 Chapters, with a total of 40 hours lecturing, plus Moodle's support activities, hands-on bioinformatics laboratory and Students' Report activity, corresponding to 6 cfu. The second part is composed of 20 hours lecturing, reading and discussion of scientific results, corresponding to 3 cfu.

LEARNING ASSESSMENT METHODS

The ability to search, analyse and report results of recent scientific papers on the course subjects is achieved through a practical "Students' report" activity. It is evaluated as such, together with an evaluation of Student's participation to e-learning support activities. 1) congruence; 2) difficulty; 3) contextual framework; 4) analysis of results; 5) comprehension; 6) clarity of report, are graded. The level of participation in support activities and bioinformatics hands-on laboratory is evaluated as % participation, quiz or lesson execution, and writing in methodological Wikis. Grading is out of 30, with "cum laude" counted as 33/30.

The ability to interpret experimental results and schemes is evaluated by a Moodle-based test, which is composed of 15 questions in which, based on Figures extracted from scientific papers or reviews discussed during course lectures, Students are required to answer questions (multiple choice, short answer, short essay). Grading is out of 30, with "cum laude" counted as 33/30.

The ability to expose and discuss course topics is evaluated through a short interview, usually no longer than 30

minutes. During first 10 min Students are expected to expose a general topic at Teacher's choice among a list published in advance on the course website. There will be no break and no question in this first period. A specific question may be offered at the end. Finally, during last 10 minutes, a Figure from one of the 5 Research Papers discussed during the course is chosen and Students are required to explain in detail the experiment. Grading is out of 30, with "cum laude" counted as 33/30.

The final grade is the mean of the three single grades. The "cum laude" is assigned when one of the single grades is "cum laude" (33/30) and the general average is above 30.

SUPPORT ACTIVITIES

Support activities are organized on the Moodle e-learning platform (http://cmb.i-learn.unito.it/). Activities such as quizzes, lessons, and guided website visualization are posted and participation monitored. Two students' wikis are organized, one for the search of Research papers for Students' Report and one concerning methodological aspects. Last, for each chapter of the course, Research papers are posted that Students must read and that are discussed thoroughly during the lessons.

SYLLABUS

- Nuclear topographic organization, chromosomal territories, eu- and hetero-chromatin and functional aspects.
- Genomics and post-genomics, NGS technologies, epigenomics, genomic imprinting, chromatin dynamics and functional domain programming. ENCODE.
- Transcriptomics, microarray and RNA-seq technologies. Genic Unit and transcript variants. Non-coding RNAs. Genomic databases.
- The regulation of gene transcription. Promoters, CpG methylation, nuclear positioning. Coregulators, Transcription Factors, enhancers, signal transduction. LncRNA role in transcriptional regulation and chromatin dynamics.
- Alternative splicing: regulatory factors and mechanisms. Stability, decay and intracellular localization of RNAs. RNA interference. MicroRNA, lncRNAs and transcriptional and post-transcriptional regulatory circuits.
- The role of transcriptional enhancers in cell identity definition, in tumor progression and in other diseases.
- Super-enhacers: characterization and functional aspects in human diseases
- Epigenomics of Alzheimer Disease and Multiple Sclerosis.

SUGGESTED TEXTBOOKS AND READINGS

There is no specific textbook for this course. For basic and general reference, recent (>2010) editions of any Molecular Biology textbook for undergraduate students will be OK.

As a support for the study of this course, specific scientific Reviews are posted on the Moodle course website. Websites containing support videos, texts, images and other materials are also indicated.

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=6wm0

BEHAVIORAL NEUROENDOCRINOLOGY

BEHAVIORAL NEUROENDOCRINOLOGY

Academic year:	2017/2018
Course ID:	SVB0056
Teacher:	Prof. Giancarlo PANZICA
Teacher contacts:	116706607, *giancarlo.panzica@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	2nd year
Type:	Elective
Credits/recognition:	4
Course SSD (disciplinary sector):	BIO/16 - anatomia umana
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Oral

Borrowed from: Basi anatomiche e neuroendocrine del comportamento (MFN1533/INT0856)
Corso di Studi in Scienze Naturali

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=ray1

BIOINFORMATICS

BIOINFORMATICS

Academic year:	2017/2018
Course ID:	SVB0047
Teacher:	Francesca Cordero Dott. Marco Beccuti
Teacher contacts:	+39-011-6706773, *francesca.cordero@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	1st year
Type:	Related or integrative
Credits/recognition:	6
Course SSD (disciplinary sector):	INF/01 - informatica
Delivery:	Formal authority
Language:	English
Attendance:	Optional
Type of examination:	Written and oral

PREREQUISITES
Formally none. Knowledge of algorithms, artificial intelligence and basic biology would help.

COURSE OBJECTIVES

The course provides, on one side, a general overview of biological problems, and, on the other side, describes the main techniques used to deal with these problems.

COURSE AIMS

The student will be able to discuss with the biologist, to understand the biological problem at hand, and to suggest a solution based on the techniques learned during the course.

COURSE DELIVERY

Lectures and seminars

Emphasis is given to the scientific topics of the syllabus, by surveying the status of art.

Moreover, seminars on specific issues will be presented by experts in the field.

LEARNING ASSESSMENT METHODS

Exercises and discussions with the students during the lessons are the main tools for controlling the learning experience. A final written test checking the acquired knowledge lasts 90 minutes and evaluates the student ability to answer both theoretical questions and solving problems related to the topics introduced during the course. Moreover, an oral exam consists in the review of a scientific article, chosen by the student and related to the topics of the course.

SYLLABUS

Introduction to molecular biology. Sequence alignment algorithms. Multiple sequence alignment algorithnms. Phylogenetic tree construction algorithms. Protein structure prediction algorithms. Gene networks: models and inference algorithms. Organization and query of biological databases.

SUGGESTED TEXTBOOKS AND READINGS

A.M. Lesk, "Introduzione alla Bioinformatica", McGraw-Hill Ed. G. Valle, M. Helmer Citterich, M. Attimonelli, G. Pesole "Introduzione alla Bioinformatica", Zanichelli Ed. D.E. Krane e M.L. Raymer, "Fondamenti di Bioinformatica", Pearson Education Italia Ed.

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=81me

BIOPHYSICS

BIOPHYSICS

Academic year:	2017/2018
Course ID:	SVB0048
Teacher:	Prof. Luca Munaron Prof. Alessandra Fiorio Pla
Teacher contacts:	0116704667, *luca.munaron@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	2nd year
Type:	Distinctive
Credits/recognition:	6
Course SSD (disciplinary sector):	BIO/09 - fisiologia
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written and oral

PREREQUISITES
Basic knowledge of General and Cellular Physiology

COURSE OBJECTIVES

The course is organized in 6 ECFT and aims to provide theoretical, technical and methodological background to critically investigate biophysical functions of the cells.

The course aims to foster the training of students in the application of the physical sciences and engineering to fundamental biological questions at the molecular, cellular, and systems levels. Additional objective points to a quantitative analysis of some conceptual and technical approaches to signal transduction mechanisms from a molecular and postgenomic pint of view, with particular emphasis on selected themes.

COURSE AIMS

- use multiple experimental tools and results to solve a biological problem in cell physiology
- Extending and applying knowledge of biophysics to new contexts
- Re-analysing information
- Selecting robust information from a variety of sources
- Making reasoned predictions and generalisations from experimental evidence and theoretical information
- Drawing valid conclusions and giving explanations supported by evidence/justification
- Drawing on knowledge and understanding of biophysics to make accurate statements, describe complex information, provide detailed explanations and integrate knowledge
- Critically evaluating scientific publications and media reports
- Discuss the strenght and limitations of the results published on research papers, eventually identifying sources of errors and biases
- Communicating biophysical findings and concepts fully, appropriately and using a variety of different modalities

COURSE DELIVERY

Lectures and tutorials

Students will be assigned specific readings on selected topics and will present and discussed together.

- Lectures : Attention is given to focused scientific questions, starting from the knowledge provided by the scientific literature. Experimental approaches, results and conclusions are deeply analysed.
- Research assays: discussion sessions in which students will be divided into working groups focusing on the different topics of the course.

LEARNING ASSESSMENT METHODS

Examinations will be based on material covered in lectures, assigned readings, seminars and on site activities.

Research Assay: This at-home assignment will refer to specific topics of the course. The essay (up to 2000 characters + figures, tables and references) will be prepared by groups of normally three students and presented orally by the end of the semester. The Research Essay will give rise to additional points to the final grade of final exam. Correspondence between vote to the Research Essay and additional points for final exams is as follows: 22-23, 0.5 points; 24-25, 1 points; 26-27, 1.5 points; 28-30, 2 points.

Final exam – This exam will be a Moodle-based test (duration 1,5h) of questions in different formats : 6 open question, 20 multiple choice qizzes that can very between multiple choice quizzes, true/false, short answers, open-ended questions; interpretation of experimental data and resolution of exercises . The maximum grade will be 30/30. Any additional points obtained by research assay will be added to the final exam of the first exam session. Grading 31-33 will give rise to " 30 cum laude".

SYLLABUS

The main objective of the course is to convey to the students the ability to

- critically analyze scientific papers on piophysical topics;
- design integrative experimental protocols to address functional questions, taking into account the strengths and limitations of the different approaches.

Topics:

- Review on Topics already presented on Cell Physiology.Cell membrane permeability: fluxes across the plasma membrane. Transporters classification. Fluxes and lows for neutral species and electrolytes. Fick. Nernst-Plank. Goldman-Hodgkin-Katz
- Cell membranes: structure and functions. Lipid rafts, caveolae, signalplexes
- Electric Excitability of the cells. Action Potential. Patch clamp technique
- Ion channels: Structure and function
- Fluorescence and Fluorochromes. Fluorescent probes for ion fluxes studies
- Intracellular messengers: Ca2+ and cAMP and their crosstalk in live cells.
- Mitochondria as Ca2+ homeostasis regulators
- Cell volume regulation and Aquaporin
- Mechanosensitive channels. Two examples: Piezo and TRP
- Genetic approaches to control living cells: OPTOGENETIC, CHEMOGENETIC and MAGNETOGENETIC

SUGGESTED TEXTBOOKS AND READINGS

Lectures, selected papers and websites are available on Moodle.

For some topics selected textbooks available at DBIOS library.

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=3qlm

CELL PHYSIOLOGY

CELL PHYSIOLOGY

Academic year:	2017/2018
Course ID:	SVB0044
Teacher:	Prof. Luca Munaron
Teacher contacts:	0116704667, *luca.munaron@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	1st year
Type:	Distinctive
Credits/recognition:	6
Course SSD (disciplinary sector):	BIO/09 - fisiologia
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written and oral (optional)

PREREQUISITES
A good knowledge of basic Cell Biology (Biologia Cellulare) and General Physiology (Fisiologia Generale).

COURSE OBJECTIVES

This is a 6 ECTF course aimed to provide theoretical, technical and methodological background to critically investigate cell functions.
Students learn to address issues related to the functional biology of the cell. Particular attention will be focused on live cell imaging techniques as experimental tools to investigate physiological processes in time and space at different biological scales (from intracellular to multicellular). For each item, students learn how to highlight the specific scientific question, to interpret data, to discuss the experimental approaches employed by the authors.The main objective is to develop the ability to critically analyze and interpret the results of the related scientific literature.

COURSE AIMS

- Extending and applying knowledge of cell physiology to new contexts
- Re-analysing information
- Selecting robust information from a variety of sources
- Making reasoned predictions and generalisations from experimental evidence and theoretical information
- Drawing valid conclusions and giving explanations supported by evidence/justification
- Drawing on knowledge and understanding of cell physiology to make accurate statements, describe complex information, provide detailed explanations and integrate knowledge
- Critically evaluating scientific publications and media reports
- Discussing the strenght and limitations of the results published on research papers, eventually identifying sources of errors and biases
- Communicating cell physiology findings and concepts fully, appropriately and using a variety of different modalities

COURSE DELIVERY

Lectures and tutorials

Students will be assigned specific readings and online activities and will prepare a multidisciplinary research assay (optional).

- Lectures : Attention is given to focused scientific questions, starting from the knowledge provided by the scientific literature. Experimental approaches, results and conclusions are deeply analysed.
- Research assay tutorial: discussion sessions in which students will draw different integrative experimental designs to address functional problems concerning protein diffusion, protein-protein interaction, spatio-temporal dynamics of intracellular messengers.
- Additional exercises and tests will be provided online on the Moodle platform.

LEARNING ASSESSMENT METHODS

Examinations will be based on material covered in lectures, assigned readings, online and on site activities.

Midterm Multidisciplinary Test (MMT, optional) – This test will be in common with the courses of Advanced Cell Biology and Biotechnology, and Virology. It will be a Moodle-based test of 30 questions (10 for each course): 27 with a variety of formats (multiple choice, true/false, filling in checklists) and three open questions. The optional midterm Multidisciplinary test will give rise to additional points to the final grade of final exam of each of the three courses, provided this will be passed in the first session (January-February 2016). Correspondence between Midterm Multidisciplinary Test vote and additional points for final exams is as follows: 22-23/32, 0.5 points; 24-25/32, 1 points; 26-27/32, 1.5 points; 28-30/32, 2 points.

Multidisciplinary Research Essay (MRE, optional) – This at-home assignment will be in common with the courses of Advanced Cell Biology and Biotechnology, Cell Physiology, and Virology, and will refer to methodologies and technical approaches relevant to the three courses. The essay (up to 2000 characters + figures, tables and references) will be prepared by groups of normally three students and presented oraly by the end of the semester. The optional Multidisciplinary Research Essay will give rise to additional points to the final grade of final exam of each of the three courses, provided this will be passed in the first exam session (January-February 2016). Correspondence between vote to the Multidisciplinary Research Essay and additional points for final exams is as follows: 22-23, 0.5 points; 24-25, 1 points; 26-27, 1.5 points; 28-30, 2 points.

Final exam – This exam will be a Moodle-based test of 20-30 questions in different formats : open question, multiple choice quizzes, true/false, short answers, open-ended questions; interpretation of experimental data and resolution of exercises . The maximum grade will be 33/30. Grading 31-33 will give rise to " 30 cum laude". Any additional points obtained by MMT and MRE will be added to the final exam of the first exam session (January-February 2017).

Upon student's request, an integrative final interview can be taken (written/oral: 3/1).

Academic conduct: The penality for course-related dishonesty (ei. cheating on exams, plagism, etc) will be failure for the entire course.

SUPPORT ACTIVITIES

Weekly homework sets will be assigned, and their solution will be posted and (if time allows) discussed in class.

SYLLABUS

The main objective of the course is to convey to the students the ability to

- critically analyze scientific papers on cell physiology topics;
- design integrative experimental protocols to address functional questions, taking into account the strengths and limitations of the different approaches.

Topics:

- Cell as a complex system

- Structure-function redundancy
- Diffusional processes
- Membrane transports
- Live fluorescence microscopy approaches to investigate intracellular signaling
- Spatio-temporal features of calcium signaling
- Molecular basis of sensory physiology
- Multiscale bio-modeling

SUGGESTED TEXTBOOKS AND READINGS

Lessons, selected papers and websites are available on Moodle.

For some topics selected textbooks available at DBIOS library.

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=1b53

CELLULAR NEUROBIOLOGY

CELLULAR NEUROBIOLOGY

Academic year:	2017/2018
Course ID:	SVB0069
Teacher:	Prof. Patrizia Bovolin
Teacher contacts:	0116704679, *patrizia.bovolin@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	1st year
Type:	Distinctive
Credits/recognition:	5
Course SSD (disciplinary sector):	BIO/06 - anatomia comparata e citologia
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Oral

COURSE OBJECTIVES

This course aims to provide students with an advanced knowledge of cell and molecular biology of neurons, glia and other neural cell types

COURSE AIMS

- The students will familiarize with techniques and research strategies employed in cellular neurobiology
- They will improve their comprehension of scientific articles and develop their skills in choosing, reporting and discussing data from the neurobiology scientific literature

COURSE DELIVERY

- This course includes 40 hours of in-class lectures and seminars, discussions times and short movies
- Some seminars on special topics will be delivered by invited speakers
- The teacher will select four-five articles per topic, among all the ones proposed by the students, for end-of-the-course student ppt presentations

LEARNING ASSESSMENT METHODS

- Bibliographic search activity (obligatory): For each main topic presented by the teacher in lecture form, all the students will make a bibliographic search on PubMed/Google Scholar to find one research article, which should be interesting and pertinent to the topic
- Short article presentation (optional): Students will give a short ppt presentation before the end of the course on one of the articles previously selected through the Biobliographic Search activity. This presentation may provide additional points to the grade of the final exam, provided this will be passed in the first exam session (January-February 2016)
- Final exam: This exam will be a written test of 20-25 questions with different formats: word definitions; multiple choice quizzes; open questions; short reading-comprehension exercises based on literature material
- Scores: 15% of the final grade will be based on the Bibliographic Search activity. The remaining 85% will be covered by the final exam. The maximum grade will be 32/30. " 30 cum laude" will be assigned to grades 31 and 32. All additional points obtained with the PPT presentation will be added to the final exam of the first

exam session (January-February 2016).
- Upon request, students can take an integrative oral examination

SYLLABUS

- Ependymal, choroidal and endothelial cells: BBB, B-CSF-B, the problem of delivery of exogenous molecules to the brain
- The neuron: - origin and function of neuronal multiplicity - subcellular organization of the neuron - origin, maintenance and functional aspects of neuronal polarity - neuronal cytoskeleton, molecular motors and axonal transport - dendritic spines, transport and targeting of dendritic mRNA, local synthesis of proteins - trafficking of axonal and dendritic proteins – the neurogenetics of Intellectual Disability disorders
- Cellular communication in the nervous system: - the neuron as a secretory cell and the organization of the presynaptic terminal - the postsynaptic density, neuromuscular junction versus central synapses - general classification of neurotransmitter receptors, structure and function of GABA and glutamate receptors - molecular composition and dynamic regulation of gabaergic and glutamatergic synapses – the endocannabinoid system - adhesion molecules, synaptic maintenance and synaptic plasticity - non-synaptic communication – targeting neurons for Optogenetics - the Zebrafish model in Neurobiology
- Glial cells: - classification, morphology and classical roles – Astrocytes: morphological & functional features, reactive gliosis, gliotransmission - Myelinating cells: origin, precursor cells, myelination regulation and pathological aspects - Microglia: physiological and pathological roles.

SUGGESTED TEXTBOOKS AND READINGS

- Neuroscience – Purves et al. (2012 fifth edidion)
- Principles of Neural Sciences - Kandel et al. (2013 fifth edition)
- Scientific articles indicated in the teaching material

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=c9db

CELLULAR NEUROBIOLOGY

CELLULAR NEUROBIOLOGY

Academic year:	2017/2018
Course ID:	SVB0055
Teacher:	Prof. Patrizia Bovolin
Teacher contacts:	0116704679, *patrizia.bovolin@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	2nd year
Type:	Elective
Credits/recognition:	4
Course SSD (disciplinary sector):	BIO/06 - anatomia comparata e citologia
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Oral

COURSE OBJECTIVES

This course aims to provide students with an advanced knowledge of cell and molecular biology of neurons, glia and other neural cell types

COURSE AIMS

- The students will familiarize with techniques and research strategies employed in cellular neurobiology
- They will improve their comprehension of scientific articles and develop their skills in choosing, reporting and discussing data from the neurobiology scientific literature

COURSE DELIVERY

- This course includes 40 hours of in-class lectures and seminars, discussions times and short movies
- Some seminars on special topics will be delivered by invited speakers
- The teacher will select four-five articles per topic, among all the ones proposed by the students, for end-of-the-course student ppt presentations

LEARNING ASSESSMENT METHODS

- Bibliographic search activity (obligatory): For each main topic presented by the teacher in lecture form, all the students will make a bibliographic search on PubMed/Google Scholar to find one research article, which should be interesting and pertinent to the topic
- Short article presentation (optional): Students will give a short ppt presentation before the end of the course on one of the articles previously selected through the Biobliographic Search activity. This presentation may provide additional points to the grade of the final exam, provided this will be passed in the first exam session (January-February 2016)
- Final exam: This exam will be a written test of 20-25 questions with different formats: word definitions; multiple choice quizzes; open questions; short reading-comprehension exercises based on literature material
- Scores: 15% of the final grade will be based on the Bibliographic Search activity. The remaining 85% will be covered by the final exam. The maximum grade will be 32/30. " 30 cum laude" will be assigned to grades 31 and 32. All additional points obtained with the PPT presentation will be added to the final exam of the first exam session (January-February 2016).

- Upon request, students can take an integrative oral examination

SYLLABUS

- Ependymal, choroidal and endothelial cells: BBB, B-CSF-B, the problem of delivery of exogenous molecules to the brain
- The neuron: - origin and function of neuronal multiplicity - subcellular organization of the neuron - origin, maintenance and functional aspects of neuronal polarity - neuronal cytoskeleton, molecular motors and axonal transport - dendritic spines, transport and targeting of dendritic mRNA, local synthesis of proteins - trafficking of axonal and dendritic proteins – the neurogenetics of Intellectual Disability disorders
- Cellular communication in the nervous system: - the neuron as a secretory cell and the organization of the presynaptic terminal - the postsynaptic density, neuromuscular junction versus central synapses - general classification of neurotransmitter receptors, structure and function of GABA and glutamate receptors - molecular composition and dynamic regulation of gabaergic and glutamatergic synapses – the endocannabinoid system - adhesion molecules, synaptic maintenance and synaptic plasticity - non-synaptic communication – targeting neurons for Optogenetics - the Zebrafish model in Neurobiology
- Glial cells: - classification, morphology and classical roles – Astrocytes: morphological & functional features, reactive gliosis, gliotransmission - Myelinating cells: origin, precursor cells, myelination regulation and pathological aspects - Microglia: physiological and pathological roles.

SUGGESTED TEXTBOOKS AND READINGS

- Neuroscience – Purves et al. (2012 fifth edidion)
- Principles of Neural Sciences - Kandel et al. (2013 fifth edition)
- Scientific articles indicated in the teaching material

Borrowed from: CELLULAR NEUROBIOLOGY (SVB0069)
Cellular and Molecular Biology

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=oi0m

---

COGNITIVE NEUROSCIENCE

COGNITIVE NEUROSCIENCE

Academic year:	2017/2018
Course ID:	SVB0106
Teacher:	Prof. Benedetto Sacchetti
Teacher contacts:	116708171, *benedetto.sacchetti@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	2nd year
Type:	Related or integrative
Credits/recognition:	6
Course SSD (disciplinary sector):	M-PSI/02 - psicobiologia e psicologia fisiologica
Delivery:	Formal authority
Language:	Italian
Attendance:	Optional
Type of examination:	Oral

COURSE OBJECTIVES

The course is aimed at providing students with the most update information on the interaction between biological mechanisms and cognitive processes that lead to complex behaviors. In particular, during the course it will be analyzed i) the interaction between emotions and feelings, describing the most recent major theories, with particular attention to fear and anxiety, and to the reward and pleasure; ii) the cognitive processes underlying decision-making processes and the formation of memories. In the meantime, the course will provide information about the major disorders related to these functions (depression, anxiety disorders and post -traumatic stress, learning disorders and "false" memories, compulsive behavior and substance of abuse).

COURSE AIMS

At the end of the course the student will have gained a comprehensive understanding of the major motivational and emotional processes based on integrated knowledge of biology, medicine and psychology, so that he/she can apply such a knowledge to the different areas of neuroscience.

COURSE DELIVERY

The course is conducted through lectures with an oral explanation of the topics in the program, which are accompanied by explanatory images, and articles made available to students.

LEARNING ASSESSMENT METHODS

The exam will be in an oral form. The exam is aimed at is verifying whether the student has acquired the essential information on the topics covered during the course. Such information will be supplied fully in lessons conducted by the teacher. In addition, during the exam it will be evaluated the ability of the student to process the information acquired and to apply them to the different areas of neuroscience.

SYLLABUS

The specific topics are: i) control systems of the brain (diffuse projection systems) and related disorders (depression). ii) cognitive processes: learning and memory. Neural basis of learning disorders. iii) Feelings and emotions: main theories and neural bases. iv) The pleasure circuits in the brain and neural mechanisms. Drugs and psychoactive substances. v) Fear and anxiety: brain circuits and diseases. vii) Stress: mechanisms, stress and the immune system, stress and memory disorders, post-traumatic stress disorders (PTSD).

SUGGESTED TEXTBOOKS AND READINGS

The course is based on the more recent findings in the neuroscience topics. Therefore, there is not appropriate books.

It may be useful (but it is not sufficient to attend the exam):

Purves D, cabeza R, Huettel SA, LaBar KS, Platt ML, e Woldorff MG Neuroscienze Cognitive (II edizione) ed. Zanichelli

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=tfqo

COGNITIVE NEUROSCIENCE (non attivato nel 2017/18)

COGNITIVE NEUROSCIENCE

Academic year:	2016/2017
Course ID:	SVB0066
Teacher:	Prof. Benedetto Sacchetti
Teacher contacts:	116708171, *benedetto.sacchetti@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	2nd year
Type:	Related or integrative
Credits/recognition:	8
Course SSD (disciplinary sector):	BIO/09 - fisiologia
Delivery:	Formal authority
Language:	Italian
Attendance:	Optional
Type of examination:	Oral

COURSE OBJECTIVES

The course is aimed at providing students with the most update information on the interaction between biological mechanisms and cognitive processes that lead to complex behaviors. In particular, during the course it will be analyzed i) the interaction between emotions and feelings, describing the most recent major theories, with particular attention to fear and anxiety, and to the reward and pleasure; ii) the cognitive processes underlying decision-making processes and the formation of memories. In the meantime, the course will provide information about the major disorders related to these functions (depression, anxiety disorders and post -traumatic stress, learning disorders and "false" memories, compulsive behavior and substance of abuse).

COURSE AIMS

At the end of the course the student will have gained a comprehensive understanding of the major motivational and emotional processes based on integrated knowledge of biology, medicine and psychology, so that he/she can apply such a knowledge to the different areas of neuroscience.

COURSE DELIVERY

The course is conducted through lectures with an oral explanation of the topics in the program, which are accompanied by explanatory images, and articles made available to students.

LEARNING ASSESSMENT METHODS

The exam will be in an oral form. The exam is aimed at is verifying whether the student has acquired the essential information on the topics covered during the course. Such information will be supplied fully in lessons conducted by the teacher. In addition, during the exam it will be evaluated the ability of the student to process the information acquired and to apply them to the different areas of neuroscience.

SYLLABUS

The specific topics are: i) control systems of the brain (diffuse projection systems) and related disorders (depression). ii) cognitive processes: learning and memory. Neural basis of learning disorders. iii) Feelings and emotions: main theories and neural bases. iv) The pleasure circuits in the brain and neural mechanisms. Drugs and psychoactive substances. v) Fear and anxiety: brain circuits and diseases. vii) Stress: mechanisms, stress and the immune system, stress and memory disorders, post-traumatic stress disorders (PTSD).

SUGGESTED TEXTBOOKS AND READINGS

The course is based on the more recent findings in the neuroscience topics. Therefore, there is not appropriate books.

It may be useful (but it is not sufficient to attend the exam):

Purves D, cabeza R, Huettel SA, LaBar KS, Platt ML, e Woldorff MG Neuroscienze Cognitive (II edizione) ed. Zanichelli

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=zkz6

DEVELOPMENTAL NEUROBIOLOGY

DEVELOPMENTAL NEUROBIOLOGY

Academic year:	2017/2018
Course ID:	SVB0064
Teacher:	Prof. Silvia De Marchis
Teacher contacts:	0116704682/6605, *silvia.demarchis@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	1st year
Type:	Distinctive
Credits/recognition:	6
Course SSD (disciplinary sector):	BIO/06 - anatomia comparata e citologia
Delivery:	Blended
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written and oral (optional)

PREREQUISITES
Basic knowledges of developmental biology and citology/histology of the nervous system.

COURSE OBJECTIVES

This course contributes to the learning goals of the Neurobiological curriculum of the Master in Cellular and Molcula Biology.

The main objective is to guide students to understand the genesis of the complexity of the nervous system, by developing research skills and critical readings of scientific papers dealing with different aspects of neural development. Through the analysis of the most recent literature based on different animal and in vitro models, the students will acquire knowledge on the principles and cellular/molecular mechanisms underlying normal development of the nervous system, as well as the neurobiological bases of neurodevelopmental disorders.

COURSE AIMS

KNOWLEDGE AND UNDERSTANDING

- identify fundamental concepts in developmental biology
- use appropriate terminology in developmental biology
- explain the principles of neural induction (molecular mechanisms and conservation among metazoa)
- associate specific genes to acquisition of regional identity in the developing nervous system
- define what is an organizing center in developing brain
- describe the cellular/molecular mechanisms underlying neural circuit development
- identify the features and potential of neural stem/progenitors cells and define their regulation by cell-autonomous vs non autonomous factors.
- link specific cellular/molecular dysfunctions to neurodevelopmental disorders

APPLYING KNOWLEDGE AND UNDERSTANDING

- identify the best model systems to address specific scientific questions in developmental neuroscience
- grasp the core concept of a scientific paper
- find and elaborate data related to gene expression/distribution in the developing nervous system starting from public availabe resources (i.e. Allen Brain Atlas)
- find possible experimental approaches and choose the right technology to address specific questions in the

field of developmental neuroscence

INDEPENDENT JUDGEMENT

- interpretation and discussion of scientific data.
- peer revision of other students tasks

COMMUNICATION SKILLS

- discussion of scientific papers and/or active participation to scientific discussion following lectures and seminars.
- organization of a student's workshop focused on the last frontiers in developmental neuroscience (presentation given by the students).

LEARNING SKILLS

- learning skills will be fostered through activities with peers working in group

COURSE DELIVERY

During the course there will be lecture-based classes to introduce the main questions and established knowledge in the field, but the students will be encouraged to be actively engaged through the organization of small groups to discuss material (mainly current research papers) for each topic. Specific readings and online activities on moodle platform will be assigned to the students and monitored by the teacher.

LEARNING ASSESSMENT METHODS

Examinations will be based on material covered in lectures, assigned readings, and online activities.

Final exam will be on the moodle platform: it will consist in 3 open questions.

Upon student's request, an integrative oral examination can be taken (written/oral: 1/1).

IMPORTANT: Early registration to the e-learning platform (moodle) is mandatory !

SYLLABUS

Introduction and basic knowledge in developmental biology; animal models, in vitro models and technologies for the study of nervous system development; neural induction, derivation of the nervous system in different metazoa, origin, role and molecular nature of the neural inducer; neural patterning, Hox genes and antero-posterior axis, dorso-ventral polarity of the neural tube; Cell proliferation and migration in the developing nervous tissue; Neural cell specification, determination and differentiation; Axon growth and guidance; Synapse formation and refinement; Cerebral cortex development; Adult neurogenesis.

SUGGESTED TEXTBOOKS AND READINGS

There is no specific textbook for this course. For basic and general reference, see Development of the Nervous System (D.H. Sanes, T.A. Reh, W. A. Harris) Academic Press – Elsevier, 3rd Ed.

Specific scientific Articles and Reviews will be uploaded on the Moodle course website.

Websites containing support videos, texts, images and other materials are also indicated.

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=t6mw

EXPERIMENTAL NEUROPATHOLOGY (not activated in 2016/17)

EXPERIMENTAL NEUROPATHOLOGY

Academic year:	2015/2016
Course ID:	SVB0065
Teacher:	Prof. Luca Durelli
Teacher contacts:	0116636327, *luca.durelli@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	1st year
Type:	Related or integrative
Credits/recognition:	6
Course SSD (disciplinary sector):	MED/06 - oncologia medica
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=8i6f

FORENSIC GENETICS AND LEGAL MEDICINE

FORENSIC GENETICS AND LEGAL MEDICINE

Academic year:	2017/2018
Course ID:	SVB0053
Teacher:	Dott. Sarah GINO Dott. Carlo ROBINO
Teacher contacts:	0116705919, *sarah.gino@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	2nd year
Type:	Elective
Credits/recognition:	4
Course SSD (disciplinary sector):	MED/43 - medicina legale
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Oral

COURSE OBJECTIVES

The aim of the course is to provide theoretical and practical principles for the comprehension and the resolution of forensic genetics questions and rudiments of legal medicine useful for the expert witness and the biologist. At the end of the course students will be able to: 1) analyze and solve with the most suitable technique of molecular biology questions about identification of traces and corpses; 2) analyze and solve with the most suitable technique of molecular biology questions about kinship; 3) process laboratory data using the most appropriate statistical methods. Otherwise students will acquire general rudiments of legal medicine i.e. professional secrecy, informed consent, privacy principles, legislation about organ transplantation, voluntary pregnancy interruption and assisted medical procreation.

LEARNING ASSESSMENT METHODS

Written test.

SYLLABUS

Identification, crime scene examination, preservation and diagnosis of the nature of biological traces DNA extraction, DNA quantification Markers in forensic genetics DNA amplification and typing Identification of parental relationships Interpretation of results: the statistical calculations in forensic genetics Forensic medicine: introduction - the offence Informed consent, privacy and professional secrecy Law 194/ 1978, Law 40/2004, regulations on organ explant and transplant Traumatology.

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=fz0r

GENERAL AND MOLECULAR PATHOLOGY (not activated in 2016/17)

GENERAL AND MOLECULAR PATHOLOGY

Academic year:	2015/2016
Course ID:	SVB0045
Teacher:	Prof. Riccardo AUTELLI Prof. Fabio PENNA
Teacher contacts:	0116707761, *riccardo.autelli@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	1st year
Type:	Distinctive
Credits/recognition:	6
Course SSD (disciplinary sector):	MED/04 - patologia generale
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written

PREREQUISITES
Structure and function of biological macromolecules. Cellular and molecular biology. Cytology and histology. Structure and function of organs. Immune system function.

COURSE OBJECTIVES

Aim of the course is to provide students with instruments to understand the molecular bases of some human diseases.
Students will be able to establish connections between molecular alterations and the pathogenesis of pathological processes at higher integration levels (subcellular compartments, cells, tissues and organs, and organism).

COURSE AIMS

KNOWLEDGE AND UNDERSTANDING:

Understanding of the main pathogenetic mechanisms involved in the pathogenesis of the most frequent human diseases as well as in some rare diseases.

APPLYING KNOWLEDGE AND UNDERSTANDING:

Identification of the most important histological aspects of inflammatory lesions, tissue necrosis, fibroproliferative diseases.

JUDGEMENT:

Analysis and interpretation of data from the literature

COMMUNICATION SKILLS:

Oral and written communication with an adequate technical language in both italian and english.

COURSE DELIVERY

The course is articulated in 46 hours of formal in-class lecture time and one practical laboratory of histological analysis (2 hours x student).

LEARNING ASSESSMENT METHODS

Written examination (both short and open answers) on the e-learning platform (moodle).

SYLLABUS

Disease and syndrome. Extrinsic and intrinsic causes of disease and their interactions. Unifactorial e multifactorial diseases.

Cellular responses to stress and toxic insults: adaptation, injury and death. Oxidative stress. Ischemia-reperfusion damage. Physiological and pathological ageing, tissue and cellular senescence.

Inflammation: acute inflammation, cells and mediators. Evolution. Chronic inflammation. Role of inflammation in cancer, basic notions of oncology and tumor classification.

Immunopathology: hypersensitivity, autoimmune diseases, immune deficiency.

DNA repair defects and their consequences. Germ cells, stem cells, neoplastic cells. Macromolecular turnover, cell death.
Fibroproliferative diseases: atherosclerosis and cirrhosis.
Endoplasmic reticulum stress. Protein misfolding. Intracellular protein accumulation as pathogenetic mechanism: amyloidosis and neurodegenerative diseases.
Erithrocyte physiopathology: molecular bases of haemoglobin and erithrocyte production and degradation. Mechanisms of anemia.
Radiation biology. Ionizing radiations: direct and indirect effect, cell and tissue damage; radioprotection. Photodynamic diseases.

Pathophysiological bases of heart dynamics and circulation diseases. Ischemic heart disease; heart failure. Hypertension. Shock. Thrombosis .

Alteration of glucose homeostasis: diabetes.

Pathology on the web and under the microscope.

SUGGESTED TEXTBOOKS AND READINGS

- Kumar, Abbas, Aster Robbins & Cotran Pathologic Basis of Disease, 9th edition, Elsevier

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=lsue

HUMAN ANATOMY

HUMAN ANATOMY

Academic year:	2017/2018
Course ID:	SVB0060
Teacher:	Prof. Stefano Gotti
Teacher contacts:	011 670 6610, *stefano.gotti@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	2nd year
Type:	Distinctive
Credits/recognition:	6
Course SSD (disciplinary sector):	BIO/16 - anatomia umana
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written and oral (optional)

COURSE OBJECTIVES

This teaching contributes to the realization of the Master's Degree Program in Cellular and Molecular Biology by contributing to a graduate degree that has in-depth and integrated knowledge of biological systems and complex organisms;

It also enables students to deepen their knowledge and abilities in the human anatomy and Neuroanatomy sectors respectively

COURSE AIMS

Knowledge and understanding skills

At the end of the teaching the student should:
- Describe the anatomical nomenclature of the human body
- Describe the anatomical and functional basics of pathological processes and drug action
- Link the genesis of pathological processes with the analysis of complex systems (tissues and organs, organism).

Judgment autonomy

At the end of the course the student should:
- to integrate knowledge gained in biomedical and neurobiological fields with data obtained from scientific literature

Communicative Skills

At the end of the course the student should:
- Communicate biomedical biology knowledge at the dissemination or specialist level

COURSE DELIVERY

The teaching is articulated in:

48 hours of formal in-class lecture time of Human Anatomy (6 CFU)

practical exercises of Macro-Anatomy are provided, where possible.

LEARNING ASSESSMENT METHODS

The teaching grade is determined solely on the basis of a written examination (1 hour) conducted with multiple choice questions and with at least one open question, and an optional oral examination. The examination will focus on all teaching arguments. Hopefully, there will be an optional oral examination to improve the written mark.
The written examination will be evaluated in thirtieths.

SYLLABUS

Generalities and Anatomical Terminology.

Osteology: Classification of bones and joints. The skull. The vertebral column; the thorax. The upper extremity. The lower extremity. Generality of muscles.

The vascular system: generality, large circulation system and pulmonary circulation system. The heart. The arteries. The veins. Intestinal circulation system, the cerebral circulation system; the fetal circulation system. The Lymphatic system: lymph, lymphonodes, spleen.

The Respiratory apparatus : respiratory tract. The lungs. The pleure.

The Digestive apparatus: generality; oral cavity, pharynx, esophagus, stomach, small and large intestine. Liver and pancreas.

The urinary apparatus: the kidneys and urinary tracts.

Genital apparatus: development and generality; male genital apparatus and female genital apparatus.

Endocrine system: hormone and receptor. Hypothalamus, pituitary gland. Epiphysis. Thyroid. Parathyroids. Pancreas. Adrenal gland. Gonads.

The integument Apparatus: skin, skin appendages, vascularization and innervation, the sensorial receptors.

Nervous system: identification, nomenclature, development, spinal cord. Brainstem, cerebellum; diencephalon; telencephalon (cortex and basal ganglia). General sensorial pathway. The special senses. Motor tract. Cranial Nerves. Spinal nerves. Autonomic nervous system.

SUGGESTED TEXTBOOKS AND READINGS

Martini et al. Anatomia Umana, IV edizione - Edises;
Seeley et al. Anatomia, II edizione - Idelson Gnocchi

Seeley's - Anatomy & Physiology - Mc Graw Hill Editors

Saladin - Human Anatomy - Mc Graw Hill Editors

Gilroy - Anatomy - An essential textbook - Thieme Editor

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=7oc1

Image Analysis Laboratory

Image Analysis Laboratory

Academic year:	2017/2018
Course ID:	SVB0054
Teacher:	Prof. Giancarlo PANZICA
Teacher contacts:	116706607, *giancarlo.panzica@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	2nd year
Type:	Elective
Credits/recognition:	4
Course SSD (disciplinary sector):	BIO/16 - anatomia umana
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written and oral

LEARNING ASSESSMENT METHODS

The teaching grade is determined on the basis of the results of a series of home works and a final PowerPoint presentation of a plug-in of the Image J program that was not discussed during the laboratory.

SUPPORT ACTIVITIES

Weekly homework sets will be assigned, and their solution will be posted and (if time allows) discussed in class.

SYLLABUS

Image theory. The digital image: limits, future developments, manipulation. Shooting techniques. Limits and possibilities of correction. The programs for image manipulation. The open access programs GIMP and Image J Standardization of imaging. Examples of the use of Image J: morphometric analysis, fractional area, densitometry, three-dimensional reconstructions.

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=gg30

IMMUNOPATHOLOGY AND ONCOLOGY (not activated in 2017/18)

IMMUNOPATHOLOGY AND ONCOLOGY

Academic year:	2016/2017
Course ID:	SVB0061
Teacher:	Prof. Paola Costelli Prof. Fabio PENNA
Teacher contacts:	0116707766, *paola.costelli@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	2nd year
Type:	Distinctive
Credits/recognition:	6
Course SSD (disciplinary sector):	MED/04 - patologia generale
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written and oral (optional)

PREREQUISITES

- Regulation of gene expression and signal transduction. - Bases of cellular physiology - Bases of metabolic biochemistry - Fundaments in genetics - Good knowledge of cellular biology, ciytology and histology - Bases of anatomy and physiology

COURSE OBJECTIVES

IMMUNOPATHOLOGY: Students should have a good knowledge about
- the role of the immune system in the pathogenesis of some human diseases
- the molecular mechanisms involved in immune-based diseases - the consequences of an altered immune response

ONCOLOGY: Students should have a good knowledge about
- the cellular and molecular mechanisms at the bases of carcinogenesis
- the natural history of neoplastic diseases - the main risk factors

COURSE AIMS

IMMUNOPATHOLOGY

KNOWLEDGE AND COMPREHENSION - At the end of the course the students should have learned:

1) the relevance of the immune system as a potential source of disease;
2) the molecular mechanisms underlying pathologies due to excessive or defective immune response;
3) the relevance of the immune system in oncology and neurodegenerative diseases.

ABILITY TO APPLY KNOWLEDGE AND COMPREHENSION - The student should become able to integrate the knowledge obtained from the section of Immunopathology with that derived from other courses such as the section of Oncology, General and Molecular Pathology, Medical and Oncological Genetics. In addition, he/she should demonstrate the acquisition of skill (theory and practice) to perform some immunometric analysis.

JUDGMENT AUTONOMY - The student should be able to evaluate and provide interpretation of experimental data. In addition he should have well understood the relevance of laboratory safety.

COMMUNICATION - Italian and English communication (write and speak), skill for group working.

ONCOLOGY

KNOWLEDGE AND COMPREHENSION - At the end of the course the students should have learned:

1) the basis of oncology;
2) the molecular mechanisms underlying both neoèplastic trasnformation and tumor progression;
3) the relevance of the environment (diet, physical activity, co-morbidity, etc.) in cancer progression.

ABILITY TO APPLY KNOWLEDGE AND COMPREHENSION - The student should become able to integrate the knowledge obtained from the section of Oncology with that derived from other courses such as the section of Immunopathology, General and Molecular Pathology, Medical and Oncological Genetics. In addition, he/she should demonstrate the acquisition of skill (theory and practice) to analyse histological preparations.

JUDGMENT AUTONOMY - The student should be able to evaluate and provide interpretation of experimental data. In addition he should have well understood the relevance of laboratory safety.

COMMUNICATION - Italian and English communication (write and speak), skill for group working.

COURSE DELIVERY

The organization of the course is the following: 44 hours (22 for Immunopathology, 22 for Oncology) will be dedicated to class and seminars, 2 hour/section to practicing the discussion of scientific papers. Attendance to every type of class is optional, though recommended.

LEARNING ASSESSMENT METHODS

Learning is verified by means of a written test held in specific predefined calls.

The test consists of a series of questions dealing with all the teaching program developed during the course. Questions are mainly open, aimed at evaluating the specific knowledge, but also the skill for both synthesis and speach organization. Max punctuation is 30/30, every question having the same weight. Particularly relevant executions will be marked cum laude.

SUPPORT ACTIVITIES

Seminars held during the teaching period.

SYLLABUS

IMMUNOPATHOLOGY Cytokines: molecular aspects, role in the regulation of cell turnover and immune response, as well as in the pathogenesis of diseases. Major histocompatibility complex in pathology. Immediate hypersensitivity (type I): anaphylaxis, atopia, skin reaction, asthma, anaphylactic shock. Type II hypersensitiviy: reactions against erythrocytes, platelets, blood groups, immune-based hemoliytic anemias. Immunocomplex hypersensitivity (type III): serum sickness, glomerulonephritis, Arthus reaction, immunocomplex detection. Delayed type hypersensitivity (type IV). Transplant rejection. Role of immune system, time and prevention. Immune tolerance and autoimmunity. Tolerance mechanisms breaking, association with pathology. Diagnostic and prognostic value of autoantibodies. Rheumatoid arthritis, ESL, Hashimoto tiroiditis, pernicious anemia, multiple sclerosis. Primary immunodeficiency: B and T lymphocyte deficit, severe combined immunodeficiency (SCID), adenosine deaminase deficiency, gene therapy. Deficiency of natural immunity. Secondary immunodeficiency. AIDS. Tumor immunology: immunosurveillance, tumor-associated antigens, immune escape. Immunotherapy: active and passive, tumor

immunotherapy, anti-cytokine treatments Vaccines: theory, efficiency and safety, experimental vaccines. Vaccinotherapy as an antineoplastic tool. Discussion and presentation of scientific papers.

ONCOLOGY The course will provide students with fundaments of general oncology and knowledge about cellular and mechanisms involved in carcinogenesis, as well as about experimental approaches in the field of oncological research. Tumors are genetic diseases of somatic cells. Tumors are an heterogeneous group of diseases sharing some common biological features. Failure, in neoplstic cell populations of physiological antineoplastic defense mechanisms(apoptosis, DNA repair, cell senescence). Cancer epidemiology data. Tumor histopathologycal and clinical classification. Tumor natural history. Carcinogenesis as a multiphasic microevolutive process. Genetic and epigenetic events. Angiogenesis. The role of inflammation. Infiltrative growth. Epithelial-mesenchimal transition. Neoplastic progression. Metastatization. Stem cell theory. Tumor-host interactions. Cancer cachexia Tumor etiology. Chemical, biological and physical risk factors. Viral cancerogenesis. Hormones and cancer. Molecular oncology. Oncogenes and oncosuppressor genes. Mechanisms of activation and inactivation. Functional consequences. Outline of conventional and molecular therapeutic approaches to neoplastic diseases.

SUGGESTED TEXTBOOKS AND READINGS

Slides from lectures available on the Moodle platform.

Textbooks:

IMMUNOPATHOLOGY - Abbas A.K., Lichtman A.H., Pillai S. Cellular and Molecular Immunology, Elsevier- Saunders, 2014

ONCOLOGY - Weinberg RA. The biology of Cancer, 2nd ed, 2014 Garland Science - Tannock IA, Hill R, Bristow R, Harrington L. The basic science of Oncology. 5th edition, 2013, Mc Graw-Hill Education - DeVita, Hellman, and Rosenberg's Cancer: Principles & Practice of Oncology 8th edition http://login.offcampus.dam.unito.it/menu

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=kqb9

IMMUNOPATHOLOGY AND PHYSIOPATHOLOGY

IMMUNOPATHOLOGY AND PHYSIOPATHOLOGY

Academic year:	2017/2018
Course ID:	SVB0101
Teacher:	Prof. Fabio PENNA Prof. Riccardo AUTELLI
Teacher contacts:	011 6707759, *fabio.penna@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	2nd year
Type:	Distinctive
Credits/recognition:	6
Course SSD (disciplinary sector):	MED/04 - patologia generale
Delivery:	Formal authority
Language:	English
Attendance:	Optional
Type of examination:	Written

PREREQUISITES
The students are encouraged to already have learned the basic notions of cell biology, biochemistry, human anatomy, physiology, immunology, oncology and molecular pathology.

PROPEDEUTIC FOR
-

COURSE OBJECTIVES

Unit I

Students should acquire a good knowledge about:

- the consequences of an altered immune response

- the role of the immune system in the pathogenesis of human diseases

- the molecular mechanisms involved in immune-based diseases

Unit II

To allow the students to figure out how loss of molecular and cellular homeostasis, or failure of specific organs/systems impairs functioning of the whole organism.

To be focused also on impact of the above alterations on human health, in terms of both life expectancy and quality.

COURSE AIMS

KNOWLEDGE AND COMPREHENSION - At the end of the course the students should have learned:

1) the relevance of the immune system as a potential source of disease;

2) the molecular mechanisms underlying pathologies due to excessive or defective immune response;

3) the necessary information to understand how metabolic alterations or loss of function at cellular, tissue and organ

levels affect human health.

ABILITY TO APPLY KNOWLEDGE AND COMPREHENSION - The student should become able to integrate the knowledge obtained from the section of Immunopathology with that derived from other courses such as Oncology and Molecular Pathology, Medical and Oncological Genetics. In addition, the student should demonstrate the acquisition of knowledge on how to perform immunometric analysis.

The student will also gain the capability to face with, communicate and discuss about subjects relevant to pathophysiology and human health with a sound language.

JUDGMENT AUTONOMY - The student should be able to evaluate and provide interpretation of experimental data.

COURSE DELIVERY

Each Unit consists of 3 CFU, delivered as 24 hours of formal in-class lectures and seminars, for a total of 8 CFU (48 hours of lectures). Though recommended, attendance to lessons is optional and will be monitored exclusively for statistical purposes.

LEARNING ASSESSMENT METHODS

Learning will be assessed by means of a written test held in specific predefined calls.

The test consists of 6 questions (3 for each Unit) dealing with all the teaching program developed during the course. The time allowed will be 2 hours. Questions are mainly open, aimed at evaluating the specific knowledge, but also the skill for both synthesis and speech organization. Max punctuation is 30/30, every question having the same weight. Particularly relevant executions will be marked cum laude.

SUPPORT ACTIVITIES

Unit I

Seminars held during the teaching period and practical demonstration of immunometric and flow cytometry techniques.

Unit II

None scheduled

SYLLABUS

Unit I - Immunopathology

Cytokines: molecular aspects, role in the regulation of cell turnover and immune response, as well as in the pathogenesis of diseases. Major histocompatibility complex in pathology. Immediate hypersensitivity (type I): anaphylaxis, atopia, skin reaction, asthma, anaphylactic shock, food allergies. Type II hypersensitiviy: reactions against erythrocytes, platelets, blood groups, immune-based hemoliytic anemias. Immunocomplex hypersensitivity (type III): serum sickness, glomerulonephritis, Arthus reaction, immunocomplex detection. Delayed type hypersensitivity (type IV). Transplant rejection. Role of immune system, time and prevention. Immune tolerance and autoimmunity. Tolerance mechanisms breaking, association with pathology. Diagnostic and prognostic value of autoantibodies. Rheumatoid arthritis, ESL, Hashimoto tiroiditis, pernicious anemia, multiple sclerosis. Primary immunodeficiency: B and T lymphocyte deficit, severe combined immunodeficiency (SCID), adenosine deaminase deficiency, gene therapy. Deficiency of natural immunity. Secondary immunodeficiency. AIDS. Tumor immunology: immunosurveillance, tumor-associated antigens, immune escape. Immunotherapy: active and passive, tumor immunotherapy, anti-cytokine treatments Vaccines: theory, efficiency and safety, experimental vaccines. Discussion and presentation of scientific papers.

Unit II - Pathophysiology

Heart and circulation diseases. Myocardial infarction and outcomes.

Blood pressure control and alterations: hypertension, hypotension. Genetic factors and monogenic forms of hypertension.

Thrombosis and embolism.

Edema: localized and systemic forms; pathogenesis. Acute mountain sickness and complications. Shock: different types, related pathogenesis, evolution and outcomes.

Diabetes. classification and pathogenesis. Long-term complications.

Atherosclerosis: lipoprotein metabolism and molecular pathogenesis of intimal lipoprotein accumulation. Basic vascular defenses against alterations of endothelial permeability.

Liver pathology: viral and non-viral pathogenesis. steatosis, fibrosis; cirrhosis and complications. Liver failure.

Lung diseases, pulmonary edema, obstructive and restrictive diseases. Impact of pulmonary disease on acid-base equilibrium.

Gene therapy: principles and applications to monogenic diseases. Cancer gene therapy: principles, feasibility, strategies, perspectives.

SUGGESTED TEXTBOOKS AND READINGS

The slides used for the class lectures will be made available to registered students on the Moodle platform. This material will represent a trace of the subjects covered by the formal lessons, but will not replace the official information conveyed by the reference course textbook, as detailed below.

Unit I

Abbas A.K., Lichtman A.H., Pillai S. Cellular and Molecular Immunology 8th edition, Elsevier- Saunders, 2014. Specific papers discussed during the lessons.

Unit II

Robbins and Cotran, Pathologic basis of disease, Elsevier.

Specific papers conveying last updates on critical subjects, for whose the recommended textbook may reveal not adequately updated.

NOTE

-

Borrowed from: -

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=kup8

MEDICAL AND CANCER GENETICS

MEDICAL AND CANCER GENETICS

Academic year:	2017/2018
Course ID:	SVB0062
Teacher:	Prof. Claudia Giachino Tiziana Venesio
Teacher contacts:	0116705056, *claudia.giachino@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	2nd year
Type:	Related or integrative
Credits/recognition:	6
Course SSD (disciplinary sector):	MED/03 - genetica medica MED/08 - anatomia patologica
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written

COURSE OBJECTIVES

The aim of the course is to provide students with knowledge about the genetic basis of human diseases. We will develop application aspects, such as diagnostic and therapeutic possibilities of genetic-based diseases and will deepen the aspects related to new technologies that allow an innovative approach to applied research in medical genetics. This will complete biomedical training of students with the latest information about the causes of hereditary diseases and their prevention.

COURSE AIMS

KNOWLEDGE AND UNDERSTANDING
Knowledge of medical genetics
ABILITY TO APPLY KNOWLEDGE AND UNDERSTANDING
Learn about the genetic basis of diseases and the use of genetic testing for diagnosis, for the study of the susceptibility and for the prevention of genetic diseases
AUTONOMY OF JUDGEMENT
Be able to understand the scientific literature on the subject, and evaluate the potential applications in medical practice
COMMUNICATION SKILLS
Develop terminology and information to be transferred to potential users.

LEARNING ASSESSMENT METHODS

The candidate is offered a few open-ended questions and some problems of medical genetics.

Scritto (che consiste in risposte brevi a quesiti aperti) Al candidato vengono proposte una decina di quesiti, che prendono avvio da un caso, un risultato di un test, un'immagine, e che si articolano ciascuno in 3-4 domande.

SYLLABUS

Introduction to the course

Genes, genomes and genetic diseases genetic variability
Classification of genetic disorders
Transmission of characters and Examples of monogenic diseases
Risk of recurrence of monogenic diseases
Methods of study of the alteration of genetic information: DNA tests
The diagnosis of hereditary diseases
Prenatal diagnosis of genetic diseases
Concepts of medical genetics applied to artificial insemination
Cystic diseases of the kidney, as an example of monogenic disease
Outline of human cytogenetics: the structure of chromosomes and their study.
The chromosomal diseases and their causes
The diagnosis of chromosomal alterations
Risk of recurrence of chromosomal disorders
Molecular Cytogenetics and fields of application
Multifactorial or complex diseases
Immunogenetics
Disease Celiac disease as an example of Complex
Stem cells and application in medicine
Treatment of genetic diseases
Exercises and course evaluation
Hereditary tumors, family and sporadic
Oncogenes and tumor suppressor genes
Genetic markers, linkage analysis and linkage disequilibrium, positional cloning and candidate gene approach
The model of retinoblastoma and the loss of heterozygosity in the study of tumor suppressor genes
Mutations and their characterization
Hereditary tumors transmitted dominant and recessive cancer of the colon
Hereditary tumors and shelter systems: cancer of the colon and breast cancer, hereditary tumors, family and sporadic gastric cancer and melanoma
Stem cells and cancer
Qualitative and quantitative variations of splicing, alternative splicing as a low-penetrance allele, RNA interference therapy
Oncogene addiction and targeted therapy

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=87pa

METABOLIC BIOCHEMISTRY

METABOLIC BIOCHEMISTRY

Academic year:	2017/2018
Course ID:	SVB0042
Teacher:	Dott. Giovanna Di Nardo Prof. Gianfranco Gilardi
Teacher contacts:	0116704689, *giovanna.dinardo@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	1st year
Type:	Distinctive
Credits/recognition:	6
Course SSD (disciplinary sector):	BIO/10 - biochimica
Delivery:	Formal authority
Language:	Italian
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Oral

COURSE OBJECTIVES

The course aims to provide students with organ-specific and advanced biochemistry by studying the biosynthesis and degradation of specific molecules and cofactors with high impact on metabolic balance, medicine and pharmacology. Furthermore, it aims to elucidate the molecular mechanisms underlining metabolic and hormonal regulation. In the last part, specific metabolic pathways from different organisms will be studied to understand how they are exploited for biotechnological applications.

COURSE AIMS

KNOWLEDGE AND UNDERSTANDING. Chemical/biochemical aspects: the students will be able to master advanced biochemical concepts; must be able to understand how metabolic regulation is key to life; will learn how some metabolic pathways can be exploited for biotechnological applications.

APPLYING KNOWLEDGE AND UNDERSTANDING. Advanced biochemical, molecular and biotechnological methodologies.

COURSE DELIVERY

The course consists of frontal lectures (48 hours in class). Frequency to in-class lessons is optional (and highly recommended).

LEARNING ASSESSMENT METHODS

The final grade consists of a written exam with 3 questions, each one counting 1/3 of the final grade.

The possible questions are published in the teaching material of the course.

Students should gain a sufficient grade (18 or more) on all the three questions in order to pass the exam.

The examination committee, if necessary, reserves the right to verify the preparation of the student with an oral exam, before registration of final grade.

SUPPORT ACTIVITIES

Support activities are organized on the Moodle e-learning platform (http://biologia.i-learn.unito.it/).

SYLLABUS

Part 1. Advanced metabolic biochemistry.

1- Tissue - specific metabolic regulation.

2- Iron metabolism.

3- Amino acid metabolism: biosynthesis of amino acids.

4- Metabolism molecule derived from amino acids : porphyrins and heme.

5- Protein metabolism; sorting protein destiny, chaperones and folding, protein degradation, diseases linked to proteostasis.

6- Metabolism of xenobiotics: Phase I and Phase II

Part 2. Mtabolic and hormonal regulation

1- Hormones: classification, structure and function. Hormone receptors, signal transduction and metabolic effects.

2- The hormonal regulation

3- Steroid and steroid hormones : biosynthesis and regulation . Role and regulation in the endocrine and neuroendocrine .

Part 3. Applied biochemistry

1- Microbial metabolism and fermentation: potential applications

2- Production of biofuels

3- Detoxification of pollutants

SUGGESTED TEXTBOOKS AND READINGS

David L. Nelson, Albert L. Lehninger, Lehninger principles of biochemistry.

Robert K. Murray, David A. Bender, Kathleen M. Botham, Peter J. Kennelly, Victor W. Rodwell, P. Anthony Weil. Harper's Illustrated Biochemistry

Slides and notes of the lectures.

Recent reviews and reserach papers indicated during the lectures and available on the Moodle e-learning platform (http://biologia.i-learn.unito.it/).

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=mz1e

MOLECULAR PHARMACOLOGY

MOLECULAR PHARMACOLOGY

Academic year:	2017/2018
Course ID:	SVB0043
Teacher:	Dott. Loredana SERPE Dott. Roberto CANAPARO
Teacher contacts:	0116706235, *loredana.serpe@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	1st year
Type:	Distinctive
Credits/recognition:	6
Course SSD (disciplinary sector):	BIO/14 - farmacologia
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written

PREREQUISITES
Basic knowledge of Anatomy, Biohemistry, Cellular and Molecular Biology, Physiology and Pathology.

COURSE OBJECTIVES

- Core and advanced knowledge of the fundamental principles of drug action at the molecular level, through which students will be able to connect the action of selected groups of clinically important drugs with body's responses
- Drug knowledge not only as a therapeutic tool but also as a research tool, so students will be able to understand preclinical and clinical research strategies for drug development
- Scientific thinking through the development of students' critical analysis skills, so students will be able to understand experimental approaches and data of scientific literature improving their knowledge as well as their research skills

COURSE AIMS

- Understanding of drug principles and molecular targets of selected groups of clinically important drugs
- Practical experience of pharmacokinetic/ pharmacodynamic studies
- Research skills to characterize drug action
- Pre-clinical and clinical strategies for drug discovery and development

COURSE DELIVERY

The course consists of:

- 36 teaching hours to provide core knowledge of the different topics covered
- 12 hours of activities for students discussing scientific literature on pharmacological topics of interest

LEARNING ASSESSMENT METHODS

The examination consists of a written test with 21 multiple choice questions (1/30 for each multiple choice question) and 3 open questions (3/30 for each open question) to evaluate the understanding of basic principles of Pharmacology and the student ability to correlate molecular mechanisms and drug response

SYLLABUS

Part I - General Principles

- Drug discovery and development
- Pharmacokinetics
- Pharmacodynamics
- Pharmacogenetics and Pharmacogenomics

Part II - Selected groups of clinically important drugs will be discussed with respect to the mechanism of action at the molecular level

- Drugs affecting the Cardiovascular System
- Drugs affecting the Nervous System
- Anti-inflammatory and immunosuppressant drugs
- Antibacterial drugs
- Antiviral drugs
- Anticancer drugs

SUGGESTED TEXTBOOKS AND READINGS

Teaching Materials:

- "Molecular Pharmacolgy" at UniTo website

Reference Books:

- Goodman & Gilman's "The pharmacological basis of therapeutics" Mc Graw Hill Ed.
- Katzung "Basic & Clinical Pharmacology" Mc Graw Hill Ed.
- Rang & Dale "Pharmacology" Elsevier Ed.

Websites of Interest:

- http://www.nature.com/pharma
- http://www.ncbi.nlm.nih.gov
- http://www.bps.ac.uk
- http://farmacologiasif.unito.it

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=6gac

NEUROANATOMY AND IMAGING

NEUROANATOMY AND IMAGING

Academic year:	2017/2018
Course ID:	SVB0063
Teacher:	Prof. Giancarlo PANZICA Prof. Stefano Gotti
Teacher contacts:	116706607, *giancarlo.panzica@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	1st year
Type:	Distinctive
Credits/recognition:	9
Course SSD (disciplinary sector):	BIO/16 - anatomia umana
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written and oral

PREREQUISITES
Morphology, Physiology and Biology of the cell. Tissue organization. Vertebrate Anatomy. Use of computer…

COURSE OBJECTIVES

This teaching contributes to the realization of the Master's Degree Program in Cellular and Molecular Biology by contributing to a graduate degree that has in-depth and integrated knowledge of biological systems and complex organisms; It also enables students to deepen their knowledge and abilities in the human neuromorphology

COURSE AIMS

Knowledge and understanding skills
At the end of the teaching the student should:
- Describe the anatomical and functional structures of the nervous system
- to acquire an advanced scientific training in basic neuroscience
- Link the genesis of pathological processes with the analysis of complex systems (tissues and organs, organism).

- Ability to use software image manipulation programs and image analysis.
- Understanding the characteristics of the digital image, the principles of morphometry and statistical interpretation

Judgment autonomy
At the end of the course the student should:
- to integrate knowledge gained in neuroanatomy fields with data obtained from scientific literature
- Ability to choose between various alternatives for solving problems of image analysis

Communicative Skills
At the end of the course the student should:
- Communicate neuroscience knowledge at the dissemination or specialist level

- Presentation of the results in statistical tables

COURSE DELIVERY

The teaching is articulated in 40 hours of formal in-class lecture time for the Neuroanatomy module and in 56 hours of formal in-class lecture time and work solving practical exercises for the Imaging module.

Practical exercises of Macro-Anatomy are provided, where possible.

LEARNING ASSESSMENT METHODS

Neuroanatomy module:

The teaching grade is determined solely on the basis of a written examination (1 hour) conducted with multiple choice questions and with at least one open question, and an optional oral examination. The examination will focus on all teaching arguments. Hopefully, there will be an optional oral examination to improve the written mark.
The written examination will be evaluated in thirtieths.

Imaging module:

The teaching grade is determined on the basis of the results of a series of home works and a final PowerPoint presentation of a plug-in of the Image J program that was not discussed during the laboratory. The examination will be evaluated in thirtieths.

The final mark (in thirtieths) will be the average of marks obtained in the two modules.

SUPPORT ACTIVITIES

For the Imaging module weekly homework sets will be assigned, and their solution will be posted and (if time allows) discussed in class.

SYLLABUS

Neuroanatomy module:

Introduction to the course. General and Anatomical Nomenclature.

Endocrine system: hormone and receptor. Hypothalamus, pituitary gland. Epiphysis. Thyroid. Parathyroids. Pancreas. Adrenal gland. Gonads.

The integument Apparatus: skin, skin appendages, vascularization and innervation, the sensorial receptors.

Nervous system: identification, nomenclature, development, spinal cord. Brainstem, cerebellum; diencephalon; telencephalon (cortex and basal ganglia). General sensorial pathway. The special senses. Motor tract. Cranial Nerves. Spinal nerves. Autonomic nervous system.

Imaging module:

Image theory. The digital image: limits, future developments, manipulation. Shooting techniques. Limits and possibilities of correction. The programs for image manipulation. The open access programs GIMP and Image J Standardization of imaging. Examples of the use of Image J: morphometric analysis, fractional area, densitometry, three-dimensional reconstructions.

SUGGESTED TEXTBOOKS AND READINGS

Martini et al. Anatomia Umana, IV edizione - Edises;
Seeley et al. Anatomia, II edizione - Idelson Gnocchi

Seeley's - Anatomy & Physiology - Mc Graw Hill Editors

Saladin - Human Anatomy - Mc Graw Hill Editors

Gilroy - Anatomy - An essential textbook - Thieme Editor

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=js8h

---

NEUROPHYSIOLOGY

NEUROPHYSIOLOGY

Academic year:	2017/2018
Course ID:	SVB0102
Teacher:	Prof. Alessandra Fiorio Pla Dott. Annalisa Buffo
Teacher contacts:	0116704667, *alessandra.fiorio@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	2nd year
Type:	Distinctive
Credits/recognition:	6
Course SSD (disciplinary sector):	BIO/09 - fisiologia
Delivery:	Formal authority
Language:	English
Attendance:	Obligatory
Type of examination:	Oral

COURSE OBJECTIVES

The course is organized in 6 ECFT and aims to provide theoretical, technical and methodological background to critically investigate nervous system functions.

The course is focused on the relevant issues of Neurophysiology and aims to foster basic knowledge of students on cellular neurophysiology and electrical signals transmission as well as integrated knowledge of neurophysiology. Additional objective points to a quantitative analysis of some conceptual and technical approaches to neurophysiological mechanisms including specific hands on in modern Neuroscience labs using cutting edge techniques in the field by means of invited seminars.

For each item, students learn how to highlight the specific scientific question, to interpret data, to discuss the experimental approaches employed by the authors.

The main objective is to build a solid background on cellular and integrated neurophysiology in order to develop the ability to critically analyze and interpret the results of the related scientific literature.

COURSE AIMS

- Have strong knowledge of the cellular and integrated neurophysiology
- Re-analyzing information
- Critically evaluating scientific publications and media reports
- Selecting robust information from a variety of sources
- Extending and applying knowledge of cellular neurophysiology to new contexts
- Making reasoned predictions and generalizations from experimental evidence and theoretical information
- Drawing valid conclusions and giving explanations supported by evidence/justification
- Drawing on knowledge and understanding of cellular and integrated neurophysiology to make accurate statements, describe complex information, provide detailed explanations and integrate knowledge
- Discuss the strenght and limitations of the results published on research papers, eventually identifying sources of errors and biases
- Communicating cellular neurophysiology findings and concepts fully, appropriately and using a variety of

different modalities

COURSE DELIVERY

Lectures and seminars

Students will be assigned specific readings on selected topics and will present and discussed together.

- Lectures : Attention is given to focused scientific questions, starting from the knowledge provided by the scientific literature. Experimental approaches, results and conclusions are deeply analysed.
- Research assays: discussion sessions in which students will be divided into working groups focusing on the different topics of the course.

LEARNING ASSESSMENT METHODS

Examinations will be based on material covered in lectures, assigned readings, seminars and on site activities.

Research Assay: This at-home assignment will refer to specific topics of the course. The essay (up to 2000 characters + figures, tables and references) will be prepared by groups of normally three students and presented orally by the end of the semester. The Research Essay will give rise to additional points to the final grade of final exam. Correspondence between vote to the Research Essay and additional points for final exams is as follows: 22-23, 0.5 points; 24-25, 1 points; 26-27, 1.5 points; 28-30, 2 points.

Final exam – This exam will be an oral exam based on the topics presented during the course. The maximum grade will be 30/30. Any additional points obtained by the Research Assay will be added to the final exam of the first exam session. Grading 31-33 will give rise to " 30 cum laude"

Academic conduct: The penality for course-related dishonesty (ei. cheating on exams, plagism, etc) will be failure for the entire course.

SYLLABUS

The main objective of the course is to convey to the students the ability to

- provide theoretical, technical and methodological background to critically investigate nervous system functions
- Drawing on knowledge and understanding of cellular and integrated neurophysiology to make accurate statements, describe complex information, provide detailed explanations and integrate knowledge.

Topics covered:

- Cell membrane permeability: fluxes across the plasma membrane. Fluxes and lows for neutral species and electrolytes; Fick; Nernst-Plank; Goldman-Hodgkin-Katz;
- A modern classification of transporters and pumps. Functional roles. Ion channels: classification, structural and functional properties.
- How to study ion fluxes through plasmamembrane and intracellular membranes? Electrophysiology: history and techniques. Patch clamp.
- Electric Excitability of the cells. Action Potential. Hodgkin and Huxley's analyses of the squid giant axon. Amplitude and frequency coding. Postsynaptic and receptor potentials.
- Synaptic transmission: presynaptic mechanisms; Ca2+ and transmitters release; postsynaptic mechanisms
- Genetic approaches to control neural living cells: OPTOGENETIC, CHEMOGENETIC and MAGNETOGENETIC
- Cellular bases of sensory physiology: role of TRP channels
- Physiology of photoreceptors. Receptive fields of visual neurons. Retinotopic maps and columnar organization of the visual cortex. Principles of motion perception and color vision.

SUGGESTED TEXTBOOKS AND READINGS

Lectures, selected papers and websites are available on Moodle.

For some topics selected textbooks available at DBIOS library.

Selected textbooks

- Johnston, and Wu. Foundations of Cellular Neurophysiology. MIT Press.
- Hille. Ionic Channels of Excitable Membranes, 3rd Edition. Sinauer Associates, Inc.

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=r4yt

---

ONCOLOGY AND MOLECULAR PATHOLOGY

ONCOLOGY AND MOLECULAR PATHOLOGY

Academic year:	2017/2018
Course ID:	SVB0100
Teacher:	Prof. Paola Costelli Prof. Luca Durelli
Teacher contacts:	0116707766, *paola.costelli@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	1st year
Type:	Distinctive
Credits/recognition:	6
Course SSD (disciplinary sector):	MED/04 - patologia generale
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written and oral (optional)

PREREQUISITES
- Regulation of gene expression and signal transduction - Bases of cellular physiology - Bases of metabolic biochemistry - Fundaments in genetics - Good knowledge of cellular biology, ciytology and histology - Bases of anatomy and physiology

PROPEDEUTIC FOR
Immunopathology and Physiopathology, Medical and Cancer Genetics

COURSE OBJECTIVES

The teaching fits with the general objectives of the Master in Cellular and Molecular Biology, that is aimed to provide students a deep and integrated knowledge of biological systems, from molecules to the whole organisms, and the ability to apply such knowledge in specific fields such as biotechnologies, biomedicine and neurosciences. The teaching will focus on the molecular bases of human diseases, including oncology.

COURSE AIMS

At the end of the teaching students will be able to establish connections between molecular alterations and the pathogenesis of disease processes at high integration levels (subcellular compartments, cells, tissues/organs and organism). The following specific competencies will be acquired:

KNOWLEDGE AND COMPREHENSION

- to describe the molecular alterations involved in the pathogenesis of the most frequent human diseases;

- to identify the role played by the inflammatory process in the onset and progression of human pathologies;

- to show the influence of both genetic and epigenetic background in the development of diseases;

- to understand the relevance of the environment in the occurrence of pathological states

- to recognize the reciprocal interplay of the different organ/tissue compartments in the disease progression;

- to critically read and discuss scientific papers dealing with the mechanisms underlying diseases;

JUDGEMENT AUTONOMY

At gthe end of the teaching the students will be able to:

- evaluate and provide interpretation of experimental data;

- integrate the knowledge obtained in the present teaching with that deriving from other teachings , with particular emphasis to the understading of pathogenetic mechanisms.

COMMUNICATION SKILL

Students will develop the ability to:

- produce oral and/or written communications with an adequate technical language, in both italian and english;

- perform group working.

COURSE DELIVERY

The organization of the course is the following: 44 hours will be dedicated to class and seminars, 4 hour to practicing the discussion of scientific papers. Attendance to every type of class is optional, though recommended.

LEARNING ASSESSMENT METHODS

Learning is verified by means of a written test held in specific predefined calls.

The test (90 minutes) consists of a series of questions dealing with all the program developed during the teaching. Questions are mainly open, aimed at evaluating the specific knowledge, the acquisition of an appropriate technical language, the skill for both synthesis and speach organization. Since all the didactic material is available online, no differences will be made among students that have physically attended the teaching or not. Max punctuation is 30/30, every question having the same weight. Particularly relevant executions will be marked cum laude.

SUPPORT ACTIVITIES

Seminars held during the teaching period.

SYLLABUS

Molecular Pathology

Disease and syndrome. Extrinsic and intrinsic causes of disease and their interactions. Cellular responses to stress and toxic insults: adaptation, injury and death. Oxidative stress. Ischemia-reperfusion damage.

Physiological and pathological ageing. Progeroid syndromes. Tissue and cellular senescence.

DNA repair defects and their consequences. Germ cells, stem cells, neoplastic cells.

Genetic diseases. Causes and mechanisms of mutation. Chromosomes: structural and numerical alterations. Trinucleotide repeat pathologies (X-fragile). Genomic imprinting (Prader-Willy syndrome). Monogenic diseases. Lysosomal storage diseases

Acute inflammation: cells and mediators. Evolution. Chronic inflammation. Fibroproliferative diseases: atherosclerosis and cirrhosis

Endoplasmic reticulum stress. Protein misfolding. Intracellular protein accumulation as pathogenetic mechanism.

Amyloidosis and neurodegenerative diseases.

Erythrocyte physiopathology: molecular bases of haemoglobin and erythrocyte production and degradation. Mechanisms of anemia.

Histopathology on the web, paper discussion

Oncology

The nature of cancer: monoclonality, heterogeneity. Epidemiology. Classification. Lifestyle and cancer.

Carcinogenesis as a multifactorial progressive process. Inflammation and cancer

Cancer stem cells.

Oncogenes and oncosuppressor genes

Angiogenesis

Invasion and metastasis

Tumor etiology. Viral carcinogenesis. Chemical carcinogenesis

Tumor-host interaction-1: immune response to tumors

Tumor host interaction-2: obesity, metabolic syndrome and cancer

Tumor host interaction-3: cancer cachexia

Outline of conventional and molecular therapeutic approaches to neoplastic diseases.

Paper discussion

SUGGESTED TEXTBOOKS AND READINGS

Slides from lectures and papers/videos available on the Moodle platform (http://cmb.i-learn.unito.it/course/view.php?id=60).

Textbooks:

- Kumar, Abbas, Aster Robbins & Cotran Pathologic Basis of Disease, 9th edition, Elsevier

- Weinberg RA. The biology of Cancer, 2nd ed, 2014 Garland Science

-Tannock IA, Hill R, Bristow R, Harrington L. The basic science of Oncology. 5th edition, 2013, Mc Graw-Hill Education

- DeVita, Hellman, and Rosenberg's Cancer: Principles & Practice of Oncology 8th edition
http://login.offcampus.dam.unito.it/menu

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=g12a

PARASITOLOGY

SVB006

Academic year:	2017/2018
Course ID:	
Teacher:	Dott. Marco Albonico (Lecturer)
Teacher contacts:	011- 4310218, *albonico@tin.it*
Year:	
Type:	Elective
Credits/recognition:	4
Course SSD (disciplinary sector):	VET/06 - parassitologia e malattie parassitarie degli animali
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Oral

PREREQUISITES
Basic knowledge in general biology Basic knowledge in zoology, epidemiology, immunology, pathogenesis, public health Interest in international health

COURSE OBJECTIVES

The teaching objectives are to illustrate through the biological cycles and the host-parasite interactions the evolution, epidemiology, pathogenesis and immunology of the most important parasitic diseases of humans with hints on clinical, diagnostic and therapeutic aspects. The teaching wish to stimulate the students to deep their knowledge on different topics of parasitology through the lens of history, biology, pharmacology, economy and human development, and of international health themes of global relevance.

COURSE AIMS

Parasitology is a discipline which demands a multi-disciplinary approach. Parasites, in fact, are an hazard for human and animal health, can be transmitted by insect vectors, and their transmission is often due to insufficient hygienic-sanitary conditions. This is confirmed by the fact that these infections hit mainly countries with limited resources, lacking a sewage system and proper sanitation facilities, access to safe water and with a warm and tropical climate. This situation is worsened by the vicious cycle poverty-disease. Parasitic diseases have had and still have a huge social burden and their control is one of the worldwide challenges to improve the health and development of entire communities. Parasitology is fascinating because goes beyond the relation between a host and a parasite and entangles aspects of anthropology, social sciences, public health, environment, human and veterinary medicine, and, ultimately the economic and human development.

The teaching of parasitology is of fundamental importance for the student who wish to approach these global challenges and also for those who plan to look for a professional occupation in Italy, being parasitic diseases emerging or-remerging associated to travels and population migrations. The aim of the course is therefore to complement a traditional approach in which the students are introduced to the world of parasites and their diseases describing the general aspects, from the epidemiology to the diagnosis, with a particular focus to up-to-date hot topics like migrations movements, new technologies, epidemics and drug resistance. The special part of parasitology teaching deals with the specific host-parasite interaction for the main species which are pathogens to humans, the biological hazard for the host, and explores in details the big endemic parasitic diseases and the public health aspects related to their control in endemic communities. The lecturer will try to transfer his experience of parasitologist and expert in international health acquired during years of work in developing countries where parasites are endemic.

LEARNING ASSESSMENT METHODS

Oral interview

SYLLABUS

Argomento	Ore Lez.	Ore Esercit.	Data	Ora	Sede
OSPITE - PARASSITA: EVOLUZIONE, ADATTAMENTO, SIMBIOSI. E' nato prima l'ospite o il parassita? IMMUNO PARASSITOLOGIA Parassiti, citochine e ricerca di punta	1 1		3/3	11-13	Aula 5 Via Accademia Albertina
EPIDEMIOLOGIA 1 La mappa del mondo secondo i parassiti. Malattie parassitarie: causa/effetto della povertà EPIDEMIOLOGIA 2 Micro e macro parassiti, carica parassitaria. Anche i parassiti viaggiano	1 1		10/3	9-11	Aula 5 Via Accademia Albertina
FARMACI ANTIPARASSITARI E RESISTENZE Chi resiste di più	2		10/3	11-13	Aula 5 via Accademia Albertina
ENTOMOLOGIA 1 I vettori volanti: zanzare, mosche, flebotomi ENTOMOLOGIA 2 I vettori terrestri: pulci, zecche, cimici, pidocchi	1 1		31/3	11-13	Aula 5 via Accademia Albertina
TECNICHE DI DIAGNOSTICA PARASSITOLOGICA Dal vetrino alla PCR Update sulla diagnostica molecolare	1 1		7/4	9-11	Laboratorio didattico, cortile (corso Raffaello)
DIAGNOSI DIRETTA DI LABORATORIO Il microscopio: questo sconosciuto ENTOMOLOGIA PRATICA		1 1	7/4	11-13	Laboratorio didattico, cortile (corso Raffaello)
TRIPANOSOMI Americani e africani	2		14/4	11-13	Aula 5 via Accademia Albertina
LEISHMANIA, TOXOPLASMOSI I parassiti "nostrani"	2		21/4	11-13	Aula 5 via Accademia Albertina

MALARIA The big killer Esercitazioni	2	2	28/4 28/4	9-11 11-13	Laboratorio didattico, cortile (corso Raffaello)
AMEBE, GIARDIA CRIPTOSPORIDI, ISOSPORA, MICROSPORIDI I protozoi e la diarrea Esercitazioni	2	2	12/5 12/5	9-11 11-13	Laboratorio didattico, cortile (corso Raffaello)
NEMATODI INTESTINALI, FILARIE, SCHISTOSOMI I parassiti dimenticati	2		19/5	11-13	Aula 5 via Accademia Albertina
TENIE Cisti e cisticerchi	2		26/5	9-11	Laboratorio didattico, cortile (corso Raffaello)
ELMINTI Esercitazione		2	26/5	11-13	Laboratorio didattico, cortile (corso Raffaello)
CONTROLLO E PREVENZIONE Caso didattico. Zanzibar esperienza di un laboratorio di salute pubblica		2	9/6	11-13	Aula 5 via Accademia Albertina

SUGGESTED TEXTBOOKS AND READINGS

The teaching material and content presented and discussed during the lectures is available on University website in Cell Biology under the topic Course of General and human Parasitology.

The text recommended for the training is :
Ivo de Carneri "Parassitologia medica e diagnostica parassitologica" Casa Editrice Ambrosiana

The use and reading of the following texts is an added advantage for more detailed knowledge and insights:
District Laboratory Practice in Tropical Countries, Cheesbrough, Ed. Tropical health technology

Basic laboratory methods in medical parasitology, OMS Ginevra

Atlas of Medical Parasitology, www.cdfound.to.it, Editor P. Caramello

The following websites could be of interest:

www.who.int
www.simetweb.it
www.gnntdc.sabin.org
www.ilgirodelmondo. it
www.cdfound.to.it
www.cdc.gov

www.tropicalmed.eu

NOTE

The course is hold every other year and therefore gathers students of the 1st and 2nd year.

The participants who are particularly motivated and interested to develop topics of parasitology for their thesis may be followed and supervised in stages according to the availability of time and resources of the lecturer.

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=r63i

---

STRUCTURE OF MACROMOLECULES AND PROTEOMICS

STRUCTURE OF MACROMOLECULES AND PROTEOMICS

Academic year:	2017/2018
Course ID:	SVB0049
Teacher:	Dott. Giovanna Di Nardo Prof. Sheila Sadeghi
Teacher contacts:	0116704689, *giovanna.dinardo@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	2nd year
Type:	Distinctive
Credits/recognition:	6
Course SSD (disciplinary sector):	BIO/10 - biochimica
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written and oral (optional)

COURSE OBJECTIVES

The course provides the student the fundamental knowledge about protein folding, structure and the spectroscopic techniques used to study protein conformation and solve their 3D structure, with particular emphasis on protein crystallography.

It also provides the knowledge of instrumentation and techniques employed and conceptual approaches to interpret current studies in the field of proteomics and equipment of protein arrays and protein chips. The course provides students with detailed knowledge of: - Structure-function relationships of biological macromolecules - The study of protein folding - Evolution of protein structures and protein modules – Spectroscopy applied to biological macromolecules – X-ray crystallography - Techniques for the study of the proteome - Protein arrays and protein chips.

Laboratory-based experiments on protein crystallization and protein stability analysis through calorimetry (DSC) will provide the student a practical overview of the approaches that can be used for protein folding and structure studies.

COURSE AIMS

KNOWLEDGE AND SKILLS UNDERSTANDING . Knowledge of the different levels of protein structure and their graphical representation . Structural interpretation in terms of polypeptide chain folding. Functional interpretation of binding and catalytic sites of proteins / enzymes , starting from the nature of amino acids.

APPLYING KNOWLEDGE AND UNDERSTANDING. Visualize, calculate and study the protein structures using molecular graphics software.

JUDGEMENT. Recognition of molecules and structures in the graphical representation in databases. Interpretation of Molecular Biology basic protocols.

COMMUNICATIONS SKILLS. Written test on the practicals part about molecular mechanics approaches .

LEARNING ABILITY. Familiar with protein databases and tools available online.

COURSE DELIVERY

Lectures: 36 hours; Practicals: 24 hours

Lecture attendance is optional, while practicals is compulsory.

LEARNING ASSESSMENT METHODS

Final written exam with 3 open questions:

- one question on the module of Dr. Di Nardo (50% of the final grade)

- one of them on the module of Prof. Sadeghi (30% of the final grade)

- one question on the Practicals of "Protein bioinformatics" (10% of the final grade)

The seminars of the students, based on an original research article about a protein structure, are also assessed (10% of the final grade).

The final grade will be expressed in a maximum of 30.

The examination committee reserves the right to have an oral exam to clarify the preparation of the student before registering the vote.

SYLLABUS

PROTEIN STRUCTURE

• Protein structure classification according to Linderström-Lang, superscondary structure, protein domain classification

• Membrane proteins

- Biological spectroscopy: fluorescence, circular dichroism and IR.
- Structure resolution by X-ray crystallography
- Practical on crystallization of lysozyme and basics on analysis of x-ray diffraction images

• Protein structure: comparison, classification and prediction. Prediction of protein function from sequence and structure

• Practical class molecular modelling: construction and evaluation of protein models, ligand docking, docking of protein structures and domains

• Protein folding: Key concepts and methods, Thermodynamics, Kinetics, Effect of denaturants on rates of folding and unfolding, The molten globule, Folding funnels, Folding patterns, Protein misfolding and chaperons, Proteins misfolding and disease

• PROTEOMICS

• Technical background on electrophoretic methods-2DE-DIGE

• Obtaining and scanning gel maps, Image analysis software for matching and semi-quantitative analysis.

• Mass spectrometry (MS) for proteomics (Maldi, ESI, De novo sequencing). Data analysis.

• Examples of application of 2DE and MS for diagnostics and research: presentation of recent papers on various

fields of proteomics research.

• Protein array and protein chip: overview on available approaches and detection (SPR, fluorescence).

• Immobilisation strategies for arrays and chips. Nanoarrays and nanotechnologies applied to the development of protein chips. Examples of protein chips applications.

• Functional proteomics: activity based protein profiling (ABPP), theory and examples.

SUGGESTED TEXTBOOKS AND READINGS

- A.M-Lesk: Introduction to protein science. Architecture, functions and genomics, Oxford University Press
- AC supply Orengo, D.T. Jones & J.M. Thornton: Bioinformatics. Genes, protein & Computers
- BIOS Scientific Publishers Limited It 'strongly advised to use the following material for insights and additions:
- Powerpoint presentations and lecture notes;
- Articles and reviews taken from the literature as shown in class.

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=i0lm

SYSTEMS BIOLOGY

SYSTEMS BIOLOGY

Academic year:	2017/2018
Course ID:	SVB0050
Teacher:	Francesca Cordero Prof. Michele Caselle
Teacher contacts:	+39-011-6706773, *francesca.cordero@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	2nd year
Type:	Related or integrative
Credits/recognition:	6
Course SSD (disciplinary sector):	FIS/02 - fisica teorica, modelli e metodi matematici INF/01 - informatica
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written and oral

COURSE OBJECTIVES

This is a 6 credit course aimed to provide theoretical, technical and methodological background to Systems Biology Particular attention will be focused on Gene Regulation and Network Theory.

COURSE AIMS

KNOWLEDGE AND LEARNING SKILLS. Theoretical approaches for the quantitative study of gene regulation

USE OF KNOWLEDGE AND LEARNING SKILLS. At the end of the course, the student is expected to be able to:
- use mathematical modelling to discuss relavant issues in Systems Biology
- understand the main results published on a research paper
- prepare a presentation based on a research paper in Systems Biology

COURSE DELIVERY

The course is articulated in two parts of 24 hours each of formal in-class lectures.

LEARNING ASSESSMENT METHODS

The course grade is determined on the basis of a written examination for the first part and an oral discussionfor the second part.

SUPPORT ACTIVITIES

Weekly homework sets will be assigned.

SYLLABUS

Microarray platforms, Next Generation Sequencing platforms. Experimental design. Microarray: data acquisition and primary analysis. Signal normalization. Data filtering. Differential expression techniques (Linear models, permutation based statistics). Classification methodologies. Meta-analysis techniques. Next Generation Sequencing: algorithms for

short reads mapping.
Complex Systems:
Quantitative description of Biological Systems using mathematical and physical methods. In particular, after a short introduction to Statistical Mechanics, we shall discuss the applications of network theory and computer simulations to
the study of complex biological systems.

SUGGESTED TEXTBOOKS AND READINGS

U. Alon, Introduction to Systems Biology, Chapman & Hall/CRC

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=1f5y

VIROLOGY

VIROLOGY

Academic year:	2017/2018
Course ID:	SVB0046
Teacher:	Prof. Giorgio Gribaudo
Teacher contacts:	0116704648, *giorgio.gribaudo@unito.it*
Degree course:	Cellular and Molecular Biology
Year:	1st year
Type:	Distinctive
Credits/recognition:	6
Course SSD (disciplinary sector):	BIO/19 - microbiologia generale
Delivery:	Formal authority
Language:	English
Attendance:	Lessons optional and laboratories mandatory
Type of examination:	Written

PREREQUISITES
Basic knowledge of General and Applied Microbiology, Cell Biology, Molecular Biology, Immunology (First level degree).

COURSE OBJECTIVES

This course aims to provide students with an advanced knowledge of cell and molecular biology of animal viruses, of the interactions between viruses and cells in which they replicate, and of the applications of viruses to deliver and express either their own or foreign genes.

Specific objectives are to learn:

- the repertoire of viral strategies for genome replication and expression;
- the principles of viral pathogenesis: from the infection of single cells in the laboratory to the interplay with their host organisms and spread in populations;
- how to cultivate and assay viruses in the laboratory;
- the principles involved in developing methods of treatment and control of viral infections;
- how to engineer viral genomes to deliver and express specific genes.

COURSE AIMS

Knowledge and understanding: At the end of the course, students will have to prove:

- to know:

- the diversity of the molecular strategies of virus replication;
- the principles of viral pathogenesis
- the basic methodology for virus cultivation and assay;
- the principles of control and prevention of viral diseases;
- the most important applications of viruses to deliver and express genes of interest;

- to understand:

- how to design and develop a candidate antiviral drug or vaccine;
- what methodological approach based on engineering of viral genomes should be used to deliver and express genes to answer a specific problem;
- how to exploit this knowledge to develop a potential vaccine or therapeutic strategy.

Acquisition of this knowledge and understanding will be assessed through the Multidisciplinary Midterm Test (MMT), the evaluation of the Multidisciplinary Research Project (MRE), and the Final exam.

Applying knowledge and understanding: At the end of the course, students are expected to be able:

- to integrate the theoretical and methodological knowledge acquired with the course of Virology with those learned in the courses of Advanced Cell Biology and Biotechnology, and Cell Physiology;
- to carry out literature searches on topics of the course;
- to analyze and understand scientific papers and technical reports;
- to select methodological and technical approaches among those learned for planning a research project to answer a specific scientific question;
- to organize and present a written report dealing with the development of a research project that address a specific scientific problem.

Acquisition of these skills will be tested through both discussion during lessons and evaluation of the Multidisciplinary Research Project (MRE).

Making judgements: Students will be able to integrate data from the scientific literature with the acquired knowledge, to formulate independent judgements about the choice of methodologies and technical approaches relevant to the preparation of the Multidisciplinary Research Project (MRE).

Verification of judgement will be carried out through evaluation of Multidisciplinary Research Project (MRE).

Communication skills: Comprehension and practice of English language for oral and written communication. Preparation and presentation of the Multidisciplinary Research Project (MRE).

COURSE DELIVERY

The course consists in 48 hours of formal in-class lectures and in at-home activity to prepare the Multidisciplinary Research Assay.

LEARNING ASSESSMENT METHODS

Midterm Multidisciplinary Test (MMT, optional) – This test will be in common with the courses of Advanced Cell Biology and Biotechnology, Cell Physiology, and Virology. It will be a Moodle-based test of 30 questions (10 for each course): 27 with a variety of formats (multiple choice, true/false, filling in checklists) and three open questions. The optional midterm Multidisciplinary test will give rise to additional points to the final grade of final exam of each of the three courses, provided this will be passed in the first session (January-February 2016). Correspondence between Midterm Multidisciplinary Test vote and additional points for final exams is as follows: 22-23/32, 0.5 points; 24-25/32, 1 points; 26-27/32, 1.5 points; 28-30/32, 2 points.

Multidisciplinary Research Essay (MRE, optional) – This at-home assignment will be in common with the courses of Advanced Cell Biology and Biotechnology, Cell Physiology, and Virology, and will refer to methodologies and technical approaches relevant to the three courses. The essay (up to 2000 characters + figures, tables and references) will be prepared by groups of normally three students and orally presented for discussion with Teachers at the end of courses. The optional Multidisciplinary Research Essay will give rise to additional points to the final grade of final exam of each of the three courses, provided this will be passed in the first exam session (January-February 2016). Correspondence between vote to the Multidisciplinary Research Essay and additional points for final exams is as follows: 22-23, 0.5 points; 24-25, 1 points; 26-27, 1.5 points; 28-30, 2 points.

Final exam – This exam will be a Moodle-based test of 22 questions with different formats (multiple choice, true/false, filling in checklists) and two open questions for a maximum grade of 32/30. Grading 31 and 32 will give

rise to " 30 cum laude". Any additional points obtained by MMT and MRE will be added to the final exam of the first exam session (January-February 2016).

Upon student's request, an integrative oral examination can be taken.

SYLLABUS

- Cell and molecular biology of animal viruses: the infectious cycle, the diversity of replicative strategies of DNA and RNA viruses,
- Basic techniques for virus cultivation and assay. Principles of diagnostic virology.
- Virus-host cell interactions. Pathogenesis of viral infections: dissemination, virulence and epidemiology. Oncogenic viruses and mechanisms of transformation and oncogenesis.
- Selected DNA virus infections.
- Selected RNA virus infections.
- Prevention and control of viral infections and diseases. Antiviral drugs: mechanisms of action of approved molecules. Examples of the design, discovery, and validation of candidate antiviral compounds.
- Vaccine: a proven defense against viral infections. Examples of the discovery and development of candidate viral vaccine targets.
- Engineering viral genomes to deliver and express genes of interest. Rational design, development and applications of the most common viral vectors. Examples of viral vectors: AAV, Adenovirus, Baculovirus, Poxvirus, Retrovirus). Examples of applications of viral vectors for protein expression, gene delivery, gene therapy, and vaccine development.

SUGGESTED TEXTBOOKS AND READINGS

The material presented in class is available at the E-Learning (Moodle) platform (http://cmb.i-learn.unito.it/).

The following textbooks are recommended and available at the DBIOS library:

Flint et al., Principles of Virology, vol. 1 and 2, 3rd Ed. ASM Press, Washington, 2009.

Acheson, N.H., Fundamentals of Molecular Virology, 2nd Ed. Wiley 2011.

Course webpage: http://cmb.campusnet.unito.it/do/corsi.pl/Show?_id=ve4g